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Amateur Radio

CQ

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In this issue:

Lew McCoy Talks Antennas . . .

Bill Orr on Intermodulation Distortion . . .

Doug DeMaw on Solid State VFO Interfacing . . .

Golden Oldies from Dave Ingram . . .

Complete Coverage on the 1990 CQ WW DX Phone Contest . . .

and lots more great reading!

On The Cover: KY1H, Peru, MA

THE RADIO AMATEUR'S JOURNAL

KENWOOD

TS-950SD

"DX-clusive" HF Transceiver

The new TS-950SD is the first Amateur Radio transceiver to utilize Digital Signal Processing (DSP), a high voltage final amplifier, dual fluorescent tube digital display and digital meter with a peak-hold function.

The Ultimate Signal.

• Dual Frequency Receive Function. The TS-950SD can receive two frequencies simultaneously.

• New! Digital AF filter. Synchronized with SSB IF slope tuning, the digital AF filter provides sharp characteristics for optimum filter response.

• New high voltage final amplifier. 50 V power transistors in the 150-watt final section, resulting in minimum distortion and higher efficiency. Full-power key-down time exceeds one hour.

• New! Built-in microprocessor controlled automatic antenna tuner.

• Outstanding general coverage receiver performance and sensitivity. Kenwood's Dyna-Mix™ high sensitivity direct mixing system provides incredible performance from 100 kHz to 30 MHz. The Intermodulation dynamic range is 105 dB.

• Famous Kenwood interference reduction circuits. SSB Slope Tuning, CW VBT (Variable Bandwidth Tuning), CW AF tune, IF notch filter, dual-mode noise blanker with level control, 4-step RF attenuator (10, 20, or 30 dB), switchable AGC circuit, and all-mode squelch.

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

DSP

Digital Signal Processing

Without DSP With DSP

• Digital Signal Processor. DSP is a state-of-the-art technique that maximizes your transmitted RF energy.

• High performance IF filters built-in† Select various filter combinations from the front panel. For CW, 250 and 500 Hz, 2.4 kHz for SSB, and 6 kHz for AM. Filter selections can be stored in memory!

• *Multi-Drive Band Pass Filter* (BPF) circuitry. Fifteen band pass filters are available in the front end to enhance performance.

• Built-in TCXO for the highest stability.†
• Built-in electronic keyer circuit.
• 100 memory channels. Store independent transmit and receive frequencies, mode, filter data, auto-tuner data and CTCSS frequency.
• Digital bar meter.

Additional Features: • Built-in interface for computer control • Programmable tone encoder • Built-in heavy duty AC power supply and speaker • Adjustable VFO tuning torque • Multiple scanning functions • MC-43S hand microphone supplied

Optional Accessories
- DSP-10 Digital Signal Processor *
- SO-2 TCXO* • VS-2 Voice synthesizer
- YK-88C-1 500 Hz CW filter for 8.83 MHz IF*
- YG-455C-1 500 Hz CW filter for 455 kHz IF*
- YK-88CN-1 270 Hz CW filter for 8.83 MHz IF
- YG-455CN-1 250 Hz CW filter for 455 kHz IF*
- YK-88SN-1 1.8 kHz SSB filter for 8.83 MHz IF
- YG-455S-1 2.4 kHz SSB filter for 455 kHz IF*
- SP-950 External speaker w/AF filter
- SM-230 Station monitor w/pan display
- SW-2100 SWR/power meter
- TL-922A Linear amplifier (not for QSK)

* Built-in for the TS-950SD
† Optional for the TS-950S

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KENWOOD

TM-731A/631A

144/450 and 144/220 MHz FM Dual Banders

- **Extended receiver range** (136.000 – 173.995 MHz) on 2 m; 70 cm coverage is 438.000 – 449.995 MHz; 1-1/4 m coverage is 215 – 229.995 MHz. (Specifications guaranteed on Amateur bands only. Two meter transmit range is 144 – 148 MHz. Modifiable for MARS/CAP. Permits required.)
- **Separate frequency display for "main" and "sub-band."**
- **Versatile scanning functions.** Dual scan, and carrier and time operated scan stop.
- **30 memory channels.** Stores everything you need to make operating easier. Two channels for "odd splits."
- **50 Watts on 2 m, 35 watts on 70 cm, 25 watts on 1-1/4 m.** Approx. 5 watts low power.
- **Automatic offset selection.**
- **Dual antenna ports.**
- **Automatic Band Change (A.B.C.)** Automatically changes between main and sub-band when a signal is present.
- **Dual watch function allows VHF and UHF receive simultaneously.**
- **CTCSS encode/decode selectable from front panel or UP/DWN keys on microphone.** (Encode built-in, optional TSU-6 needed for decode.)
- **Balance control and separate squelch controls for each band.**
- **Full duplex operation.**
- **Dimmer switch.**
- **16 key DTMF/control mic. included.**
- **Frequency (dial) lock.**

Optional Accessories:

• **PG-4H** Extra interface cable for IF-20 (for three to four radios) • **PG-4J** Extension cable kit for IF-20 DC and audio • **PS-430** Power supply • **TSU-6** CTCSS decode unit • **SWT-1** 2 m antenna tuner • **SWT-2** 70 cm antenna tuner • **SP-41** Compact mobile speaker • **SP-50B** Deluxe mobile speaker • **PG-2N** DC cable • **PG-3B** DC line noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MA-700** Dual band 2 m/70 cm mobile antenna (mount not supplied) • **MB-11** Mobile bracket • **MC-43S** UP/DWN hand mic. • **MC-48B** 16-key DTMF hand mic.

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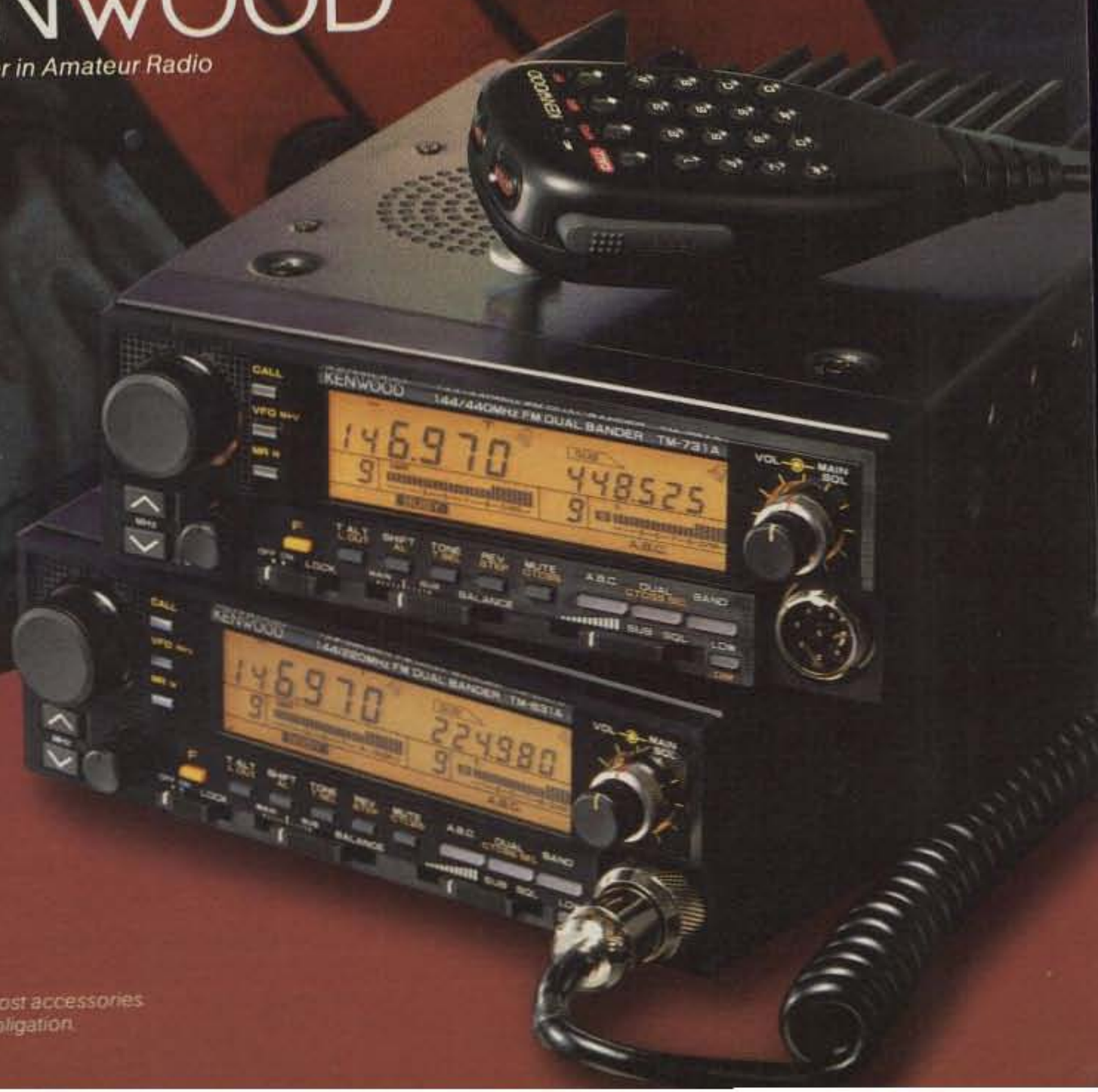
"Dynamic Duals"



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

KENWOOD

Compact Champion!

TH-27A/47A

2 m and 70 cm Super Compact HTs

Here is a great new addition to Kenwood's HT family – the all new TH-27A for 2 meters and TH-47A for 70 cm! Super compact and beautifully designed, these pocket-sized twins give you full-size performance.

- **Large capacity NiCd battery pack supplied.** The standard battery pack is 7.2 volts, 700 mAh, providing extended transmit time with 2.5 watts. (TH-47A: 1.5 W.)
- **Extended receive coverage.** TH-27A: 118–165 MHz; TH-47A: 438-449,995 MHz. TX on Amateur bands only, (TH-27A modifiable for MARS/CAP. Permits required. Specifications guaranteed for Amateur bands only.)
- **Multi-function scanning.** Band and memory channels can be scanned, with time operated or carrier operated scan stop.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- **Built-in digital clock** with programmable timer.
- **Dual Tone Squelch System (DTSS).** Compatible with the TH-26AT Series and the TM-941A Triple bander, as well as other Kenwood series transceivers, this selective calling system uses standard DTMF to open squelch.
- **Five watts output** when operated with PB-14 battery pack or 13.8 volts.
- **T-Alert for quiet monitoring.** Tone Alert beeps when squelch is opened.
- **Auto battery saver, auto power off function, and economy power mode extends battery life.**
- **DTMF memory.** The DTMF memory function can be used as an auto-dialer. All characters from the 16-key pad can be stored, allowing repeater control codes to be stored!
- **41 memories.** All channels store receive and transmit separately for "odd split."
- **DC direct in operation.** Allows external DC to be used (7.2 – 16 volts). When external power is used, the batteries are being charged. (PB-13 only.)
- **Automatic offset selection (TH-27A).**
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **CTCSS encode/decode built-in.**
- **Supplied accessories:** Rubber flex antenna, battery pack, wall charger, belt hook, wrist strap, dust caps.

Optional accessories:
- **BC-14:** Wall charger for PB-13, 14
- **BC-15:** Rapid charger for PB-13, 14
- **BH-6:** Swivel mount • **BT-8:** Six cell AA Alkaline battery case • **HMC-2:** Headset with VOX and PTT • **PB-13:** 7.2 V, 700 mAh NiCd pack • **PB-14:** 12 V, 300 mAh NiCd pack • **PG-3F:** DC cable with filter and cigarette lighter plug • **PG-2W:** DC cable • **SC-30:** Soft case • **SMC-31:** Standard speaker mic • **SMC-32:** Compact speaker mic
- **SMC-33:** Compact speaker mic with controls
- **WR-2:** Water resistant bag.

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CQ The Radio Amateur's Journal

ON THE COVER: Dave Robbins, KY1H, uses this setup at his Peru, Mass. QTH to while away an occasional weekend chasing a few multipliers. Dave's lash-up shows once again, that the elaborate station set-up is not an absolute necessity for having fun in a CQ DX contest. (Photo by Larry Mulvehill, WB2ZPI)

SEPTEMBER 1991 **VOL. 47, NO. 9**

FEATURES

DEPARTMENTS

ZERO BIAS EDITORIAL

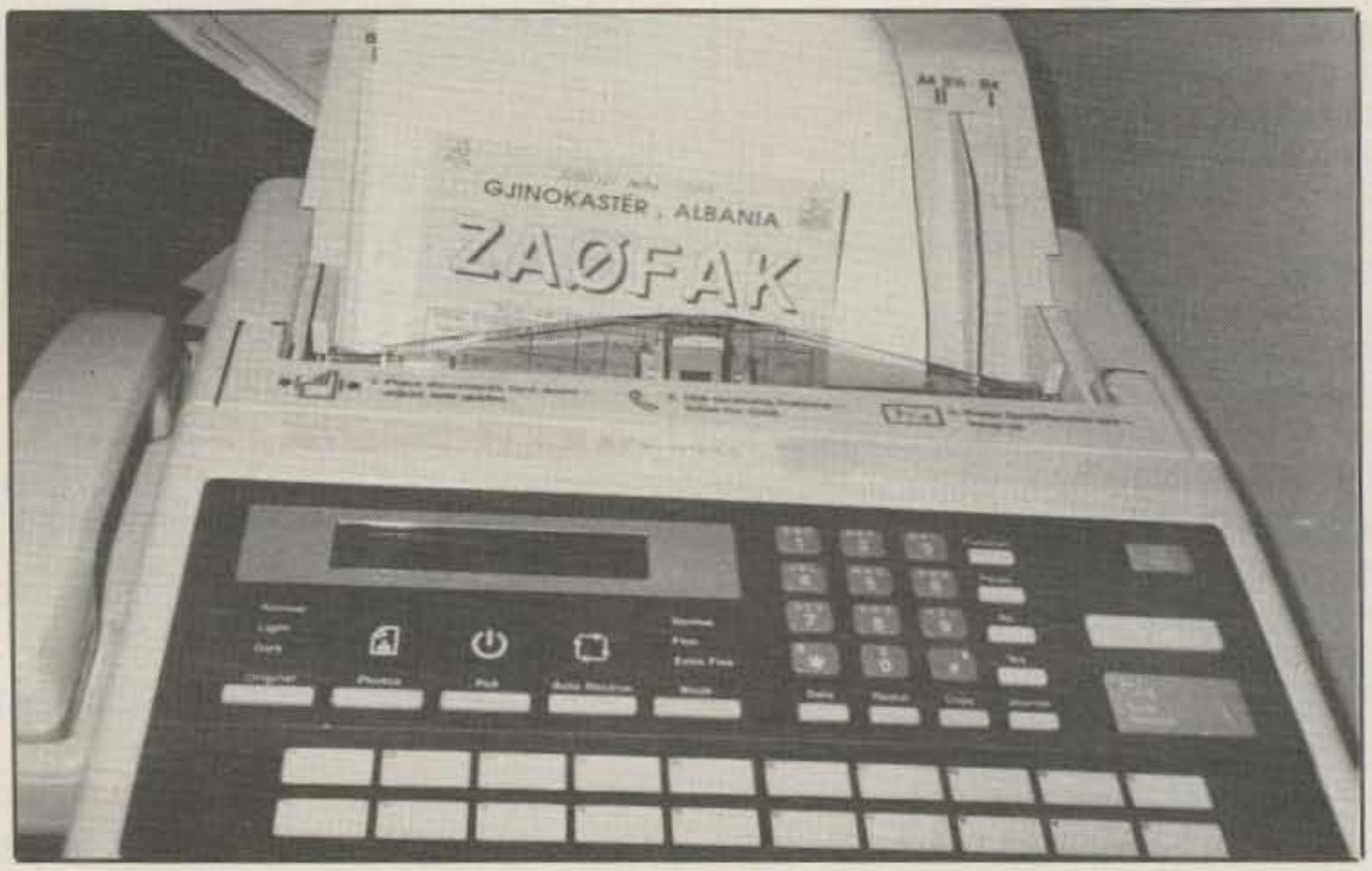
The other day I received a copy of a video tape from Jack Reed, WA7LNW, on the PJ9W operation during our 1990 CQ WW DX Contest. At first viewing it is a most imposing effort (as their score attests), and on some levels it is sort of depressing in that it's hard to imagine competing against it. If you get a chance to view the tape, you'll see what happens when determination, planning, unbounded imagination, and apparently unbounded funds co-mingle. Of course, let's not forget to mix in ability, talent, and expertise, too.

Basically, this contest effort represents everybody's fantasy whereby you design the perfect or perceived ultimate anything and then are able to use it or do it, and everything is wonderful. For the Finnish group, at least, there is no doubt that things were wonderful and came out pretty much as planned. At the moment I can't think of what they or any other group can do to top that score.

I think that it's safe to say that most of us will not attain scores of that magnitude nor undertake a DXpedition resembling a military operation. A lot of us will still go all out, no holds barred, for this event, even though we know we may run up against another PJ9W. Obviously, most of us know that we have only two chances to win—slim and none. However, the excitement and the rush exist in being part of the contest and not necessarily its winner. We all tend to be deadly serious in the quest for something, making most of us more competitive than we think we are. Even the most dedicated "couch potato" among us can become the hunter if the goal or prey is right. The chase for the world record, a certain number of countries, counties, prefixes, islands, or whatever can drive us wild, albeit seriously wild.

Speaking of serious, a great deal of the PJ9W videotape shows many of the Finnish team seriously hard at work assembling the antennas and the various stations. Some of the dialogue between the members was in Finnish, and it was hard at times to tell whether or not they were having a good time for all this effort. Maybe it's just me, but I have difficulty at times in "reading" the faces of Scandinavian people. As with other peoples it is easier to tell what's going on by their facial expressions alone. Well, one thing for sure is these people were serious about what they were doing. However, at the end, setting aside all the high-tech gear, the specialized antenna systems, the banks of computers, etc., the group huddled around a table while one member anxiously did a quick final total on a small hand-held calculator and came up with the record-breaking score. Suddenly, as if by magic, they all had this wondrous expression of glee and happiness. There was the shouting and the joy that says in any language, this was worthwhile, this was worth all the pain, this was my moment.

Well, we all get that moment to some degree in achieving anything new. Some get it by edging up their score from a previous contest, others from a few new countries added to their total. Teams, clubs, and groups get it from working together towards some common goal and enjoy recounting the experiences, funny and otherwise, that took place during the short period. Whatever the reason, whether we would like to admit it or not, we tend to enjoy the high that comes with competing. It's called *fun*.



FAX QSLing (FSLs)—when you just can't wait for that new one.

There is another side benefit to all of the contests on the air and all of the people who chase and collect whatever. It is that we provide the animus to those who dislike everything happening in amateur radio except for what *they* do in it. These people need their fun, too. Their enjoyment comes in complaining, exhorting, and letter writing (a form of QSLing). So, all of this doing and achieving has something in it for everyone.

I expect to hear a lot of you in this year's CQ World-Wide Contest trying to make a lot of people, including yourself, happy. Enjoy. That's what it's all about.

FSLs

Contests mean hundreds, if not thousands, of contacts. While some of us diligently QSL these contacts for various awards, it generally takes a long time for us to see the results of these contacts—the return QSL. If you're among the few amateurs who are bored and blase about QSLing or indifferent to either sending or receiving QSL cards, then skip the rest of this editorial and go on to the articles. If you're one of those amateurs who think that DXing or award chasing is a blatant conspiracy perpetrated by money-hungry, zillionaire QSL printers, then skip to the articles. If you're interested in utilizing the latest technology to enhance your amateur radio fun and expand your possibilities, then read on.

First I have to admit that this was done purely as an experiment to see if it could be done in real time, and was not something designed to drive the folks up in Newington to stock up on antacid tablets. The idea for the test came from Michael Klein, KC3NE. It was used on a small scale in 1990, with further testing scheduled later in the year. I'll let KC3NE describe what's been going on:

"You've heard the adage 'Work 'em first, worry later.' Well, why worry? FAX manufacturers are now taking a hint from rig manufacturers and are getting into the DXpedition-for-promotions biz. That's why on the next big DXpedition *(unnamed so far—ed.)*, FAX machines will go along. When the DX station gives his ID, the operator will also announce a FAX number. That way you can run out to the local Quickie Copy store that has a FAX machine (until you get your own), whip your QSL through the machine, and send your card directly to the DXpedition. Within minutes the DX operator will FAX back his card. No IRCs, no green stamps, no bureaus, no mess, no fuss. Just reach out and touch either CQ-DX or DXCC. It's the next best thing to being there."

While strictly unauthorized at the moment, FSLs may be the wave of the future and the shape of things to come.

New World Record Set

If you check page 46, you'll read about a new world record for amateur radio communications—154 miles. To a lot of us communicating over 154 miles doesn't sound like DX or something that is hard to do. At the moment, however, none of our major amateur radio equipment manufacturers market gear for this frequency, and I doubt that they have any plans to do so in the immediate future. We're talking about laser communications here, and 154 miles is quite a bit of DX. The equipment may look strange and different, but it's still amateur radio and it's still exciting.

73, Alan, K2EEK

AEA is...

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If you want the best Packet or multi-mode equipment available, look no further. These data controllers have no equal when it comes to features, performance and value.

The versatile DSP-2232 (above) is simply the most powerful multi-mode controller available to amateurs. It features Digital Signal Processing modems, dual simultaneous ports, all known amateur digital modes, Packet and AMTOR mailboxes, and much more.

The legendary PK-232MBX (top right) has long been the most popular data controller ever, and is still going strong. Includes: Chebyshev filter design, Host Mode, Signal Identification mode and more. With features like these, no wonder it's number 1.

For Packet only, the PK-88 (center) and its PC-compatible plug-in counterpart, the PCB-88 (bottom right) offer AEA's famous Host Mode, Packet maildrop, KISS mode, lithium battery-backed RAM...the list goes on and on.

When hams think of Packet, they think of AEA.

AEA *is* Packet...plus!

For complete information on these or any other AEA products, call the toll-free Info-Line at (800)432-8873.

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AR1000 $499

1000 Channels. 8-600MHz, 805-1300MHz

Standard Features:

- Extremely compact size.
- Continuous coverage (except UHF TV 600-805)
- Antenna attenuator switch, 10db.
- Manual tuning knob.
- Earphone jack, 3.5mm.
- AM, FM and wide band FM tuning modes.
- Backlighted LCD display.
- 10 Scan Banks, 10 Search Banks.
- Selectable Priority Channel.
- Delay, Hold Features.
- Selectable Search Increments, 5-955KHz.
- Permanent memory backup.
- 4 AA Ni Cad batteries included.
- AC adaptor/charger.
- Carry Case.
- Cigarette Lighter Charger.
- Belt Clip.
- Earphone.

Options:

External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs		$45/$55

Specifications:

Coverage:	8-600, 805,1300MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM
Speed:	20 ch/sec. scan. 40 ch/sec. search
IF:	561.225, 58.075, 455KHz or 10.7MHz
Increments:	5 to 955KHz selectable/ 5 or 12.5 steps.
Audio:	.4 Watts
Power:	Input 9 - 13.8 V. DC
Antenna:	BNC
Display:	LCD
Dimensions:	6 7/8H x 1 3/4D x 2 1/2W. 12oz wt.

AR950 $239

100 Channels. Low, Air, High, UHF & 800MHz.

Standard Features:

- Extremely compact size.
- Unrestricted 800MHz coverage.
- 100 channels permanent memory.
- Earphone Jack & Attenuator.
- Delay, Hold features.
- Channel 1 Priority.
- 5 Scan Banks, 5 Search Banks.
- Telescopic and Flexible Antennas w/ BNC connector.
- AC & DC Power cords w/ mtng hardware.
- One Year Limited Warranty.

Options:

Base type antenna 25 to 1000MHz w 50'coax.	AS300	$59.95
Mag Mnt Mobile Antenna. 15' coax.	MA100	$25.00
Cigarette Lighter power adaptor.	CP100	$4.00
External Speaker with mobile mount.	MS100	$19.50
Extended Warranty. 2/3 yrs		$40/$55

Specifications:

Coverage:	27-54, 108-174, 406-512, 830-950MHz
Sensitivity:	.4uV Lo,Hi. .8uV Air. .5uV UHF. 1.0uV 800
Scan Speed:	15 ch/sec.
IF:	21.4MHz, 455KHz
Increments:	10,12.5,25,30
Audio:	1W
Power:	12.8VDC, 200MA
Antenna:	BNC
Display:	LCD w/backlight
Dimensions:	2 1/4H x 5 5/8W x 6 1/2D. 14oz wt.

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ACE COMMUNICATIONS

AR2500 $499

2016 Channels. 1 MHz to 1500 MHz

Standard Features

- Continuous coverage
- AM, FM, wide band FM, & BFO for SSB, CW.
- 64 Scan Banks.
- 16 Search Banks.
- RS232 port built in.
- Includes AC/DC pwr crd. Antenna, Mntng Brckt.
- One Year Limited Warranty.

Options:

Earphone.	EP200	$2.00
External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs.		$65/75
Mobile Mounting Bracket.	MM1	$14.90
RS232 Control Package (software & cable) offers spectrum display and database.	SCS2	$295.00

Specifications:

Coverage:	1 MHz - 1500MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM/SSB/CW
Speed:	38 ch/sec. scan. 38 ch/sec. search
IF:	750.00, 45.0275, 5.5MHz 455KHz
Increments:	5,12,5,25 KHz
Audio:	1.2 Watts at 4 ohms
Power:	Input 13.8 V. DC 300mA
Antenna:	BNC
Display:	LCD, backlighted.
Dimensions:	2 1/4H x 5 5/8W x 6 1/2D Wt. 1lb.

AR3000 $995

400 Channels. 100KHz to 2036MHz.

Standard Features:

- Extremely compact size.
- Continuous coverage
- Attenuation Programmable by Channel.
- Manual tuning knob.
- Tuning increments down to 50Hz.
- AM, FM, wide band FM, LSB, USB, CW modes.
- Backlighted LCD display.
- 4 Scan and Search Banks, Lockout in Search.
- 4 Priority Channels.
- RS232 control through DB25 connector.
- Delay, Hold Features.
- 15 band pass filters, GaAsFET RF amp.
- Sleep and Alarm Features.
- AC adaptor/charger. DC power cord.
- Telescopic Antenna.

Options:

Earphone.	EP200	$2.00
External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs.		$65/75
Mobile Mounting Bracket.	MM1	$14.90
RS232 Control Package (software & cable) offers spectrum display and database.	SCS3	$295.00

Specifications:

Coverage:	100KHz - 2036MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM/SSB/CW
Speed:	20 ch/sec. scan. 20ch/sec. search
IF:	736.23, (352.23) (198.63) 45.0275, 455KHz
Increments:	50Hz and greater
Selectivity:	2.4Khz/-6db (SSB) 12KHz/-6db (NFM/AM)
Audio:	1.2 Watts at 4 ohms
Power:	Input 13.8 V. DC 500mA
Antenna:	BNC
Display:	LCD
Dimensions:	3 1/7H x 5 2/5W x 7 7/8D Wt. 2lb 10oz.

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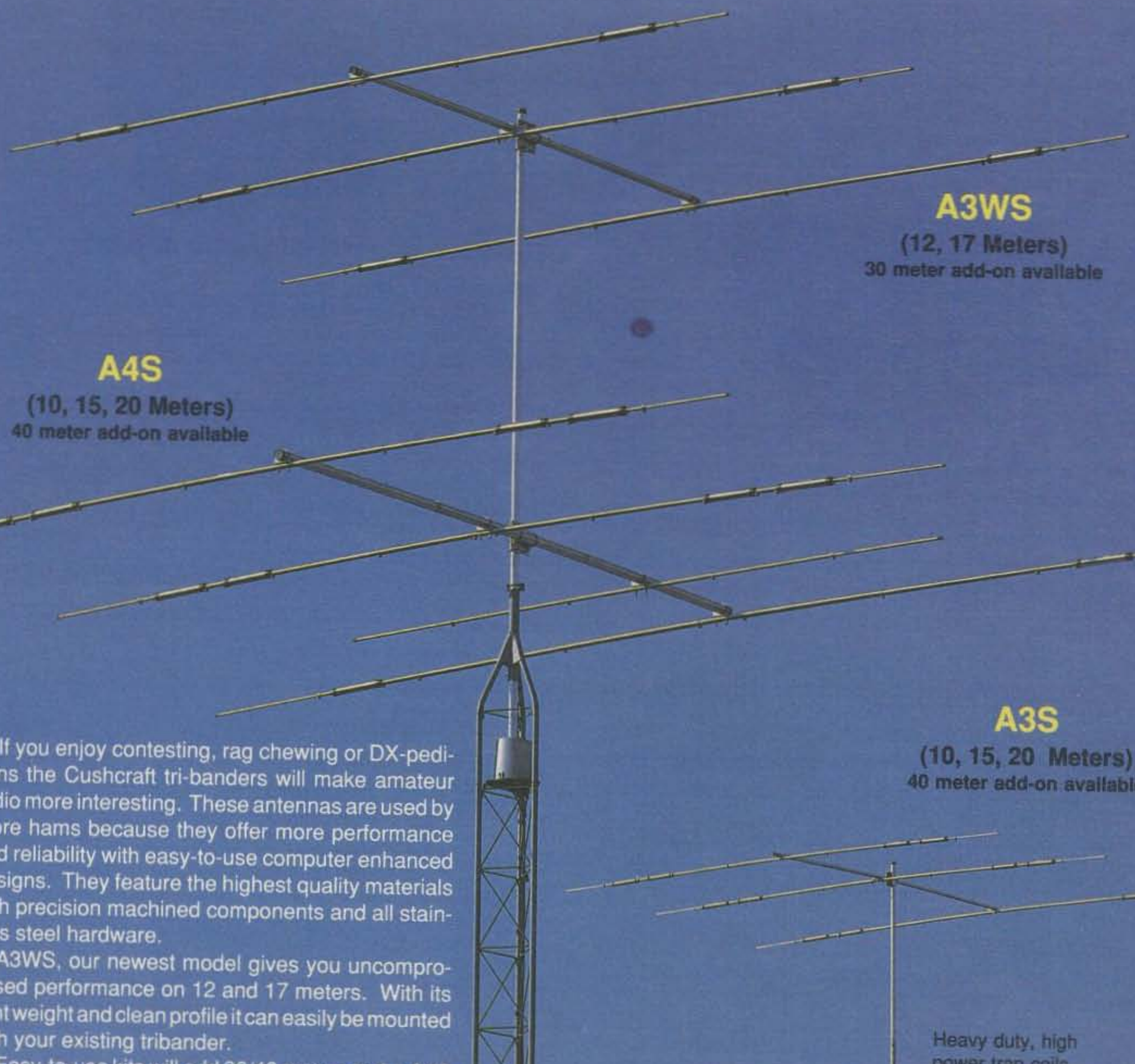

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A4S
(10, 15, 20 Meters)
40 meter add-on available

A3S
(10, 15, 20 Meters)
40 meter add-on available

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Forward Gain, dBd	8	8.9	8.0
Front to Back Ratio, dB	25	25	25
2:1 Bandwidth, KHz	>500	>500	300
Power Rating, Watts PEP	2000	2000	2000
Boom Length, ft (m)	14 (4.3)	18 (5.5)	14 (4.3)
Longest Element, ft (m)	27.7 (8.4)	32 (9.7)	25.1 (7.7)
Turning Radius, ft (m)	15.5 (4.7)	18.4 (5.5)	14.4 (4.4)
Mast Size Range, in	1.25-2.0	1.25-2.0	1.25-2.0
Wind Load, ft² (m²)	4.4 (0.47)	5.5 (0.51)	4.1 (0.38)
Weight, lb (kg)	27 (12.9)	37 (16.8)	22.5 (10.2)
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• The following Special Events will take place in September:

K2BR, from Miss America Pageant, Atlantic City, New Jersey; Southern Counties ARA; from 9 AM EST Sept. 9–14; Phone 25 kHz and CW 65 kHz inside lower General class band edge, Novice 28.100–28.500 MHz. For QSL send #10 SASE to SCARA, P.O. Box 121, Linwood, NJ 08221.

KD3XN, from Fort Delaware, Pea Patch Island, Delaware; Tristate ARC; Sept. 27–29 (no times given); 10, 12, 15, 17, 20 meters. Ops: N3EMY, N3IGK, N3ISR, KD3XN. For QSL send SASE to op worked.

KA3TFI & WF3T, from Harley-Davidson 88th anniversary, York, Pennsylvania; Hilltop Transmitting Assn.; 1400–0400Z Sept. 27–29; CW and SSB 80–10 meters General subbands, Novice 10 meters. For certificate send QSL and SASE to KA3TFI, RD #6 Box 119, Circle Drive, Red Lion, PA 17356.

AD4U, from Raylrode Daze Festival, Branchville, South Carolina; Edisto ARS; 10 AM to 10 PM EDST Sept. 28, 1 PM to 6 PM EDST Sept. 29; freq. 14.285, 21.375, 28.400 MHz (plus or minus QRM), and area 2 meter repeaters; For 8½ × 11 certificate send QSL and SASE to AD4U, P.O. Box 2045, Orangeburg, SC 29115-2045.

WD4DAT, from Bear Bryant Special Event, University of Alabama Campus, Tuscaloosa, Alabama; West Alabama ARS and University of Alabama ARC; 1300–2300Z Sept. 28; HF and packet (145.670 MHz and accessed through TCL5 digipeater) in the bottom 25 kHz of General phone band, 40–10 meters. For 8½ × 11 certificate send QSL and SASE to WAARS Special Event, P.O. Box 1741, Tuscaloosa, AL 35403-1741.

NR4R, from Choo-Choo Festival, Chattanooga, Tennessee; Chattanooga Choo-Choo Chapter of 10-10 International; 1300–2400Z Sept. 14–15; General/Novice portions of 40, 20, 15, 10 meters. For certificate send QSL and large SASE to Alice Jenkins, NR4R, One Mitchell Lane, Rossville, GA 30741.

4-land, from the James Madison Days, Madisonville, Kentucky; Hopkins County ARA; 1400–2100Z Sept. 28; General subbands and Novice 10 meter SSB. For certificate send QSL and SASE to Dwight Orten, KM4FO, 4785 Nebo Rd., Madisonville, KY 42431.

K4HY, from International Bluegrass Music Festival, Ohio River bank, Owensboro, Kentucky; Owensboro ARC; 1900Z Sept. 27 through 2200Z Sept. 29; lower portion of General bands, Novice portion of 10 meters. For certificate send QSL and 9 × 12 SASE to Bob Hardin, N4PNG, 57 Colonial Ct., Owensboro, KY 42303.

AA5KG, from 50th anniversary of Goodfellow Air Force Base, San Angelo, Texas; Sept. 13–14 (no times given); 40–12 meters and about 28.367 on 10 meters. For certificate send QSL and SASE (#10 for folded, 9 × 12 unfolded) or $1.00 to Al Peterson, AA5KG, 205 N. Oxford Dr., San Angelo, TX 76901.

W6TKV, from Barney Oldfield Special Event, Corona, California; Corona Norco ARC; 1600Z Sept. 14 to 2400Z Sept. 15; on 28,450, 21,350, 14,250, 7,270 kHz, and local 2 meter repeaters. For commemorative QSL send SASE and QSL to CNARC, P.O. Box 1783, Corona, CA 91718.

WB6WKF, from 18th anniversary of Hughes Aircraft Co. ARC, El Segundo, California; 1630–2400Z Sept. 7 and 1700–2300Z Sept. 8; lower portion of General 20 and 15 meters and lower Novice 10 meters. For certificate send #10 SASE to T. Reeves, KK6XC, 708 Flagler Ln., Redondo Beach, CA 90278.

W6PI, from Amador County Gold Country Jubilee, Amador County, California; Amador County ARC, 1700–0500Z (SSB on first half hour, CW on second half hour) Sept. 14–15; SSB and CW in lower 25 kHz of General subbands and Novice/Tech 10 meters. For commemorative QSL send QSL and SASE to ACARC, P.O. Box 1094, Pine Grove, CA 95665.

W6PIY, from 35th anniversary of West Valley ARA, San Jose, California; 1600–2200Z Sept. 15; CW 14055, 21120, 28120 and SSB 14250, 21350, 28450. For certificate send SASE to WVARA, P.O. Box 6544, San Jose, CA 95150-6544.

K8CJQ, from Allegan County Fair, Allegan, Michigan; Allegan County ARC; Sept. 6–14 (no times given); all band operation. For QSL (or SWL card) send SASE to ACARC, P.O. Box 8, Allegan, MI 49010.

WM8E, from 50th Preston County Buckwheat Festival, Kingwood, West Virginia; Preston County ops; 1400Z Sept. 27 to 0200Z Sept. 29; SSB or CW on 40, 20, 15, 10 meters approx. 25 kHz up from bottom of General voice or Novice CW bands. For certificate send QSL and SASE to John Wills, KE8NO, 104 Swartz Rd., Kingwood, WV 26537.

KB8BN, from 178th anniversary of Battle of Lake Erie, Perry's Victory and International Peace Memorial, Put-In-Bay, Ohio; Oliver Hazard Perry Expeditionary Force; beginning at 2100Z Sept. 6 through Sept. 8; 28.365, 21.365, 14.265, 3.965 MHz. For certificate send QSL and 9 × 12 SASE to Commodore Don Wills, 30372 Bates Rd., Perrysburg, OH 43551-3822.

KB9AVT, from 1991 Zimmerfest, Warsaw, Indiana; American Red Cross ARC; 1200–2200Z Sept. 14; 10 kHz up from bottom of General 20 and 40 meters, 28.450 (plus or minus .005). For certificate send QSL (include contact number) and SASE to KB9AVT.

WB9TXO, from Schaumburg Septemberfest,

(continued on p. 82)

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Results of The 1990 CQ World-Wide DX SSB Contest

BY BOB COX*, K3EST/6, AND LARRY BROCKMAN**, N6AR/4

Looking back over the last year with dramatic change and turmoil in the world almost every day, it is hard to imagine what else lies around the corner. As I sit and write this article, the moon is eclipsing the sun in northern California. Everyone along its path has temporarily forgotten their troubles, and they are focused on a common event. Just like last year, we are all forgetting about our troubles and are joined in a worldwide engrossing event.

Here are a few comments that stand out: "Never had more fun in my whole life" . . . *9M6HF*. "Ham radio is like golf. You don't have to be good at it to have fun . . . *KI6PG*. "Anyone who doesn't work this contest is brain dead!" . . . *N6VMS*. Thanks for a once-in-a-lifetime contest. CQ WW is the best! . . . *KR0Y*. "Over 100 countries on one band in a contest for the first time" . . . *N2UN*. "This was my first contest 'without pencil' " . . . *OH1BV*. "Many hams, much QRM, big pleasure" . . . *YO3DCO*.

Everyone was hoping that cycle 22 would hold on long enough for the 1990 fall season. It looked like the cycle was declining slowly and that great conditions on the high bands would soon be put to bed for another 11 years. Contesters from Novices to old timers kept their fingers crossed. DXpeditions were heading out to the far corners of the world, the result of months of planning by American, Japanese, Finnish, French, German, Hungarian, and English hams. As the clock ticked toward 0000Z, anyone who tuned the bands could hear the encouraging number of stations from all over the world testing out their signals. "CQ, this is CN0A. Anyone copy?" The roar on the frequency was encouraging. CQ, this is it. This is the fun that novices and experts both share. Stay tuned for the results.

The operators of PJ1B, new holders of the world multi-multi record. Left to right standing K2EK, W3HHG, N4RV, KB2XZ, NL7GP, WW2Y, K2SS, K3EST, W3BSY; kneeling N3ED, N7ZZ, WA3LRO.

All-Band Results

If it's true as KI6PG commented that ham radio is like golf, then this year's winner finished far under par. Martti Laine, OH2BH, operating from CT3BH, talked his way to a new world record that makes everyone take notice. Martti asked, "Where is the world's best location? Many people go too far out for fishing." Martti sure found the best fishing for the 1990 contest, reeling in over 7000 QSOs. Combining good multipliers on the low bands because of his proximity to Europe with high rates on the high bands, he broke his old record by 2 million points.

Over in the Pacific Ocean, Rich, N6KT, was also looking for that same special location. He traveled down to HC8A, where after a week of hard work rebuilding antennas, he finished second in a close race with FG5R operated by Jim, W7EJ.

Go west, young man. That is exactly what the USA top scorer did. Hitting the ground running after his fine finish in the Goodwill Games, Jeff, KR0Y, steered WM5G to the USA championship. Combining the best of JAs and Europe openings made for a Texas-sized score.

Before the European signals made it to Texas, they had to pass through K3OO's QTH. Rick caught enough of them to take second-place honors. As Yugoslavia tries to sort out its problems, our man in Slovenia, YT3AA, had no trouble in setting his sights on establishing a new European record. He did just that. Tine handed out YT90A enough times to walk away with 7 million points and the European crown. Second place goes to Steve, GW4BLE.

High-Band Results

"Very nice to work CQ WW like inside a mosquito cloud. Hi!Hi!" . . . *L4D*. Well, that about sums up the activity on 28 MHz this year. From 300 to 900, the band was humming. A new world record was established by ZP0Y operated by Luis, ZP5JCY. Putting 5400 QSOs in the log is not an easy task even for an all band entry. That is just what Luis did to end up on top of PQ5C and LS6T. In the US, NR5M from Texas ran away from the pack to take top 28 MHz honors. The scores on 10 reflect the widespread band opening from 1- to 7-land in the USA top six. Bill, W0ZV, from Colorado, finished second over Doug, K1DG, from New Hampshire. Except for 4N3AA, 28 MHz was a North/South American contest. He just edged out LZ1KOZ for the high European score.

Fifteen meters was greatly improved over the previous year. Three stations broke the 2 million point barrier. K4UEE operating from P40R set a new world record. He sure likes to set new records. Every year he seems to set another one. Frank, 9Y4VU, pushed the gasoline pedal down and finished second with a fine 2.2 million points. In the US it was a northeast competition for top honors. The spot goes to NG2X, who ran away from the pack. NB2P finished second with a fine effort. Reflecting the worldwide great conditions on 21 MHz, CQ4A operated by CT1BOP finished the test with 1.7 M points for a new European record. YU3PV operating from a mountain in Slovenia drew a second-place finish.

Looking at the results on 14 MHz does not show the hard work it takes to stick with the effort in spite of the continuous QRM. Sometimes the band was open to every continent at once. If you called CQ, a JA, SV, KP4, and ZS might call you at the same time! After the dust settled, the world winner was YV3A operated by YV5IVB. Not far behind was CQ Contest Hall of Famer, Al, G3FXB. He finished as top score in Europe. Second in Europe was the famous club station YU1EXY operated by YU6AR. Finishing first in the US but just missing the US record was John, W1RR. John finished ahead of another John, K2VV.

Low-Band Results

This was quite a year. Not only were the conditions on the high bands great, but the conditions on the low were also outstanding. Over 150 countries were available on 7 MHz if you could have worked them all. The single op who

*1816 Poplar Lane, Davis, CA 95616
**12041 Walker Pond Road, Winter Garden, FL 34787

Always a big signal by the boys from RT1U, the #1 UB-score. Left to right: UT4UZ, UA9CSS, UT5UGR, UV9CP, UT3UA; front UB5CGN.

put together the best combination of QSOs and countries was ZF2JR operated by N6RJ. Jim set a new world record. In his log you could see where he checked into daytime nets to work strings of Cubans and other Caribbean stations. Second place goes 4000 miles farther east to IK5BAF, who took the European title. Second in Europe goes to avid contester DL3OI. KV0Q was doing something right. It is not easy to win this band from the west, but that is just what he did. NQ2D and W2SC/1 finished second and third, repectively.

Wow! The scores on 3.7 went through the ceiling. HA8IE was not satisfied with just breaking the European record. He set a new all-time world record as well. GW4OFQ took both second in the world and Europe. In the States, Bob, W6RJ, continued to astound the competition by finishing third in the world and number one in the USA—quite an effort from the west coast. The long-path opening to Europe must have been good. Moving up to fourth in the world and second in the US was N2KK.

Taking advantage of good top-band conditions and looking into Europe, UG6GAW more than tripled the next highest score. Of course, it is not so easy to get multipliers and QSOs from Nova Scotia. That is where VE1ZZ took second place. Once again the US's outstanding 160 meter operator is Rick, K5UR. He sure appears as the first W in a lot of DX logs. He was followed by W2FCR. In Europe UT5DK took the top-band honors by beating OM6JDX.

Multi-Op Categories

In a year with so much activity from everywhere it was not surprising to see so many high-scoring multi-single scores. The top four teams were from four different continents. The Italian team of IQ4A out-distanced the rest with an outstanding score of 17 M. Finishing second was 8P9X, a bunch of great ops who every year go on their "fishing trip" to catch the big one—the CQ WW. A joint Hungarian and Turkish team made everyone happy with YM5KA. Finishing second in Europe was the familiar club call of LZ9A.

In the USA the team of K1AR set a new US record. They did not just set the record, they exploded the old record. Using K1EA to its highest efficiency, they racked up an unbelievable multiplier. Look at their band-by-band breakdown and compare that against the multi-multis!

The multi-multi category was unbelievably fought over. All the top six world scores have a special story to tell. They brought out the best in contesting with hard work. The two South American giants, PJ1B and PJ9W, fought it out in true contesting style. Both stations were erected just for the contest. All the antennas, cabling, and electrical supply had to be put up just before the test. And these were not just little stations. PJ9W erected a station which might have been the largest ham radio installation anywhere just for the two CQ WW test weekends! For example, 24 elements on 28 MHz was just the main antenna. PJ1B was not far behind with 8 elements on 14 through 10. All PJ9W's antennas as well as their towers were homebrew!

The team of KH0AM carried all their antennas and equipment to Saipan the week before the test. After setting up on the roof of a hotel, this all-Japanese team waited to see how they would do against the Southern California Contest Club's effort at 5W1.

Meanwhile in the States, N2RM was getting ready in a small room in eastern New Jersey to try to break W3LPL's record. N5AU and W3LPL both tried to assemble the best operators they could find to operate their well-planned stations. Out in the far northwest W7XR was taking up the tradition from the Seattle area trying to win or put a scare into the east coast boys.

As the contest approached, strategy at all the multi-multis was kept very secret. What was the advantage of each of the other's band setups? Who were the other teams' operators? What were their weaknesses? How can we take advantage of the team's weak points? . . . and then the contest began. After the test was finished, the new world champion was PJ1B, setting a world record that may last until the next sunspot maximum. Their 57M + points involved great skill in passing multipliers from band to band. If you look at their multipliers, you may wonder how such a large multiplier can happen. It doesn't happen just by looking for mults or calling CQ. It means that everyone operating must know at all times which mults are needed on another band and they must know to pass them at the right time.

Fifty miles away PJ9W settled for second place in the world with 51 M points. Setting a new Oceania record was KH0AM. Trying to get as many QSOs as possible, they were even working JAs on 10 meter FM! In the US N2RM apparently found their cramped QTH to their liking by setting a new US record. Second place went to the boys from Texas. The number one score from Europe was IQ3A on a mountaintop in northern Italy.

Where are all the young hams? They have a good foothold on Cyprus. All the operators at 5B30ES were 17 years old. Left to right: 5B4WN, 5B4XF, 5B4XN, 5B4WS.

QRP Results

Three stations topped a million points this year. Some of the operators could run stations at 60/hour for a while. The QRP category also had the lowest unique rate of anyone in the contest—less than 1%. It shows that when you call someone, you probably will have their call right. The number one score in the world this year goes to Doug, KR2Q. Operating from northern New Jersey, he operated almost the full 48 hours to edge out 4M1G. Number-three K5RX had the largest QRP multiplier in the world.

Assisted

This category continues to grow each year. Participation from Europe and Japan is growing. It appears as if the Yankee Clipper Contest Club packet system is very effective. Almost all the top ten scores are from that area. The winner of the world crown is Jeff, K1ZM, who was followed closely by K1TO. The top non-W score comes from Ulli, DJ2YA.

New Records

The following stations enter the All-Time Records list found in the October issue of *CQ*.

World. All Band: CT3BH (Opr. OH2BH); 28 MHz: ZP0Y (Opr. ZP5JCY); 21 MHz: P40R (Opr. K4UEE); 7 MHz: ZF2JR (Opr. N6RJ); 3.7 MHz: HA8IE; Multi-Multi: PJ1B.

North America. All Band: FG5R; 7 MHz: ZF2JR (Opr. N6RJ); Multi-Single: 8P9X.

Europe. All Band: YT90A (Opr. YT3AA); 21 MHz: CQ4A (Opr. CT1BOP); 7 MHz: IK5BAF; 3.7 MHz: HA8IE; Multi-Single: IQ4A.

Asia. 21 MHz: 7L1GVE; 7 MHz: JA8IXM; Multi-Single: YM5KA.

Africa. All Band: CT3BH (Opr. OH2BH); 14 MHz: EA9LZ.

South America. 28 MHz: ZP0Y (Opr. ZP5JCY); 21 MHz: P40R (Opr. K4UEE); Multi-Multi: PJ1B.

Oceania. All Band: YJ1A (Opr. OH1RY); Multi-Multi: KH0AM.

USA. Multi-Single: K1AR; Multi-Multi: N2RM.

Congratulations to these fine operators.

Comments

It should be remembered that the CQ WW multipliers are determined by the DXCC and WAE country lists. Last year after the SSB test the ARRL decided that East and West Germany count as one country, Germany. The new German country was credited before the SSB test! However, when the contest took place, there were two Germanys. When the contest begins the list is the list. I guess someday we will have to face the problem of a new country occurring *during* a CQ WW test.

Please take a careful look at the rules this year. After receiving letters and through conversations with hams from around the world, it has been decided to start a new low-power cat-

TROPHY WINNERS AND DONORS

Single Operator, All Band
World
CT3BH (Opr. Martti Laine, OH2BH)
Donor: Dave Rosen, K2GM
WA2RAU Memorial

U.S.A.
WM5G (Opr. Jeffrey Steinman, KRØY)
Donor: Potomac Valley Radio Club
KC8C Memorial

Carib./C.A.
FG5R (Opr. Jim Sullivan, W7EJ)
Donor: Alex M. Kasevich, VP2MM

Europe
YT9ØA (Opr. Tine Brajnik, YT3AA)
Donor: Potomac Valley Radio Club
W4BVV Memorial

Africa
ZD8Z (Opr. Jim Neiger, N6TJ)
Donor: Gordon Marshall, W6RR

Asia
L.V. Welikanov, RLØO
Donor: Japan CQ Publishing Company Ltd.

Oceania
YJ1A (Opr. Pekka Kolehmainen ,OH1RY)
Donor: Northern California DX Club

South America
HC8A (Opr. Richard Smith, N6KT)
Donor: CQ Magazine

Japan
Akira Asai, JA8RWU
Donor: Japan Crazy Contesters

World—Single Operator Assisted
Jeffrey Briggs, K1ZM
Donor: Pavillion Software

World QRP
Doug Zwiebel, KR2Q
Donor: Milliwatt Books, WØRSP

SINGLE OPERATOR, SINGLE BAND
World—28 MHz
ZPØY (Opr. Luis Kemper, ZP5JCY)
Donor: Joel Chalmers, KG6DX

World—21 MHz
P4ØR (Opr. Robert Allphin, K4UEE)
Donor: Peter R.D. Munroe, WB1DQC

World—14 MHz
YV3A (Opr. Pablo Alonso, YV5IVB)
Donor: North Jersey DX Assn.
K2HLB Memorial

World—7 MHz
ZF2JR (Opr. James Rafferty, N6RJ)
Donor: Fred Laun, K3ZO
K7ZZ Memorial

World—3.7 MHz
Ferenc Deim, HA8IE
Donor: Fred Capossela, K6SSS

U.S.A.—28 MHz
George A. De Montrond III, NR5M
Donor: Donald Thomas, N6DT

U.S.A.—21 MHz
Bradley Petersen, NG2X
Donor: Bill Gioia, K2EK

U.S.A.—14 MHz
John Kenny, W1RR
Donor: Southern California DX Club

U.S.A.—7 MHz
William Johnson, KVØQ
Donor: Stanley Cohen, WD8QDQ

U.S.A.—3.7 MHz
Robert Ferrero, W6RJ
Donor: Arnold Tamchin, W2HCW

Caribbbean/Central America (21 MHz)
Franklin Brooker, 9Y4VU
Donor: Pedro Piza, Jr., NP4A
KP4ES Memorial

Europe—28 MHz Zone 14
DFØSSB (Opr. Hans-Joachim Burger , DF9ZP)
Donor: A.G. Anderson, GM3BCL

Japan—28 MHz
Tadao Katsuta, JH7DNO
Donor: Take Yokoyama, JL1BLW

Japan—21 MHz
Hiro Shiozawa, 7L1GVE
Donor: DX Family Foundation

MULTI-OPERATOR, SINGLE TRANSMITTER
World
IQ4A (I4AVG, I4EAT, I4EWH, I4IKW, I4IND, I4LCK, I4LEC, I4TJE, I4VEQ, IK4AUY, IK4CZF, IK4DCT, IK4EWK, IK4JSI, IK4NPD, IW4ANU)
Donor: Southern California DX Club
W6AM Memorial

U.S.A.
K1AR (K1AR, K1EA, KM3T, N2IC, N6BV)
Donor: Carolina DX Assn.

Europe
LZ9A (LZ2BE, LZ2CC, LZ2DF, LZ2ES, LZ2HE, LZ2II, LZ2PO, LZ2PS, LZ2TT, LZ2UA, LZ2UU, LZ2WM, LZ2XA, LZ2-E-41, LZ2-E-72)
Donor: Bob Cox, K3EST

MULTI-OPERATOR, MULTI-TRANSMITTER
World
PJ1B (WW2Y, N3ED, WA3LRO, K2EK, N7ZZ, K3EST, N4RV, KB2XZ, K2SS, KT3Y, W3HHG, K1KI, NL7GP, W3UM, PJ9EE, K2SB)
Donor: CQ Magazine
W1WY Memorial

U.S.A.
N2RM (N2RM, N4HY, WM2H, KZ2S, N2AA, K2TW, KQ2M, N2NT, K3UA, W2RQ)
Donor: K4VX/Ø Operators

Europe
IQ3A (I3MAU, I3EVK, I3ON, I3JSS, I3QJZ, I3KVW, I3FIY, I3VHO, I3VJW, I3VRD, IK3HRZ, IW3FCG, IK2BHX, IK2NCJ, I1POR, K1RX, I6FLD, I6NOA, IK3NXF, IV3PRK, IV3YYK, IV3WMP, IV3ZCS, IV3TQE, IN3BYV)
Donor: Finnish Amateur Radio League

Japan
JL1ZCG (JO1BMV, JO1RUR, JF2IWL, JN3PYQ, JHØNZN, JHØSPE, JRØIRZ, JA9VDA, JS1INN, JQ1UXN, JI1UTP, JK3GRR, JP1OGL, JK1JEO, JRØJFM, JR5KDR)
Donor: Nippon Television Network Corp.

CONTEST EXPEDITIONS
World—Single Operator
V63DX (Opr. Shoji Igawa, JA7HMZ)
Donor: Stuart Meyer, W2GHK

World—Multi-Operator
YM5KA (HAØLC, HAØMM, HAØNNN, HA5PP, TA5B, TA5C)
Donor: The German CDXG & SDXG
(DJ3NG & DJ4EI Memorial)

CQ Special Recognition Trophy
PJ9W (OH6NU, OH6MW, OH6RM, OH6FT, OH6JW, OH5BM, OH6YF, OH6DO, OH2MM, OH5NZ, OH2BAD, OH6XY, OH3UU, OH2KK, OH1XX, OH6IG, OH3NJZ, OH1MA, OH3XA)
Donor: CQ Magazine

egory. This new category allows 100 watts out. It is hoped that this new category will encourage activity. Also note that we require a paper log from you. When you send us a disk, please don't forget to send a paper log. Most of the computer contest software forgot to include club affiliation on the cover sheet. Remember to add your club name if you want credit for your club. The new categories of assisted and low power have not yet been added to the cover sheet for this year. If you enter the assisted category, you can help us a lot by adding the word "assisted" next to your call. Please add the letters "LP" next to your call for the low-power category.

It is with sadness that we report the passing of several famous contesters over the past year. One of our committee members, Homer, K7RA, always had a vision of what contesting could become, and his thoughtful comments and hard work will be missed by all of us. George, UA1DZ, became a Silent Key late last year. Besides being the RadioSport champion of the USSR, he was always very active in contests. Phil, K6ZM, was an inspiration to all the operators who passed through his station. We will miss their signals on the air.

Our experts who scored and submitted the results you see on these pages are W9RE, N3ED, AD6C, K4XS, K6NA, W2RQ, K1DG, K2VV, N6AW, KR2Q, N2AA, W7EJ, K5NA, K5ZD, WA8YVR, and KE7V. A special thanks also goes to KB3MM, who helped develop software to read your disks, and I2UIY who helped with Italian data bases. Also DX members of the committee YT3AA and JE1CKA contributed information for the grading of the scores.

Congratulations to all the winners.

73, Bob, K3EST/6, and Larry, N6AR/4

DX QRM

We enjoyed working many stations, especially with W's . . . *JA5EXW*. I was testing the K1EA log program for the first time in CQ WW. It was GREAT! . . . *OH1MDR*. Every contest should have Assisted category . . . *SM3SGP*. Lost my quad in storm. My first contest . . . *PY2NY*. Really good propagation on especially the South Pacific . . . *LP3F*. First contest, wonderful propagation . . . *YV5JDP*. Need a category for South America minus the Caribbean islands; it's so difficult to compete with them . . . *OA4ZV*. My last QSO in the test was my father, WR9X . . . *AL7KS*. Usually 40 meters goes to sleep; this time the operator went to sleep . . . *KL7U*. After 45 years off the air, it was a challenge to face the pile-ups from Antigua. Hope to return next year! . . . *V2/G6QQ*.

My first contest. Had a ball with my special prefix . . . *VO7TM (Opr. VO2TM)*. My age is catching up. The new guys are taking over . . . *VO6AW (Opr. VO1AW)*. The old Drake B-Line did it again, trouble-free . . . *XM31Y*. Still like CQ WW best of all . . . *VE3FJX*. Fun trying to get the last "thank you" with a Japanese operator; he won, 3 to 2 . . . *VE3OMU*. WOW, 5W1JJ on 160 . . . *VE3DO*. Good thing it rained; no noise the second night . . . *ZF2JR*. Rig problems again this year . . . *TI2OB*. Enjoyed my first contest. *(Check his score listing, a super job—ed.)* . . . *XE2BEU*. My great pleasure to work on 40 meters with my special call . . . *6GQV (Opr. XE2GV)*. Too many parties and weddings, but got on 160 for a while at least . . . *XE1VIC*. Operating table was 25 feet from mats where a karate meet was held. Couldn't tell the difference between the yells, howls, and grunts with the headphones off or on . . . *4U45UN*.

First CQ WW DX contest. Very happy and we hope next year to have more operators with more experience . . . *CE2GVM*. Only one word—fantastic!! . . . *CN0A*. Only our second contest and first with computer logging—very nice. We would really like to have the full reciprocity and full French calls, as we are residents of French Guiana. This call quite a mouthful for contesting . . . *FY/KD3FK*. Thanks, Pedro (my brother) for your fantastic antenna work . . . *CQ4A (Opr. CT1BOP)*. Thanks a lot, guys! Next year I will be there again, with all my power . . . *CT1CLR*. Bad QRM, best band for me was 28 MHz. ARS since 1937. My age is 77 years old. Best 73 . . . *CT1QF*. Thrilling contest. Considering the antennas I was highly surprised about the score. It takes a very long time to see the contest results . . . *DF1IK/p*. Can't compete with DF0SSB . . . *DA2AA*.

What a great contest. Using club radio station I was hunted instead of the hunter . . . *DA2CF (Opr. VE2UJE)*. To all of you Merry X-mas and specially a very healthy, happy, and peaceful New Year 1991 in prosperity . . . *DJ2UU*. My power and antenna were too poor to break through the pile-up around KH0AM, KH2/N3EMA, and TY2FG, who would have been new countries for me . . . *DJ3DE*. In spite of a hoarse voice after the contest I enjoyed my 40 meter single op so much . . . *DL3OI*. Three weeks before the contest started the new 6 over 6 quad was ready for new motivation . . . *DJ4PT*. Output 12 volts from car battery; antenna was mounted with magnet on the roof of my car . . . *DL6AM/M*. I had some visitors. Therefore, no more time to work, but very good conditions on 10 meters . . . *DJ6TK*.

Always a joy, but a lot of QRM. Best contest . . . *DL8PC*. Problems with my rotator—antenna mounted on a living tree . . . *DJ8UV/p*. Started a new rig in the middle of the test and it did well . . . *DF8WS*. We had an emergency-power engine which powered the battery. It was old army stuff and smoked like a broken oven, hi. We had too much beer, too much company, no drinking water, no electric power. Great hobby . . . *DL0SG*. Good conditions on 40, 80, and 160 . . . *EA1CON*. Amazing, lots of new ones to me!! Ole!! . . . *EA1DCQ*. QSL 100% . . . *EA1IF*. This is my first contest. I've been licensed for 2 months . . . *EC2AUS*. Very happy to be in contest! Many zones and good participation . . . *EA3GCJ*. Please be here in the next contest, see ya . . . *EA3NY*. Computer problems . . . *EA4DX*.

Enjoyed the contest very much, fantastic propagation and activity . . . *F1HWB*. A great contest as usual . . . *F1JDG*. Many thanks for this contest . . . *FE1JND*. I am 16 years old and this is the second WW contest. Very fine . . . *FB1OMN*. Always a pleasure. I hope to be better than last year . . . *F2EE*. Big TVI troubles with my neighbor. Next year I'll have a new location and a new antenna . . . *F6FGZ*. Very happy to QSO three BY stations during the contest . . . *FE6FNA*. First try on monoband—fun . . . *FF6KAW*. If I'm really 59, how come so many get my callsign wrong? An honest report conveys the need to take care in transmitting information. I'm sure there were lots of incomplete QSOs. Or is it ESP? . . . *G3JKY*. This is the first contest I've entered as single op. I even managed to get rid of the family for the weekend . . . *G3XSV*.

Lost delta loop on Saturday night in high winds, if found in USSR, I'm OK in Callbook! . . . *G4PKP*. Biggest thrill–having 78 QSOs on 15 in 1 hour. Best propagation ever . . . *G4XKR*. My first SSB contest since 1980. Made more QSOs during contest than on SSB during last 10 years . . . *GB0DX (Opr. G4BUE)*. DX stations should give their callsign a little more often. I enjoyed the contest as always . . . *GJ3XZE*. Some stations use up to 10.5 Kc of band and call without listening. This gives QRP stations little hope.This Shetland Islands station was called by some 300-400 high-power bad-signal stations none of which were answered. Why not monitor this contest and disqualify any bad operators for bad use of equipment, etc.? . . . *GM0AVR*. K1EA should get a medal . . . *GM3BCL*. Condx quite good except to Asia. Wish some DX stns would send their calls more frequently . . . *GM3CFS*.

Antenna was "dipole of delight" . . . *GM4HQF*. Rotator damaged in gales . . . *GM4WEW*. My first-ever entry, but much reduced score due to serious laryngitus coming on 48 hours earlier . . . *GM4XTA*. My first-ever attempt at all band single op. Wait til next year when I get it all sorted out. Best fun I've had for weeks . . . *GM0ECO*. Sorry to have missed last year's. Thanks for great contest . . . *GM0DBW*. Had to wind down tower at 4 PM local time Sunday due to strong winds . . . *GW4BLE*. First CQ WW contest I have entered. Became ill near the end. Will try again next year . . . *GW4OFQ*. Nice to work US pile-up . . . *HB9CJG*. Great contest—always look forward to CQ WW contests . . . *EI4DW*. Excellent condx. The CQ contests certainly bring the DX out of the woodwork. Really enjoyed myself . . . *EI9FK*.

Here is a voice everyone has worked, Tine, YT3AA, with his special call YT90A on his way to a new European record.

First time in this contest. Old Atlas 210 still doing a fine job . . . *HB0DL4ZBC/P*. My first contest ever . . . *LA4PHA*. Nice to be in this test again! Nissed some multipliers because it didn't make it through the pile-up. I wish I had more power . . . *LA9DFA*. My best result in CQ WW contest—one month preparation, mental, physical, technical, hi . . . *LX9DX*. Very poor condx on 10. My time was too short. Better next year . . . *ON4ACB*. Wish I worked everything I've heard—enjoyed it! . . . *ON4APU*. My first participation in this contest. It was very nice. See you in 1991 . . . *ON7RN*. Hope you will soon change points so we have same rules as for CQ WW RTTY Contest . . . *OY9JD*. It's not always easy with 100 watts and dipole on 40 meters. CU AGN next year . . . *OZ3ABE*. I worked my first zone 5 (CY9CF) on 160 meters . . . *OZ3SK*.

Many thanks for another FB DX contest. Very happy to work 4U45UN and CY9CF for new countries . . . *OZ6PI*. Part time only, but I enjoyed participating . . . *OZ7AX*. First time I use K1EA log program. It's a great help. Condx the best ever . . . *OZ7HT*. Again FB! Worked DXCC within 30 hours . . . *PA3ELD*. I enjoyed the contest greatly despite a breakdown in the 21 mc dipole which resulted in no activity on that band . . . *PA0DOM*. I could only partly participate due to our national annual amateur meeting on Saturday . . . *PA0HML*. Condx good, JAs on 7 mc, fine test, hope better next year . . . *PA0KDM*. A lot of QRM on 15 and 40 meter bands but 10 was clean, so I worked some nice stations and new countries . . . *PA0MVW*. Contesting remains an enjoyable aspect of our hobby. Keep organizing them . . . *PA0YN*.

Nice contest. See you next year . . . *PA0ZH*. Thanks for the contest, CU AGN . . . *SK3AH*. My first big test ever . . . *SM3EDF*. Got my license only 6 months ago and it was very nice to work many new countries . . . *SM3TLG*. Good condx but there are many better QTHs for the contest . . . *SM0$AJU*. Sorry could only spend a few hours on the contest . . . *SM7TV*. Found the CW contest more rewarding as per QSOs with a beam up again instead of dipoles . . . *SM0BDS*. I propose two new classes: 160, 80, 40 and 20, 15, 10. This would make a station with only a triband Yagi more competitive . . . *TF1MM*. Still using a new prefix for each *CQ* contest. 3A90 prefix was used for first time . . . *3A90F (Opr. 3A2LF)*. First try in this category. Wish propagation had been better. Will be there next year . . . *HC0E*.

We must stay in same grace of school next year on account of this contest . . . *JA3YBF*. Wish we could QRV for 48 hours . . . *JA5ZBI*. Very enjoyable contest. Our low-band antenna is not so good . . . *JJ3YBB*. Thanks again for lots of fun. Did have a good time even if 10 meters goes dead at seven and 75 never opens to anywhere but lower 48 . . . *KL7TG*. Very nice to work CQ WW like in a Field Day, of course inside a mosquito cloud Hi!Hi! . . . *L4D*. Need bigger antennas . . . *P40T*. *Really missed out on mults on 10 meters* . . . *V31K*. First try at multi-op contesting. Had great fun and will be back next year . . . *VE1AUE/1*. Good conditions for a change . . . *VE6AO*. New location, new callsign, new group of operators—and next year better score! . . . *VE6SV*. Loved tuning the 160 antenna at 3 AM with a flashlight in the rain . . . *VE7GFC*.

Amplifier died twice the first day, then dumped the keyboard and lost 150-200 QSOs from 0001-0800 on 28th . . . *VQ9CQ*. Our pet peeve: The KL7 who refused to log us because "Sure your call is VY2CA, all VY's are in zone 2, not zone 5!" Everyone loved Prince Edward Island's new prefix. Next year bigger antennas and more efficient use of our multiplier station . . . *VY2CA*. Kicking computer for lost Q's with six power outages during test . . . *XE2/N6IC*. First CQ WW with this special call. Problems on 80 and 160 meters with bad propagation and bad antennas. For next year better antennas and we will ask God for good propagation on 80 and 160 . . . *ZW0JR*. It was very fine propagation on 10 meters and I got a new country (TY2FG) . . . *JO1DFG/8*. My first contest. Only 10 watts and antenna is homemade 4-element Yagi . . . *JK6ISK*.

If I had a big antenna and power . . . *JG1BPS*. What fun! I'm writing this in HB9 before being QRV from 6W1 in CQ WW CW . . . *JA8RWU*. Biggest problem was

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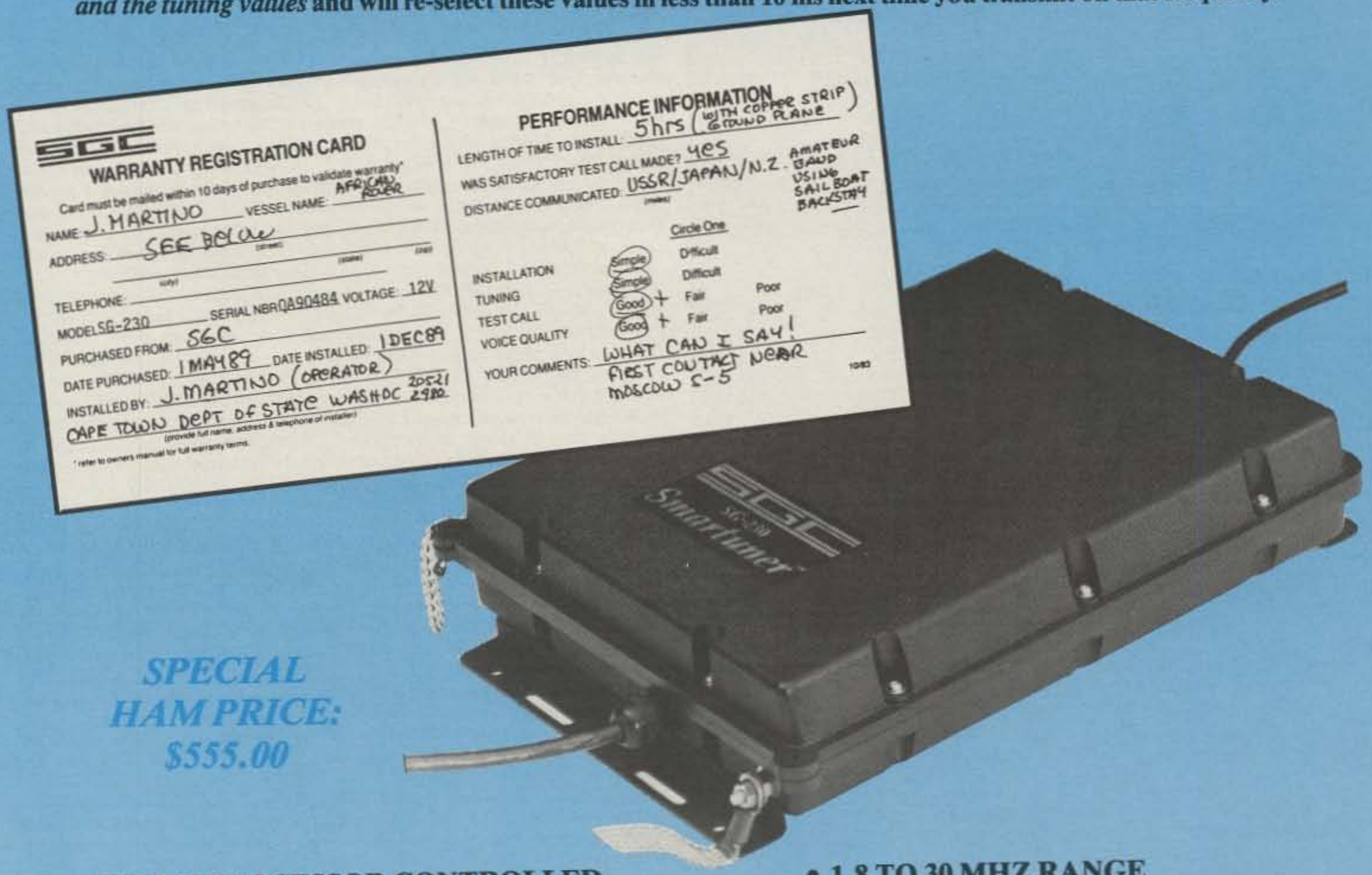

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FG5R	12,192,368	K5ZD/3	4,922,856	ON4UN	5,494,159
9Y4H	10,908,869	N4RJ	4,683,448	CQ0N	5,432,952
KP2A	10,677,460	K1RU	4,664,400	LY3BA	5,001,768
YJ1A	9,516,731	K3ZO	4,561,608	IA8A	4,449,648
ZD8Z	8,852,625	W9RE	4,525,010	GMØECO	4,254,678
P4ØV	8,627,385	K8PO/1	4,129,521	EA3NY	4,192,650
AH3C	7,999,209	W3BGN	3,959,928	OY9JD	3,963,984
YT9ØA	7,120,204	N2LT	3,892,876	DL8PC	3,944,192
28 MHz		**28 MHz**		**28 MHz**	
ZPØY	2,961,295	NR5M	1,116,390	4N3AA	1,363,425
PQ5C	2,658,240	WØZV	975,175	LZ1KOZ	1,328,041
LS6T	2,648,018	K1DG	932,696	IR9R	1,325,835
FM5DN	1,805,089	KS1L	915,399	DFØSSB	1,256,266
CX8BBH	1,604,536	N7BG	913,674	IT9BLB	1,225,194
4N3AA	1,363,425	KM1C	912,560	IOØMNI	1,123,981
21 MHz		**21 MHz**		**21 MHz**	
P4ØR	2,719,336	NG2X	943,578	CQ4A	1,757,780
9Y4VU	2,231,037	NB2P	685,542	YU3PV	1,127,829
PR5T	2,096,680	K2SX/1	600,483	OM7DX	1,122,108
CQ4A	1,757,780	N6VV	502,366	OH1AD	1,086,534
N7DF/NH2	1,751,272	W5WMU	487,139	YT3M	1,035,045
CE3FIP	1,726,812	KDØZR	381,312	OHØMAM	879,712
14 MHz		**14 MHz**		**14 MHz**	
YV3A	1,529,500	W1RR	1,028,020	G3FXB	1,423,450
G3FXB	1,423,450	K2VV	939,624	YU1EXY	1,229,680
EA9LZ	1,244,340	NB1H	902,275	F2EE	1,102,887
YU1EXY	1,229,680	WOØG	734,290	YT3M	1,035,045
F2EE	1,102,887	K2HFX	689,095	G4CNY	1,029,908
G4CNY	1,029,908	KV4P	439,520	YU1KQ	936,320
7 MHz		**7 MHz**		**7 MHz**	
ZF2JR	870,480	KVØQ	181,252	IK5BAF	687,040
IK5BAF	687,040	NO2D	146,875	DL3OI	493,626
4M3X	622,251	W2SC/1	130,625	GBØDX	392,160
YV5JDP	534,936	WQ2M	130,161	IG8R	263,128
DL3OI	493,626	N4ZC	120,832	OZ4MD	204,753
HC1HC	492,833	K8MJZ	102,368	OZ1FTE	203,574
3.7 MHz		**3.7 MHz**		**3.7 MHz**	
HA8IE	361,343	W6RJ	105,343	HA8IE	361,343
GW4OFQ	135,590	N2KK	102,390	GW4OFQ	135,590
W6RJ	105,343	KZ3H	74,700	LY1BZG	91,368
N2KK	102,390	W2VP	63,597	SP5MXZ	90,300
YV1CP	96,640	AD1G	62,392	OH4BEN	56,643
LY1BZG	91,368	KE5FI	59,486	DL8QS	54,556
1.8 MHz		**1.8 MHz**		**1.8 MHz**	
UG6GAW	119,955	K5UR	14,152	UT5DK	26,880
VE1ZZ	31,974	W2FCR	4,719	OM6JDX	21,774
UT5DK	26,880	K5WXZ	1,914	UC2ABC	20,515
OM6JDX	21,774	K4TEA	1,856	SM5AQD	19,588
UC2ABC	20,515	K8CFU/4	1,300	OZ3SK	19,500
OZ3SK	19,500	W2VO	1,288	CT1AOZ	16,473
Multi-Operator Single Transmitter		**Multi-Operator Single Transmitter**		**Multi-Operator Single Transmitter**	
IQ4A	17,255,700	K1AR	11,193,606	IQ4A	17,255,700
8P9X	15,388,604	N3RS	7,752,168	LZ9A	13,224,200
YM5KA	15,056,664	KS9K	7,190,746	GU6UW	13,155,792
EA8AGD	14,796,344	K5NA/2	6,194,342	HG5A	12,400,080
CNØA	14,008,363	KØRF	6,124,248	OM5W	10,249,516
LZ9A	13,234,208	K1YR	6,066,750	HG1S	9,544,185
Multi-Operator Multi-Transmitter		**Multi-Operator Multi-Transmitter**		**Multi-Operator Multi-Transmitter**	
PJ1B	57,610,400	N2RM	18,146,246	IQ3A	25,214,252
PJ9W	51,388,610	N5AU	16,736,436	R6L	14,948,868
KHØAM	35,730,600	W3LPL	16,517,214	DAØBV	13,628,376
IQ3A	24,875,479	W7XR	12,232,124	ON7LR	10,398,388
5W1JJ	22,285,168	KY1H	11,468,292	YT2B	10,268,253
N2RM	18,146,246	K8CC	9,785,580	LY2ZO	9,544,185

splatter for nearby multi-multi club station . . . *JA3LDH*. Dipole was built on Friday night and made the contest fun for me (but why couldn't I work zone 5?) . . . *JR4PMX/1*. Many USA stations called me; thanks a lot! . . . *JF1SEK*. Worked over 900 stations for the first time . . . *JE7DOT*. Static level was very high on 80 meters . . . *JE2LPC*. Never saw such good conditions before . . . *7L1GVV/8*. I was called on TVI on second day so could not operate fully, hi . . . *JA6COW*. I wanted to sleep at night but good conditions to Africa didn't permit . . . *JA1YFG*. Very good conditions of 10 meters . . . *JA8YBY*. I got two new countries, PJ and 9Y . . . *JP1SRG*.

Tnx for my three new countries on 15 meters . . . *SP4EEZ*. Good conditions, but not too much JAs calling me! . . . *I2PJA*. First time over 3,000 QSO in test . . . 4N3AA. Very interesting DX stations active . . . *IKØDWN*. It was nice contest, but I had strong problem with my neighbors for TVI! . . . *YO6OBH*. It was big fun to work 1,000 W's on 10 meters . . . *OE2VEL*. Unbelievable propagation! One new country (YSØYS) after trying many times in abt 4 hours . . . *OH3MIG*. Big condition for USA. I see them next year . . . *IT9HBT*. Got the missing zone on 10 meters at last . . . *OE1TKW*. It was really enjoyable contest. Lot of good DX active on 20 meters . . . *YT3T*. Tired? I slept my JA chances on Sunday morning . . . *OH6NIO*. My first CQ WW DX SSB contest with home call . . . *LZ3YY*.

Big fun. Many thanks to XM2ZP, WL7E, TF1MM, VK6HD, BY8AA, and KH6CF, the only stations worked from their zones . . . *IT9GSF*. It was my first WW SSB contest . . . *SV3AQR*. I think that more important is working new countries and bet better paper than last time and I get it . . . *EA1DDU*. Yeahh!! BIG CONTEST . . . *I3BQC*. First in single all band because I got married a month ago, so I could say one more time "I'm a single!" . . . *IK2GSN*. Many stations on air. I'm happy to take part to yours tests . . . *IK2IKW*. Finally worked BY's for first time, herd em last year but cudn't get my beam off stateside . . . *SVØAB*. Had unexpected visit first few hours of contest by DL4NAC. It made my day! . . . *YT9ØA (Opr. YT3AA)*. Best contest, but I lost my voice! Next year I will be on CW! . . . *LZ1KOZ*. First night was excellent on 20 meters . . . *YU1EXY*. No better contest then CQ WW DX. 73 for *CQ* magazine . . . *SP5OAU*.

This was my first contest "without pencil" . . . *OH1BV*. Next year, new antennas, new score! . . . *IK8DUI*. So many Finnish contesters in Curacao that OH had become rare? . . . *OH1WZ*. It's hard to make two nights up in radio, but contest is contest! . . . *IN3ZNR*. Many hams, much QRM, big pleasure . . . *YO3DCO*. I didn't lose my voice this time!! . . . *OH3OJ*. Worked KL7 20 minutes before the contest, none during. Fell out with XYL due to a newly acquired beard after 42 hours solid!! Best contest I've ever entered . . . *ZC4BS*. Murphy struck with a sore throat the day before the contest . . . *VU2NBT (Opr. AA4U)*. 10 meters + popular QTH + local evening/night hours = Awesome DX! . . . *VQ9FM (Opr. NH6IJ)*. Thought all the Europeans were crocodiles until I discovered my antenna was stuck in the wrong direction a day after the contest. Will be back next year and the next and the next. . . . Never had more fun in my whole life . . . *9M6HF*.

Thanks to Alex, 9V1XR. At his presence I could show him what contests are all about . . . *9V1XR (Opr. SP5DDJ)*. Had a great time as usual, great cndx . . . *VK3PU*. Listening to W's wrking JA's all Saturday and being able to wrk either . . . *ZM1IM*. Tnx to all for a grand contest. Aloha till next year . . . *KH6FKG*. I've followed this contest since 1988 and 1989 with my previous call, YC8RFF . . . *YB8RB*. Frustrating is the only way I can describe my first time in the CQ WW from 4X. Newly installed G5RV would not load properly. Waited until it got light to put up my "miracle antenna"—a 31 foot random wire . . . *AA4KD/4X*. Somebody recorded me while calling CQ and then played it back. When he stopped, people started calling!! . . . *ZS6WPX*. Tnx vy much to boys in Senegal . . . *YU5AD/6W*.

Good time had. Missed a few hours at the start. Gained a few new zones and countries. Next year I will not have to look after my 2-year-old son . . . *VK2PWS*. This is a great contest when I'm Stateside and a fantastic contest when I'm DX. Tnx for another super contest . . . *HL9RY (Opr. KG5EG)*. It was great fun to wrk so mni stations in my first effort in the phone contest . . . *VU2PTT*. Really enjoyed using 5 watts with some contacts, only possible via long path (with less QRM). Tnx for a very nice contest, can't wait till next year . . . *DU1CHD/6*. Only could operate about 15 hrs, but I will be back! . . . *CU3LF*. Just got the station set up at new in time for this GREAT contest. New call is VK2KS. CU next year . . . *VK8XX/2*. A complete new team joined us, so the old rats made QSOs and the Novices searched for multipliers! That's why this is a great contest . . . *ON6NL*.

We had a very good operation in the CQ WW. First major contest using our 2 element quad and it performed very well . . . *OZ7HVI*. Stormy weather as usual, but great fun . . . *GØKPW*. Best results ever . . . *DLØWU*. No rain on Guernsey for six months, then we get five days of it . . . *GU6UW*. First OK contest expedition to ITU HQ Geneva. It was big fun. We were tired but lucky . . . *4U1ITU*. Where were all the JA's on 10 and 15? Why is it always necessary that it rains during a contest when you have to build your station? It is sure an experience and we will be there again next year . . . *PI4COM*. K1EA's Contest Program performs VFB! Very nice conditions on 10 both days. This is our best score in 20 years . . . *HB9CIP*. Gale-force winds forecast for Sunday, threatening a repeat of 1989, did not materialize . . . *GW8GT*. At last, no aurora for 48 hrs . . . *KL7RA*.

Nice pile-ups from the 140m high building in Vienna . . . *4U1VIC*. Six hours of QRT appeared to be only handicap. Very glad to set new JA record at first try. We will be back next year . . . *JL1ZCG*. Another VE record falls . . . *VE7ZZZ*. Ambiente favoloso tra "vecchi" OMs . . . *HB9AJM*. Much better way to spend election weekend than watching political TV! Really enjoyed 1990's CQ WW. Can't wait for 1991 and a big score . . . *ZM2K*. You guys didn't print our soapbox last year, so we had to go back again! We set a new father-son record, breaking our last year's score. *(Maybe we shouldn't print this again so you will go back and make a lot of people happy—ed.)* . . . *FS/KC1F*.

USA QRM

Heard 35 zones on 75, missed 3 . . . *W6RJ*. Very little time for contest this year due

to other commitments. Bands seem to be wide open! . . . *WW6O*. Is there a low score award? . . . *N6TPT*. Great to work XU8DX barefoot on 10 meters with antenna only 5 feet above roof! . . . *NE6I*. This was my second CQ WW DX Contest. I more than quadrupled my score from last year! Anyone who doesn't work this contest is brain dead! . . . *N6VMS*. Overall, the best-ever CQ WW phone conditions! . . . *N6AW*. Condx were very good, and so were the computers. *(We all will miss Phil's call on the bands—ed.)* . . . *K6ZM*. At 16 years old, I was more concerned with just having fun, than how many points I scored . . . *KC6FZU*. Op WA2MKM collapsed a folding chair while operating—didn't miss a beat! . . . *KQ2O*.

Nice to have 10 meters as biggest point getter . . . *N7RO*. This was the club's first contest. We all had fun watching the neon lights modulate to our voices . . . *W5KS*. First serious attempt for most of us. Great time. Looking forward to next year . . . *N7QQ*. Biggest thrill was working JT1CO barefoot on a vertical . . . *WA6SDM*. Very glad the woodpecker died! . . . *WC6H*. Europe tough from U.S.A. west coast with low power . . . *KB6RMN*. Thanks for a once-in-a-lifetime contest. CQ WW is the best! . . . *KR0Y*. Search and pounce is the only way to go with 100 watts into a vertical! . . . *KO9Y/5*. Because of similar calls, having NI4M and NR5M in the contest makes life interesting! . . . *NI5M*. Working D68GA on two bands cost lots of time, but was a great thrill . . . *W5QZ*. With a couple of exceptions, the efficiency of DX operators and courtesy of U.S. ops seemed better this year . . . *W5AE*.

Worked all continents in less than 21 hrs. It took 11 months to get WAC last year! . . . *W9CNF/4*. Over 100 countries on one band in a contest for the first time . . . *N2UN*. You know it's getting too easy when you start thinking about getting a faster printer because it takes 30 minutes to print the logs . . . *AB4RU*. Always have a backup rig—lost 16 hours of operation . . . *WB2ULI*. First contest with new stn design, new team. Wait til next year . . . *K1NG*. Five Soviet hams operated as members of our team . . . *W1AF*. Our first contest where nothing broke—the only way to fly . . . *W1BK*. Finally nothing broke, FB test . . . *K2OWE*. Great fun. First contest ever. Will be back . . . *KE2TW*. Murphy stayed away. The amplifier kept the shack warm . . . *WB2JTE*. One YL has about 40 dB gain. "The YL go ahead" . . . *K3YL*.

Let's all pay homage to K1EA . . . *K3NZ*. Biggest Plus: K1EA. Biggest Dud: 10 meter antennas at 100 feet . . . *W4PRO*. Pile-up after pile-up—WOW what a weekend! . . . *W4AQL*. This was our first attempt at CQ WW. We are hooked . . . *W9NQ*. Worked 7Z and XZ after looking for them for 10 years . . . *NO7F*. Too many relatives and interruptions. When JA's in we had a big reunion of family and friends . . . *K7ABV*. Still trying to build antenna system that works . . . *K9UWA*. Glad to meet JF1SEK, JR3NZC, and KH6BZF . . . *KA7FEF*. Great time. Next year will have antenna for low band . . . *N7MVX*. Just starting to work on 5BDXCC, and this looked like a way to do it . . . *WK7Z*. Conditions better than I had expected. Only thing missing was Eastern Europeans and Scandinavians . . . *W7FP*. One-and-a-half-hour power failure one hour into contest . . . *NN7L*.

My first entry into CQ WW. Couldn't get going on 10 meters calling CQ Contest when Stateside stations called for QSO for WAS . . . *W7CFL*. Down 3 dB in power and down 3 dB in antennas didn't prevent me from having a blast . . . *K7LXC*. Great conditions for the contest this year . . . *N7MPS*. Big problem with equipment this year—standby light in linear burned out . . . *WA7FAB*. My very first SSB contest . . . *K7JYE*. Band conditions good . . . *W7QN*. Seemed like fewer multipliers this year . . . *WG7A*. My 10-year-old son insisted on sending in this log—my first one . . . *KY7H*. Tried to break pile-up to TF for 30 minutes with no luck . . . *NW7Q*. Great fun. My first CQ WW and certainly not my last . . . *KE7UH*. Missed VQ9CQ AND D68GA Saturday only to wake up and work both on Sunday . . . *K7FD*.

Biggest thrill was working the TY station . . . *WB7VUB*. K1EA program crashed and ate my log . . . *K7LZJ*. My score was over a million for the first time—thanks to all the DX stations that were on . . . *K7WK*. The whole event was very exciting as my first contest; been in radio one month . . . *KA8UBK*. First DX contest. Can't wait till next one . . . *KB8HMA*. Don't know how the real contesters do it . . . *KD8EU*. Must be getting old. XYL said I looked like a zombie Sunday . . . *N9CIC*. Very happy to work BY4SZ with 42 minutes left in test for a new one . . . *WG8Y*. Realized I had a chance to meet my goal of 1 meg, given my modest station and fact that 98% of QSOs were hunt and pounce . . . *KC8FS*. My first contest. Can't wait till next year . . . *KF8IF*. Nothing broke . . . *N8EXS*.

Couldn't believe I worked BY1PK then turned around and worked a 5N . . . *KE8FO*. It's fun to work enough countries for DXCC in a few hours . . . *NC8V*. First time I ever kept score and submitted a log. Have to admit I had a blast . . . *KE8OQ*. My first contest. Was a lot of fun . . . *N8MMB*. Hate having to ask for a call . . . *WZ8T*. Good propagation. Sorry I couldn't work all 48 hours . . . *KE8NH*. I had hoped to work the whole period, but got sicker than a dog. Still had a great time . . . *N8KSO*. Enjoyed the contest and great conditions on 21 MHz . . . *KF8K*. Like to say thank you all for the fun and all the nice contacts. See you next year . . . *KA8VPL*. My first ever CQ WW and really enjoyed it, but next year I hope to have an amplifier so TF1DD in zone 40 will hear me . . . *NW8F*. Worked 9 new countries . . . *W8MKO*.

Erected 40 and 160 dipoles Saturday during test then had to repair wind damage on Sunday. This isn't good for single op . . . *K3ZJ/8*. Beat last year's score by 1.5 times . . . *WD8EOL*. Fun digging out contacts in mess of kws. At age 83 don't burn the midnight oil any more. *(Always a pleasure to hear you.—ed.)* . . . *W8YGR*. Had a ball this year with the good conditions. Looking forward to next year . . . *WA8NDE*. Working DXCC in less than 48 hours . . . *WI9H*. First time I worked contest. Wished I had more time for it . . . *N9IHW*. You can't lose when your having that much fun. TNX for a great contest . . . *KA9WBX*. Had my best contest. Can't wait til next year . . . *KD9MF*. Last year without a computer . . . *KK9L*. First time I worked over 200 contacts. Worked 10 new countries . . . *KB9CRJ*.

Nothing broke for a change . . . *K9QVB*. Too many stations not identifying . . . *WU9D*. My first contest. Wish I had a filter for QRM from XYL . . . *N4XMV/9*. Multipliers from dawn until midnight—from one end of the band to the other . . . *N9AG*.

Jim, N6RJ, decided to try 40 meters from ZF2JR. He now owns the new world 40 meter SSB record.

Station that said I was loudest station on band, I was barefoot . . . *WD9DYR*. Used my new voicebox . . . *WD9GGY*. Ten meter contest are always terminated by the Chicago Bears football games . . . *K9MDO*. Had a good time. Wish I could spend more time at it . . . *NI9C*. Too much machine operation . . . *W9GIL*. Beam went bad after 12 hours. Finished with dipole . . . *K9CLO*. Fortunately my neighbor waited til 15 minutes before end of test to tell me I had been wiping out his TV all weekend . . . *KK9L*. Low power and low antenna make for low score still had most fun in years . . . *N9RO*.

Thanks to KD8PQ and WS8Q for all the antenna help that made it possible. . . . *W0CG*. The JA pile-up working the station in ND and one op asking if he was an expedition . . . *KA0ZPP*. More than doubling my country count . . . *KA0ZIA*. Never enjoyed a contest so much—thanks to band conditions and K1EA software . . . *W0YA*. Have been working CQ WW since 1976 and love it more each year . . . *WA0DCB*. Catching CE and HC on first call for two new ones . . . *N0LYK*. ST2SA called me. First CQ WW and should have done better . . . *K4VX/0 (Opr. WX9E)*. I'll be back next year for serious try . . . *KA0KHE*. Computers don't like special calls any more than humans do . . . *WB0YWO*. BY1QH and UJ8JCQ and about 95 percent of all calls were from my CQ . . . *W0ACT*. Awesome contest . . . *KA3DRR/0*.

Best effort yet and still got two good night's sleep . . . *WK0F*. Really glad to hear a lot of stations on this year. Hope they continue . . . *K9BQL*. First contest . . . *N0HCH*. While running JA's 9L1US called me on 10 meters for a new one . . . *KA0ZFX*. Smoked linear and limited time equal low score . . . *KM0L*. Happiness is beating last year's score by 400 Q's and 146K . . . *KD0ZR*. I just couldn't find a frequency to call CQ! . . . *K1VR*. Got computer two days before the contest. Loved it! . . . *K3ND*. After years of meaningless 59 signal reports, decided to give out meaningless 57 signal reports. Fun screwing up all those computers that assume a 59 report! . . . *K8MR*. What a great way to learn the controls on a new radio . . . *K9OSH*. Used CT program and packet for the first time—WOW! . . . *KB8FJ*.

Would have broken million but some unwanted RF in the shack late Sunday morning wiped out about 100K . . . *KF2U*. Used CT and packet for first time & had a ball. Tnx to K1EA . . . *KI3L/5*. This was my first contest attempt. Worked 28 new DX countries . . . *KI5GX*. Ham radio is like golf—you don't have to be good to enjoy it . . . *KI6PG*. Was going to multi-op with XYL but she got busy so ended up running single op with her call . . . *N0IDR/5 (Opr. W0VX)*. My first CQ WW . . . I'm hooked . . . *N4GVF*. PJ9W was everywhere . . . *N4XMX*. The CT software takes the drudgery out of keeping the log . . . *N6ST*. XYL didn't let me know of neighbor's TVI problem until after test—that's love . . . *N7IRR*. Operating this contest barefoot with a dipole is an experience in being ignored . . . *N7KZN*. My first try with packet. Lots more mults available . . . *N8BJQ*.

My biggest score and I even slept 8 hours a night and watched softball Sunday afternoon! . . . *NE9U*. Packet + Computer logging + Superb conditions = One great contest . . . *W2GD*. Hats off to the YCCC Packetcluster . . . *W2HG*. Too bad I had to paint the garage on Sunday . . . *WA4CTC*. Simply incredible! Nothing broke and the neighbors waited until after the contest to complain . . . *WB2K*. Power outage spoiled my Saturday AM run—reset the electronic alarm clock . . . *WE9R*. Doubled last year's score using CT for first time. Wow! Throw away the pencils . . . *WG2E*. What other hobby marries all of man's obsessions? Now I can play on the computer, contest, chase DX, and watch packet all at once! . . . *WK6V*. Working CY9CF on 40 meters with only 110 watts for a brand spanking "new one" . . . *WM2D*. This was my first contest . . . *WV9Q*.

STATION OPERATORS
Multi-Op Single Transmitter

4D1P: DU1CEY, DU1DDP, DU1EGA, DU1EIB, DU1ELB, DU1ELI, DU1EUV, DU1FMG, DU1MSD, DU1NGE. **4N4U**: YU4ENS, YU4NS, YU4RS-4000, YU4RS-4004, Dado, Danny. **4N7M**: Al, Bob, Gaby, Zoran. **4U1ITU**: OK3JW, OK3LZ, OK3PC. **4U45UN**: JA6TIT, K2GM, NA2K, W6ISQ. **4Z7M**: 4X1OM, 4X4YM, 4Z4KM, 4X6MI, 4X6UT, 4X6ZI. **5B38ES**: 5B4WN, 5B4WS, 5B4XF, 5B4XN, Charalambides, Georgiou. **6D2X**:

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
CT3BH	136/11/43	371/20/64	686/29/82	1877/38/115	2212/35/118	1895/33/109
HC8A	52/8/13	311/21/61	586/22/74	1180/33/99	1638/31/102	3120/28/111
FG5R	100/8/18	430/20/69	721/26/89	1055/31/99	1624/35/121	3076/34/114
9Y4H	183/11/26	426/23/70	852/26/83	1154/31/95	1060/30/73	2603/29/87
KP2A	145/11/28	394/15/60	570/23/75	1190/26/95	1086/33/102	3837/33/113
YJ1A	11/4/6	162/22/31	710/32/76	1385/36/96	1546/33/87	2601/33/85
ZD8Z	7/5/7	101/21/37	301/29/77	795/36/107	1316/35/124	2132/38/129
P40V	33/6/13	123/8/15	592/19/61	1968/28/85	1135/30/67	2651/29/92
AH3C	54/12/16	329/18/27	480/29/59	786/37/89	1305/32/82	2500/30/73
YT90A	84/8/36	128/13/54	516/30/82	880/31/99	1032/36/102	1603/36/103

USA TOP SINGLE OPERATOR, ALL BAND

Station	160	80	40	20	15	10
WM5G	15/7/11	67/18/43	127/25/72	897/36/129	427/37/124	1733/36/134
K3OO	21/7/15	129/15/53	105/20/62	992/36/115	624/36/110	1333/34/118
K5ZD/3	20/8/13	73/14/42	179/22/78	656/35/119	753/34/121	988/33/120
N4RJ	18/7/16	77/15/52	80/17/59	540/36/106	508/36/115	1420/34/123
K1RU	13/7/7	100/13/48	116/20/62	552/36/108	730/33/106	1216/34/124
K3ZO	14/6/6	118/18/54	151/22/67	716/33/91	575/34/91	1258/36/110
W9RE	26/11/18	68/16/45	108/24/71	566/37/113	713/32/114	1002/35/119
K8PO/1	13/7/10	156/16/53	66/18/39	634/37/112	747/32/96	986/30/111
W3BGN	25/9/18	108/14/52	106/20/54	569/30/91	632/36/106	967/31/106
N2LT	12/7/10	70/12/36	99/21/64	486/31/100	609/33/96	1117/33/116

WORLD TOP MULTI-OPERATOR, SINGLE TRANSMITTER

IQ4A	56/11/56	108/22/75	768/34/112	2188/39/166	1822/39/153	2311/38/155
8P9X	86/11/27	334/17/56	817/29/103	1544/34/122	2715/37/140	2230/37/135
YM5KA	75/8/34	144/15/63	744/27/92	1376/38/119	1509/37/114	3761/39/126
EA8AGD	16/5/17	135/15/60	493/25/82	2062/35/127	1597/32/129	2901/35/130
CN8A	29/7/29	47/9/46	397/21/70	2111/36/122	2181/33/125	2369/33/116
6D2X	17/9/15	79/15/38	760/31/88	2179/35/120	1624/36/124	3510/34/122

USA TOP MULTI-OPERATOR SINGLE TRANSMITTER

K1AR	32/12/30	197/18/76	154/26/95	1370/39/167	1167/38/165	1517/37/170
N3RS	21/10/20	114/18/69	215/26/92	1204/39/158	766/37/144	1046/37/154
KS9K	27/12/25	63/26/60	168/31/97	653/38/152	1229/36/158	893/35/160
K5NA/2	28/13/25	121/18/70	122/24/85	1000/38/145	598/37/152	846/36/160
K0RF	23/11/21	76/25/60	318/27/79	460/38/126	791/36/130	1349/34/140
K1YR	16/8/15	70/16/56	107/26/78	733/37/146	807/36/144	1088/37/151

WORLD TOP MULTI-OPERATOR, MULTI-TRANSMITTER

PJ1B	531/19/50	1335/24/99	2104/31/117	4860/38/179	5395/38/176	5430/39/182
PJ9W	377/15/46	1275/22/88	2275/30/123	4925/37/159	5329/38/166	4959/37/149
KH0AM	4/3/4	679/27/54	1935/34/95	3501/39/142	5279/39/131	4911/37/139
IQ3A	305/10/55	936/24/85	1945/37/126	2937/39/166	2707/38/139	3010/38/151
5W1JJ	35/8/11	476/21/36	1203/31/76	2146/39/121	4158/37/132	3473/37/115
N2RM	80/13/26	531/19/82	466/24/95	2216/40/170	2082/39/172	1946/36/171

USA TOP MULTI-OPERATOR MULTI-TRANSMITTER

N2RM	80/13/26	531/19/82	466/24/95	2216/40/170	2082/39/172	1946/36/171
N5AU	53/12/27	192/27/73	583/30/94	1793/40/162	2211/39/167	1916/39/168
W3LPL	92/16/37	483/21/83	545/28/102	1779/39/164	1821/39/157	1857/36/160
W7XR	95/11/14	307/26/60	663/32/91	1509/39/158	1882/39/151	1229/38/131
KY1H	133/14/28	446/17/75	338/26/90	1321/40/158	1797/40/164	1023/38/159
NQ4I	89/11/27	112/24/59	198/26/88	1235/39/150	1401/37/150	1367/36/148

AA5VC, K5TSQ, KD5GY, KI5GO, N5KEV, N5NYK, NA5C, XE2NU, XE2YNE, XE2YNS, W5VX. **6I2A**: XE2AFL, XE2AQ, XE2CRT, XE2DRM, XE2FU, XE2IR, XE2KB, XE2LV, XE2TX. **8P9X**: K3KG, K3ZR, K4FJ, W4NL. **AA1K** & K3WJV, KD3UC, N8NA.**AA4LH** & N4NDL, WA4NAT. **AA6TD** & N6ST. **AA9A** & KB9XG, WA9SRW, WB9SAU, WJ9W. **AB4RU** & AA4GA. **AC8N** & K8UCN, KB8GCT, KB8KSU, KF8IR.

AG6D & KJ6LD, N1EE, N6BIS. **BY1PK**: BZ1AA, BZ1AI, BZ1AL, BZ1DX, BZ1HAM. **BY1QH**: Chin, Huntgr, Jan. **BY3CC**: KU6T, Fu Hao, Li Zhao, Sun Hong-Qi, Tian Hai-Ping, Wang Yi, Zhang Jie. **BY4AA**: BZ4AA, BZ4AYL, BZ4CBC, BZ4COP, BZ4CPU, BZ4DAB, BZ4DDL, DJ7BU. **BY4RSA**: BZ4RA, BZ4RBC, BZ4RC, BZ4RDX, BZ4ROM. **BY4SZ**: BZ4SAA, BZ4SAB, BZ4SBC, BZ4SBD, BZ4SBG, BZ4SBP. **C9QL**: W6KG, W6QL. **CE2AA**: CE2EPB, CE2FME, CE2FTF, CE2GOV, CE2HI, CE2HKK, CE2LZN, CE2MH, CE2NHV, CE2NHW, CE2NJ, CE2WO, CE3BSV, CE5EMZ. **CE2GVM**: CE2BFR, CE2GLR, CE2OXG. **CN8A**: CN8AR, CN8GI, CN8LU, CN8MK, F1LBL, F1NYQ, F2CW, F6ATQ, F6EEM, F6FYP, F6GKQ, F6IMS. **CR3M**: CT3BD, CT3BM, CT3DL, CT3DZ. **CZ7SZ**: VE7CC, VE7ON, VE7SZ. **DA0FDX**: Club. **DA1RF**: DA2BA, DA2QK, DA2QX, DA2RZ, DA2VA, DC7OU, DJ0HO, DL7UR, DL/F11KWI. **DF0AT**: DF6QV, DJ8CR, DL4YAO, DL9NC.

DF0PK: DL2ECU, DL3EBM, DL5JQ. **DF0RN**: DK1IT, DL3YCJ. **DF0RR**: DH7AET, DL7AEN, DL7AKC, DL7ALM, DL7APU, DL7ON, DL7SI. **DK0IN**: DA2JV, DL4DAW, DL4FBU, DL4FBW, DL4ZBG. **DK0KX**: DF9VJ, DF9VV, DF9XV, DJ8CG, DL4QE, Y24CD, Y62SD. **DL1DAS** & DK4DW. **DL0ER**: DF2EY, DK7FP, DK8JL, DL1EFD, DL5EAE. **DL0JU**: DL7ANR, DL7ANW, Y28FO, Y37JO, Y46TO. **DL0OH** & DF4RD, DK6NP, DL3NCI. **DL0TD**: DF1FJ, DG8FCA, DH5IAE, DL2ZBN, DL3FCE, DL5ZBI, DL8AAM, DL8AAU, DL8OBC, Y41FL. **DL0WH**: DF2IC, DF4ZK, DF6IH, DF7IT. **DL0WU**: DJ4AX, DK4TP, DK5EZ, DL3EBX, DL4EBE. **DU3/N2HEV** & DU3/KA1OLN, DU3/KB0FUE. **DX1L**: DU1EIU, DU1JOH, DU1TH, DX1UST. **EA2RCF** & EA2BSJ, EA2CFZ, EA2CGA, EC2AQR. **EA3CUQ**: & EA3EBN, EA3FBJ, EC3CWK. **EA3RKO**: EA3FHP, EA3FZO, EA3GBH, EA3GDH.

EA6ARM: EA6AAY, EA6KZ, EA6MQ, EA6MR, EA6MS, EA6WA, EA6YP. **EA6FB**: EA3ADW, EA3CCN, EA3EZD, EA3XO, EA6FO, EA6PZ, EA6QB, EA6TQ, EC6PJ. **EA8AGD**: OH1EB, OH1EH, OH1NOA, OH6EI, OH8PF. **ED1DD**: EA1AGE, EA1AX, EA1BKB, EA1DCT, EA1EGZ, EA1MC. **ED1SML**: EA1EVQ, EA1EVR, EA1EVS, EC1CXP. **ED3IN**: EA3CCI, EA3CUK, EA3DMN, EA3GEO, EA3IN. **ED3MM**: EA3CAC, EA3FPR, EA3GBW, EA3GEJ, EA3GEM, EA3GEP, EA3GFA, EC3CTU, EC3CUP, EC3CVD. **ED3OD**: EA3BOW, EA3BOX, EA3DGQ, EA3EIO. **ED5TD**: EA4KR, EA5BRA, EC7DMU, EA7TL, EA9EO, EA5TD. **ED5WS**: EA5EVC, EA5FYT, EA5WX. **EI7M**: EI3DP, EI4BZ, EI5FT, EI6BT, EI7DNB, EI7DKB, EI7DPB.

F6BGC & F6BNH, F6HYE, F6IOC, F6IRF, HB9AMO. **F6CQU** & FD1NBX. **F6HLC** & F6BSJ, F6EPY, F6EZV, FD1HQY. **FF1LPW**: Club. **FF1PBT**: FD1PFP, FD1PGP, FD1PXT, F11MON. **FF6KRC**: F6GLH, F6GLI, F6GYT, FD1LHA, F11LTF. **FF6KTF**: FD1MYT, FD1OHW. **FF6RSM**: F6DLM, F6IUI. **FO8AA**: FO0IGS, FO5DB, FO5IW, FO5LQ, K8JRK, N6VO. **FY/KD3FK** & FY/N4QDX. **G3NAS** & G3NLY. **G0KPW**: G4BAH, G4FSG, G4PIQ, G4VMM, G4WFR, G7ABQ. **GM3BSQ**: GM0CIT, GM4AFF, GM4BAP. **GU6UW**: G3UML, G3XTT, G3ZAY, G4BUO, G4DQW, G4DSE, G4JVG, GM3YOR, GU0JCI, 5B4LP, 5B4MF. **GW8GT**: G3OAY, G4BIK, G4VXE, GW0MAW, GW3KYA, GW3NWS, GW4JBQ, GW4LXO, GW4TTJ, GW5NF. **GX0BS**: G0IZM, G0KYM, G1MLK, G4JYE, G4SEA. **HA8KCK**: HA8FM, HA8FT, HA8FW, HA8KH.

HB0/HB9AON: DF1JC, DJ2YE, DL1EIJ, DL6EAQ, DL8EAQ. **HB9GT**: HB9BTI, HB9CMX, HB9COH, HB9IQB. **HB9H**: HB9AFI, HB9AYX, HB9BLQ, HB9CAT, HB9CIP, HB9CXZ, HB9DDO, HB9SFD, HB9STL, HB9YC. **HC8E**: HC1BI, HC1DD, HC1GZ, HC1H, HC1HN, HC1HT, HC1JQ, HC1PS, HC1RF. **HG1S**: HA1AH, HA1DAC, HA1DAE, HA1SV, HA1TD, HA1TJ, HA1TW. **HG5A**: HA5AWH, HA5BNL, HA5FM, HA5GF, HA5IW, HA5LN, HA5MK, HA5ML, HA5OM, HA5UA, HA5WE, HA6WX, HA7RY. **HG6N**: HA6ND, HA6NF, HA6NQ, HA6NY, HA6ON, HA6OQ, HA6PN, HA6PX. **I4GAD** & I4AUM, I4GAS, I4VOS. **IC8SDL** & I5FWT, IC8BNK, IC8WIB, IC8WIC, IK8LFS. **IK1LBO** & I1HJT, I1XOI, IK1AIF, IK1HJR, IK1LZE, IK1NAG, IK1NEZ, IK1OUJ, IK1OUK, I1-1666/GE. **IQ4A**: I4AVG, I4EAT, I4EWH, I4IKW, I4IND, I4LCK, I4LEC, I4TJE, I4VEQ, IK4AUY, IK4CZF, IK4DCT, IK4EWK, IK4JSI, IK4NPD, IW4ANU. **IY2A**: I1JQJ, I2MQP, I2UIY, I2YSB, IK1GPG.

JA1YKX: JA1RPK, JA4OWG, JH9JFH, JL1STM, JO1VVT, JQ1VNM. **JA2YDC**: S. Hirooka, Kimata, Moroto, Sakakibara, Torai, Uno. **JA2YKA**: JF2PZH, JJ2CKV, JK1GRI, JK2CZL, JL2KRA, JM2FPO, JN2SGJ, JR0IRB. **JA3YBF**: JE1TND, JF4FUF, JG4CLV, JJ2CIA, JJ3IMX, JJ3KGS, JO3VUS. **JA3YDH**: JA3BCT, JS3FYR. **JA3YDI**: Kakuta, Kita, Myomoto, Tamura. **JA3YQD**: JE6MYI, JF0MLM, JO3JYE, JO3SEN. **JA5ZBI**: JG4DDN, JO3OPC, Tsunoda. **JA6YCL**: JE6EKC, JE6UWK, JF4CZL, JG6RWS, JI6MYW, JK6XNC, JL6UOM. **JA6YJS**: JF4ETK, JG4SVN, JQ3BAM, JS1PWV. **JA7YAA**: JE0AWL, JE1CSW, JE7HLZ, JH0ORW, JJ3CNL. **JA7YAL**: JF6NKV, JH7VXM, JR7TNW, M. Ohkido. **JA9YAV**: JR9FNN, JA9-3017. **JA0YAK**: JE0DUA, JG7JMO, JH0VYG, JH9PUO, JI7OED, JK2PVL, JR0DVM, JR0FQM, JR0HYT, JR0IJW, JR9EMM, JR9KPO, JS1PTU.

JA0YMU: JA0NQO, JR0GJX. **JA0YPB**: JA0NFP, JH0OBD. **JA0ZRY**: JP1NOM, JR0BQD, JR0TGT. **JE2YRD**: JA2EZD, JA2KVD, JF2EOC, JF2XJE, JH1ORL, JH2BNL, JH4RHF, JI2KVW, JK3GAD, JR2SQU, JA9-10148. **JE6ZIH**: JF1DMS, JF6DEA, JG6CVO, JG6GNR, JG6OFE, JG6OZC, JH5GLL, JI6BRB, JR2GKT, NARMI. **JH1YDT**: JH0VMJ, J01IDL, 7K1BWM. **JH1YHS**: JF1MIA, JM1NKT, JR7GGO. **JJ3YBB**: JA3AHL, JA3CZY, JA3FHL, JA3LHL, JA3PJL, JE3TXA, JH3FQF, JH3LLV, JH3UHG, Koyama. **JL1YOE**: JH8WJY, JI1CMZ. **JT1T**: JT1BX, JT1-183. **K0BJ** & KF0MJ. **K0CS** & KB0U, N8DGV, W8TN, W0UO. **K0GAS** & KJ0G, WB0OWV. **K0RF** & K6RF, W0UN, W0UA, WZ6Z. **K1AR** & K1EA, KM3T, N2IC, N6BV. **K1NG** & KI1G, WA1S, WD1N, WF1B. **K1SSN** & KA1WCG, KA1WGF, KA9WHZ, KC4SLZ, KD3HN, WB6JBM, WB7EZO, WD5CPX.

K1YR & KB1WH, KC1SL, WA1U, WJ1U. **K2OWE** & W2GSN. **K2SG** & N2EA. **K2TR** & N1CC, K2WR, K2XA, WA2SPL, WB2KMY. **K3ANS** & AJ3H, K3YD, KU3K, NU3L, W3TB. **K3DI** & KB3HH, W3ICM, WD4IEH. **K3IVO**: K3HOI, K3YDX, KA3BHP, KA3SCY, KA4RHS, N2GAR, N3CBJ, NN3O, W3IP, WA3KZR, WA3TID, WB3EVS, WB3HOL, WA7NTF, WB6VGI. **K3NZ** & KA3MND, KU3X. **K3YL** & K3OX, K3PA. **K5NA/2** & KU2Q, KY2J, N2EK, N2GQS, WB2O. **K5BDA** & W5PWG, WE5P. **K5QHD**: KI5JC, KY5N, N5QLO, WA5TGP. **K6BR** & K6KLY, WC6I. **K6SSS** & Kate, Thomas. **K7ABV** & K7LGV. **K8OUA** & KB8FLY, WD8JRC. **K9MA** & W9IXG. **K9UWA** & K9VFE, KA9A, KC9LA, KE9AG, KR9U, KR9V, WD9DGA. **KA0BHO** & KA0BAT, KB0GZO, N0BLD, N0CBG, WB0YJT. **KA1GG** & K1KJT, N1AVA, N1HBF, N1ZE, W1KM. **KA1X** & AK1I, KA1FBY, WB1H.

KA3PIT & AB2E, KC3NE, NU3Y, WB3X. **KB0KK** & AA0A, KE0YO, KM0R, W0HBH, WD0CHW, WD0FPY, WD0HDK, WF0F. **KB1H** & K1GH, KA1LMN, KA1NJW, KA2CIW, KD2SX, KR1U, WA1HYN, WA1OEH, WA1RLV. **KB7IMC** & NL7QT. **KB9ECC** & N9IFM. **KC0LX** & K0QNS. **KC1XX** & NX1T. **KD8SQ** & KA8YNN, Jim, Buff. **KE2TW** & N2AEC, WR2I. **KE6WL** & KD6NT. **KE2UZ** & KE2VI. **KG5VK** & N5OCD. **KH6RS**: K6GSS, KI6CG, AH6KI, KI6EZ. **KL7TG** & NL7RE. **KN4PE** & KC4AVF, KM4ON, WB4NNX. **KR0B** & AF9T, K0II, K0IJL, KJ0B, KS0T, N0BIL, N0BKL, WJ0M. **KS9K** & K9CJK, K9GS, N9AU, N9AW, N9GNQ, N9EJ, NB9C, NI9U, NK9I, NO9F, W9RN, WE9V. **KZ0C** & KD0HY. **KZ1M** & KB1RI, WJ1P. **L4D**: LU1EYW, LU5EEK, LU7ADN, LU7DW, LU8EWD. **LA1H**: LA2MV, LA5NM, LA6EDA, LA6VDA.

LA1K: LA1BEA, LA1BFA, LA2RY, LA3BHA, LA4OFA, LA4UEA, LA6MGA, LA6PGA, LA7VV, LA8RGA, LA8UGA, LA9IY, LA9PU. **LA2AB**: LA8SDA, LA9EEA, LA9SEA. **LA2T**: LA2AD, LA2AFA, LA8NC. **LY1BXT**: Yukna, Tautvydas, Freyus, Okas, Yukna. **LY2WW**: LY2BIJ, LY2BKW, LY2BMW, Barusevicius. **LZ1KNP**: Club. **LZ6W**: LZ3DX, LZ2F230, Hubenov. **LZ9A**: LZ2BE, LZ2CC, LZ2DF, LZ2ES, LZ2HE, LZ2II, LZ2PO, LZ2PS, LZ2TT, LZ2UA, LZ2UU, LZ2WM, LZ2XA, LZ2-E-41, LZ2-E-72. **N2NU** & G4FRE, K2WI, WA2D. **N2SS** & W2GMA. **N3HW** & N3RW. **N3RS** & N3RD, NW3B, NZ3O. **N4AA** & AB4ZL, KN4HW. **N4UMI** & KC4FJX, KC4GCK, N4XCW, WB3A. **N6TV** & N3AHA. **N7JTS** & WA7CYP. **NA3K** & K3IE, NM3W. **N8BNG** & AA0AW, AA0BY, KA0JZV, KB0LC, N0HHB, VE3KRP, VE3MOE. **N8ILS** & N0IOS.

NC0P & K0AM, WB0THC, WO0V, WR0G. **NF6S** & KF6VU. **NJ2L** & KR1S. **NJ9C** & N4OKX, WB4ZFO. **NJ9Z** & KB9FLD. **NK7U** & KB7JWM, KG6LF, KH6WZ, N7GPO, NI7T. **NL7DU** & AL7KT. **NN3Q** & K3NW. **NO7F** & KF7DQ, KG7DK. **NU0P** & K0AL, K0JGH, N0ICI, N0OH, NC0O, NY0V, WA0FYG, WB8ZRL, WE0M. **NS2K** & WB2AOH. **OE3GBB** & OE3GEA, OE5VBL. **OE3XCW**: OE3MDC, OE3PUW. **OG7NTM**: OH7BNK, OH7MHL, OH7PI, OH7WV. **OH1MCX**: Club. **OH2BR** & UA1CK, UA1DJ. **OH4AB**: OH4EA, OH4MDY, OH4SE, OH4TY, OH4YR. **OH4YC** & OH4JK, OH4MI, OH4NZI, OH4ZS. **OK1KQJ**: OK1AYP, OK1BY, OK1DLE, OK1ICM, OK1IMR. **OK1ORA**: Club. **OK2KET**: Club. **OK2KJU**: Club. **OK2KOD**: OK2BDI, OK2BGR, OK2BHM, OK2WAZ. **OK2KVI**: Club.

OK2KYC: Club. **OK2RAB**: OK2HBY, OK2PDK, OK2PEM. **OK3KUN**: Club. **OK5SWL**: Club. **OK7ZZ**: Club. **OM5W**: OK1AEZ, OK1CF, OK1JJB, OK1JKT, OK1TA, OK1TN, OK1WT, OK2FD, OK2HBY, OK2PDK. **ON4KRW** & ON5EU. **ON6AH** & ON5AV, ON5IQ, ON6MH, ON6QR, ON6VL, ON7PC, ON9CMB. **ON6NL** & ON1AZY, ON1ANK, ON1AUE, ON1AWS, ON1AYW, ON1BCA, ON1CFQ, ON4AEK, ON4AKL, ON4AST, ON6JZ, ON6MP, VP8BPZ, ONL6680, ON44180, ONL4638, Jacques. **ON7UN** & ON1CGX, ON5HO, ON6SK, ON7YU, ONL741. **OR5EEC**: DF3TJ, ON5GA, ON8BK. **OZ1ADL** & OZ1XJ, OZ6VW. **OZ4HAM** & OZ2JZ. **OZ7HVI**: OZ1AXG, OZ1HDF, OZ1JRF, OZ1KGS, OZ1TV. **P40T**: K4PI, W3BTX, WX4G. **PI4COM**: PA3DMH, PA3ERC, PA3EWP. **PI9IRC**: N5GRU, PA3EWM, PA3EZL. **PP5JD** & PP5MCB, PP5ZYZ, PY3FJ. **PT7FX**: PT7AQ, PT7BL, PT7BZ, PT7NK, PT7SY, PT7VB, PT7WA, PT7WZ.

RB4EXN: Vailo, Pervyj, Krivoruchko. **RB4IWM**: Nikituk, Pood, Izvekov. **RB4IYJ**: UB5-073-3972, UB5-073-4364, UB5IAN. **RL0L**: UW9AR, UL7LEZ, UL7LEG, UL7LT, UL7-026-177, ex-RA6XA. **RQ9W**: UQ2-037-116, UQ2-037-83, YL2AG, 3W3RR. **RT1U**: UT4UZ, UT5UGR, UT3UA, UA9CSS, UV9CP, UT3UZ, UB5CGN, UT4UX, UL8GBK. **RW4LYL**: UA4LU, UA4LY, UA4LDY, UA4LCH, UA4LFN, UA4HTT, RA4LZ, RA4LW. **RW9HZZ**: UA0-098-167, UA0OGS, UA9-158-860, UA0-098-168, UA9HEC, RL7JDK. **RZ6AXO**: RA6AX, UV6ADE, UA6AHS, UV6AOW, UV6AOK, UV6AOB. **SK0MT**: SM0JHF, DM0MPV, SM0PYP,

HF Equipment

	Regular	SALE
IC-781 Xcvr/ps/tuner/scope • *Special*	$6149.00	**4999**

IC-765 Xcvr/ps/keyer/tuner	$2692.00	**2399**

IC-751A 9-band xcvr/.1-30 MHz rx	$1699.00	**1399**
PS-35 Internal power supply	219.00	**199.95**
FL-63A 250 Hz CW filter (Ist IF)	59.00	
FL-52A 500 Hz CW filter (2nd IF)	115.00	**109.95**
FL-53A 250 Hz CW filter (2nd IF)	115.00	**109.95**
FL-70 2.8 kHz wide SSB filter	59.00	
IC-735 HF xcvr/SW rcvr/mic	1149.00	**969.95**
PS-55 External power supply	219.00	**199.95**
AT-150 Automatic antenna tuner	445.00	**389.95**
FL-32A 500 Hz CW filter	69.00	
EX-243 Electronic keyer unit	64.50	
UT-30 Tone encoder	18.50	

IC-725 HF xcvr/SW rcvr	$949.00	**799.95**
AH-3 Automatic antenna tuner	489.00	**429.95**
IC-726 10-band xcvr w/6m	1299.00	**1089**

HF Accessories:

	Regular	SALE
IC-2KL HF solid state amp w/ps	$1999.00	**1699**
IC-4KL HF 1 kw amp w/ps • *Special*	6995.00	**5795**
EX-627 Auto ant selector • *Special*	315.00	**269.95**
PS-15 20A external power supply	175.00	**159.95**
PS-30 Systems p/s w/cord, 6 pin plug	349.00	**319.95**
SP-3 External speaker	65.00	
SP-7 Small external speaker	51.99	
CR-64 High stab. ref. xtal; 751A, etc	79.00	
SM-6 Desk microphone	47.95	
SM-8 Desk mic; two cables, scan	89.00	
AT-500 500w 9 band auto ant tuner	589.00	**519.95**
AH-2 8-band tuner w/mount & whip	758.00	**689.95**

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VHF/UHF Base Transceivers

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IC-275A 25w 2m FM/SSB/CW w/ps	$1299.00	**1129**
IC-275H 100w 2m FM/SSB/CW	1399.00	**1199**
IC-475A 25w 440 FM/SSB/CW w/ps	1399.00	**1199**
IC-475H 100w 440 FM/SSB/CW	1599.00	**1399**
IC-575A 25w 6/10m xcvr/ps	1399.00	**1199**
IC-575H 25w 100w 6/10m xcvr	699.00	**1469**
IC-1275A 10w 1.2GHz FM/SSB/CW	1849.00	**1599**

VHF/UHF FM Transceivers

	Regular	SALE
IC-229A 25w 2m FM/TTP mic	$423.00	**369.95**
IC-229H 50w 2m FM/TTP mic	462.00	**CALL**
IC-448A 25w 440 FM/TTP • *Closeout*	599.00	**469.95**
IC-449A 35w 440FM xcvr/TTP	563.00	**499.95**
IC-1201 10W 1.2GHz FM xcvr	799.00	**699.95**

Dual band FM Transceivers

	Regular	SALE
IC-3220A 25w 2m/440 FM/TTP mic	$659.00	**569.95**
IC-3220H 45w 2m/35w 440 FM/TTP	699.00	**599.95**
IC-2500A 440/1.2GHz FM • *Special*	999.00	**849.95**

Multi-band FM Transceivers

	Regular	SALE
IC-901 50w 2m/35w 440MHz FM xcvr	$999.00	**869.95**
UX-R91A Broad band receiver unit	389.00	**349.95**
UX-19A 10w 10m unit	299.00	**269.95**
UX-59A 10w 6m unit	349.00	**319.95**
UX-S92A 2m SSB/CW module	599.00	**529.95**
UX-39A 25w 220MHz unit	349.00	**319.95**
UX-S94A 430MHz SSB/CW module	TBA	
UX-129A 10w 1.2GHz unit	549.00	**499.95**
IC-970A 25w 2m/430MHz transceiver	2895.00	**2499**
IC-970H 45w 2m/430 MHz transceiver	3149.00	**2699**
UX-R96 50-905 MHz receive unit	389.00	**349.95**
UX-97 1.2GHz band unit	999.00	**869.95**

VHF/UHF Mobile Antenna

	Regular	SALE
AH-32 2m/440 Dual Band mobile ant	$39.00	
AHB-32 Trunk lip mount	35.00	
Larsen PO-K Roof mount	23.00	
Larsen PO-TLM Trunk-lip mount	24.70	
Larsen PO-MM Magnetic mount	28.75	

VHF/UHF Repeaters

	Regular	SALE
RP-1510 2m 25w repeater	$1849.00	**1649**
RP-2210 220MHz 25w rptr • *Special*	1649.00	**1399**
RP-4020 440MHz 25w repeater.	2299.00	**1999**
RP-1220 1.2GHz 10w repeater	2599.00	**2249**

Handhelds

	Regular	SALE
IC-02AT/High Power 2m	$409.00	**349.95**
IC-04AT 440 HT • *Closeout*	449.00	**329.95**
IC-2SA 2m HT • *Special*	419.00	**289.95**
IC-2SAT 2m/TTP • *Special*	439.00	**319.95**
IC-3SAT 220MHz HT/TTP	449.00	**369.95**
IC-4SAT 440MHz HT/TTP	449.00	**369.95**
IC-2GAT 2m HT/TTP	429.00	**379.95**
IC-4GAT 440MHz/TTP	449.00	**369.95**
IC-12GAT 1.2GHz/TTP	529.00	**469.95**
IC-W2A 2m/440 HT	629.00	**529.95**
IC-24AT 2m/440 HT	565.00	**419.95**

Handhelds for Aircraft band

	Regular	SALE
A-2 5W PEP synth aircraft HT	525.00	**479.95**
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EX-310 Voice synthesizer	59.00	
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SP-3 External speaker	65.00	
CK-70 (EX-299) 12V DC option	12.99	
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SMØTQX. **SK3LH**: SM2ODB, SM3JLA, SM3PZG, SM3RJL. **SK5SE**: SM5PAX, SM5SPK, SM5SYO, SM5TNF, SM5TNL, SM5TQC, SM5TQL, SM5TST. **SK5WB**: SM5BCO, SM5INC, SM5NUZ, SM5NWJ, SM5PPS. **SLØCB**: SM4OSR, SM5NZY, SM7TFS. **SMØSNI** & SM5KWS.

SP1PBW: SP1AMU, SP1BZZ, SP1MVZ. **SP3KVE**: SP3UQA, SP3UQC, SP3UQD. **SP3PLD**: SP3IBM, SP3SBB. **SP3ZAT**: Club. **SP4KTO**: Club. **SP9ZHR**: Club. **T3ØF**: OH6ZS, OH8NFR. **TGØAA**: TG9AJR, TG9CXM, TG9GI. **TMØE**: Club. **TM5A**: F6CWN, F6GWV, F6HMQ, F6IFR. **UB4MWU**: UB5MBM, RB5MRE, Club. **UB4MXR**: UB5MVK, UB4MLP, UB4MLD, UB5-059-61. **UB4QWW**: RB5QW, RB5QRQ, RB5QRW, UB1MM, UBØQQ, UB5-064-866. **UB4WWW**: Samulyak, Panas. **UB4WZA**: UB5WCY, UB5WCX, UB5WGR, UY5XE, UB5WAD, UB5-4468-996, UB5-068-997. **UB4XWK**: Club. **UB4IWI**: Club. **UC1WWF**: UC2XW, UC2-006-27, UC2WY. **UF7FWM**: UF6FM, UF6AW, UF6FJD. **UF7QWW**: Pavluchenko, Leonovich, Kurski. **UF7VWA**: UB5IOK, RB5IJ, RB5II, UB5III, UF6FBZ, UB5-073-1151, UB5IKW, UB3IDV.

UL8LWA: UL7LEN, UL7LER, UL7-026-587, RL7LFW. **UO4OXU**: UO5OOC, UO5-039-537. **UQØA**: YL2KL, YL2GM, YL3GN, UQ2GID, UQ2GTW. **UT4JWB**: Wedensky, Visich, Belikov. **UW2F**: UA2FF, UA2FJ, UA2FM, UA2FX, UA2FZ. **UZ1AWQ**: Timofeev, Onischenko, Doeszenkov. **UZ1TWC**: UA1TAN, UA1TFG, UA1-144-1068. **UZ2FWN**: Club. **UZ3AWR**: UV3AEV, UA3ABJ, UA3-170-1169. **UZ3DWZ**: RA3DRA, UA3DNR, UA3-142-291. **UZ3DXS**: Titov, Muchin, Secal. **UZ3DYU**: Club. **UZ3DZD**: RV3DA, UA3-142-1896. **UZ3GYM**: UA3GMM, RV3GJ, RA3GDU, UA3GCH, RA3GAX, RA3GCJ. **UZ3QYA**: UA3-121-1644, UA3-121-2158. **UZ4AYT**: Club. **UZ4HXX**: UA4HVX, UA4HOX, Syamrikov. **UZ4PWW**: RA4PO, UA4-094-976, UA4-094-705, UA4PBZ. **UZ6LWB**: RA6LW, UV6LMK.

UZ6LWL: RW6LB, RA6LNG, UA6-150-1360, Levakin. **UZ9FZD**: Izergin, Arsenkov. **UZ9QWA**: UA9QA, UW9QA, UW9QR, UA9QGX, UA9RQ. **UZ9XWV**: UA9-090-1053, UA9-090-1088. **UZØCXD**: UA0CR, UA0CID, UA0-110-775. **UZØLWQ**: Club. **UZØQWZ**: UA0QFR, Orlov, Chikachev, Sherstukov. **UZØSXF**: UWØSN, UA0-124-494, UA0-124-44. **UZØWWL**: Golubev, Doronin, Chernopiliskiy. **V31K**: K5GA, W5ASP, WB5N. **V63BD**: VE3RMM, VE3SMA. **V73AZ**: V73AS, V73AT, V73BN. **VE1AUE/1** & VE1BAN, VE1JON. **VE5FX** & VE5GHX, VE5MX, VE5RJR, VE5SWR. **VE6AO**: VE6AMR, VE6BSA, VE6CG, VE6GLR, VE6KC, VE6KZ, VE6LB, VE6LP, VE6TFM, VE6UUG. **VE6SV** & VE6AKY, VE6BOS, VE6GAS, VE6VW. **VE6GFC** & VE7GFS. **VK2BUV** & JM1CAX, VK2FUL. **VK3VT** & VK3BMV, VK3CHR, VK3CRA, VKEMCV, VK3MZ, VK3MZ, VK3VR.

VP2V/N6LL & N6DLU. **VP9AD** & N8ET, W3MA. **VQ9CQ** & VQ9HW. **VY2CA**: VY2AC, VY2AZ, VY2BM, VY2DM, VY2RB, VY2UA, VY2VN, VY2ZV, Linda. **W8CP** & WYØJ. **W8RA** & K5LVP, WB7VNF. **W1AF**: K3UOC, KC1SW, KC1SY, KC1WY, KI4PR, KO1O, N1IR, NZ1W, WD1Y, UA1ABR, UA1AIU, UA1ALZ, UA1CFL, UV1AA. **W1BK** & WA1UAR. **W1FY**: G4DZC, KA1USL, KA1UUD, N1BRM, N1DLW, N1HSE. **W1GIH** & NK1Z. **W1KOO** & KC1WH, KD1R, N1HRO, N1HRP, N1IAG, NV1Y, W1CTM, WA1SVR, WB2JSJ, WE1E. **W2HPF** & KB2SG. **W2UI** & N3KR. **W3KWH**: K3RYA, N3EQP. **W3XU** & N3FDL, NW3Y. **W4AQL**: KØDI, KC4JAY, N4VMD, N9HZQ, WD4DWN. **W4MYA** & K4BAM, KA4GHY, KB4DI, KX4S, N4LSP, W4DR, WA4PGM, WB4BVY, WK4Y, WU4G, VICKY. **W4NC** & KB2FEX, KB4WJA, KC4HEN, KF4ZS, KI4TB, KJ4IC, N1DRI, N4UGS, N4VHK, WA4IAM.

W4PRO & AA4NG, KB4WYR, KDØR, N4PUV, N4RKO, WA4BRL, WA4OHX, WB8HDD. **W5WX**: KA5VOZ, WA4NXI, WB5EUC, WD5BWR, WZ5C. **W6OAT** & N6BT. **W6QHS** & KK6QM, W6XB, WØZZ. **W6YX**: KA4OYF, KJ2B, KX6C, N5PEE, N6BDE, N6UOK, N6VYT, N6YWI, N8JUF, N9FZX, W2FRT, WA2HID, WA6AZP. **W6/W1FEA** & K2BA. **W6/W9NQ** & KI6VC, WB6RXE. **W7TSQ** & AA7FT, N7JGS, N7LOX. **W7ZR** & AA7CM. **W9EBN** & K9MWU, KA9TBM, KB9CQZ, N9FBB, N9GTL, WS9C. **W9JZ** & K9IMM, KB9ASQ, N9CHN, N9IQG, NG9V, WB9NOV, WV9X. **WA4CUG** & K2UFT, KA4GUM, KC4EWK, KS4Q, N4REE, N4VCY. **WA6AHF** & W6BSY. **WA6IET** & N6NMH, W2KVA, W6KFV, W6OUL. **WA6ISP** & N6AV, N6TLP. **WB2JTE** & Johnny. **WB2CJU** & KA3PCX. **WB2ULI** & N2BOW. **WB3FIZ** & KA3GIK, KB3MM, N3ARK, WB3HHAZ, WB3LFZ. **WB8K** & K8YSE, W8CZN, W8GMH, W8JGU, W8XD, WA8BIN.

WD4Z & KE4QL, N4NSL. **WD9INF** & KB8HAE, WA8ZZA. **WE2K** & KB2HYR. **WF2A** & AA2AP, K1MEO, K2MFB, KB2LDY, KE2DN, N2BLX, N2HR, N2KIV, NE2W, NK2H, NX9O, WB2GHH, WE2K, WS2U. **WF3M** & WF3L. **WØ9Z** & WR9R. **WS7V** & KB7ILC, KF7TF, WI7R. **WZ2B** & AA2AG, AA2AY, K1JUL, KA2RDO, KA2YVU, N1ATN, N2KKB, N2KTJ, WZ2B. **XE2/N6IC** & NY6Y. **XM1DX**: K2NJ, NR2H, VE1DH, VE1DX, VE1GJ, VE1IW, VE1JCI, VE1PBM, VE1ZJ. **XM3EJ**: VE3EJ, VE3OZB, VE3XN. **Y22YD** & Y24YH. **Y38I**: DK9FE, Y21JI, Y23WI, Y27WI, Y31WI, Y54UI. **YM5KA**: HAØLC, HAØMM, HAØNNN, HA5PP, TA5B, TA5C. **YO7KAJ**: YO7CKP, YO7LBU. **YO7KJS**: YO7CEG, YO7ALG. **YT2R**: YT2FI, YT2GW, YU2DQ, YU2EU, YU2HO, YU2KM, YU2MM, YU2MP, YU2MY, YU2NJ, YU2OG. **YT4T**: YU4AV, YU4AY, Mirzo. **YT5R**: YU5FK, YU5GB, YU5GX, YU5JA, YU5PK, 4N5BFC.

YT7A: YU7BJ, YU7GO, YU7NW, YU7OA, Eddy, Ivan. **YU2CFL**: Denis Vincek, Ana Vincek. **YU3AI** & YT3OT, YU3BM, YU3EO. **YZ4Z**: 4N4AE, 4N4CX, 4N4EX, 4N4MX, YU4AX, YU4EX, YU4FF, YU4NW, YU4SA, YU4RW, YU4TB, YU4MI, YU4RO, YU4PZ, YU4NR, YU4BK, YZ4NCS, YZ4DMN, Cera, Dave, Amelica, Samir, Jasmin. **ZWØJR**: PP5JR, PP5WG.

Zone Leaders Single Operator

Zone	Call	Score	Zone	Call	Score
1	WL7E	3,048,430	21	RF6FO	1,058,050
2	XM2ZP	3,790,320	22	VU2NBT	404,995
3	WC6H	3,002,830	23	JT1CO	1,735,798
4	WM5G	6,308,064	24	VS6WV	762,550
5	K3OO	5,706,990	25	JA8RWU	3,869,760
6	XE2BEU	993,568	26	No entrant	
7	TI2YO	450,840	27	KG6DX	6,009,018
8	FG5R	12,192,368	28	YB2FRR	983,066
9	9Y4H	10,908,869	29	VK6ANC	83,990
10	HC8A	12,199,477	30	VK8XX/2	681,876
11	ZPØY	2,961,295	31	AH3C	7,999,209
12	CE3BFZ	2,917,068	32	YJ1A	9,516,731
13	LU9DBK	1,702,008	33	CT3BH	14,892,102
14	GW4BLE	6,329,120	34	No entrant	
15	YT90A	7,120,204	35	TY2FG	551,078
16	RC2AZ	1,835,526	36	ZD8Z	8,852,625
17	RLØO	3,900,480	37	5Z4BI	1,818,357
18	RAØBR	211,692	38	ZS6WPX	887,220
19	UAØQO	502,756	39	FT5XA	1,501,056
20	ZC4BS	2,537,447	40	TF1MM	1,949,184

Station Operators
Multi-Operator Multi-Transmitter

4D3HSP: 4F3AAL, 4F3BAA, DU3MY, DU3CWF, DU3WPX, DU3CWM, DU3FBB, DU3FSK, Crisostomo. **4N4C**: YU4MA, YU4ZC, 4N4OXZ, Suad, Cedo, Vucko, Bob, YU4KM. **4U1VIC**: DL1SCQ, DL2SCQ, DL4NAC, DL6FAL, HS1ANV, DL4MFM, NK4N, DK7ZT, DK7ZH, DF5BM. **5W1JJ**: N6AA, N6ZZ, W6MKB, W6XD, WB6OKK, 5W1AT, 5W1AU. **DAØBV**: DB6QS, DF2RG, DG6MGP, DH5MBB, DJØIP, DJ1OJ, DK6WL, DL1MAY, DL1MFL, DL3MAA, DL4MEH, DL4MLF, DL5MAE, DL5RBK, DL5RBW, DL6RAI, DL7AV, DL7MAT, DL8RBR, LX1II, Y21RM. **DF3QG** & DJ1FC. **DLØCS**: DCØLR, DD7LO, DG7LAK, DF7RX, DF9LJ, DK7FW, DK2OY, DK9VW, DL1LAA, DL2LBP, DL2NBU, DL3LAB, DL4RJJ, DL6EFM, DL6LBB. **EA1KI** & EA1DOK, EA1DQB. **FS/KC1F** & N1AU. **GB2AA**: G3GAF, G4TNB. **HB9AJM** & HB9AGC, HB9ALM, HB9FAA, HB9AIB, HB9CVN. **IQ3A**: I3MAU, I3EVK, I3ON, I3JSS, I3QJZ, I3KVW, I3FIY, I3VHO, I3VJW, I3VRD, IK3HRZ, IW3FCG, IK2BHX, IK2NCJ, I1POR, K1RX, I6FLD, I6NOA, IK3NXF, IV3PRK, IV3YYK, IV3WMP, IV3ZCS, IV3TQE, IN3BYV.

J37DX: W8KKF, WD8ATS, K8CV, NY8E, WA8LOW, WA2ICE, KP2A, KJ4VH. **JA1YXP**: JJ1WYS, JM1BYR, JI7QPV/1, JE1BHJ, JI2KRK/1, JG1TNX, JG2QHQ, JL1SXX, Sakurai, Ogata. **JA3YKC**: JH4PAM, JG3MRT, JG3WDN, JG3CPF, JR5ARQ, JG6VTM, JF3VXV, JL3MCM, JL3HEY, 7K1CDS, JP3AIK, JM3FVL, JO3UGI, Ken. **JA6YFL**: JL6FBF, JE4VXZ, Shinokawa. **JA7YRR**: JA7FDY, JA7JUD, JA7LBY, JA7MQM, JA7OZW, JH7MEV, JH7VHZ, JR7LVA. **JH8YCT**: JR8XWU, JE8JZX, JE8URM, JG8QMN, JF7LGH, JM3GZO, JH8WAH. **JL1ZCG**: JO1BMV, JO1RUR, JF2IWL, JN3PYQ, JHØNZN, JHØSPE, JRØIRZ, JA9VDA, JS1INN, JQ1UXN, JI1UTP, JK3GRR, JP1OGL, JK1JEO, JRØJFM, JR5KDR. **K6ZM** & AK6T, KI6YB, NB6L, NP4IW, WB6MZQ. **KHØAM**: JE1CKA, JL1BLW, JI1QPU, JR2GMC, JA9SSY, JR7OMD, JI3ERV, JHØKHR, JI2GUT, JR2IOV, JH4UTP, JR6PGB, JH7PKU, JAØDXG, JAØQNJ, JHØLFE, JHØUSD. **K8CC** & AC8W, K5GO, K8DD, KU8E, KT8X, KE8OC, N8COA, NZ4K, W8UA, WA8RRR, WD8IJP.

KL7RA & KL7TC, KL7XD, AL7AF, AL7CO, AL7HC, AL7KC, NL7V, NL7PH, AA6DX. **KQ2O** & WA2MKM, KB2HZ, K2BK. **KY1H** & WA1ZAM, KR1R, NJ1F, N2MG, KB1W, NT2X, NI8L, KM1P, KA1XN, NU1P, KA1CI, KA1RE. **LA3BL** & LA9ML. **LY2ZO**: LY2NK, LY2BFN, LY2BKZ, LY2BMX, LY2BOA, LY2BTD, LY3BN, LYR346, LYR728, LYR1751, LYR1853. **N2RM** & N4HY, WM2H, KZ2S, N2AA, K2TW, KQ2M, N2NT, K3UA, W2RQ. **N5AU**: WB5VZL, KN6M, W5XZ, N5CR, KM5X, WN4KKN, NM5M, AA5B, K5TA, KS1G, N5TR, N5RZ, N5KEA, N5OAO. **N6ND** & N6CW, NC6U, NI6W, KM6K, K6JYO, K9VV, W6YA, WB6ORX, N6LRW. **N6RO** & N6IG, N6TIB, AD6E, K6TMB, WX6M, W6RGG. **N7QQ** & NØAFW, N6NU, N6UU, KJ6QE, WB6CNR, WA2FIJ. **N7RO** & W7EKM, N7MMH, KC7GX, WA7ZWG, WB7CLU. **N8JMN** & K8AQM, KB8ECG, KDØPF, N8IVQ. **NE3F** & KS3F, W3AP, KY3N, NZ3G, NK3Z, NT3V. **NF2L** & KY2T, K2TCK, WY2X.

NQ4I & N4FD, KB4HZ, WI4R, K4BAI, WB4FLB, KM4HH, DF3CB. **ON7LR**: Club. **PJ1B**: WW2Y, N3ED, WA3LRO, K2EK, N7ZZ, K3EST, N4RV, KB2XZ, K2SS, KT3Y, W3HHG, K1KI, NL7GP, W3UM, PJ9EE, K2SB. **PJ9W**: OH6NU, OH6MW, OH6RM, OH6FT, OH6JW, OH5BM, OH6YF, OH6DO, OH2MM, OH5NZ, OH2BAD, OH6XY, OH3UU, OH2KK, OH1XX, OH6IG, OH3NJZ, OH1MA, OH3XA. **R6L**: UA6LO, UA6LV, UB5ITW, UB5IBG, UA6-150-1104, UV6LPL, UA6-150-1060, UA6-150-1070. **SKØUX**: SMØHBV, SMØGZT, SMØNZB, SMØMRO, SMØAVK, SMØNEJ. **VE3SWA**: VE3MAH, VE3NQM. **VE7ZZZ**: VE6BBP, VE6EZ, VE6SF, VE6WP, VE7ARS, VE7AV, VE7CV, VE7DRS, VE7EME, VE7HBQ, VE7KD, VE7NNN, VE7RBL, VE7RK, VE7SK, VE7SSS, VE7WGT, VE7XYL. **W3KV** & W3GU. **W3LPL** & WI2T, ND3A, KC3EK, W3EKT, N3GB, W3IDT, KF3P, K3RA, K3RV, K3SO, NM3U, KA3UBJ, WD4AXM, KN5H, WA8MAZ, N8II, KD9J. **W5KS**: KF5DA, KG5TO, N5PYD, KD5RQ, N5NVQ, KB5IYB, N5OQN, KB5QIP. **W7XR** & W7AWA, K7IDX, WS7I, NN7L, VE7NKI, K7RI, K7SS, W7TJ, N7UA, KE7V, WA6VEF, W7WA.

WØAIH/9 & N9KAU, KA9PVY, KA9FOX, NØBSH, KØFVF, ACØW. **WB2YOF** & K2TD, WB2R, K3GYS. **WD3V** & N3LR, NT3F. **WØ9I** & Crew. **YT2B**: YU2NK, YU2VR, YU2NY, YT2LG, YT2NM, YT2IW, YT2JB, Pero, Sale, Ica, Zajo, Zvone, Braco, Alexandara, Sandra. **ZF2MZ**: K3IPK, WB2P. **ZX4V**: PY4VD, PY4OY, PY4NL, PY4BHB, PY4BA, PU4WHO.

WORLD TOP TEN QRPp
All Band

1. KR2Q	1,248,207	6. WA2UUK	584,684
2. 4M1G	1,144,827	7. F1BEG	556,920
3. K5RX	1,103,513	8. KD2TT	531,286
4. YU2TY	739,112	9. W5VGX	498,980
5. KN1M	606,816	10. K2WK	422,177

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, Zones, and Countries. Certificate winners are listed in boldface.

SSB RESULTS
SINGLE OPERATOR
NORTH AMERICA

UNITED STATES

K1RU	**A**	**4,664,400**	**2727**	**143**	**455**
K8PO/1	"	**4,129,521**	**2602**	**140**	**421**
W1WEF	"	**3,434,291**	**2069**	**137**	**444**
W1PH	"	3,323,895	2031	132	433
K1ST	"	2,574,000	1728	139	389
W1GD	"	2,297,350	1461	124	426
K8LT/1	"	2,191,140	1675	117	353
W1NG	"	1,689,120	1123	129	423
N1API	"	1,548,052	1162	109	357
KS9Z/1	"	1,264,224	1084	101	315
KQ1Y	"	1,190,280	1299	103	261
K1CLN	"	998,580	936	100	274
K5MA/1	"	885,870	1138	63	207
KA1HGY	"	771,907	975	67	214
K1TN	"	725,400	701	98	274
W1OP	"	707,544	769	95	222
KA1DWX	"	629,300	627	83	267
K1VSJ	"	616,383	645	83	250
KA1DWX	"	603,018	604	97	254
W1KRS	"	577,709	635	85	234
WE6G/1	"	522,636	633	72	219
W1FM	"	491,550	606	78	212
K1JKS	"	479,214	504	83	254
NY1L	"	463,404	583	66	210
NU1G	"	411,876	567	81	225
W1FJ	"	352,836	513	66	176
W1BIH	"	316,008	377	90	207
W1CB	"	314,534	361	81	238
NW1U	"	244,647	406	63	158
KC1SG	"	216,295	333	68	171
NU1E	"	201,596	345	55	147
N4XR/1	"	201,201	271	82	191
W1IHN	"	164,700	264	62	163
NF1J	"	162,162	312	44	138
W1MK	"	155,124	304	51	135
W1RM	"	133,397	258	52	129
KA1WR	"	122,265	250	42	129
WA1C	"	114,729	309	45	122
N1DJX	"	89,090	212	47	104
WA1LXP	"	86,394	214	48	106
W1AX	"	81,432	195	42	105
WC1D	"	78,590	200	47	98
KV1J	"	55,948	143	50	92
K1JBS	"	51,744	158	28	84
W1TSJ	"	44,004	139	34	80
WA1IIE	"	21,725	100	20	59
WM1G	"	18,480	110	21	45
KA5GIS/1	"	14,833	61	33	58
K1FIR	"	14,161	98	10	39
W1FV	"	14,144	73	18	50
N1RC	"	13,932	67	32	49
WK1P	"	13,167	91	16	41
NA1O	"	5,980	40	19	33
W1OPZ	"	4,165	41	11	24
K1DG	**28**	**932,696**	**1739**	**35**	**149**
KS1L	"	**915,399**	**1647**	**37**	**156**
KM1C	"	912,560	1781	38	149
NX1H	"	779,365	1594	35	138
K1VUT	"	633,368	1418	33	131
NX1P	"	382,298	812	34	132
W2AX/1	"	165,490	428	30	104
KA1RLI	"	121,968	338	28	98
KA1SSU	"	82,455	250	25	90
K1VWL	"	78,438	284	24	78
W1OPB	"	58,446	209	26	76
N1FWC	"	58,045	227	27	68
N1FHR	"	36,271	155	21	62
N1FUS	"	23,112	117	20	52
KA1UGO	"	16,140	108	14	46
KA1VMG	"	15,128	89	18	43
AA1M	"	12,566	75	14	47
N1GPY	"	8,601	68	17	30
KA1UKR	"	4,140	35	16	29
KA1RRX	"	2,220	26	8	22
KA1SVV	"	1,140	15	5	15
K2SX/1	**21**	**600,483**	**1227**	**36**	**137**
N8RA/1	"	376,200	906	34	118
K1DWQ	"	250,308	568	33	120
W1XN	"	150,027	405	32	97
KA1IOR	"	148,592	92	16	37
K1WNT	"	104,995	320	27	88
KA1GTR	"	52,689	217	24	67
W1RR	**14**	**1,028,020**	**1804**	**39**	**157**
NB1H	"	**902,275**	**1650**	**38**	**155**
NY1E	"	163,080	447	32	103
W2SC/1	**7**	**130,625**	**368**	**28**	**97**
KA1DZP	"	3,102	33	8	25
AD1G	**3.7**	**62,392**	**288**	**18**	**70**
N2LT	**A**	**3,892,876**	**2393**	**137**	**422**
K2DM	"	**3,700,578**	**2258**	**132**	**442**
KM2P	"	**3,537,720**	**2233**	**145**	**413**
K2PS	"	2,414,000	1704	123	377
K2PH	"	1,496,480	1131	116	354
N2WK	"	1,485,562	1190	108	334
WB2UEY	"	1,272,312	1039	106	325
KF2O	"	1,259,650	1048	104	323
N2VW	"	1,200,284	1051	100	304
WF2W	"	1,170,448	1070	104	279
WA2C	"	1,076,901	966	109	290
K2JLA	"	860,079	785	104	285
N2MR	"	765,808	738	101	267
KB2SE	"	718,680	743	92	247
WA2UDT	"	683,296	738	87	239
NW2J	"	676,800	744	86	234
K2FL	"	674,424	689	91	251
KB2WN	"	643,104	679	85	251
W2JGR	"	628,064	733	79	225
K2ZJ	"	570,505	617	94	241
KE2WK	"	551,286	773	69	180
N2BJX	"	365,160	680	58	146
K2UF	"	334,881	464	64	173
NZ2R	"	305,640	1132	82	188
KD2BW	"	295,929	420	65	186
WJ2O	"	294,998	419	72	181
NQ2O	"	287,028	429	68	170
W2TZ	"	268,840	402	64	171
K2BQW	"	238,320	572	72	121
K2ONP	"	212,184	306	77	175
N2CFD	"	208,075	366	61	142
N2KA	"	201,552	316	70	158
KS2M	"	199,916	332	56	156
KA2HSK	"	170,321	325	53	128
N2EIK	"	150,775	291	45	140
W2SDO	"	129,720	250	63	121
WM2Y	"	126,248	259	52	120
N2AGO	"	114,736	211	63	139
N2FF	"	112,944	250	39	117
WB2MRX	"	98,340	243	42	107
KB2DE	"	87,731	211	50	101
K2JF	"	79,316	187	15	38
N2DUB	"	77,103	381	71	172
AA2Z	"	76,254	197	46	96
WM2U	"	69,662	198	36	86
K2AJY	"	64,400	168	44	96
W5KI/2	"	57,528	147	55	98
WK2N	"	50,181	165	42	87
W2KHQ	"	48,910	136	42	92
WB2EAR	"	44,778	162	33	69
W2FR	"	40,068	125	40	86
W2HCA	"	39,078	133	38	79
N2RO	"	34,216	119	33	71
K1JUL/2	"	31,233	124	25	62
KB4VL/2	"	26,864	102	27	65
W2OKJ	"	25,564	231	39	97
KB2UW	"	25,284	102	40	58
K2MW	"	23,970	103	21	64
N2GST	"	22,422	82	39	62
KA2AQV	"	16,260	85	25	47
W2AOY	"	15,104	89	17	42
W2LU	"	12,142	80	26	52
AA2Q	"	11,115	61	20	45
K2TCK	"	10,362	56	21	45
WY2Z	"	6,909	59	21	26
K2BMI	"	6,204	45	16	31
W2EBF/2	"	2,072	41	17	20
WY2E	"	1,701	26	21	24
N2KLO	"	672	15	11	10
KZ2I	**28**	**327,408**	**653**	**34**	**118**
K2MFY	"	305,788	663	34	129
KC6ETY/2	"	151,500	516	24	80
K2LE	"	111,544	272	34	112
N2BCF	"	77,010	269	25	77
N2AUV	"	68,338	252	23	71
KA2AWE	"	62,310	232	32	61
N2KKB	"	47,642	202	20	63
N2JTW	"	40,140	168	21	69
N2JOH	"	38,590	160	23	62
KB2IUA	"	36,225	171	18	57
N2LDU	"	25,205	141	20	51
K2PF	"	23,004	116	23	48
K2SWZ	"	22,032	112	22	50
N2JNZ	"	17,400	101	17	43
KM2X	"	13,224	83	16	41
KB2KXC	"	10,950	81	15	35
WF2B	"	4,095	42	14	25
K2SKO	"	561	17	5	6
NG2X	**21**	**943,578**	**1806**	**38**	**140**
NB2P	"	**685,542**	**1261**	**38**	**149**
WB2DND	"	133,280	336	33	103
KA2RGI	"	4,905	39	7	38
K2VV	**14**	**939,624**	**1771**	**38**	**150**
K2HFX	"	**689,095**	**1372**	**38**	**149**
K2MGA	"	247,940	624	32	108
KB2BF	"	147,500	1180	32	93
WA2UZI	"	122,580	319	33	102
NS2W	"	68,013	244	22	77
WA2ASQ	"	24,222	131	12	54
WV2B	"	3,955	40	11	24
NQ2D	**7**	**146,875**	**447**	**28**	**97**
WQ2M	"	130,161	352	28	101
W2VP	**3.7**	**63,597**	**306**	**18**	**69**
WA2WVL	"	**26,480**	**130**	**20**	**60**
W2FCR	**1.8**	**4,719**	**83**	**12**	**27**
W2VO	"	1,288	25	7	16
K3OO	**A**	**5,706,990**	**3204**	**148**	**473**
K5ZD/3	"	**4,922,856**	**2669**	**146**	**493**
K3ZO	"	**4,561,608**	**2832**	**148**	**419**
W3BGN	"	**3,959,928**	**2407**	**140**	**427**
K3ZJ	"	2,460,025	1833	122	353
N3BJ	"	2,158,927	1545	124	367
KE3Q	"	1,292,062	1030	111	335
W3UJ	"	997,893	986	91	260
KB3TS	"	817,235	807	91	274
K4JLD/3	"	669,960	675	100	260
K3II	"	566,004	651	83	220
K3TEJ	"	548,744	679	77	210
NC3C	"	523,692	503	97	276
K3FNW	"	518,502	587	81	228
N3IGV	"	509,292	605	82	219
AD3V	"	493,115	484	99	266
W3FJY	"	377,667	510	71	190
K3ZNV	"	369,200	497	70	190
WB3AVN	"	342,544	426	79	192
W3OV	"	335,808	424	80	208
W3ZZ	"	324,279	436	73	190
K3LR	"	315,112	463	61	177
WA3OFR	"	267,546	370	75	183
W3GRW	"	220,696	390	59	137
KA3VNB	"	214,704	354	64	152
NZ3T	"	181,806	346	53	140
KB3MP	"	175,725	291	62	151
W3HVM	"	138,904	275	53	126
NS3L	"	120,032	247	50	126
K3JGJ	"	105,386	232	45	113
KU3X	"	78,560	187	26	59
KC3AJ	"	57,568	187	33	79
K3SKE	"	56,889	138	50	97
W3FTG	"	56,348	147	54	92
W6AXX/3	"	53,599	143	44	89
N6CQ/3	"	51,708	147	42	82
KA3AVB	"	37,088	131	45	77
KD3CQ	"	35,712	113	42	82
WA3YOB	"	27,360	119	22	58
WB3LGG	"	20,075	125	12	43
K3NL	"	18,320	86	25	55
W3FQE	"	16,198	156	28	63
W3QIR	"	14,929	108	31	68
N3GLK	"	14,136	73	29	47
K3LA	"	8,235	50	26	35
WB3ANZ	"	7,328	100	23	54
KD3TB	"	4,344	77	13	20
WE3C	**28**	**729,289**	**1537**	**36**	**131**
K3MD	"	279,840	738	30	102
KA3VEL	"	76,608	281	26	88
KA3UIH	"	39,920	175	23	57
N3IOE	"	11,544	222	17	35
W3CPB	"	7,904	59	16	36
W8FJ/3	"	3,864	35	16	30
N3GUK	"	1,782	26	10	17
WB3ICL	**21**	**330,536**	**741**	**34**	**124**
N3EC	"	152,510	352	35	116
N3FYN	"	104,340	328	27	84
WB3EKO	"	92,574	270	29	82
WA3DMH	"	30,170	152	19	51
W3FW	**14**	**354,815**	**846**	**35**	**110**
WB3JQE	"	97,104	306	27	85
N3ARK	"	33,360	145	21	59
N3HCP	"	28,897	143	19	52
AK3Z	**7**	**13,140**	**80**	**13**	**47**
KZ3H	**3.7**	**74,700**	**318**	**22**	**78**
KQ3V	"	17,632	153	13	45
N3HHE	"	13,832	106	13	43
N4RJ	**A**	**4,683,448**	**2643**	**145**	**471**
					(Opr. KM9P)
N4WW	"	**3,597,756**	**2203**	**135**	**429**
					(Opr. WA6DGX)
WA4QQV	"	**2,116,836**	**1483**	**131**	**377**
K4XS	"	2,337,390	1655	129	366
KØEJ/4	"	2,045,840	1511	120	358
N4CC	"	1,870,304	1212	148	406
K4GFH	"	1,181,460	997	103	317
KJ4VG	"	1,169,630	956	109	325
N4UH	"	1,082,810	942	111	299
W9LT/4	"	1,070,622	938	104	302
K4AMC	"	1,041,590	1009	98	276
W3VT/4	"	927,185	799	111	302
W4CVX	"	801,024	740	101	283
KE4BM	"	763,542	802	89	249
KM4YY	"	754,952	718	95	278
WR4K	"	737,450	628	123	307
WB4FOT	"	731,786	753	92	249
KE2JO/4	"	726,768	879	79	215
K4GKD	"	679,890	689	92	254
K4UVH	"	668,472	726	88	234
AA4UJ	"	589,176	622	100	234
W4JVN	"	561,600	626	99	221
AA4XU	"	534,432	625	87	217
N4VYZ	"	527,706	574	104	238
N4ANV	"	479,641	595	81	212
N4DT	"	458,339	572	77	210
WA5DTK /4	"	425,868	536	73	203
WB4FTI	"	425,520	560	74	196
KJ4TI	"	425,048	561	75	193
K8AC/4	"	417,720	511	82	213
KA4C	"	407,040	460	90	228
KB4RME	"	388,354	497	73	204
KF4CI	"	367,605	432	88	227
WA4ORG	"	338,766	461	74	188
AA4EL	"	299,136	438	66	180
K4NMH	"	292,740	444	77	169
KL7TF/4	"	283,346	427	72	187
W4GTS	"	267,930	407	61	173
N4MAD	"	257,807	360	80	173
K2AOE/4	"	257,023	408	56	165
AA4S	"	244,020	346	83	166
WA4HIW	"	206,652	365	57	147
W4LMJ	"	188,006	368	44	138
K4MF	"	185,472	337	52	140
AG4Q	"	171,105	376	56	127
AB4OH	"	164,692	302	58	139
WK4F	"	147,169	272	53	134
WB4IUX	"	125,396	239	60	128
N4OLE	"	122,800	223	64	136
K4FPF	"	119,475	241	50	127
N8LM/4	"	109,251	224	60	123
N6NSM/4	"	90,915	221	41	104
KJ4WH	"	80,500	207	42	98
N4SBI	"	74,803	205	38	89
WA4YLD	"	72,076	183	51	97
KBØFIR/4	"	69,264	170	47	101
W4HVU	"	65,048	147	60	113
AB4MG	"	57,760	158	48	104
AB4ST	"	55,328	147	55	97
WA4FTM	"	52,245	158	40	89
KQ4G	"	50,386	155	38	80
N4PUQ	"	46,620	150	38	73
AA4LR	"	37,720	141	21	71
K4RD	"	35,910	112	47	79
WG4P	"	34,496	118	40	72
K5OTI/4	"	30,765	105	34	71
N4MM	"	26,260	95	41	60
KM4MG	"	25,728	94	33	63
W4UYC	"	24,500	95	40	58
KC4NKR	"	20,485	225	34	85
KF4TE	"	17,820	92	23	43
WD4JNS	"	17,712	78	30	52
AB4YC	"	13,024	74	32	42
NQ4K	"	10,620	71	24	35
KD4DI	"	6,780	44	25	35
KF4AM	"	4,305	37	15	26
N4ZZ	**28**	**737,975**	**1464**	**36**	**139**
KT4W	"	**725,760**	**1506**	**35**	**133**
WA4SWY	"	396,984	1004	32	104
ND4Y	"	349,378	835	32	114
WC4E	"	200,157	502	29	108
KA4RRU	"	168,264	478	31	92
KC4UH	"	87,576	204	46	118
NY1H/4	"	69,328	214	28	84
KB4IOS	"	54,417	201	23	74
AB4YU	"	52,374	217	24	63
KB4YJG	"	50,336	175	25	79
KC4TIR	"	33,615	149	21	62
W9CNF/4	"	25,130	128	18	52
N4YKD	"	22,780	121	19	48
W4BFR	"	11,507	57	28	45
KC4QWF	"	7,038	67	18	28
KC4OLE	"	2,244	30	16	18
KM4GW	"	576	13	9	9
N4CT	**21**	**357,133**	**768**	**36**	**127**
N4MO	"	304,612	691	34	120
WA4ZBC	"	173,040	575	27	85
KM4FC	"	106,575	368	28	77
N4KE	"	71,628	200	34	93
K4NNQ	"	20,661	107	21	50
W4EZ	"	11,448	79	17	37
HP8ADU /W4	"	7,998	108	18	25
WA4DAZ	"	2,945	35	10	21
KV4P	**14**	**401,162**	**878**	**36**	**122**
N4WRG	"	44,772	200	24	67
N4ZC	**7**	**120,832**	**353**	**23**	**99**
WA4SVO	"	78,116	244	27	91
WA4FFW	"	63,130	215	25	82
WD4KXB	"	54,908	189	25	81
W4KMS	"	8,100	64	7	38
W4QCU	**3.7**	**16,224**	**83**	**23**	**55**
KC4GR	"	6,210	60	11	34
K4TEA	**1.8**	**1,856**	**30**	**10**	**19**
K8CFU/4	"	**1,300**	**25**	**8**	**18**
WM5G	**A**	**6,308,064**	**3266**	**159**	**513**
					(Opr. KRØY)
N3BB/5	"	**2,457,054**	**1711**	**138**	**385**
NI5M	"	**1,506,996**	**1089**	**134**	**358**
K9MK/5	"	1,264,572	929	134	352
N5CG	"	947,052	1098	74	242
WA5POK	"	909,324	877	112	265
N5NMX	"	854,760	776	113	295
K5KLA	"	743,924	731	100	258
W5KFT	"	718,536	763	97	232
K5FUV	"	654,286	697	85	261
N5AW	"	533,618	525	106	261
KG5OA	"	356,160	416	101	219
WA5VBE	"	335,160	473	75	177
W5LMG	"	332,906	403	95	206
WA5SOG	"	302,455	446	67	184
W9FI/5	"	286,342	455	62	164
KO9Y/5	"	276,768	359	97	191
WT5U	"	215,915	375	60	139
WK5K	"	189,614	318	78	148
KI5EI	"	182,172	329	71	117
WA5JDU	"	161,745	282	63	142
W5QZ	"	152,520	272	69	136
N5MBD	"	148,033	295	51	128
AA5CV	"	126,412	219	76	145
K5DB	"	123,234	306	39	102
KI5HP	"	119,340	237	56	124
N5KT	"	113,324	252	51	113
W5LFS	"	101,924	223	50	116
KB5GON	"	101,178	230	49	105
KM5R	"	98,640	238	47	97
NN5T	"	92,904	224	51	96
N5OVV	"	81,744	186	45	111
W5AE	"	65,360	160	52	100
K5EC	"	52,272	149	49	83
AA5PA	"	50,391	187	40	59
WD5EHU	"	23,433	169	51	81
KI5IB	"	11,865	102	45	75
KC5WA	"	7,380	70	12	29
WA5OYU	"	7,040	47	23	32
K8SWC/5	"	2,970	45	29	37
WC5D	"	2,052	21	18	20
NR5M	**28**	**1,116,390**	**2093**	**37**	**150**
WV5S	"	302,539	678	35	122
KF5QR	"	243,984	634	32	104
K5HYB	"	197,340	495	28	110
KC5CP	"	186,690	440	32	115
KB5KTY	"	169,620	466	28	104
N5QDE	"	51,606	217	21	73
KC5AC	"	50,139	224	20	61
KB5MSN	"	39,100	154	24	68
WB5CRG	"	23,532	113	27	47
KI5HF	"	12,627	174	25	52
N5PCA	"	3,572	65	16	22
W5WMU	**21**	**487,139**	**1070**	**37**	**130**
WB5UDX	"	329,522	787	33	113
KA5W	"	299,932	636	36	131
AA5SU	"	88,128	287	27	81
N5IZY	"	76,368	251	27	84
W5LKP	"	57,000	197	27	73
N5GM	**14**	**188,343**	**436**	**34**	**119**
KI5FI	"	84,224	271	26	86
KD5IA	"	59,732	200	28	81
N5WA	"	49,698	184	28	71
W5FO	"	3,145	31	16	21
W5CWQ	**7**	**38,220**	**151**	**25**	**66**
K5NU	"	19,314	95	21	53
KE5FI	**3.7**	**59,486**	**314**	**26**	**72**
W5EU	"	41,679	168	28	71
K5TKJ/5	"	8,313	71	19	32
K5UR	**1.8**	**14,152**	**149**	**18**	**43**
K5WXZ	"	1,914	31	10	19
WC6H	**A**	**3,002,830**	**2242**	**128**	**342**
N6AW	"	**2,585,410**	**1936**	**133**	**325**
K6HNZ	"	**1,656,534**	**1422**	**126**	**292**
KM6B	"	1,640,656	1133	146	342
N6EK	"	995,788	1063	113	233
KE6ZE	"	939,709	1030	103	228
N6MB	"	893,368	805	121	271
WB6JMS	"	805,832	770	128	255
W6FSJ	"	765,210	783	110	235
W6UJX	"	605,010	648	106	229
N6VMS	"	486,772	603	87	199
KH6DW /W6	"	440,146	509	99	199
KD6XM	"	415,650	455	94	232
N6JL	"	415,044	569	75	177
N6GG	"	344,040	404	97	208
K6MA	"	326,570	415	95	194
K6DR	"	274,468	409	80	156
N6JM	"	269,814	409	79	154
WI6N	"	259,920	471	75	115
W6DBV	"	254,928	401	79	147

KG6AO	"	231,352	360	89	153
N6IBP	"	221,840	348	81	155
WA6SDM	"	182,405	338	67	124
NE6I	"	180,268	342	60	127
N6AN	"	137,268	293	61	103
W6KXG	"	133,020	263	60	120
K6SG	"	125,493	250	71	106
W6REC	"	123,200	411	53	101
		(Opr. KB6UNC)			
K6UO	"	113,367	240	73	86
W6EEN	"	100,989	244	48	99
WB6ZSO	"	91,512	216	65	99
WA6RNF	"	79,800	174	60	108
WA6UFY	"	69,138	184	58	80
W6GSQ	"	66,882	162	61	96
N6HE	"	48,160	166	45	67
WA6FIT	"	42,228	146	39	63
KJ6UD	"	35,055	131	33	62
AA6EE	"	25,026	109	33	53
W6OVO	"	24,650	103	36	49
WW6O	"	23,634	112	35	43
N6BFN	"	22,496	109	32	44
N6TDC	"	2,170	30	15	16
W6NV	**28**	**877,389**	**1917**	**39**	**138**
		(Opr. WB6SHD)			
W6PU	"	447,216	914	39	129
W6UQF	"	268,826	674	32	107
WA6ISP	"	252,044	592	33	115
WB6MBF	"	197,169	563	30	93
K6SIK	"	150,398	382	33	106
K6PJY	"	147,034	410	32	90
N6CDA	"	138,096	427	31	81
AI6Z	"	130,290	347	32	97
WA6FGV	"	99,130	302	30	85
W6RCL	"	88,608	301	24	80
W6BIP	"	72,657	220	30	87
N6WLF	"	48,450	199	25	60
WA7BNM /6	"	40,204	189	22	54
WB0PVN /6	"	39,530	204	22	45
KB6RMN	"	35,968	193	20	44
W6MVW	"	18,966	118	22	36
WX6M	"	18,836	106	24	44
WA6KXN	"	15,964	107	20	32
N6IFW	"	13,824	101	16	32
KB6GK	"	11,515	84	17	32
W6SVU	"	7,965	62	20	25
KC6FZU	"	4,788	50	16	26
KA6EZP	"	924	24	41	66
N6TPT	"	864	22	8	8
N6VV	**21**	**502,366**	**1076**	**38**	**125**
N6HR	"	279,260	889	36	111
N6YKL	"	224,436	672	34	84
WB6NFO	"	87,792	261	26	92
WA6WPG	"	75,735	264	28	71
N6HK	"	37,444	141	25	67
WB6DFA	"	21,515	121	25	40
W6PM	"	18,971	109	14	47
K6SVL	**14**	**285,576**	**652**	**37**	**126**
N6TU	"	109,650	299	34	95
W6FRZ	"	80,645	222	32	95
W6OK	"	41,041	161	25	66
AA6TT	**7**	**38,948**	**156**	**26**	**65**
K5KT/6	"	27,489	130	21	56
W6RJ	**3.7**	**105,343**	**450**	**32**	**69**
N2KK/6	"	**102,390**	**358**	**33**	**72**
N6UC	"	5,198	47	17	29
K6MO	1.8	80	8	6	4
NN7L	**A**	**2,227,905**	**1917**	**129**	**276**
WZ7J	"	**1,713,417**	**1404**	**124**	**315**
K7LXC	"	**1,392,204**	**1257**	**119**	**279**
W7TSQ	"	1,314,800	1300	122	258
K7WK	"	1,151,382	1068	109	272
W7CFL	"	1,128,330	1154	122	283
K7PB	"	704,060	756	96	233
K6XO/7	"	695,772	812	95	213
NY7T	"	540,054	731	91	183
KA7MCX	"	527,472	626	84	212
K7JYE	"	517,140	764	86	174
WG7A	"	407,416	559	82	172
WC7S	"	395,928	835	72	162
K7RA	"	371,750	533	79	171
KS7T	"	371,358	571	70	164
KC7UP	"	292,740	437	79	167
WR7Q	"	282,880	602	73	135
W7HS	"	261,608	442	77	135
K7HBN	"	215,009	350	67	144
KE7UH	"	207,570	430	61	109
KR7G	"	185,968	283	86	150
WR7E	"	152,678	285	67	127
KE0RO/7	"	144,000	296	63	117
W7QN	"	140,524	288	62	110
WS7O	"	138,105	331	64	91
KR7L	"	107,970	308	42	80
N7MMQ	"	107,768	256	60	92
N7MVX	"	102,900	264	51	89
N7MPS	"	83,512	207	52	94
WA6RNF /7	"	79,800	174	60	108
WA7BAY	"	72,268	216	42	74
N7JAM	"	67,983	192	48	81
N7ER	"	67,402	184	47	87
K7EFB	"	64,797	147	27	100
KA7FEF	"	36,860	168	30	46
W7BQG	"	36,792	173	27	46
W7GUR	"	30,276	125	30	57
KY7H	"	28,026	121	23	57
N7AME	"	17,316	134	49	62
N7KJE	"	8,874	63	22	29
N7BG	**28**	**913,674**	**1807**	**36**	**138**
K7QQ	"	**588,141**	**1321**	**36**	**123**
NX7K	"	**569,328**	**1285**	**40**	**134**
NW7Q	"	354,672	898	32	112
NB7N	"	303,778	807	32	107
W7FP	"	219,834	574	33	105
W7AYY	"	143,010	469	28	77
KB7IRF	"	140,097	414	29	94
KQ7I	"	129,108	425	29	77
WB7VUB	"	76,154	269	26	75
KX7J	"	21,975	103	23	52
NQ7Q	"	12,834	77	20	42
W7TZO	"	6,327	63	16	21
W7UPF	**21**	**189,040**	**569**	**28**	**108**
K7LZJ	"	154,542	419	31	98
KE7RT	"	34,432	186	20	44
W7VIH	"	6,012	60	17	19
K7LR	**14**	**315,068**	**708**	**36**	**130**
WA7FAB	"	120,708	345	31	95
K7FD	"	101,964	330	32	84
W7LGG	"	48,706	176	27	71
WW7Q	"	48,100	117	35	113
WK7Z	**7**	**12,958**	**78**	**20**	**42**
K3ZJ/8	**A**	**2,460,025**	**1833**	**122**	**353**
WB3KKX /8	"	**2,123,985**	**1359**	**139**	**416**
KC8FS	"	**1,000,416**	**884**	**99**	**309**
N8ESB	"	988,000	883	110	290
N8FEH	"	741,354	823	83	231
NC8V	"	726,024	806	85	227
WD8EOL	"	457,478	564	75	212
KI8W	"	426,162	660	71	171
KC8KE	"	382,436	498	73	195
KA8D	"	361,299	518	81	168
WA4ORG /8	"	338,766	461	74	188
K8CLA	"	316,416	412	67	189
KE8KG	"	275,334	448	62	156
K8OOL	"	235,176	340	73	173
W8UPH	"	208,075	364	58	147
WA8RSA	"	164,358	286	62	145
NW8F	"	144,255	311	47	116
N8KSO	"	137,741	274	51	130
KE8OQ	"	134,872	270	55	129
KF8DF	"	120,204	232	52	137
N8LM	"	109,251	224	60	123
NS8O	"	108,576	237	63	145
WC8W	"	107,910	348	30	80
W8LNK	"	99,012	244	43	105
W8URM	"	65,750	184	39	86
KE8FO	"	50,460	159	35	81
W8OK	"	50,127	126	53	94
WB2VTN /8	"	48,375	143	45	84
NE8T	"	44,196	133	41	75
WR8R	"	43,911	146	40	78
W8JRK	"	35,182	124	27	71
N8MMB	"	34,768	125	39	67
AF8C	"	19,980	79	32	58
W8YGR	"	8,436	41	37	39
W8IDM	"	8,357	51	19	42
K8AZ	**28**	**697,363**	**1413**	**34**	**139**
N8CXX	"	**628,830**	**1281**	**35**	**135**
N8MSF	"	292,699	927	30	91
N0AON/8	"	172,458	417	33	110
K8BSW	"	97,112	283	29	93
KA8NRC	"	72,452	218	29	89
KE8NH	"	62,652	239	21	71
WG8Y	"	47,483	156	30	73
KA8VPL	"	38,335	151	23	62
KF8IF	"	33,866	148	23	59
KA8UBK	"	28,782	126	22	60
KB8HMA	"	10,624	61	21	43
K8MNG	"	4,448	52	14	18
N8JHG	"	1,173	20	10	13
N8IXT	"	1,058	20	11	12
KF8K	**21**	**200,312**	**483**	**33**	**113**
WZ8T	"	154,632	404	33	103
N8EXS	"	98,530	290	39	79
W8MKO	"	23,490	126	24	57
WB8OHO	**14**	**353,722**	**1013**	**38**	**104**
W8TWA	"	308,880	683	37	128
K8HJD	"	167,616	412	31	113
KA8WAS	"	86,188	264	27	89
WA8NDE	"	37,887	196	19	54
K8KUH	"	20,550	170	20	55
KD8EU	"	10,710	68	21	42
K8MJZ	**7**	**102,368**	**317**	**28**	**84**
AD8C	"	65,540	213	26	87
KV8S	"	23,598	119	20	49
W8WOJ	"	21,883	104	22	57
W8IQ	"	4,134	38	13	26
W8UVZ	**1.8**	**288**	**10**	**7**	**9**
W9RE	**A**	**4,525,010**	**2483**	**155**	**480**
K9SH	"	**1,528,620**	**1256**	**122**	**316**
K9CAN	"	**1,137,955**	**882**	**123**	**332**
W9NB	"	740,344	751	94	264
KB0C/9	"	664,274	625	106	271
K9BQL	"	633,033	669	97	236
K9QVB	"	537,776	615	81	223
NG9L	"	520,572	650	73	211
KC9EW	"	488,351	612	76	201
KA9JOL	"	463,232	1504	93	215
KA9YMV	"	414,036	575	67	185
KE9XR	"	413,316	570	76	191
N9EHQ	"	286,974	383	31	100
KF9P	"	269,115	428	62	171
W9BCV	"	223,608	330	77	165
KW9E	"	219,008	350	67	165
KB9BUM	"	190,684	365	56	137
WU9D	"	189,924	350	61	143
K9DN	"	184,894	345	54	139
K9UQN	"	176,961	339	52	131
KB9CRJ	"	166,428	295	64	143
WD9GGY	"	148,608	281	57	135
NI9C	"	128,040	249	63	131
W9KVF	"	115,878	231	53	125
AJ9C	"	115,866	267	52	105
WB9CXY	"	108,770	266	38	108
KA9WBX	"	107,000	225	75	125
W9RZW	"	90,628	237	41	98
N9XX	"	70,091	185	43	90
W9NA	"	61,600	146	49	91
WA9GON	"	53,066	123	44	113
WD9DYR	"	49,920	151	36	84
WD9FEN	"	25,927	137	33	78
KA9HDN	"	25,839	115	24	57
WU9B	"	23,594	98	35	59
KB9OD	"	21,538	112	32	57
N9IUM	"	16,881	115	58	104
AJ9U	"	11,661	60	44	25
W9CA	"	10,904	65	16	42
W9YCV	"	8,330	42	31	39
N9AG	**28**	**585,820**	**1221**	**34**	**136**
K9MDO	"	501,858	1168	32	115
KK9L	"	449,280	1148	33	111
KC9AL	"	210,343	505	34	117
K9JS	"	190,138	466	29	113
KB9ABI	"	143,190	408	28	101
N9IHW	"	53,385	49	14	31
N4XMV/9	"	51,975	234	24	53
N9RO	"	50,400	221	23	57
K9PNG	"	12,768	81	18	39
W9GIL	**21**	**177,141**	**450**	**32**	**105**
W9ZRX	"	100,116	334	28	80
KJ9D	"	21,406	100	26	51
W9LNQ	"	14,740	80	15	52
K9CLO	**14**	**176,808**	**460**	**32**	**103**
WI9H	"	116,640	287	33	111
K9YNF	"	116,459	313	33	98
N9CIC	"	70,296	215	31	85
KD9ST	**7**	**55,752**	**199**	**25**	**76**
W9CH	"	55,263	220	24	85
KD9Q	"	12,508	75	19	40
KE9U	**3.7**	**4,972**	**49**	**15**	**29**
WØEJ	**A**	**2,039,342**	**1544**	**129**	**353**
WØCG	"	**2,014,830**	**1635**	**115**	**326**
KØSCM	"	**1,676,896**	**1427**	**107**	**309**
WAØPUJ	"	**1,556,688**	**1174**	**134**	**358**
NØZA	"	1,238,297	1125	120	271
KØKE	"	891,624	821	120	263
W4ETO/Ø	"	814,576	759	112	280
WKØF	"	749,634	864	83	226
WØRXL	"	536,239	610	93	226
WØMJN	"	530,658	678	74	205
KAØZFX	"	432,408	678	81	177
NKØN	"	383,736	501	75	196
WØYA	"	348,948	535	69	174
KMØL	"	305,280	417	83	182
KDØNB	"	251,304	413	71	151
NSØB	"	244,530	378	67	167
WBØIEL	"	232,143	366	72	151
W3GRW/Ø	"	220,696	390	59	137
WSØQ	"	211,004	428	58	156
KEØUI	"	173,144	284	53	131
WØPPF	"	161,130	404	56	149
WAØDCB	"	155,092	277	68	135
WBØISW	"	138,475	259	68	123
KA3DRR /Ø	"	126,420	348	58	114
KAØZPP	"	122,589	271	50	109
KØHB	"	110,880	237	52	116
WCØD	"	106,799	194	73	136
AJØE	"	98,236	226	58	106
KBØFIR	"	69,264	170	47	101
NØASN	"	67,620	225	25	73
ND1H/Ø	"	62,152	171	45	91
KØINR	"	36,725	126	39	74
NØHJZ	"	33,376	111	40	72
WØSPF	"	25,520	173	42	64
WØWUU	"	20,361	103	13	32
AIØZ	"	13,650	76	25	45
NØHBH	"	5,805	53	16	29
WØZV	**28**	**975,175**	**1912**	**35**	**140**
KCØD	"	425,796	1043	33	115
KEØOL	"	368,836	787	33	131
WØJLC	"	324,311	660	36	133
KCØUH	"	263,340	652	33	107
WA3TIH/Ø	"	95,004	266	29	97
KØTLM	"	71,022	219	28	86
WBØGFV	"	40,050	158	22	68
KAØAIA	"	31,304	132	24	62
WRØU	"	24,353	121	26	45
NNØM	"	19,008	109	16	38
NØLYK	"	10,353	78	16	38
WBØB	"	10,266	69	20	39
KDØZR	**21**	**381,312**	**1021**	**35**	**109**
WBØO	"	129,630	314	34	111
WØACT	"	103,158	385	26	73
NØHCH	"	84,252	314	25	77
WOØG	**14**	**734,290**	**1433**	**39**	**155**
WBØYWO	"	48,208	190	26	66
KAØKHE	"	21,560	114	19	51
KVØQ	**7**	**181,252**	**553**	**30**	**83**
KØGT	"	21,976	101	21	61
KØOD	**3.7**	**23,532**	**136**	**21**	**53**
KØKX	"	19,125	105	21	54

ALASKA

WL7E	**A**	**3,048,430**	**3388**	**129**	**256**
NL7RA	"	290,250	1031	52	77
KL7AF	"	97,350	396	43	67
NL7KB	**28**	**409,016**	**2396**	**26**	**56**
NL7KJ	"	171,864	1008	28	49
KL7FAP	"	88,893	772	22	29
NL7EL	"	1,738	63	6	5
AL7KS	**21**	**76,304**	**425**	**24**	**52**
NL7HT	"	12,284	131	17	20
KL7U	**7**	**281,731**	**1108**	**29**	**78**
KL7HFA	**3.7**	**11,550**	**212**	**12**	**13**

ANGUILLA

VP2E	**1.8**	**6,936**	**143**	**6**	**18**
		(Opr. VP2EXX)			

ANTIGUA

V2/G6QQ	**A**	**193,875**	**734**	**45**	**80**

BARBADOS

8P6SH	**A**	**1,933,955**	**2483**	**93**	**242**

BRITISH VIRGIN ISLANDS

VP2V /N6LL	**A**	**2,256,520**	**3381**	**74**	**206**

CANADA

VE1CBF	**A**	**401,157**	**603**	**69**	**192**
XM1MQ	"	369,036	794	54	150
VE1TI	"	309,308	518	50	162
VO1SO	**28**	**130,872**	**610**	**22**	**62**
VO6AW	21	4,725	50	9	26
VE1CGF	**14**	**76,145**	**274**	**29**	**68**
VO6SF	"	40,710	258	18	51
VE1ZZ	**1.8**	**31,974**	**201**	**20**	**53**
XM2ZP	**A**	**3,790,320**	**3818**	**102**	**306**
VE2AYU	"	**1,132,047**	**1210**	**87**	**270**
VO7TM	"	585,980	1541	50	116
VE2TAE	"	142,232	320	60	124
XM2GSX	**28**	**206,584**	**601**	**29**	**95**
VE2MRP	"	86,655	300	24	85
VE2QK	"	64,600	293	24	61
VE2EW	**21**	**97,790**	**317**	**25**	**85**
VE2BMC	"	41,728	279	17	47
VE2 /VK2DXI	"	25,680	294	13	27
XM2PJ	**14**	**847,207**	**1869**	**39**	**140**
VE2GVZ	"	31,806	227	20	42
XM3IY	**A**	**4,802,364**	**3673**	**137**	**395**
XM3AT	"	**2,138,142**	**2063**	**87**	**280**
VE3ZD	"	758,542	899	92	255
VE3OTL	"	476,012	789	66	170
VE3EZU	"	114,760	305	49	102
VE3FJX	"	102,721	238	42	97
VE3OMU	"	64,638	183	42	84
VE3 /OZ1DRK	"	63,535	174	42	89
VE3ST	"	18,430	69	41	56
VE3ACB	"	3,465	29	17	28
VE3FWQ	**28**	**438,051**	**1140**	**31**	**120**
VE3MVV	"	82,530	233	29	102
VE3CPA	**21**	**1,010,758**	**2271**	**37**	**125**
VE3NTW	"	563,996	1287	34	130
VE3NYT	14	64,124	268	23	69
VE3CXK	3.7	5,394	84	9	20
VE3DO	**1.8**	**12,960**	**193**	**12**	**24**
VE3PN	"	**12,168**	**262**	**11**	**13**
VE4GV	**A**	**878,349**	**1055**	**97**	**242**
VE4VV	"	**743,595**	**1306**	**84**	**183**
XM4AIY	"	212,316	638	51	105
VE4HQ	"	147,312	639	68	148
VE4IM	**14**	**98,325**	**309**	**27**	**88**
VE4AA	"	24	2	2	2
VE5TQ	**A**	**586,524**	**1229**	**77**	**145**
VE5SF	"	121,104	358	48	96
VE6UO	**A**	**548,758**	**968**	**89**	**177**
XM6BMX	"	269,876	445	87	181
VE6NAO	"	192,372	319	74	172
VE6JY	"	155,495	256	81	146
VE6YZ	"	50,976	195	45	51
VE6DZ	"	8,000	75	25	25
VE6REV	**21**	**103,530**	**518**	**23**	**64**
VE6GB	"	62,997	281	25	58
VE6MAA	14	7,700	74	19	25
VE7XO	**A**	**186,900**	**1246**	**52**	**98**
VE7AWL	"	67,408	312	38	50
VE7FIJ	"	57,630	129	72	98
XM7ABC	**28**	**532,120**	**2074**	**32**	**74**
XM7SV	**21**	**1,281,057**	**3051**	**36**	**131**
VE7EIK	"	840,164	2041	36	115
VE7ETY	"	404,674	1201	31	91
XM7IRA	"	146,880	700	25	65
VE7COR	3.7	7,460	203	10	10
VE7CRW /VE8	**14**	**339,357**	**1092**	**34**	**89**

CAYMAN ISLANDS

ZF2JI	**A**	**2,563,770**	**3359**	**105**	**225**
		(Opr. K4IIF)			
ZF2JR	**7**	**870,480**	**2253**	**33**	**123**
		(Opr. N6RJ)			

COSTA RICA

TI2OB	**28**	**281,190**	**1425**	**21**	**70**
TI2YO	**21**	**450,840**	**1361**	**34**	**102**
TI6FLM	"	20,368	138	24	52

DOMINICAN REPUBLIC

HI8LUZ	**A**	**759,120**	**1343**	**69**	**171**
HI8A	"	173,505	633	45	84
		(Opr. JA5DQH)			
HI500UD	"	37,230	229	29	44
		(Opr. HI3AMF)			
HI3LRR	**28**	**41,272**	**333**	**20**	**36**
HI3LFE	"	22,747	221	14	29
HI8DMX	**21**	**148,167**	**636**	**26**	**75**
		(Opr. JP1DMX)			

GUADELOUPE

FG5R	**A**	**12,192,368**	**7006**	**154**	**510**
		(Opr. W7EJ)			

JAMAICA

6Y5X	**A**	**876,384**	**2013**	**62**	**142**
		(Opr. KN5X)			

MARTINIQUE

FM5DN	**28**	**1,805,089**	**4247**	**36**	**133**

MEXICO

XE2BEU	**A**	**993,568**	**1665**	**93**	**151**
XE2UGG	"	220,977	1713	54	75
XE2MX	"	90,628	273	53	86
XE2HWH	"	47,644	255	33	53
XE1AVM	"	23,384	133	36	43
XE2 /NY6Y	28	5,152	151	8	8
6G8V	**7**	**36,518**	**289**	**20**	**38**
			(Opr. XE2GV)		
XE1ABA	**3.7**	**23,808**	**387**	**11**	**20**
XE1VIC	**1.8**	**3,168**	**98**	**7**	**9**

MONTSERRAT

VP2MBK	**A**	**299,322**	**524**	**69**	**172**
			(Opr. N8MK)		

PUERTO RICO

KP4CZ	**A**	**105,560**	**389**	**33**	**83**
WP4WD	**28**	**227,154**	**946**	**26**	**76**
NP4P	"	141,360	407	30	94

ST. KITTS AND NEVIS

V47KP	**A**	**3,345,572**	**3885**	**101**	**266**
			(Opr. K2DQX)		
V47NS	"	442,423	861	69	158
			(Opr W9NSZ)		

SINT MAARTEN

PJ7 /OH3VV	**A**	**741,576**	**1174**	**67**	**197**
PJ7 /WY2W	"	428,968	1142	50	122
PJ8CW	**28**	**76,272**	**616**	**14**	**42**

TURKS & CAICOS ISLANDS

VP5T	**A**	**7,030,044**	**5940**	**120**	**356**
			(Opr. NM2Y)		
VP5JM	**21**	**581,914**	**1821**	**33**	**94**

U.S. VIRGIN ISLANDS

KP2A	**A**	**10,677,460**	**7222**	**141**	**473**
			(Opr. KW8N)		

AFRICA

ASCENSION ISLAND

ZD8Z	**A**	**8,852,625**	**4652**	**164**	**481**
			(Opr. N6TJ)		

BENIN

TY1DX	A	1,036	16	13	15
TY2FG	**28**	**551,078**	**1514**	**31**	**92**
			(Opr. IK6FHG)		

CANARY ISLANDS

EA8BVH	**A**	**2,026,633**	**2252**	**78**	**223**
EA8DM	"	238,238	812	21	77
EA8BDR	"	45,978	158	28	69
EA8ALY	**28**	**624,861**	**1652**	**36**	**95**
EA8AKN	"	92,782	673	16	30
EA8BBP	**21**	**264,500**	**797**	**32**	**83**
EA8BWW	"	111,010	443	24	61

CEUTA

EA9LZ	**14**	**1,244,340**	**2685**	**32**	**123**

DIEGO GARCIA

VQ9FM	**28**	**185,472**	**679**	**27**	**65**
			(Opr. NH6IJ)		

DJIBOUTI

J28RQ	A	23,701	150	37	110

GABON

TRØD	A	22,080	118	23	41

GUINEA-BISSAU

J5CVF	28	6,601	57	12	29
			(Opr. CT1CVF)		

IVORY COAST

TU2UI	**A**	**323,760**	**522**	**74**	**139**

600 WATTS OUT . . . $649

Ameritron's new

AL-811 linear amplifier gives you plenty of power to bust thru QRM.

You get a quiet desktop linear that's so compact it'll slide right into your operating position -- you'll hardly know it's there . . . until QRM sets in. And you can conveniently plug it into your nearest 120 VAC outlet -- no special wiring needed.

You get three tough 811A transmitting tubes, extra heavy duty power supply, all HF band coverage, pressurized ventilation, tuned input, dual illuminated meters, adjustable ALC and much more . . . for an incredible $649 . . .

The first 600 watts makes the most difference

The AL-811 gives you 600 watts PEP output — that's nearly 2 full S-units over your barefoot rig.

That could mean the difference between hearing, "You're Q-5 armchair copy" and, "Sorry can't copy you, too much QRM."

Now you won't have to stand aside while the "big guns" steal your DX. You'll be able to log some of those stations first.

Going from 600 watts to the full legal limit gives you less than one S-unit increase. But is that fraction of an S-unit worth the 3 to 4 times more money it'll cost you?

The AL-811 gives you a powerful punch at a price that's easy on your wallet.

All band, all mode coverage

The AL-811 covers all HF bands (10/12 meters with easy user mod). There's no compromise on WARC and most MARS bands — you get a 100% rated output.

You can operate the AL-811 on all modes. You get 600 watts output PEP SSB and 500 watts output CW. You even get 400 watts on demanding continuous carrier modes like RTTY, SSTV, FM and AM.

How the low cost 811A tube resists premature failure - even when your amplifier is mistuned

811A tubes resist premature failure in two ways.

First, they're constructed with widely spaced elements that minimize the chance of elements touching and causing a short — even if the plate gets hot enough to melt.

Second, they use a directly heated thoriated tungsten filament cathode that prevents the electron emitting layer from instantly stripping off — even if mistuning causes a sudden, severe current overload.

Indirectly heated oxide cathode tubes (like the $400 3CX800A7) can be rendered instantly useless if their electron emitting layer is stripped off because of a severe current overload due to mistuning.

The Ameritron AL-811 is excellent for the newcomer because it's tough enough to withstand momentary mistuning. And the tubes are so inexpensive that you can replace one for mere pocket change.

The Ameritron advantage: extra heavy duty power supply that gives you peak performance year after year

The heart of the AL-811 power supply is its heavy duty power transformer with a high silicone steel core weighing a hefty 17 pounds.

A full wave bridge using 52.5 ufd of total capacitance (four 210 ufd, 470 volt capacitors) produces 1500 volts under full load and 1700 volts no load. That's excellent high voltage regulation!

Full height computer grade filter capacitors with screw terminals are used — not short stubby, light duty soldered-in "high technology" capacitors that can't dissipate the heat generated by high current.

The rectifier diodes are rated for a massive surge current of 200 amps. They won't blow even if you accidentally short the high voltage supply.

Wire wound, 7 watt, 50 K ohm equalizing resistors safely protect each filter capacitor — not 2 watt, 100 K ohm carbon composition resistors that can open and cause your filter capacitors to explode or fail.

The Ameritron AL-811 power supply is built tough so you get peak performance year after year.

Tuned input provides excellent load for any rig

A Pi-Network *tuned input* provides a 50 ohm load for your rig. Even fussy solid state rigs can deliver their full drive to AL-811.

Low loss slug tuned coils — tunable from the rear panel — let you optimize performance. High quality low drift silver mica capacitors maintain proper tuning.

Output tank: optimum Q on each band

The low loss pi-network output tank of the AL-811 has been carefully designed for optimum Q on each band and built with quality RF components.

The result is peak performance over each band, wide impedance matching range and exceptionally smooth tuning with efficiencies close to 70%. Even a 3:1 SWR load won't damage the tubes or tank components.

A ball bearing vernier reduction drive makes plate tuning precise and easy.

Quiet pressurized ventilation keeps your tubes safely cooled

A quiet fan pressurizes the cabinet with over 20 cubic feet per minute of cool air.

This large volume of air flow keeps the 811A tube temperature safely below the tube manufacturer's rating — even with a key down carrier at 500 watts output.

Two illuminated meters

Two illuminated meters give you a clear picture of your AL-811 operating conditions so you can tell right away if something is wrong.

The Grid Current meter continuously checks for improper loading. The other meter switches between high voltage and plate current to warn of abnormal conditions.

Ameritron exclusive Adapt-A-Volt™ power transformer

Too high line voltage stresses components and causes them to wear out and fail. Too low line voltage causes a "soft-tube" effect — low output and signal distortion.

Ameritron's exclusive Adapt-A-Volt™ power transformer has a special buck-boost winding that lets you compensate for stressful high line voltage and performance robbing low line voltage.

This makes your components last longer and gives you peak performance — regardless of your line voltage.

Plus more . . .

An Operate/Standby switch lets you run barefoot, but you can instantly switch to full power if you need it.

A transmit LED tells you when your rig is keying your AL-811.

A 12 VDC keying relay makes it compatible with all solid state and tube rigs. A built-in back-pulse cancelling diode protects your rig's keying circuit.

Shielded RF compartment. One year limited warranty. Compact 16" D x 13¾" W X 8" H. 30 pounds. UPS shippable. Shipped with transformer installed and wired for 120 VAC. Draws 8 amps at 120 VAC. Export model Al-811X wired for 240 VAC and includes 10 and 12 meters.

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KENYA

5Z4BI	A	1,818,357	2832	64	155	
5Z4DU	21	382,750	1030	34	91	

KERGUELEN ISLAND

FT5XA	A	1,501,056	1771	84	204	

MADEIRA ISLANDS

CT3BH	A	14,892,102	7177	166	531	(Opr. OH2BH)

MALAWI

7Q7JA	28	86,130	276	30	80	(Opr. JL1IHE)

MOROCCO

CN8MC	A	241,200	660	29	105	(Opr. CN8MK)

MAURITIUS

3B8DB	28	126,000	509	25	59	

REPUBLIC OF SOUTH AFRICA

ZS6HO	A	295,040	620	49	111	
ZS6WPX	28	887,220	1927	38	117	

SENEGAL

6W /YU5AD	28	285,100	968	27	73	

TANZANIA

5H3RF	A	54	6	3	3	

ZAIRE

9T5E	A	319,736	789	47	89	(Opr. WA9INK)

ZAMBIA

9J2FR	28	778,950	2003	35	100	

ASIA

HONG KONG

VS6WV	28	762,550	2111	37	114	
VS6 /W4WET	"	49,364	114	24	48	
VS6BG	3.7	15,540	170	16	26	(Opr. KB7G)

INDIA

AT#T	A	369,736	627	59	167	
VU2NBT	28	404,995	1382	28	79	(Opr. AA4U)
VU2PTT	14	81,900	310	37	80	

ISRAEL

4X /AA4KD	A	98,000	276	33	92	
4Z4UT	"	325,663	660	46	123	

JAPAN

JF1SEK	A	2,907,024	2335	131	295	
JH1AEP	"	2,779,343	2253	141	286	
JA1XAF	"	2,260,940	1829	140	290	
JR1GSE	"	863,328	1105	99	177	
JA1PUK	"	675,880	841	96	181	
JH1DAG	"	585,964	785	93	170	
JA1BUI	"	284,820	505	69	133	
JA1LZR	"	254,800	430	67	141	
JH1UUT	"	249,482	545	58	100	
JA1IFB	"	206,400	345	80	135	
JP1SRG	"	179,892	375	62	109	
JL1MWI	"	120,632	299	52	84	
JR1TLA	"	58,995	216	44	51	
JA1ASO	"	56,496	153	52	80	
JR1MRG	"	56,049	193	50	69	
JH1HGF	"	42,952	151	48	56	
JI1FYC	"	41,093	145	44	65	
JH1RMH	"	35,945	162	32	47	
JA1AAT	"	33,672	172	30	62	
JA2FNY/1	"	27,146	103	41	57	
JR1CCL	"	26,904	131	38	38	
JA0NQD/1	"	22,494	130	24	34	
JA1OLH	"	14,124	92	29	37	
JR1GGB	"	13,260	85	23	29	
JA1BNW	"	10,220	48	28	45	
JL1UMX	"	5,474	43	21	25	
JG1RDV	"	4,526	75	27	31	
JG1BPS	"	3,936	41	18	23	
JM1QZV	"	3,686	37	18	20	
JI1LNR	"	392	14	3	11	
JR1IJV	28	881,488	2035	36	112	
JM1CML	"	98,071	331	32	69	
JA1EMQ	"	31,289	160	22	45	
JH1PXY	"	11,232	80	24	28	
JH1HPH	"	8,208	62	18	30	
JR1OYL	"	7,104	76	14	18	
7L1ICV	"	210	9	4	6	
7L1GVE	21	1,278,560	2809	38	123	
JA1USO	"	839,930	1732	37	132	
JM1XCW	"	654,590	1699	35	99	
JA1YFG	"	596,430	1532	34	101	
						(Opr. JP1JFG)
JF1LLT	"	190,773	549	34	89	
JN1VOC	"	159,018	556	30	72	
JE1PSL	"	82,700	296	29	71	
JQ1NGT	"	39,516	199	28	46	
JA1QXC	"	38,350	119	32	86	
JL1KUH	"	20,463	131	21	36	
JA1XPU	"	10,716	89	19	28	
JG1TVK	"	9,936	67	21	33	
JM1DOJ	"	3,420	37	15	21	
JS1MRM	"	2,970	45	13	17	
JJ1NUI	"	2,430	29	12	18	
JG1TVC	"	952	25	7	10	
JS1HPX	"	702	15	7	11	
JR1UJW	"	518	22	3	5	
JA1LBZ	"	372	11	5	7	
JA1JLP	"	282	12	4	4	
JL1DRX	"	27	3	1	2	
JA1SKE	14	112,640	325	36	92	
JA1VBW	"	40,859	157	31	60	
JR4PMX /1	"	22,996	104	29	55	
JA1GO	"	8,064	49	22	42	
JI1LAI	"	4,180	35	17	27	
JR1WGW	"	3,102	53	9	12	
JO1TLP	"	1,768	24	12	14	
JE1GZB	"	1,716	30	9	13	
JP1RMK	"	1,675	25	12	13	
JK1AFI	7	6,909	49	18	29	
JK1GKG	"	2,968	41	13	15	
JI1NJC	"	1,474	23	10	12	
JA1IT	"	735	14	9	12	
JA1DXR	3.7	5,704	48	19	27	
JR2AGL	A	1,023,460	1282	101	191	
JA2ESR	"	561,661	263	100	163	
JG2MLI	"	105,000	310	46	79	
JH2WHS	"	79,886	247	45	73	
JJ2EEN	"	68,086	211	40	78	
JA2BEY	"	46,767	144	55	76	
JH2HFD	"	34,270	119	43	72	
JF2PTA	"	10,874	106	30	41	
JH2BCN	28	405,720	1116	36	90	
JH1OAI/2	"	282,625	774	33	92	
JA2AXB	"	242,746	841	31	67	
JI1HHX/2	"	224,576	663	31	85	
JE2IFM	"	106,392	359	33	71	
JA2DHL	"	77,865	303	26	61	
JA2IHS	"	43,890	211	23	47	
JR2IGV	"	4,437	55	14	15	
JA2NQE	21	368,676	1013	33	93	
JA2BNN	"	206,424	760	29	65	
JA2QQC	"	89,148	309	31	71	
JA2HKR	"	15,120	105	22	26	
JF2PXB	"	7,400	76	15	22	
JA2MGG	"	6,804	57	16	26	
JA2OG	14	63,911	282	27	52	
JG2TSL	"	8,917	135	28	53	
JA2EJ	"	3,920	37	14	26	
JI2DYK	"	1,442	41	4	10	
JA2BAY	7	261,612	795	29	88	
JF2LTH	"	300	13	6	9	
JA2IVK	3.7	15,980	141	19	28	
JA2DLM	"	5,565	70	14	21	
JE2URF	"	2,700	12	10	10	
JE2LPC	"	1,144	25	10	12	
JG3KIV	A	2,302,426	2153	114	257	
JA3LDH	"	955,420	1224	82	186	
JI3BFC	"	590,940	675	106	209	
JA3VOV	"	33,572	114	45	64	
JA3HPD	"	12,425	65	28	43	
JA3BCT	"	6,426	46	24	27	
JR3NZC	28	840,219	2022	37	104	
JA3XOG	"	379,290	915	35	106	
JH3PAS	"	201,495	653	34	71	
JA3EQC	"	169,737	721	25	62	
JA3IVU	"	1,708	21	13	15	
JA3UWB	21	34,320	178	22	44	
JR3CVJ	"	18,104	92	25	48	
JA3FZI	"	9,259	71	23	24	
JR3KAH	"	6,600	56	21	29	
JE3BMU	"	5,772	65	19	20	
JG3EHD	"	2,356	28	13	18	
JQ3LCO/3	"	56	4	4	4	
JA3SHL	14	75,779	328	27	56	
JA3SSW	7	32,760	155	27	57	
JA3GLU	"	3,689	49	13	18	
JH4NMT	A	1,066,090	1186	112	198	
JA4ESR	"	571,057	712	104	189	
JA4AQR	"	44,910	177	40	50	
JE4HIH	"	8,234	65	20	25	
JA4AQA	"	5,782	38	28	31	
JI4ARB	"	2,242	48	6	11	
JH4ADK	28	514,497	1195	37	112	
JH4DIT	"	441,981	1194	35	93	
JH4XKW	"	272,844	813	34	83	
JR4GPA	"	148,032	533	28	68	
JA4CTL	"	68,544	287	27	57	
JA1XCZ/4	"	37,604	202	23	45	
JA4PA	"	2,160	60	5	6	
JE4VVM	21	528,220	1209	36	118	
JG4AKL	"	316,512	760	37	107	
JA4ETH	"	52,456	243	24	55	
JA4JJI	"	7,335	61	18	27	
JR4ISK	"	4,902	49	15	23	
JE4RBR	"	1,302	26	8	13	
JA4FCR	7	23,182	141	22	45	
JA4CZM	"	18,291	109	24	43	
JA4DUD	"	15,504	110	21	36	
JF4GXN	3.7	4,860	61	16	20	
JH5FXP	A	1,221,393	1086	131	286	
JA5APU	"	688,880	1081	78	140	
JE5MCV	"	534,333	688	103	174	
JH5AUE	"	249,052	395	72	154	
JA5IP	"	212,971	371	81	128	
JA5EXW	28	581,856	1319	37	115	
JA5PDS	"	32,227	184	22	45	
JA5EO	"	15,704	106	18	34	
JE5XYT	21	16,402	104	22	37	
JE6ZIH	A	3,745,987	3106	131	308	
JA6LDD	"	1,454,037	1684	103	196	
JA6COW	"	1,086,288	1142	103	233	
JA6BWH	"	86,944	178	57	119	
JS6GIM	"	73,144	160	62	102	
JH6FTJ	"	48,285	194	35	52	
JF6JQM	"	47,066	172	33	68	
JF6KAC	"	5,763	40	17	34	
JH6AUS	28	342,357	918	36	103	
JH6ZHV	"	170,016	437	36	102	
						(Opr. JA6WJL)
JA6EFT	"	90,404	332	28	69	
JA6QDU	"	60,344	277	26	50	
JA6PJ	"	51,282	181	33	66	
JA6RXA	"	42,000	186	26	54	
JJ6DGP	"	9,891	57	22	41	
JK6UPO	21	13,936	110	21	31	
JI6JTH	"	6,985	46	16	39	
JK6ISK	"	4,752	54	16	17	
JI6JSD	"	1,012	18	9	13	
JR7HOD /6	"	858	28	4	7	
JJ6MYB	7	2,270	31	15	16	
JJ6MXA	"	858	18	11	15	
JA7QFU	A	1,009,304	1110	102	214	
JE7DOT	"	658,560	947	84	161	
JE7HFL	"	604,032	1081	64	128	
JH7NPF	"	419,796	862	62	107	
JR7LVK	"	45,409	179	32	59	
JA7ASD	"	12,992	76	25	33	
JH7DNO	28	1,143,807	2647	36	111	
JR7BKB	"	252,519	708	33	90	
JA7DOT	"	239,146	755	32	76	
JH7KTI	"	141,456	453	31	81	
JR7CDL	"	120,700	415	28	72	
JH7CJM	"	37,664	132	29	78	
JA7AXP	"	6,072	50	18	26	
JA7KM	"	2,346	36	6	17	
JH7XGN	21	484,024	1250	35	101	
JA7FTR	"	398,607	983	35	106	
JA7BEW	"	327,240	868	37	98	
JA7NVF	"	291,992	888	31	82	
JH7LGJ	"	265,330	716	35	95	
JA7ZWD	"	199,563	608	33	86	
JA7CXT	"	5,547	56	18	25	
JH7HJF	"	110	5	5	5	
JR7QHV	"	75	5	2	3	
JA7SGV	14	594,528	1187	39	137	
JH7QXJ	"	122,515	410	31	76	
JA7UJ	"	97,110	290	33	84	
JA7JH	"	57,685	152	37	102	
JE7MAY	"	3,666	39	18	21	
JR7CDL	7	6,840	65	17	23	
JA8RWU	A	3,869,760	1074	127	308	
JA8YBY	"	3,598,372	2744	135	317	
						(Opr. JH8PNE)
JE8PHS	"	78,874	264	44	69	
JA8HBO	"	26,404	105	39	53	
JE8UZG	"	1,450	18	14	15	
JH8CLU	28	859,415	2044	36	109	
JO1DFG/8	"	426,790	1093	34	100	
JA8RJE	"	204,516	606	33	84	
JH8DHV	"	96,096	405	25	59	
JR8FLY	"	88,480	392	25	54	
JH8UQJ	"	21,760	99	24	56	
JA8CJY	"	1,742	23	9	17	
7L1GVV/8	21	1,188,352	2351	38	139	
JA8UJY	"	45,362	227	23	51	
JA8HYB	"	100,352	333	33	79	
JA8IXM	7	469,012	1304	38	110	
JH7AJD/8	"	3,094	39	16	18	
JA9JFO	A	668,626	728	106	220	
JA9KKD	"	236,704	423	75	133	
JR9GQP	"	87,527	280	44	65	
JA9BOH	28	94,968	451	24	48	
JH9KVF	"	50,706	220	28	53	
JA9XBW	"	49,410	221	25	56	
JA9CWJ	"	6	1	1	1	
JA9MJR	21	69,399	253	30	69	
JH9URT /9	"	26,144	124	26	50	
JA9NB	"	3,406	48	10	14	
JH9CAV	7	3,388	48	11	17	
JH9AMJ	"	2,436	35	11	17	
JA0DMV	A	478,113	592	98	193	
JE0RHE	"	175,028	324	66	122	
JA0OVG	"	144,990	335	56	106	
JA0EPF	"	138,930	296	60	105	
JA0EZP	"	99,180	284	65	125	
JE0VSW	"	33,856	142	41	51	
JA0JHA	28	1,068,632	2618	37	103	
JE0EHE	"	42,438	225	25	41	
JR0BQT	"	21,518	128	23	35	
JE0UXR	21	283,968	735	33	103	
JH0SGG	"	20,868	100	24	50	
JR0UFK	"	10,395	61	25	38	
JH0SQM	"	8,064	64	19	29	
JA0HYU	"	2,730	30	15	20	
JH0TUO	"	364	11	6	8	
JA0AD	14	25,326	140	19	48	
JH0ZHQ	7	66,836	304	24	53	
						(Opr. JH1BBT)
JA0UMV	"	57,785	240	30	61	
JA0GZ	"	96	5	4	4	

JORDAN

JY9SR	14	39,644	265	12	41	

KOREA

HL9RY	A	1,342,884	1787	97	185	(Opr. KG5EG)
HL9FY	28	2,904	36	14	19	(Opr. KA0QFY)

MONGOLIA

JT1CO	A	1,735,798	3246	107	227	
JT7KAA	"	155,248	626	37	87	
JT1BR	21	101,550	902	25	50	
JT5AA	14	18,556	169	15	31	
JT1CS	"	10,718	141	17	29	

REPUBLIC OF CHINA

BV2WA	A	100,001	415	24	43	
BV /JP1RIW	21	125,664	1142	29	59	

SAUDI ARABIA

7Z1AB	21	1,016,715	2339	39	122	(Opr. K2ZJ)

SINGAPORE

9V1XR	21	42,735	400	30	47	(Opr. SP5DDJ)

SOVEREIGN BASES OF CYPRUS

ZC4BS	A	2,537,447	2339	99	290	

WESTERN MALAYSIA

9M2DM	A	340,158	586	91	182	
9M2HG	"	59,787	873	27	36	

U.S.S.R

ARMENIA

UG6LJ	A	249,124	730	76	168	
UG6JJ	28	117,040	520	22	54	
UG6GAW	1.8	119,955	805	10	45	

AZERBAIJAN

UD6AS	21	45,150	260	23	47	

ASIATIC RUSSIA

RW9AB	A	240,669	632	33	110	
UW9CH	"	144,672	416	47	87	
UA9XC	"	22,725	90	35	66	
UA9YNC	"	10,184	65	25	42	
UA9XAC	28	107,835	418	23	68	
UA9LFN	"	72,624	629	25	77	
UA9CUA	"	33,672	161	26	66	
UA9JJQ	"	11,972	143	8	33	
UA9XLN	"	1,224	17	9	15	
UA9MBM	21	16,932	127	18	33	
RA9XSL	"	15,386	124	17	32	
UW9AG	14	41,705	169	26	69	
UW9CYA	3.7	73,320	423	12	48	(Opr. UC2AFE)
UA0QO	A	502,756	759	107	209	
UA0KW	"	470,220	1185	59	111	
UA0ZDA	"	350,875	1245	56	69	
UA0LCZ	"	238,741	572	72	121	
RA0BR	"	211,692	552	42	114	
UW0SR	"	112,307	267	57	106	
UA0QGY	"	23,166	115	42	57	
UA0SFN	"	11,935	62	29	48	
UA0KCI	21	254,529	1013	28	71	
UA0KD	"	243,904	1435	27	47	
UA0AGI	"	147,546	527	33	93	
UW0ST	"	26,070	175	22	44	
RA0SU	14	166,443	581	34	75	
UW0CM	"	429	17	6	7	
UA0SR	7	11,816	84	15	41	
UA0ZDD	3.7	25,368	293	14	19	

GEORGIA

RF6FO	A	1,058,050	1139	94	256	
UF6FFH	"	9,960	94	10	30	
UF6QAZ	28	50,608	292	22	50	
RF6FR	14	105,369	399	26	67	
UF6VX	7	9,504	84	10	34	

KAZAKH

RL8O	A	3,900,480	3020	117	361	
UL7BAY	"	407,592	553	86	210	
UL7FZ	"	59,286	195	36	87	
UL7RER	"	26,718	120	27	55	
UL8PWJ	28	5,040	687	13	23	
RL7FGJ	"	3,286	48	9	22	
UL7GS	21	54,472	262	27	61	
UL7CQ	14	3,999	50	8	23	
UL7JV	7	20,867	280	17	60	

KIRGHIZ

UM8MAU	A	26,600	150	27	43	
UM8MGO	21	280,566	874	36	107	
UM8DX	14	326,344	1069	32	81	
UM8MTA	7	51,830	300	17	54	

TADZHIK

UJ8KA	A	605,288	800	72	176	
UJ8XA	7	4,092	135	9	22	

UZBEK

RB3MO /UI9B	A	375,968	1458	85	210	
UI8ADR	"	45,510	168	37	74	
UI8ZAA	3.7	13,552	122	11	33	

EUROPE

AALAND ISLANDS

OH0MAM	21	879,712	2591	35	113	
OH0BCI	3.7	52,950	555	16	59	

AUSTRIA

OE6MBG	A	3,274,089	2637	122	415	
OE6CLD	"	1,113,984	1211	93	291	
OE5XXL /500	"	1,071,600	1286	100	280	(Opr. OE5KE)
OE6WIG	"	959,280	1142	66	214	
OE2BZL	"	908,694	1193	93	249	
OE1WEU	"	597,135	1171	85	244	
OE5CWL	"	65,505	238	50	115	
OE1TKW	"	27,945	94	38	57	
OE3HCS	"	23,084	85	42	74	
OE /DL4NAC	"	4,559	56	16	31	
OE2XEL	28	911,267	1922	37	145	(Opr. OE2VEL)
OE1DH	"	502,203	1222	35	128	
OE6GND	"	167,195	570	28	91	

AZORES

CU3LF	A	310,200	811	45	143	(Opr. KB3RG)
CU2AF	21	32,706	235	17	52	

BALEARIC ISLANDS

EA6ZS	A	49,067	198	42	97	
EA6AAX	28	148,302	671	31	95	
EA6LA	"	110,682	601	26	60	
EA6WY	"	5,535	59	13	28	
EA6ZZ	21	241,440	1060	30	90	

BELGIUM

ON4UN	A	5,494,159	4050	134	382	(Opr. DJ6QT)
ON4ACB	"	438,669	826	68	143	
ON7RN	"	36,482	172	26	48	
ON5CZ	"	29,000	175	27	73	
ON4ZD	28	149,776	584	27	65	
ON4APU	"	81,968	349	27	67	
ON4ZT	"	28,944	169	22	50	
ON4XG	21	105,392	436	27	85	
ON7CC	"	8,100	66	17	33	
ON5KL	14	63,648	300	26	78	

BULGARIA

LZ1ZD	A	304,470	995	85	221	
LZ3YY	"	210,336	630	53	171	
LZ1KVF	"	26,880	98	43	69	
LZ6Z	"	7,938	88	19	44	(Opr. LZ2QE)
LZ2QR	"	7,424	40	26	38	
LZ1KOZ	28	1,328,041	2851	38	142	(Opr. LZ1-I-244)
LZ5N	"	953,403	2246	38	134	(Opr. LZ1NG)
LZ5M	"	387,840	1022	37	123	(Opr. LZ1PM)
LZ1HA	"	271,803	670	37	110	
LZ1CW	"	80,444	395	27	64	
LZ2JR	14	37,701	309	21	38	
LZ1QR	"	21,903	123	19	60	
LZ1MM	"	13,524	105	18	28	
LZ2ZY	7	11,716	163	12	46	

CORSICA

DL7HZ /TK	A	1,886,785	2613	91	262	

CZECHOSLOVAKIA

OM6RU	A	859,812	1050	104	307	
OK1KKD	"	543,508	726	83	246	
OK2ABU	"	373,516	712	79	207	
OK1BB	"	232,566	511	67	182	
OK1EP	"	211,584	378	71	161	
OK3RRC	"	180,075	613	49	126	
OM6KZ	"	171,171	503	58	151	
OM2HI	"	161,332	527	51	161	
OK3CDZ	"	138,400	454	49	124	
OM3YCA	"	113,286	335	48	110	
OM6SWD	"	114,449	296	52	97	
OK3CGT	"	88,640	160	53	117	
OK1KT	"	82,915	220	55	106	
OK1DQT	"	82,170	256	50	115	
OM2PWR	"	70,597	514	58	132	
OK1SBB	"	64,998	301	41	116	
OK1AXB	"	64,125	297	38	133	
OK2PDT	"	60,950	218	43	72	
OK3CXS	"	29,760	206	23	73	
OK1CSU	"	25,632	113	30	66	
OK2PSZ	"	20,025	128	32	57	
OM6BHQ	"	19,788	132	27	75	
OK1JST	"	17,360	126	18	38	
OK1FHI	"	14,868	112	26	58	
OK /DL4NAC	"	13,300	120	20	50	
OK1DQC	"	13,145	140	18	37	
OK2BBQ	"	5,530	81	18	54	
OM1FRR	"	2,464	54	13	33	
OK1ALW	28	1,003,591	2210	36	127	

OM6ADS	**	**565,692**	**1464**	**36**	**105**
OM2PAY	**	**560,880**	**1486**	**35**	**109**
OK3CFA	**	**539,968**	**1391**	**37**	**106**
OK3CAP	**	231,424	744	31	97
OK1VAM	**	206,886	642	33	90
OK1XW	**	142,830	435	34	104
OK3PO	**	43,659	196	24	57
OK2PAX	**	19,323	127	21	36
OK1DHJ	**	12,508	92	17	36
OK3CEL	**	7,752	92	13	25
OM7DX	**21**	**1,122,108**	**3067**	**37**	**157**
			(Opr. OK3DX)		
OM1DIG	**	238,572	721	34	107
OK2PMA	**	151,032	553	29	95
OK3YK	**	101,964	503	30	86
OK3IA	**	14,558	109	16	42
OK2BPK	**	1,825	27	11	14
OK1FPG	14	7,954	107	10	31
OK1JRW	**	7,310	139	10	33
OK3THU	**	3,850	68	11	24
OK2PEL	**	3,750	99	9	21
OK2PPM	**	2,790	62	7	24
OK1MKI	**	2,542	76	7	24
OK3YCL	**3.7**	**13,552**	**309**	**6**	**38**
OK1UQA	**	2,040	22	5	17
OM6JDX	**1.8**	**21,774**	**382**	**9**	**48**
			(Opr. OK1JDX)		

DENMARK

OZ3ABE	**A**	**239,465**	**629**	**63**	**172**
OZ6PI	**	80,475	308	44	141
OZ1ASP	**	56,682	240	39	95
OZ1FNX	**	55,860	190	43	71
OZ7DX	**	50,699	225	31	90
OZ7AX	**	43,044	233	35	67
OZ6ABL	**	23,808	114	30	63
OZ8ND	**	9,945	80	23	28
OZ8T	**	2,024	32	10	12
OZ4ABH	**	2,144	29	14	18
OZ5EV	**28**	**319,992**	**873**	**33**	**101**
OZ1KWC	**	**300,265**	**1039**	**34**	**81**
OZ1INN	**	122,969	590	23	54
OZ1ACB	**	82,618	340	29	72
OZ8AE	**	39,995	167	29	66
OZ9HN	**	11,550	115	16	19
OZ8UW	**	6,579	63	18	33
OZ4VW	**	4,128	65	13	11
OZ1LTB	**21**	**216,370**	**810**	**29**	**81**
OZ3ACZ	**	50,778	254	25	66
OZ7HT	**14**	**514,794**	**1613**	**33**	**114**
OZ1LRT	**	71,820	361	28	77
OZ6EI	**	1,134	24	8	19
OZ4MD	**7**	**204,753**	**755**	**30**	**101**
OZ1FTE	**	**203,574**	**785**	**31**	**100**
OZ3SK	**1.8**	**19,500**	**300**	**10**	**50**

ENGLAND

G4XKR	**A**	**334,884**	**595**	**66**	**170**
G0KTN	**	154,959	415	49	108
G5LP	**	83,584	461	29	99
G4MZJ	**	33,352	181	27	61
G3JKY	**	21,406	203	26	51
G4NXG/M	**	11,501	73	21	32
G0LMX	**28**	**54,815**	**246**	**25**	**70**
G3TXF	**21**	**218,790**	**622**	**36**	**117**
G3XSV	**	108,288	532	26	70
G3FXB	**14**	**1,423,450**	**3242**	**38**	**137**
G4CNY	**	**1,029,908**	**2402**	**38**	**140**
G0DX	**7**	**392,160**	**1484**	**28**	**92**
			(Opr. G4BUE)		
G4PKP	**3.7**	**40,870**	**513**	**13**	**54**

FAROE ISLANDS

OY9JD	**A**	**3,963,984**	**2845**	**140**	**474**

FEDERAL REP. OF GERMANY

DL8PC	**A**	**3,944,192**	**3049**	**126**	**373**
DK2XX	**	**2,828,540**	**2254**	**123**	**383**
DF1IK/P	**	**1,280,268**	**1345**	**104**	**292**
DL3LU	**	1,233,960	1150	118	337
DJ5FT	**	1,000,991	1030	109	310
DJ8UV/P	**	532,008	924	84	240
DJ5AV/A	**	393,221	654	72	199
DK5WQ	**	387,247	600	87	256
DL5ZBA	**	308,465	704	57	134
DL8OBL	**	274,188	557	64	155
DK8KC	**	218,772	469	58	148
DJ2UU	**	217,560	442	66	156
DK3YD	**	200,932	498	48	143
DL5XB	**	178,620	389	67	128
DL1IAO	**	162,806	310	57	146
DF2KD	**	143,178	464	46	101
DL8SDC	**	143,040	412	48	101
DL2BAY	**	103,161	257	50	87
DF3IS	**	94,248	350	43	89
DL7YS	**	79,517	249	46	85
DL8AAE	**	67,640	255	46	106
DL8NBJ	**	57,645	164	52	83
DL9NCR	**	38,533	127	43	70
DL2GBB	**	30,392	126	42	74
DL2OBN	**	16,200	115	24	57
DK9IP	**	13,694	82	30	52
DL4YBP	**	8,415	51	23	32
DL9VDQ	**	3,478	31	21	26
DL3YDY	**	630	28	10	11
DF8SSB	**28**	**1,256,266**	**2463**	**39**	**148**
			(Opr. DF9ZP)		
DF8WS	**	**666,995**	**1830**	**37**	**96**
DA2CF	**	**653,430**	**1773**	**34**	**104**
			(Opr. VE2UJE)		
DL2DBH	**	239,775	689	34	105
DL1EK	**	183,875	564	30	95
DJ9ZB	**	148,590	449	31	99
DJ6GK	**	116,850	298	35	115
DL9SN	**	111,780	308	32	106
DK5IC	**	109,648	371	29	83
DL3BCQ	**	102,626	430	26	71
DLØSG	**	54,352	279	27	52
DL4FJ	**	46,410	230	22	56
DA2AA	**	28,644	180	23	54
			(Opr. K7VAY)		
DJ6TK	**	26,312	130	24	64
DL3ME	**	15,416	117	17	30
DL6AM/M	**	9,214	105	12	22
DK3LM	**	3,861	51	13	26
DJ4WS	**21**	**64,989**	**302**	**22**	**65**
DJ4PT	**14**	**1,288,617**	**2713**	**37**	**150**
DK5OY	**	212,316	575	39	117
DL2SBY	**	72,100	486	25	78
DJ3GE	**	33,654	161	24	55
DJØBX/P	**	31,326	283	17	52
DL6BCR	**	25,280	245	18	46
DL8QS	**3.7**	**54,556**	**446**	**21**	**71**

FINLAND

OH2PM	**A**	**2,122,406**	**1740**	**130**	**403**
OH3OJ	**	**1,801,632**	**2176**	**104**	**288**
OH1BV	**	**705,168**	**1017**	**94**	**260**
OH8LQ	**	552,096	1192	60	156
OH6NEV	**	548,208	598	106	317
OH1TD	**	386,474	746	65	177
OH2LP	**	288,344	613	69	202
OH4MCV	**	225,780	485	64	149
OH6OS	**	170,403	343	65	172
OH6SU	**	167,200	334	64	145
OH7MQF	**	144,396	399	57	134
OH7NW	**	121,923	380	54	153
OH2MO	**	112,428	342	50	112
OH2BLF	**	108,108	215	66	168
OH3AD	**	74,936	388	42	94
			(Opr. OH3HY)		
OH5TE	**	64,845	233	39	92
OH6QP	**	57,156	239	38	94
OH6YLS	**	43,608	258	31	107
			(Opr. OH6CD)		
OH3JR	**	35,754	115	46	72
OH6VR	**	34,648	90	63	79
OH6ZJ	**	31,878	190	34	92
OH2LU	**	29,148	127	31	53
OH2OO	**	26,712	118	48	78
OH8MCE	**	23,980	105	42	67
OH2BYS	**	20,979	71	41	70
OH3NHF	**	19,747	87	34	57
OH2VZ	**	11,210	68	25	34
OH2RL	**	10,296	73	29	59
OH7JL	**28**	**349,962**	**1021**	**34**	**112**
OH6AT	**	**206,555**	**792**	**31**	**78**
			(Opr. OH6MJM)		
OH2MPO	**	140,360	566	29	92
OH3MMH	**	123,760	506	30	82
OH3WD	**	120,414	313	34	107
OH3MIG	**	94,068	369	26	82
OH3MFP	**	92,748	296	31	87
OH1MHX	**	72,400	309	24	76
OH6MPJ	**	54,008	304	23	63
OH2MKX	**	42,596	217	25	67
OH2BPA	**	31,570	212	20	62
OH5PA	**	31,209	123	27	76
OH5LAQ	**	27,279	219	20	43
OH6RC	**	26,000	158	21	59
OH2MDC	**	15,180	111	21	39
OH5OD	**	11,660	142	12	32
OH6MIL	**	5,355	61	13	38
OH1MTT	**	4,896	65	13	23
OH1AD	**21**	**1,086,354**	**2454**	**37**	**134**
			(Opr. OH1WZ)		
OH2BAH	**	**866,640**	**2207**	**34**	**123**
			(Opr. OH2PO)		
OH8SR	**	833,760	2161	36	124
OH7MA	**	774,177	1974	36	115
OH6NIO	**	538,580	1552	33	107
OH2BCD	**	78,866	335	25	69
OH2BNT	**	53,406	320	23	63
OH7MKR	**	38,556	204	22	59
OH5RZ	**	9,460	119	13	30
OH6UP	**	7,100	76	16	34
OH1MCX	**14**	**265,173**	**934**	**36**	**121**
OH2BVF	**7**	**126,464**	**580**	**23**	**81**
OH4BEN	**3.7**	**56,643**	**563**	**17**	**62**
OH7UE	**	52,720	415	20	60
OH1KF/2	**1.8**	**5,282**	**141**	**5**	**33**

FRANCE

F6AOJ	**A**	**2,022,272**	**1704**	**113**	**335**
HXØU	**	**1,830,080**	**2569**	**90**	**254**
			(Opr. F6DZU)		
F8WE	**	541,150	1202	76	198
F6EXQ	**	407,700	656	80	222
F3VX	**	295,032	613	66	162
F1HWB	**	159,030	399	53	137
F9LX	**	142,528	288	71	201
FD1OPW	**	112,161	331	41	68
F2RO	**	101,728	299	47	89
TM2A	**	67,167	201	55	98
			(Opr. FE6HAC)		
F6FHA	**	40,848	161	38	73
FE6DRP	**	32,240	259	23	57
FE1JND	**	4,747	63	19	28
F5JY	**28**	**416,070**	**1189**	**32**	**102**
FD1LFY	**	265,776	904	29	83
F1JDG	**	79,566	418	23	66
FB1OMN	**	5,220	59	14	22
F6AXD	**	1,815	26	13	20
FB1PQG	**	783	31	5	4
FU1X	**21**	**787,314**	**2168**	**37**	**114**
			(Opr. F6GMB)		
FF6KBF	**	**725,712**	**1840**	**35**	**121**
FF6KAW	**	432,790	1590	31	82
F6FJE	**	67,773	353	22	65
F6FGZ	**	8,507	111	14	33
F2EE	**14**	**1,102,887**	**2842**	**39**	**138**
FE6FNA	**	59,421	425	23	64
F6ASS	**	17,580	199	16	44
F6BVB	**3.7**	**18,480**	**302**	**9**	**46**
F6AML	**1.8**	**8,415**	**161**	**7**	**44**

GERMAN DEMOCRATIC REP.

Y58IO	**A**	**2,556,659**	**2683**	**109**	**300**
Y32WF	**	**287,245**	**415**	**83**	**200**
Y21XC	**	**209,070**	**494**	**59**	**171**
Y31EM	**	179,361	512	63	166
Y67UL	**	178,868	474	52	142
Y48PJ	**	121,260	347	51	121
Y25OF	**	110,953	304	55	126
Y41NK	**	94,215	247	50	115
Y25KA	**	93,010	309	43	99
Y41YM	**	84,987	405	29	42
Y48GN/P	**	77,602	320	46	115
Y63SI	**	75,020	249	37	84
Y21YT	**	64,233	190	49	134
Y31NB	**	49,006	233	25	82
Y25ZA	**	44,733	217	34	77
Y23GB	**	44,288	228	37	91
Y23RJ	**	40,348	208	36	95
Y51TO	**	40,296	127	51	95
Y25PE	**	35,638	158	34	69
Y33UL	**	30,525	107	37	74
Y23CM	**	28,431	116	39	78
Y32ZF	**	19,008	109	25	39
Y24SH	**	13,747	90	24	35
Y59UJ	**	11,055	89	21	46
Y57PO	**	5,814	81	17	40
Y26DM	**	3,444	34	19	23
Y68TH	**	2,496	28	16	23
Y54TA	**	1,269	26	10	17
Y22EK	**28**	**226,996**	**638**	**33**	**101**
Y54VA	**	127,687	430	30	89
Y25JA	**	49,725	255	24	61
Y38YE	**	30,030	170	21	45
Y22AN	**	11,520	110	17	31
Y25GH	**	4,250	69	13	21
Y25DA	**	1,643	24	9	22
Y41HL	**21**	**195,506**	**645**	**32**	**102**
Y36UE	**	56,368	272	27	77
DL3OI	**7**	**493,626**	**1761**	**32**	**106**
Y41SM	**	2,170	35	8	23
Y37KM	**	45	9	2	3

GIBRALTAR

ZB2					
/WA6CDR	**A**	**673,056**	**1180**	**85**	**257**

GREECE

SVØAB	**28**	**81,406**	**361**	**28**	**73**
			(Opr. WB4ZAA)		
J43A	**21**	**159,624**	**1188**	**30**	**78**
			(Opr. SV3AQR)		

HUNGARY

HAØHW	**A**	**1,415,260**	**1816**	**96**	**289**
HA8XX	**	490,840	869	81	199
HA9CD	**	307,951	616	66	193
HA8FD	**	103,376	222	67	115
HA4XX	**	73,032	266	47	99
HA8CO	**	31,779	250	23	49
DF2UU /HA	**	31,178	163	36	83
HA /DL4NAC	**	5,400	72	15	35
HG1S	**28**	**948,445**	**2324**	**37**	**118**
			(Opr. HA1YU)		
HA9PP	**	**893,200**	**2257**	**38**	**116**
HG4P	**	453,001	1450	34	91
			(Opr. HA4ZZ)		
HA7TM	**	200,685	936	26	59
HA1RJ	**	155,008	567	34	78
HG8FH	**	61,831	367	21	52
HAØIR	**	58,240	257	27	64
HG8QB	**	22,320	162	22	40
HG3FMZ	**	5,810	73	13	22
HA2KMR	**21**	**53,720**	**327**	**23**	**62**
HA3GN	**	27,580	217	18	52
HA8CQ	**	27,027	209	17	46
HA5AND	**	19,260	155	16	44
HA6NW	**14**	**68,908**	**355**	**27**	**80**
HA9BVK	**7**	**109,820**	**673**	**22**	**73**
HA8IE	**3.7**	**361,343**	**1455**	**35**	**116**
HA4FF	**	33,916	519	11	50

ICELAND

TF1MM	**A**	**1,949,184**	**2883**	**76**	**206**

ITALY

IA8A	**A**	**4,449,648**	**3348**	**136**	**396**
			(Opr. I8CZW)		
I2SVA	**	**3,228,120**	**2581**	**123**	**381**
IK2GSN	**	**2,144,240**	**1585**	**130**	**417**
I08JOQ	**	1,713,582	1392	97	254
IK5ACO	**	1,032,004	1258	99	268
I3BQC /IL3	**	977,112	1364	102	267
I0SQ	**	425,538	764	81	201
			(Opr. I5VXG)		
IK1NDB	**	419,468	639	79	205
IK2LCY	**	312,127	583	68	161
IK1NPH	**	244,565	523	63	142
IK8LWA	**	206,492	427	60	149
IØYQV	**	131,760	301	52	131
IN3XUG	**	128,575	528	44	95
I03EJ	**	82,935	201	61	110
			(Opr. I3EJ)		
IK8NSR	**	80,088	281	51	90
I2FUM	**	75,110	163	68	135
IK2IKW	**	68,076	193	53	133
IK4FNF	**	63,900	213	44	98
I4CSP	**	56,610	133	45	125
IK4JOJ	**	50,179	171	56	83
IK2IAR	**	47,867	152	49	102
IKØNGI	**	30,030	121	40	70
IK3HMD	**	28,208	165	28	58
I2HWI	**	21,840	103	33	58
IKØHTM	**	15,925	167	24	41
IK8IFW	**	12,994	99	26	47
IK4CBM	**	12,342	187	22	44
IØØMMI	**28**	**1,123,981**	**2510**	**37**	**136**
			(Opr. IKØMMI)		
I2PJA	**	**926,649**	**1999**	**37**	**134**
I2HVE	**	702,560	1595	36	124
I4RHP	**	548,856	1413	36	118
IK5MES	**	536,380	1476	32	98
I5JHW	**	418,215	1052	35	112
IK2AEQ	**	411,944	1182	36	100
IV3BMV	**	397,785	1203	33	82
IA3A	**	271,128	764	32	100
			(Opr. IV3TAN)		
IK2HTW	**	214,272	641	33	95
IV3SCR	**	197,245	757	28	75
IV3NVN	**	190,280	539	33	101
IK8DUI	**	74,152	352	23	69
IK1MTT	**	29,792	392	24	52
IK5BDG	**	19,404	159	16	33
I1QBI	**	6,448	80	13	18
I04FYF	**21**	**533,088**	**1464**	**37**	**112**
IN3QBR	**	244,250	856	32	93
I8RS	**14**	**312,984**	**1003**	**31**	**95**
IK5NAW	**	**251,600**	**1140**	**28**	**72**
IK1JUL	**	16,592	184	14	47
IK1DML	**	13,395	146	16	41
IK5BAF	**7**	**687,040**	**1809**	**37**	**123**
IG8R	**	263,128	1243	31	93
			(Opr. IØRIZ)		
IN3ZNR	**	164,391	874	26	85
I8IQM	**	6,750	111	11	39
IV3VFP	**	5,658	101	12	34
I5OYY	**3.7**	**36,696**	**502**	**128**	**54**
IKØDWN	**	27,020	294	13	57
I8SAT	1.8	40	8	5	8

IRELAND

EI4DW	**A**	**627,006**	**1255**	**54**	**132**
EI9FK	**28**	**352,896**	**1202**	**33**	**95**

JERSEY

GJ3XZE	**28**	**74,800**	**352**	**25**	**63**

TOP TEN SINGLE OP ASSISTED
All Band

1. K1ZM/2	4,405,350	6. WB2K	2,805,712
2. K1TO	4,088,154	7. W2GD	2,744,946
3. AG1C	3,700,400	8. K1VR	2,625,952
4. K3WW	3,580,653	9. K1CC	2,392,590
5. K8MR	2,853,600	10. K4JPD	2,332,934

LIECHTENSTEIN

HBØ /DL4ZBC/P	**A**	**52,992**	**248**	**36**	**102**

LUXEMBOURG

LX9DX	**A**	**2,446,229**	**2713**	**105**	**304**
			(Opr. LX1EA)		
LX9DD	**	**1,869,758**	**2026**	**96**	**311**
			(Opr. LX1GQ)		
LX1SG	**	150,328	470	47	105

MONACO

3A9BF	**A**	**232,190**	**625**	**56**	**161**

NETHERLANDS

PABIJM	**A**	**1,751,904**	**2551**	**78**	**238**
PI4DEC	**	**1,577,673**	**1937**	**84**	**223**
			(Opr. G4YSD)		
PABAGA	**	**1,296,750**	**1848**	**92**	**258**
PAØKHS	**	506,790	871	71	199
PA3FNE	**	323,596	605	69	185
PA3EMN	**	217,259	350	74	213
PAØZH	**	142,131	366	66	153
PAØKDM	**	103,935	260	63	132
PA3ELD	**	92,512	184	70	154
PA3BZV	**	56,358	261	33	68
PAØUV	**	18,492	111	21	48
PAØHML	**	15,210	110	25	40
PAØYN	**	9,945	102	15	30
PABMVW	**	9,490	72	25	48
PA3ENK	**	8,820	75	24	36
PAØDOM	**	8,325	65	15	30
PA3CLD	**	6,900	65	21	39
PA3BNH	**	6,213	77	18	39
PA2SWL	**28**	**72,726**	**298**	**27**	**75**
PBØAFZ	**	22,638	159	19	47
PA3DWD	**21**	**878,256**	**2065**	**38**	**133**
PA2REH	**	164,416	642	28	84

NORWAY

LJ2I	**A**	**529,480**	**720**	**83**	**222**
			(Opr. LA6GF)		
LA9WO	**	**522,546**	**924**	**79**	**203**
LA4YW	**	282,960	596	68	172
LA4GY	**	216,690	499	59	174
LA2GCA	**	130,232	429	45	101
LA5UHA	**	119,394	369	49	113
LA2IR	**	103,845	284	48	113
LA2T	**	91,204	249	52	99
LA4KGA	**	54,875	272	40	85
LA6OV	**	53,924	162	42	80
LA1KQ	**	50,736	242	34	78
LA6BBA	**	48,800	167	44	78
LA1PHA	**	30,498	125	42	60
LA2AD	**	15,504	132	20	37
LA4PHA	**	10,270	90	26	53
LA6ZFA	**	4,305	72	14	27
LA9HW	**28**	**476,762**	**1311**	**34**	**109**
LA7MFA	**	157,960	595	27	83
LA9DI	**	85,995	330	30	75
LA9CQ	**	20,460	190	15	29
LA9HFA	**	8,904	88	15	27
LA5RBA	**	4,182	44	13	21
LA9DFA	**21**	**169,094**	**682**	**28**	**90**
LA8RL	**14**	**64,024**	**257**	**27**	**79**

POLAND

SP9FIH	**A**	**2,014,408**	**1734**	**119**	**365**
SP8GNF	**	**292,388**	**500**	**78**	**190**
SP3IOE	**	139,055	416	58	145
SP1AEN	**	126,027	345	57	144
SP4BPH /A	**	105,138	375	41	121
SP9JAC	**	87,016	288	54	95
SP9DWT	**	85,008	276	60	116
SP4CJA	**	54,125	271	37	88
SP7MJG	**	48,994	288	34	97
SP9MQH	**	42,007	130	44	75
SP9AGS	**	37,828	294	23	75
SP9DGO /A	**	37,120	117	42	74
SP2JMR	**	32,816	142	39	73
SP3JHY	**	29,900	111	44	56
SP9DEM	**	25,172	85	41	75
SP7FQI	**	24,934	215	19	72
SP3IBS	**	23,184	78	44	68
SP9AVZ	**	18,348	217	15	51
SP1RWK	**	15,960	119	26	50
SP9JBX	**	13,160	70	33	37
SP3IBM	**	5,830	38	20	35

SP9ADV	**	1,044	22	10	19
SP3LPR	**	1,012	16	9	14
SN6O	**28**	**582,484**	**1578**	**38**	**104**
		(Opr. SP6DVP)			
SP5PBE	**	201,008	581	33	103
		(Opr. SP5LCT)			
SP5KVW	**	125,944	445	29	75
		(Opr. SP5OAU)			
SP8UFO	**	74,883	305	30	79
SP6EIY	**	45,279	216	25	56
SP9RVD	**	28,413	173	20	43
SP9EML	**	5,850	52	17	22
SP5LM	**	2,288	38	11	15
SP5GIQ/7	**21**	**550,530**	**1695**	**33**	**102**
SP4EEZ	**	**327,094**	**1120**	**33**	**101**
SP3EQE	**	43,134	226	22	56
SP8BJH	**	25,792	253	16	46
SP3RNF	**	17,500	108	24	46
SP9MRP	**	12,236	128	15	31
SP9ZD	**	2,072	27	10	18
SP3GRQ	**	493	14	8	9
SP5BWO	**14**	**124,079**	**503**	**32**	**95**
SP9GDB	**	44,232	247	26	71
SP7MJL	**	7,697	132	8	35
SP6DHH	**	6,321	122	10	33
SP3CMA	**	6,144	83	11	34
SP6CXH	**	5,920	110	11	29
SP5GRU	**7**	**26,151**	**271**	**14**	**55**
SP3RNZ	**	17,272	204	15	53
SP5MXZ	**3.7**	**90,300**	**521**	**14**	**56**
SP9AHB	**	22,568	411	8	44

PORTUGAL

CQ8N	**A**	**5,432,952**	**4072**	**135**	**449**
		(Opr. CT4NH)			
CT1CLR	**	751,226	1093	82	240
CT8D	**	695,020	1595	81	229
		(Opr. CT1DIZ)			
CT1QF	**	113,007	332	42	97
CT4KQ	**28**	**452,340**	**1600**	**30**	**96**
CT1 /G8AEV	**	145,077	640	26	85
CQ5AHU	**	142,848	673	25	71
		(Opr. CT1AHU)			
CT1BBJ	**	133,084	689	25	73
CT1EEB	**	15,444	213	11	28
CQ4A	**21**	**1,757,780**	**3912**	**38**	**141**
		(Opr. CT1BOP)			
CT1UO	**	23,600	190	16	43
CT1AZS	**	18,468	116	20	61
CR2COK	**14**	**494,720**	**1549**	**34**	**94**
CT1DVV	**	433,720	1389	33	107
CT1AOZ	**1.8**	**16,359**	**190**	**11**	**46**

RHODES

SV5AZA	**28**	**210,779**	**1117**	**35**	**96**

ROMANIA

YO2DFA	**A**	**359,078**	**700**	**80**	**222**
YO6VZ	**	**211,536**	**877**	**30**	**74**
YO4CIS	**	**202,048**	**753**	**49**	**115**
YO6JN	**	178,504	458	58	174
YO3DCO	**	108,808	274	56	147
YO9AHX	**	63,168	305	44	97
YO2LBN	**	57,776	176	46	111
YO7ARY	**	50,046	267	29	85
YO2AOB	**	18,080	127	27	63
YO7LCX	**	10,419	98	20	49
YO7ARZ	**	7,320	67	17	23
YO7LFV	**	4,896	63	17	31
YO2BRL	**	2,442	50	12	21
YO4CBT	**	609	11	10	11
YO2CJX	**	546	36	5	16
YO6BTY	**	525	20	9	2
YP8A	**28**	**763,464**	**2428**	**38**	**156**
		(Opr. YO9HP)			
YO7LCD	**	53,508	312	25	66
YO5OAG	**	44,384	254	21	55
YO6OBH	**	6,350	43	21	29
YO2ARV	**	2,240	44	12	16
YO3AIL	**21**	**78,645**	**322**	**26**	**81**
YO4PN	14	12,224	111	17	47
YO9FEH	**	4,640	129	10	19
YO9IAB	**3.7**	**5,106**	**130**	**68**	**31**
YO5BWI	**	1,472	61	5	18
YO8BOI	1.8	920	38	5	18

SARDINIA

IS0LLJ	**A**	**27,249**	**132**	**32**	**61**

SCOTLAND

GM0ECO	**A**	**4,254,678**	**4057**	**97**	**317**
GM3BCL	**	1,061,280	1545	72	192
GM4WEW	**	314,420	733	51	148
GM0DBW	**	228,744	648	47	169
GM4CUX	**	46,200	196	39	81
GM4XTA	**28**	**332,514**	**823**	**32**	**115**
GM4PVC	**	46,084	240	23	59
GM3CFS	**	24,034	193	14	47
GM4HOF	**21**	**76,970**	**410**	**20**	**66**

SHETLAND ISLANDS

GM4CHX /P	**28**	**84,387**	**658**	**18**	**51**

SICILY

IT9ZWV	**A**	**303,888**	**609**	**58**	**150**
IT9ZYT	**	207,240	481	56	164
IT9LPN	**	150,772	411	52	135
IR9R	**28**	**1,325,835**	**2930**	**38**	**145**
			(Opr. IT9GSF)		
IT9BLB	**	**1,225,194**	**2703**	**39**	**138**
IT9HBT	**	949,074	2087	38	139
IT9RYJ	**	446,710	1325	38	117
IO9BCC	**	40,092	263	22	56
			(Opr. IT9BCC)		
IT9NTT	**21**	**248,875**	**1024**	**31**	**94**

SPAIN

EA3NY	**A**	**4,192,650**	**3524**	**111**	**351**
ED7TV	**	**1,823,430**	**1893**	**106**	**293**
EA3BKI	**	**1,453,072**	**1465**	**97**	**297**
EA3GBU	**	1,198,570	1689	79	211
EA4DX	**	859,420	879	99	289
EA1CON	**	598,780	1009	67	178
EA1IF	**	369,610	769	61	169
EA3GCJ	**	342,717	732	64	149
EA1JO	**	337,080	640	71	194
EA5CHT	**	277,130	593	62	152
EA5DCL	**	271,400	611	57	143
EA3EJI	**	184,475	472	56	179
EA1AW	**	179,900	417	56	119
EA3DNC	**	178,791	492	51	132
EA5FYJ	**	173,346	417	55	112
EA1EVY	**	157,914	405	53	133
EA3CZR	**	144,364	356	54	133
EA1DAX	**	142,848	385	48	138
EA1BQR	**	142,416	311	60	124
EA5JC	**	141,570	316	58	137
EA5AEN	**	106,944	211	64	128
EA7DXR	**	98,532	269	53	108
EA7EBL	**	78,078	270	41	102
EA5EQ	**	77,597	262	46	81
EA5BK	**	73,625	286	39	86
EA7CDT	**	58,064	195	42	110
EA2CR	**	54,000	241	37	88
EA1ETO	**	52,151	185	44	77
EA7CZR	**	52,003	170	40	93
EA7BYM	**	46,534	189	35	71
EA3NA	**	37,120	143	38	90
EA3FKC	**	36,354	207	34	49
EA5GJM	**	34,338	148	33	64
EA3EGI	**	30,952	132	42	64
EA2CKP	**	30,016	170	30	82
EA7CP	**	30,012	118	41	81
EA7CA	**	27,972	133	41	85
EA1CNL	**	25,641	153	23	40
EA3EKT	**	22,428	185	33	56
EA1DCQ	**	21,210	119	26	44
EA5DSG	**	11,952	99	23	49
EA4DDE	**	5,406	65	16	37
EA3DBO	**	3,500	34	16	19
EA4AK	**28**	**1,039,497**	**2413**	**37**	**120**
EA3ELZ	**	100,062	415	27	75
EA2LY/4	**	83,961	536	22	35
EA1DDU	**	48,705	309	24	61
EA1BFZ	**	42,925	198	31	70
EA5GIG	**21**	**67,230**	**414**	**22**	**61**
EA1DFH	**	40,480	253	22	70
EC2AUS	**	1,794	38	10	16
EA5EYJ	14	11,340	92	18	42

SWEDEN

SM5AOE	**A**	**1,744,092**	**2016**	**93**	**231**
SM3BIZ	**	**993,111**	**1046**	**103**	**296**
SM6DER	**	692,265	969	75	210
SM6LPF	**	206,584	406	68	149
SM5RNP	**	155,116	458	48	109
SM3CER	**	149,400	329	62	118
SM7DXQ	**	88,740	188	63	111
SM0BDS	**	26,622	152	31	71
SM6IJF	**	21,918	204	19	59
SM7HSP	**	19,339	155	25	58
SM5BDY	**	12,684	71	33	51
SM6BJI	**28**	**599,466**	**1562**	**37**	**110**
SK0LM	**	62,124	364	18	44
			(Opr. SM0DRD)		
SM5BDA	**	60,214	202	35	84
SM4HEJ	**	51,522	221	26	67
SM3TLG	**	45,441	189	25	74
SM0TW	**	40,626	239	20	54
SM6LIF	**	33,072	114	31	73
SM6MVL	**	32,088	164	24	60
SM5SVR	**	31,428	164	21	60
SM4RRD	**	29,754	261	16	42
SM5DYC	**	15,620	122	20	35
SM5WC	**	14,774	64	27	56
SM2PYN	**	11,960	150	15	31
SM0FM	**	5,580	60	15	30
SM5GMG	**21**	**607,840**	**1719**	**35**	**110**
			(Opr. SM0NSJ)		
SM0KV/0	**	31,900	152	31	69
SM0AJU	**14**	**917,946**	**2258**	**39**	**139**
SK3AH	**	61,692	503	15	38
			(Opr. SM3COL)		
SM3EDF	**	46,494	402	22	59
SM7TV	**	13,688	149	15	43
SM0PXK /0	**	9,516	126	13	39
SM5GXW	**	8,745	83	17	38
SM0HBV	**	1,625	38	9	16
SM6DOI	**7**	**187,758**	**952**	**29**	**93**
SM5GZ	3.7	6,204	64	12	35
SM7TF	**	1,590	50	5	25
SM5AQD	**1.8**	**19,588**	**309**	**11**	**48**
SM5OHI	**	1,566	56	3	26

SWITZERLAND

HB9DLE	**A**	**1,169,570**	**1323**	**99**	**271**
HB9AAA	**	817,225	1088	90	247
HB9QA	**	8,008	57	28	49
HB9DCQ	**28**	**166,944**	**551**	**32**	**109**
HB9CJG	**	86,112	404	26	52
HB9ARF	**	38,592	215	22	42
HB9DX	21	27,798	101	29	94

U.S.S.R. BYELO-RUSSIA

RC2AZ	**A**	**1,835,526**	**1862**	**118**	**344**
UC2IDC	**	153,608	538	46	136
UC2SDJ	**	90,364	361	38	126
UC2OT	**	23,900	121	34	66
UC2WEV	28	26,620	218	13	42
UC2OM	**	24,192	215	15	39
UC2OBB	**21**	**41,292**	**326**	**19**	**55**
UC2LR	**14**	**83,500**	**309**	**32**	**93**
UC2IO	**	22,914	192	17	50
UC2ABC	**1.8**	**81,290**	**313**	**11**	**44**

ESTONIA

ES5RY	**A**	**781,550**	**1293**	**93**	**292**
ES4NG	**	99,396	280	51	147
ES6WN	**	47,059	737	43	123
ES4RLF	**	10,858	162	15	46
ES1RX	28	1,786	32	10	9
ES1OX	**21**	**178,899**	**619**	**34**	**113**
ES7FU	**	63,270	313	22	73
ES4LB	**	1,029	17	8	13
ES7AM	14	25,428	214	20	58

EUROPEAN RUSSIA

RA1AA	**A**	**849,771**	**1415**	**88**	**263**
UA1ANA	**	**837,692**	**1207**	**96**	**292**
UA4NC	**	**468,707**	**676**	**97**	**252**
UA4HVV	**	354,273	920	81	188
UZ6LWB	**	352,692	675	80	223
UV6AY	**	296,184	585	69	177
UA6ED	**	264,880	639	69	211
UV3DN	**	263,120	756	66	142
UA3DPX	**	251,160	558	73	207
UA3AB	**	240,279	335	97	206
RA1AG	**	160,740	311	64	164
UA4CJP	**	136,479	427	55	146
UA4AHA	**	136,382	520	44	150
UA3DRB	**	120,643	219	75	148
RZ6AB	**	120,546	428	53	128
RA3AUU	**	107,666	204	61	141
UA3GM	**	103,626	223	64	138
RA6LVL	**	94,428	281	50	114
RV1AW	**	86,817	441	35	94
UW6LC	**	83,720	265	42	68
UW1AE	**	81,880	227	54	124
RA3EA	**	70,409	229	55	126
RA3LDV	**	70,304	272	42	127
UA4CO	**	68,747	185	58	103
UA3AGW	**	51,925	125	61	94
UV3DTW	**	46,512	202	34	77
RA4PR	**	35,480	161	19	46
UA4YJ	**	28,615	203	34	101
UA6LAY	**	8,023	64	23	48
UA6HRZ	**28**	**167,902**	**669**	**34**	**100**
RA3DEV	**	65,706	376	27	67
RA3DQP	**	64,386	331	25	73
UA3XAL	**	59,122	256	28	75
UA3MDV	**	40,796	228	26	68
UV3AHM	**	28,600	200	19	46
UA6XT	**	28,779	244	20	33
UA1WES	**	19,649	199	13	36
UA1APY	**	9,636	115	13	31
UA6HPK	**	6,996	76	11	20
UA6LP	**	4,316	61	10	16
UZ6HWE	**	1,820	57	8	12
UV6LRV	**	1,034	21	9	13
UW4CO	**21**	**267,386**	**984**	**36**	**106**
RA6LUX	**	**188,897**	**848**	**26**	**83**
UA4CZ	**	79,532	315	33	85
RA3DNC	**	57,720	416	19	59
U1BA	**	19,140	211	13	45
UA6LTA	**	18,816	186	15	48
UA3TAM	**	15,015	204	9	46
RA3TFU	**	10,191	111	12	31
UA6BGB	**14**	**546,804**	**1488**	**38**	**166**
UW1ZU	**	142,972	544	30	87
UV3GZ	**	86,000	317	33	92
UA6LAK	**	40,320	229	23	73
UA1TAF	**	31,050	272	18	51
UA4NJ	**3.7**	**26,715**	**228**	**13**	**52**
UA3DOL	**	4,800	103	7	33
RV6AGG	**	37,204	385	16	55
UA3ZOV	**1.8**	**14,840**	**142**	**19**	**51**
UA6JDQ	**	7,480	90	15	40
UA3MEV	**	578	32	5	12

FRANZ JOZEF LAND

4K2OIL	**A**	**72,772**	**284**	**36**	**77**

KALININGRAD

UA2EC	**21**	**59,202**	**315**	**25**	**74**
UA2CY	**3.7**	**25,352**	**432**	**8**	**46**

KARELIA

UA1NDV	**A**	**50,520**	**272**	**29**	**91**
UA1NDY	21	6,812	70	14	38

LATVIA

YL2KO	**A**	**114,576**	**483**	**42**	**134**
YL2CP	**	32,873	416	20	51
YL2DX	**	16,430	83	40	74
UQ2GN	**21**	**125,541**	**600**	**28**	**83**
YL2SM	**	113,322	491	25	77
YL2CR	**	21,750	612	12	46
YL2II	**	4,991	63	12	19
YL2PJ	**14**	**76,806**	**427**	**27**	**75**
YL3AD	3.7	44,484	111	6	32
YL2GE	**	10,950	209	8	42

LITHUANIA

LY3BA	**A**	**5,001,768**	**3768**	**129**	**418**
LY3BH	**	**2,327,160**	**2310**	**115**	**326**
LY3BS	**	**1,097,208**	**1647**	**93**	**298**
LY2BR	**	548,163	755	94	245
LY2BNC	**	484,428	981	74	242
LY3BO	**	429,408	654	90	246
LY2BIS	**	401,268	808	58	146
LY2PAQ	**	364,180	780	65	197
LY3BX	**	272,104	874	66	175
LY2PW	**	259,308	549	79	215
LY3BU	**	197,588	524	50	138
LY2BQJ	**	159,528	533	40	144
LY3BHY	**	117,304	484	41	131
LY3BP	**	48,576	189	42	54
LY2OU	**	21,437	99	37	60
LY1VV	**	8,642	69	25	33
LY2BAA	**28**	**261,422**	**629**	**35**	**107**
LY2DM	**	244,790	745	35	95
LY2BOC	**	126,784	479	27	85
LY2BKA	**	8,319	53	19	40
LY2ND	**21**	**36,270**	**224**	**23**	**55**
LY2BN	**14**	**155,640**	**735**	**30**	**90**
LY2SA	**	36,736	257	22	60
LY1BZG	**3.7**	**91,368**	**729**	**19**	**75**
LY2BHM	**	35,828	619	10	43
LY2OQ	**	4,636	104	7	31
LY2BUE	1.8	500	25	3	17

MOLDAVIA

UO4OF	**A**	**618,840**	**1182**	**78**	**192**
UO5OL	**	149,625	427	62	163
UO5AP	**	56,515	191	39	88
UO5ODA	21	18,480	111	26	44
UO5OB	14	23,904	113	22	61
UO5GR	**3.7**	**10,000**	**154**	**9**	**41**

UKRAINE

UB5MDD	**A**	**590,208**	**1010**	**82**	**236**
RB4LJ	**	**461,295**	**911**	**74**	**171**
UY5TE	**	301,834	827	57	190
UB5WJ	**	147,889	258	79	180
UB5JOO	**	104,640	270	50	110
UB5MLP	**	88,624	231	54	137
UB5EPV	**	35,361	162	35	76
UB5WE	**28**	**997,752**	**2183**	**37**	**131**
RB5IM	**28**	**782,772**	**1868**	**37**	**135**
UB5LCV	**	353,856	1018	36	116
RB5WO	**	169,332	500	34	103
UB5ZHQ	**	115,876	423	32	86
UB5BBF	**	65,000	277	25	75
UB5XCU	**	31,915	238	15	40
UB5MKD	**	9,976	162	11	32
UB5TDI	**	1,336	57	4	4
RB5QF	**21**	**679,055**	**2003**	**36**	**119**
UB5JKC	**	285,264	958	31	113
RB5IN	**	137,484	648	30	84
UB4ME	**	122,094	533	30	89
RB5IOV	**	45,859	154	35	86
UB4ED	**	33,152	259	16	48
UB5CCP	**	19,840	294	20	60
UT5UBN	**	19,494	147	18	36
UB4TA	**	16,614	122	21	50
UB5AFI	**	12,871	115	16	45
RB5EE	**	12,449	83	21	38
RB5TBS	**	9,020	127	13	31
UB5AJP	**	3,936	74	12	29
UT5UDI	**	1,800	35	9	15
UB4AR	**14**	**139,136**	**568**	**30**	**98**
UY5ZM	**	130,032	453	33	111
RB5EX	**	61,758	348	25	69
RB4MV	7	174,500	744	30	95
UB5SDW	**3.7**	**18,816**	**367**	**7**	**41**
UB5CDX	**	18,502	260	13	45
RB4JF	**	3,219	100	5	24
RB5TK	**	1,300	45	6	19
UT5DK	**1.8**	**26,880**	**470**	**8**	**48**
UB5NBJ	**	1,064	38	6	8

WALES

GW4BLE	**A**	**6,329,120**	**4251**	**138**	**422**
GW0ARK	**	**2,877,740**	**2845**	**91**	**289**
GW4HBK	14	16,214	146	16	51
GW4OFQ	**3.7**	**135,590**	**952**	**17**	**74**

YUGOSLAVIA

YT90A	**A**	**7,120,204**	**4243**	**154**	**477**
			(Opr. YT3AA)		
YT2IJ	**	**967,988**	**1169**	**96**	**286**
YU3EA	**	920,400	875	116	356
YU1PJ	**	189,696	482	54	138
YU4EGL	**	172,935	881	46	89
YU7KM	**	165,170	313	62	137
YU1LJ	**	136,544	270	73	178
YU7KM	**	42,799	188	38	89
YU1WR	**	38,055	163	44	85
YU7SF	**	34,848	166	37	84
YU3 /DL4NAC	**	9,720	87	19	53
4N3AA	**28**	**1,363,425**	**2850**	**38**	**137**
YT3SK	**	718,865	1607	36	125
YT3L	**	715,266	1791	37	121
YU3QM	**	504,942	1406	34	104
4N2V	**	468,000	1435	34	86
YU4AR	**	331,903	956	33	110
YU2QU	**	128,760	463	29	87
YU7FT	**	17,220	148	13	29
YU1PQI	**	5,434	71	11	15
YU3PV	**21**	**1,127,829**	**2329**	**39**	**144**
YZ3A	**	584,913	1534	37	110
			(Opr. YU3WE)		
YU3XU	**	535,841	1424	36	121
YZ90S	**	417,240	1490	34	88
			(Opr. YU2AKL)		
YT3SW	**	402,600	1269	31	101
YU1EXY	**14**	**1,229,680**	**2763**	**39**	**151**
			(Opr. YU6AR)		
YT3M	**	**1,035,045**	**2251**	**39**	**148**
			(Opr. YT3ZW)		
YU1KQ	**	936,320	2494	37	123
YT3T	**	920,975	2272	39	148
			(Opr. YU3BQ)		
YT4I	**	798,000	2048	39	136
YU1JW	**	533,520	794	39	132
YU3QI	**1.8**	**12,985**	**237**	**8**	**45**

4U—GENEVA

4U /DL4NAC	3.7	8	4	1	1

OCEANIA

AUSTRALIA

VK3ALZ	**A**	**228,879**	**543**	**50**	**97**
VK3PU	**	190,298	334	74	119
VK5GN	**	140,580	353	54	88
VK2AYK	**	84,216	221	46	86
VK6ANC	**	83,990	220	44	85
VK5AKY	**	6,800	70	17	17
VK2CJH	**	3,375	38	18	27
VK8XX/2	**28**	**681,876**	**1652**	**33**	**108**
VK4NEF	**	218,712	718	29	75
VK3TZ	**	184,240	702	31	67
VK2PWS	**	93,366	506	21	42
VK2CCK	**	85,652	350	23	53
VK8BE	**	8,073	69	18	21
VK3AOR	**21**	**101,460**	**355**	**31**	**58**
VK3SM	14	43,830	187	28	62

EASTERN MALAYSIA

9M6HF	**A**	**428,940**	**831**	**72**	**108**

FEDERATED STATES OF MICRONESIA

V63DX	**A**	**3,097,748**	**3343**	**112**	**204**
			(Opr. JA7HMZ)		

GUAM

KG6DX	**A**	**6,009,018**	**4405**	**146**	**325**
KH2 /N3EMA	28	889,410	2172	35	103
NH2 /N7DF	21	1,751,272	3669	38	125
KH2D	**7**	**248,965**	**873**	**29**	**72**

HAWAII

KH6 /WR6R	A	4,503,984	3746	137	275
KH6DLW	**	449,960	1100	57	83
KH6 /N2ME	28	749,436	2236	32	82
KH6XT	**	599,844	1838	33	78
AH6IM	**21**	**70,685**	**374**	**24**	**43**
KH6FKG	**14**	**521,289**	**1392**	**36**	**93**
KH6CC	**1.8**	**6,720**	**153**	**7**	**8**

INDONESIA

YB2FRR	**A**	**983,066**	**1068**	**110**	**212**
YC3OSE	**	329,544	627	62	122
YC9VGB	**	125,256	321	57	79
YB8RB	**	85,503	444	74	139
YC6INU	**28**	**267,800**	**706**	**36**	**94**
YC2BKJ	**21**	**35,640**	**175**	**26**	**46**
YC4BAK	**	8,700	108	19	39
YB2UIJ	**14**	**50,336**	**199**	**29**	**59**

JOHNSTON ISLAND

AH3C	**A**	**7,999,209**	**5454**	**158**	**345**

NEW HEBRIDES

YJ1A	**A**	**9,516,731**	**6429**	**160**	**381**
			(Opr. OH1RY)		

NEW ZEALAND

ZM1IM	**A**	**123,520**	**346**	**53**	**75**
ZL1AAS	**21**	**215,818**	**603**	**35**	**87**

PHILIPPINES

DU3 /KE9A	A	2,399,510	2402	118	228
DU3GDX	**	814,703	1187	90	137
DU1DFU	**28**	**27,976**	**226**	**24**	**28**
KG6UH /DU1	**	15,768	103	19	35
DU9RG	**7**	**305,502**	**920**	**35**	**83**

WESTERN SOMOA

5W1JD	A	11,907	79	32	31	

SOUTH AMERICA

ARGENTINA

LU9DBK	**A**	**1,702,008**	**2179**	**78**	**186**	
LR2D	"	**222,880**	**533**	**52**	**96**	
				(Opr. LU1YU)		
LU7MAO	"	30,495	105	33	74	
LS6T	**28**	**2,648,018**	**4440**	**39**	**163**	
				(Opr. LU6ETB)		
LU4MEE	"	**1,089,288**	**2987**	**33**	**90**	
LU9FDG	"	883,272	1990	33	116	
LP3F	"	806,036	1771	37	117	
				(Opr. LU6FAZ)		
L2Q	"	418,560	1508	34	62	
				(Opr. LU2QC)		
LS1H	"	394,758	1069	32	94	
				(Opr. LU1HM)		
LU8EGO	"	393,240	1200	29	84	
LU2NI	"	270,972	850	31	86	
LU1ICX	**21**	**501,480**	**1233**	**34**	**106**	
LU1DF	"	261,602	741	33	8]	
LU1MFK	"	86,702	303	25	52	
AY9F	**14**	**55,796**	**399**	**25**	**4]**	
				(Opr. LU7FJD)		
LU1IV	**7**	**196,773**	**670**	**31**	**76**	

ARUBA

P4ØV	**A**	**8,627,385**	**6440**	**120**	**333**	
P4ØR	**21**	**2,719,336**	**4972**	**37**	**147**	
				(Opr. K4UEE)		

BOLIVIA

CP1FF	**A**	**90,489**	**245**	**49**	**90**	
CP5AK	"	20,520	103	18	39	

BRAZIL

PP5IA	**A**	**265,930**	**506**	**68**	**135**	
PY3HLM	"	132,132	344	47	96	
PY2NY	"	9,268	75	23	29	
PP5WG	"	32	4	4	4	
PQ5C	**28**	**2,658,240**	**4611**	**39**	**156**	
PY2ETR	"	104,940	387	26	73	
PR5T	**21**	**2,096,680**	**3858**	**39**	**145**	
				(Opr. N5FA)		
ZW4OD	"	**1,351,579**	**3065**	**35**	**114**	
ZY1LI	**14**	**108,360**	**416**	**28**	**62**	
PP1AAX	"	1,292	25	10	9	
ZW5B	**7**	**473,850**	**1115**	**33**	**117**	

CHILE

CE3BFZ	**A**	**2,917,068**	**2731**	**112**	**251**	
CE5BYU	"	**1,748,769**	**2232**	**90**	**179**	
CE4MWK	"	618,600	1028	71	139	
CE4ETZ	**28**	**136,538**	**599**	**23**	**54**	
CE5BPE	"	44,781	231	21	48	
CE3AEZ	"	24,764	205	17	24	
CE3FIP	**21**	**1,726,812**	**3294**	**38**	**139**	
CE6EZ	**14**	**1,005,620**	**2217**	**36**	**118**	
CE3ZI	**7**	**29,325**	**193**	**25**	**50**	

COLOMBIA

HK7MQC	**A**	**56,932**	**128**	**55**	**117**	
HK6IUI	"	17,010	133	19	35	
HK3MAH	"	8,976	71	25	41	
HK3JJH	**28**	**601,825**	**1525**	**31**	**102**	
HK3MKQ	"	**50,850**	**215**	**23**	**67**	
HK3MRU	21	67,165	248	25	77	
HK6LNO	"	12,296	80	20	38	
HJ4QIM	**7**	**67,915**	**279**	**22**	**63**	

EASTER ISLAND

CE8ZIJ	**14**	**587,142**	**1554**	**29**	**102**	

ECUADOR

HD1T	**21**	**1,486,188**	**3113**	**33**	**129**	
HC1HC	**7**	**492,833**	**1407**	**31**	**90**	

GALAPAGOS ISLANDS

HC8A	**A**	**12,276,477**	**6887**	**143**	**460**	
				(Opr. N6KT)		

PARAGUAY

ZP5M	**A**	**1,182,608**	**1411**	**89**	**195**	
				(Opr. ZP5XHM)		
ZP5T	"	150,894	331	63	103	
				(Opr. ZP5MSC)		
ZPØY	**28**	**2,961,295**	**5409**	**36**	**149**	
				(Opr. ZP5JCY)		
ZP6B	**21**	**501,385**	**1170**	**35**	**114**	
				(Opr. ZP6ARB)		
ZP7CO	14	3,570	55	13	21	
ZP5FSS	**7**	**105,074**	**360**	**31**	**76**	

PERU

OA4ZV	**A**	**1,991,000**	**1924**	**101**	**261**	
OA4ANR	**28**	**604,800**	**1807**	**30**	**90**	
OA4QV	**14**	**291,264**	**901**	**30**	**81**	
OA4CRK	**7**	**77,742**	**493**	**22**	**41**	

TRINIDAD & TOBAGO

9Y4H	**A**	**10,908,869**	**6278**	**150**	**439**	
				(Opr. K6NA)		
9Y4BU	"	138,610	308	54	113	
9Y4VU	**21**	**2,231,037**	**4387**	**36**	**135**	

URUGUAY

CX8BBH	**28**	**1,604,536**	**3230**	**37**	**130**	
CX6BZ	**21**	**94,094**	**365**	**25**	**66**	

VENEZUELA

YV5GMN	**A**	**463,392**	**580**	**89**	**199**	
4M5F	"	199,467	637	40	90	
				(Opr. YV5CLM)		
YV5CLK	"	129,008	272	58	118	
4M5Y	**28**	**803,845**	**2401**	**31**	**85**	
				(Opr. YV5LAS)		
YW3A	"	**677,264**	**2066**	**29**	**83**	
YW6W	"	291,382	1076	23	68	
				(Opr. YV6CAX)		
YV6DNP	"	247,104	822	30	74	
4M5T	**21**	**1,065,694**	**2198**	**37**	**126**	
				(Opr. YV5JBI)		
4M3BC	"	293,384	951	26	78	
				(Opr. YV3BC)		
4M5KWS	"	26,000	241	18	32	
YV3A	**14**	**1,529,500**	**2947**	**35**	**140**	
				(Opr. YV5IVB)		
4M5VP	"	288,672	1022	22	74	
YV1EQW	"	33,908	405	11	17	
4M3X	**7**	**622,251**	**1521**	**33**	**114**	
				(Opr. YV5LIX)		
YV5JDP	"	**534,936**	**1461**	**26**	**98**	
YV1CP	**3.7**	**96,640**	**524**	**20**	**44**	
4M5E	"	48,363	335	13	34	
				(Opr. YV5MBX)		
YV4ABR	"	4,160	58	8	18	
YV1DRK	**1.8**	**9,666**	**127**	**8**	**19**	

MULTI-OPERATOR SINGLE TRANSMITTER NORTH AMERICA

UNITED STATES

K1AR	**11,193,606**	**4437**	**170**	**703**	
K1YR	**6,066,750**	**2821**	**160**	**590**	
K1NG	5,803,684	2651	163	610	
AA1K	5,293,096	2668	159	559	
KA1GG	5,269,363	2716	146	525	
KB1H	4,138,416	2112	148	548	
W1AF	3,490,830	1998	141	489	
KZ1M	2,864,550	1779	128	437	
W1GIH	2,722,820	1765	134	411	
N1TZ	1,664,327	1152	128	383	
W1BK	1,481,722	1027	124	393	
W1KOO	1,039,308	1088	87	250	
KA1X	819,549	778	92	277	
K1SSN	695,565	710	110	267	
W1FY	386,370	507	72	198	
KC1XK	91,635	229	43	106	
K5NA/2	**6,194,342**	**2715**	**166**	**637**	
K2TR	**5,787,315**	**2603**	**169**	**620**	
N2NU	4,446,720	2154	161	559	
K2SG	3,590,194	1962	143	510	
W2HPF	3,458,650	1893	147	503	
WF2A	3,294,400	2027	138	442	
NJ2L	2,508,550	1606	131	419	
N2SS	1,832,250	1254	122	403	
K2OWE	1,320,948	939	116	370	
WZ2B	1,160,492	936	114	332	
KE2TW	1,106,921	1071	95	296	
NS2K	1,000,500	956	90	285	
W2UI	458,122	533	85	216	
WE2T	252,704	406	58	154	
WB2JTE	55,245	159	45	82	
KE2UZ	30,660	187	20	40	
N3RS	**7,752,168**	**3366**	**167**	**637**	
W3XU	**5,034,101**	**2687**	**143**	**516**	
NN3Q	3,341,018	1736	149	525	
K3YL	3,071,236	1710	141	503	
K3NZ	2,506,208	1529	134	444	
WB3FIZ	1,742,976	1162	127	407	
KA3PIT	1,531,132	1088	122	381	
NA3K	1,456,773	1159	108	339	
K3ANS	1,322,178	944	125	381	
K3DI	1,228,938	920	118	360	
K3IVO	953,520	843	109	302	
N3HW	459,131	548	73	220	
WF3M	404,184	544	69	195	
WB3CJU	58,377	671	20	67	
W3KWH	6,084	57	14	25	
W4MYA	**5,269,550**	**2550**	**161**	**576**	
AB4RU	**2,403,522**	**1572**	**145**	**404**	
WA4QQV	2,116,836	1483	131	377	
N4AA	2,018,862	1349	131	400	
W4PRO	1,397,322	980	119	402	
W4AQL	1,144,000	825	138	382	
WA4CUG	875,292	749	108	310	
N4UMI	620,194	772	69	220	
AA4LH	521,640	609	85	230	
WD4Z	508,592	602	77	227	
KN4PE	205,920	322	68	172	
W4NC	118,560	323	35	95	
WB2ULI/5	**2,136,582**	**1390**	**155**	**392**	
WB5E	**1,083,643**	**865**	**125**	**348**	
K5BDA	702,145	697	101	260	
K5QHD	667,998	773	80	226	
KG5VK	599,394	632	102	251	
W5WX	462,132	641	89	208	
W6QHS	**3,509,271**	**2017**	**159**	**462**	
N6TV	**2,841,332**	**1909**	**144**	**397**	
W1FEA/6	2,804,736	1914	138	390	
W9NQ/6	1,414,776	1112	124	342	
AG6D	1,272,180	1086	130	325	
NF6S	1,248,148	1061	123	295	
W6OAT	1,134,480	947	124	311	
WA6IET	1,124,024	990	126	298	
WA6AHF	969,025	811	121	294	
KE6WL	956,449	913	112	265	
K6BR	724,632	820	112	215	
W6YX	721,088	876	101	203	
AA6TD	678,500	538	134	326	
WA6ISP	252,044	592	33	115	
K6SSS	2,108	22	14	20	
NK7U	**3,550,130**	**2347**	**144**	**401**	
W7ZR	**1,386,512**	**1172**	**124**	**325**	
W7TSQ	1,314,800	1300	122	258	
NO7F	863,753	947	109	232	
WS7V	485,030	609	90	197	
K7ABV	346,542	481	85	174	
N7JTS	158,775	267	72	147	
KB7IRF	140,097	414	29	94	
KB7IMC	47,970	243	24	54	
WB8K	**2,977,058**	**1656**	**154**	**477**	
KD8SQ	246,856	384	65	171	
K8OUA	155,215	300	49	136	
AC8N	98,739	240	47	112	
KS9K	**7,190,746**	**3033**	**177**	**652**	
AA9A	**2,229,210**	**1437**	**143**	**415**	
K9UWA	1,924,032	1294	147	381	
WO9Z	1,159,600	933	121	325	
W9JZ	1,005,311	808	119	330	
W9UVI	995,820	856	110	310	
NJ9C	935,445	833	114	299	
WD9INF	623,917	648	96	247	
W9EBN	515,145	602	85	220	
K9MA	449,224	636	65	176	
NJ9Z	167,200	306	74	146	
KB9ECC	35,030	122	36	77	
KØRF	**6,124,248**	**3017**	**171**	**556**	
KØCS	**2,877,462**	**1838**	**142**	**432**	
KRØB	2,810,760	1720	145	445	
KZØC	2,468,268	1738	134	372	
WØCP	1,897,967	1364	135	388	
NCØP	1,552,526	1314	126	320	
NUØP	1,133,546	1102	98	291	
NØBNG	1,108,188	1060	100	272	
NØILS	874,494	902	93	249	
KCØLX	716,688	777	93	243	
KØGAS	654,126	730	99	219	
KBØKK	563,332	631	101	240	
WØRA	185,400	531	50	100	
KØBJ	129,325	263	63	112	
KAØBHO	129,192	301	52	116	

BARBADOS

8P9X	**15,388,604**	**7726**	**165**	**583**	

BERMUDA

VP9AD	**11,040,968**	**7426**	**155**	**497**	

BELIZE

V31K	**8,282,335**	**6146**	**131**	**434**	

CANADA

XM1DX	**11,159,888**	**6497**	**160**	**552**	
XM3EJ	**10,663,008**	**5247**	**172**	**614**	
CZ7SZ	**6,091,772**	**5867**	**127**	**327**	
VY2CA	3,189,064	3443	87	271	
VE6SV	3,051,279	3090	131	310	
VE5FX	2,905,770	3137	118	293	
VE7GFC	1,131,174	1580	110	209	
VE6AO	648,945	1176	89	164	
VE1AUE/1	466,084	882	64	154	

GUATEMALA

TGØAA	**2,250,417**	**3082**	**64**	**183**	

MEXICO

6D2X	**13,380,687**	**8169**	**160**	**507**	
6I2A	2,040,194	3697	88	174	
XE2/N6IC	1,179,152	2503	82	126	

4U—NEW YORK

4U45UN	**3,759,035**	**4786**	**86**	**249**	

AFRICA

CANARY ISLANDS

EA8AGD	**14,796,344**	**7204**	**147**	**545**	

DIEGO GARCIA

VQ9CQ	**1,670,664**	**1844**	**90**	**212**	

MADEIRA ISLANDS

CR3M	**11,698,470**	**6539**	**143**	**456**	

MOROCCO

CNØA	**14,008,363**	**7134**	**139**	**508**	

MOZAMBIQUE

C9QL	**344,805**	**639**	**63**	**118**	

ASIA

ISRAEL

4Z7M	**5,184,036**	**3756**	**115**	**362**	

JAPAN

JE2YRD	**7,938,128**	**4663**	**158**	**434**	
JA7YAA	**4,908,800**	**3285**	**145**	**375**	
JJ3YBB	**4,172,720**	**3347**	**131**	**299**	
JA3YBF	4,114,816	2667	149	395	
JA6YJS	**3,451,014**	**3033**	**130**	**297**	
JA1YKX	**2,252,104**	**1997**	**121**	**273**	
JH1YHS	2,188,750	1837	129	297	
JA6YCL	1,991,608	1707	126	286	
JH1YDT	1,746,176	1690	116	293	
JA2YKA	1,428,800	1547	111	209	
JAØZRY	**1,023,252**	**1261**	**97**	**187**	
JA2YDC	370,640	598	79	147	
JA5ZBI	155,210	335	58	112	
JA3YQD	150,980	785	69	113	
JA9YAV	136,498	350	56	83	
JL1YOE	112,008	254	68	88	
JAØYPB	68,226	194	65	72	
JA3YOI	9,240	81	18	28	
JAØYMU	1,449	25	9	14	
JA3YDH	1,026	16	11	16	

KOREA

HLØO	**507,800**	**1023**	**76**	**124**	

MONGOLIA

JT1T	**427,392**	**940**	**57**	**135**	

PEOPLES REPUBLIC OF CHINA

BY4SZ	**2,899,554**	**3192**	**113**	**244**	
BY1PK	**2,445,933**	**2989**	**114**	**229**	
BY4RSA	**1,896,630**	**2452**	**107**	**224**	
BY4SZ	1,333,420	2108	97	193	
BY4AA	755,712	1586	92	154	
BY1QH	750,738	1379	76	135	
BY3CC	71,804	873	58	58	

TURKEY

YM5KA	**15,056,664**	**7609**	**164**	**548**	

U.S.S.R.

ASIATIC RUSSIA

RW9HZZ	**5,399,016**	**3544**	**157**	**431**	
UZ9QWA	**2,356,584**	**1868**	**118**	**329**	
UZØWWL	**565,488**	**901**	**76**	**176**	
UZØCXD	203,100	1202	56	94	
UZ9XWV	159,873	368	60	131	
UZ9FZD	97,584	350	45	107	
UZØLWQ	58,170	300	39	66	
UZØQWZ	25,438	168	32	47	
UZØSXF	12,025	68	30	35	

GEORGIA

UF7VWA	**8,243,453**	**4428**	**150**	**517**	
UF7QWW	1,480,734	1639	73	233	
UF7FWM	63,002	241	28	81	

KAZAKH

RLØL	**8,947,440**	**4454**	**168**	**552**	
UL8LWA	3,896,472	2621	144	396	

EUROPE

AUSTRIA

OE3GBB	**837,162**	**1263**	**87**	**246**	
OE3XCW	356,128	607	68	180	

BALEARIC ISLANDS

EA6FB	**4,892,976**	**4052**	**121**	**407**	
EA6ARM	827,966	1820	61	153	

BELGIUM

ON6NL	**7,440,552**	**4890**	**136**	**452**	
ON6AH	3,214,450	2731	135	395	
ON7UN	3,019,410	2550	126	351	
OR5EEC	1,733,816	1999	99	293	
ON4KRW	176,754	466	51	127	

BULGARIA

LZ9A	**13,234,208**	**5884**	**202**	**726**	
LZ6W	1,134,112	1587	104	228	
LZ1KNP	630,180	1021	84	240	

CZECHOSLOVAKIA

OM5W	**10,249,516**	**5128**	**164**	**624**	
OK7ZZ	**8,371,500**	**4670**	**161**	**589**	
OK1KQJ	1,489,158	1692	100	314	
OK2RAB	755,764	1301	79	173	
OK2KOD	699,776	961	90	262	
OK5SWL	547,722	986	76	218	
OK1ORA	506,506	758	77	209	
OK2KET	311,589	722	64	203	
OK2KYC	287,718	552	60	177	
OK2KJU	105,078	409	47	119	
OK3KUN	91,884	412	46	110	
OK2KVI	6,912	79	17	37	

DENMARK

OZ7HVI	**1,445,393**	**1948**	**88**	**249**	
OZ1ADL	390,488	735	68	198	
OZ4HAM	12,064	100	20	38	

ENGLAND

GØKPW	**7,135,320**	**4797**	**135**	**447**	
G3NAS	**5,304,933**	**3912**	**122**	**391**	
GXØOBS	1,851,390	2827	77	193	

FEDERAL REP. OF GERMANY

DLØWU	**6,236,890**	**4021**	**136**	**454**	
DFØAT	**4,854,891**	**3233**	**135**	**458**	
DL8OH	**4,654,188**	**2866**	**142**	**515**	
DLØWH	3,024,868	2366	128	378	
DL1DAS	2,782,695	2491	114	321	
DFØRR	2,716,968	2395	119	355	
DKØIN	2,631,435	2363	122	343	
DKØKX	2,535,610	2197	123	395	
DLØTD	2,444,683	2298	116	345	
DAØFDX	2,145,869	2446	102	271	
DFØPK	1,188,618	1459	96	301	
DLØJU	1,103,356	1265	96	262	
DFØRN	568,512	900	82	247	
DLØER	461,338	743	67	184	
DA1RF	362,278	776	69	160	

FINLAND

OH4YC	**3,854,025**	**3141**	**135**	**390**	
OH2BR	1,674,844	2166	116	317	
OG7NTM	1,244,490	1589	101	289	
OH4AB	845,250	1091	94	281	
OH1MCX	390	10	7	8	

FRANCE

F6HLC	**7,164,960**	**4824**	**128**	**424**	
FF6KRC	**5,825,449**	**4498**	**119**	**350**	
TM5A	**4,713,390**	**4273**	**124**	**382**	
F6CQU	4,123,563	4055	99	282	
F6BGC	2,934,502	2356	112	391	
FF1PBT	960,058	1157	100	274	
FF6RSM	678,640	1055	91	249	
TMØE	637,160	2617	79	217	
FF6KTF	351,288	658	71	167	
FF1LPW	312,512	550	74	183	

GERMAN DEMOCRATIC REP.

Y38I	**4,903,254**	**3869**	**127**	**404**	
Y22YD	2,077,914	2240	111	335	

GUERNSEY

GU6UW	**13,155,792**	**6997**	**167**	**587**	

HUNGARY

HG5A	**12,400,080**	**6811**	**158**	**568**	
HG1S	**9,544,185**	**6441**	**143**	**472**	
HG6N	6,994,220	4904	131	449	
HA8KCK	2,210,208	2228	113	349	

IRELAND

EI7M	**5,982,942**	**4972**	**121**	**380**	

ITALY

IQ4A	**17,255,700**	**7253**	**183**	**717**	
IY2A	5,302,848	3934	134	434	
I4GAD	4,482,372	3896	111	315	
IC8SDL	1,634,255	2169	93	278	
IK1LBO	1,557,657	2177	89	190	

I.T.U.—GENEVA

4U1ITU	**7,662,743**	**5226**	**146**	**503**	

LIECHTENSTEIN

HBØ /HB9AON	**3,821,081**	**118**	**445**		

NETHERLANDS

PI4COM	**3,578,286**	**2690**	**130**	**424**	
PI9IRC	2,884,860	3371	86	255	

NORWAY

LA2AB	**4,084,080**	**3698**	**122**	**340**	
LA1H	2,949,596	2460	132	392	
LA1K	2,303,872	2348	113	326	
LA2T	89,096	306	48	100	

POLAND

SP1PBW	**844,480**	**1101**	**95**	**269**	
SP3PLD	301,104	522	79	193	
SP3KVE	112,861	370	47	114	
SP9ZHR	77,602	244	50	111	
SP4KTO	57,399	220	44	115	
SP3ZAT	30,784	156	37	67	

ROMANIA

YO7KJS	**49,020**	**268**	**32**	**97**	
YO7KAJ	40,452	229	27	60	

SCOTLAND

GM3BSQ	**689,136**	**1081**	**83**	**253**	

SPAIN

ED5TD	**7,732,030**	**4418**	**152**	**549**	
ED3MM	**3,565,056**	**3425**	**80**	**262**	
EA3CUQ	**3,193,250**	**2830**	**118**	**364**	
ED3QD	2,046,080	2544	94	274	
ED1DD	1,475,712	1613	94	290	
ED3IN	706,893	982	87	254	
EA2RCF	637,144	1098	77	215	
EA3RKO	265,335	468	61	184	
ED1SML	247,932	638	63	150	
ED5WS	199,500	551	60	130	

SWEDEN

SK3LH	**1,869,384**	**1926**	**114**	**324**	
SKØMT	1,712,700	2115	106	290	
SLØCB	649,792	910	88	264	
SMØSNI	305,152	551	78	178	
SK5WB	205,902	579	52	134	
SK5SE	123,804	300	51	120	

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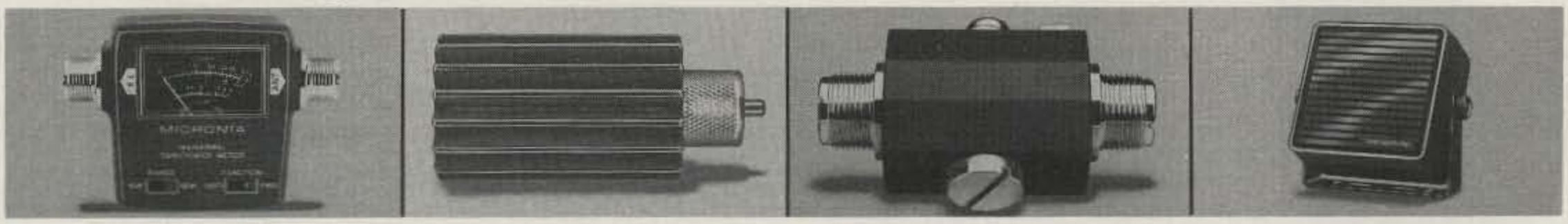
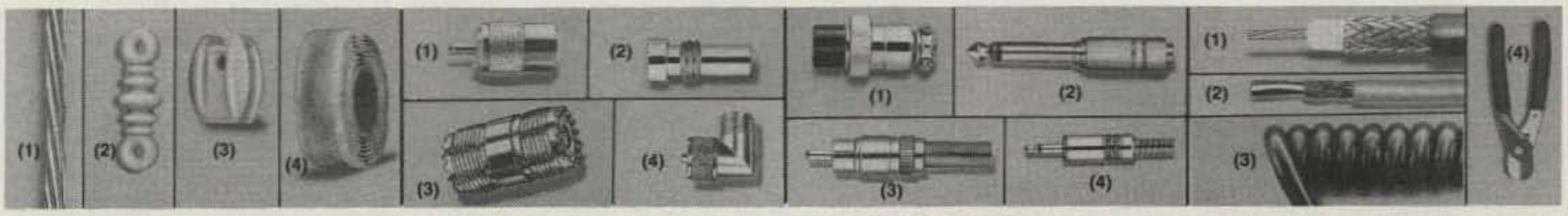


VHF/UHF SWR/Power Meter. Adjust your 2m or 70cm mobile or base antenna for best efficiency. Check transceiver's output and coax loss, too. Low insertion loss. Switchable 15 and 60W ranges. #19-320 ..... **39.95**

100-Watt Dummy Load. Ideal for transmitter tune-up with an SWR/power meter, checking coax loss and power measurement. Rated 100W intermittent, 15W continuous. DC to 500 MHz. #21-506 ..... **21.95**

Coaxial Surge Protector. Protects your valuable equipment from lightning-induced transients. Gas discharge element. (Replacements available through Radio Shack). Rated 500W PEP, DC to 1.5 GHz. #20-021 ..... **19.95**

NEW! Amplified Mobile Speaker. Gives you the extra volume needed in your mobile. 7.5 watts. Has a top-quality 4" driver, 4-ft. audio cord with 1/8" plug at each end, and a 4-ft. 12VDC cord. Adjustable bracket. #21-541 ..... **23.95**



(1) Antenna Wire. 14-gauge stranded copper. 70 feet. #278-1329 ..... **5.99**
(2) "Dogbone" Insulator. Porcelain. 3½" long. #278-1336 ..... **1.99**
(3) Mini Egg Insulators. Glazed porcelain. #278-1335 ..... **2/2.99**
(4) Outdoor RF Hookup Sealant Tape. 60" roll. #278-1645 ..... **2.49**

(1) Premium PL-259. Silver/teflon. The best! #278-188 ..... **3.49**
(2) UG-176 Reducer. For RG59 and RG8M. #278-204 ..... **Pkg. of 2/99¢**
(3) PL-258 Coupler. Joins two PL-259s. #278-1369 ..... **1.69**
(4) Coax Connector Right-Angle Adapter. #278-199 ..... **2.49**

(1) 8-Pin Mike Plug. Fits popular transceivers. #274-025 ..... **2.19**
(2) Headphone Adapter. Adapts 1/8" stereo headphone plug to monaural 1/4" jack. #274-348 ..... **1.99**
Top-Quality Gold-Plated Connectors.
(3) Phono. #274-850 ..... **2.49**
(4) Mono 1/8". #278-857 ..... **2.79**

(1) NEW! IMPROVED! RG8 Coax. Low loss. #278-1312 ..... **Per Foot 49¢**
(2) 4-Conductor Double-Shielded Cable. 30 feet. #278-777 ..... **7.95**
(3) Coiled Mike Cable. Four conductor. 5 feet. #278-356 ..... **2.99**
(4) Precision Coax Cable Cutter Tool. #278-244 ..... **5.95**

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CIRCLE 175 ON READER SERVICE CARD

SWITZERLAND

HB9H	**7,063,672**	**4818**	**144**	**472**
HB9GT	1,978,152	2141	98	283

U.S.S.R.

BYELO-RUSSIA

UC1WWF	**236,720**	**555**	**58**	**162**

EUROPEAN RUSSIA

RW4LYL	**3,639,336**	**2857**	**144**	**408**
UZ4PWW	**1,334,928**	**1658**	**109**	**302**
UZ1AWQ	1,139,424	1605	99	317
RZ6AXO	1,042,797	117	274	
UZ4HXX	1,030,264	1418	100	256
UZ3GYM	894,219	1327	91	256
UZ1TWC	712,347	1074	89	278
UZ6LWB	352,692	675	80	223
UZ3QYA	316,260	751	72	179
UZ3DXS	177,122	484	59	135
UZ3DWZ	137,685	464	56	145
UZ3AWR	61,596	539	66	140
UZ6LWL	32,421	224	27	80
UZ4AYT	18,200	161	25	75
UZ3DZD	15,756	102	21	57
UZ3DYU	3,880	65	12	28

KALININGRADSK

UW2F	**9,296,331**	**5579**	**151**	**530**
UZ2FWN	208	17	4	9

LATVIA

RQ9W	**8,893,779**	**5207**	**161**	**583**
UQ0A	5,209,225	3973	147	448

LITHUANIA

LY2WW	**4,453,610**	**3158**	**144**	**466**
LY1BXT	170,798	590	44	114

MOLDAVIA

UO4OXU	**107,520**	**309**	**53**	**139**

UKRAINE

RT1U	**6,636,312**	**4747**	**164**	**568**
UB4WZA	**3,768,992**	**2751**	**138**	**470**
RB4IWM	2,064,951	2271	109	340
UB4QWW	1,991,250	2296	115	335
UT4JWB	1,077,648	1500	96	218
UB4MXR	772,272	1195	89	257
UB4MWU	179,300	451	65	155
UB4XWK	191,520	545	55	125
RB4EXN	160,993	492	54	157
UB4IWI	24,820	126	31	54
UB4WWW	15,680	117	25	55
RB4IYJ	5,950	75	23	37

WALES

GW8GT	**7,200,496**	**4,911**	**134**	**458**

YUGOSLAVIA

YT7A	**6,207,540**	**3,799**	**152**	**522**
YT2R	**5,840,076**	**3,919**	**134**	**470**
YZ4Z	**5,011,345**	**4043**	**123**	**429**
YU3AI	3,858,724	3,553	103	349
YT5R	2,171,787	1,483	97	292
YT4T	1,253,109	1,640	83	216
4N7M	1,089,652	1,410	93	238
4N4U	542,430	886	79	236
YU2CFL	30,700	222	35	65

SOUTH AMERICA

ARGENTINA

L4D	**2,299,984**	**2298**	**110**	**234**

ARUBA

P4ØT	**12,491,478**	**6996**	**142**	**464**

BRAZIL

PT7FX	**5,072,256**	**3714**	**14**	**330**
ZWØJR	**3,809,548**	**3125**	**126**	**293**
PP5JD	3,741,000	3397	103	272

CHILE

CE2AA	**2,611,474**	**2498**	**108**	**253**
CE2GVM	55,948	416	50	67

ECUADOR

HCØE	**4,600,936**	**3484**	**121**	**325**

FRENCH GUYANA

FY/KD3FK	**1,516,880**	**1854**	**69**	**214**

OCEANIA

FEDERATION OF MICRONESIA

V73AZ	**7,018,640**	**5084**	**155**	**317**

FRENCH POLYNESIA

FOØAA	**4,115,669**	**4915**	**98**	**185**

AUSTRALIA

VK3VT	**2,992,626**	**2937**	**109**	**242**
VK2BUV	**2,535,414**	**2446**	**107**	**250**

BELAU

V63BD	**3,097,536**	**3869**	**88**	**184**

HAWAII

KH6RS	**10,621,993**	**8028**	**144**	**305**

PHILIPPINES

DU3 /N2HEV	**1,014,240**	**1473**	**86**	**154**
DX1L	788,406	1326	71	131
DX1DBT	358,519	623	68	143

WESTERN KIRABATI

T3ØF	**11,000**	**85**	**23**	**32**

MULTI-OPERATOR MULTI-TRANSMITTER NORTH AMERICA

UNITED STATES

N2RM	**18,146,246**	**7321**	**171**	**716**
N5AU	**16,736,436**	**6746**	**187**	**691**
W3LPL	**16,517,214**	**6577**	**179**	**703**
W7XR	**12,232,124**	**5627**	**185**	**603**
KY1H	**11,468,292**	**5058**	**175**	**674**
K8CC	**9,785,580**	**4671**	**180**	**625**
NQ4I	**9,532,050**	**4402**	**173**	**622**
N6ND	**8,483,628**	**4045**	**180**	**581**
NE3F	7,087,960	3554	154	558
W9 /WØAIH	**6,310,220**	**3538**	**164**	**521**
KQ2O	4,338,990	2283	146	520
WO9I	4,075,755	2301	152	493
NF2L	3,807,824	2025	153	509
N7QO	2,511,128	1734	163	405
N8JMN	2,179,485	1531	134	421
WB2YOF	1,818,592	1192	130	414
W3KV	1,568,196	1208	115	326
K6ZM	1,448,160	1223	124	296
N7RO	1,347,236	1053	131	326
WD3V	1,312,664	1105	116	312
W5KS	777,285	929	110	235

ALASKA

KL7RA	**17,130,631**	**11386**	**157**	**466**

CANADA

VE7ZZZ	**11,908,764**	**8913**	**153**	**435**
VE3SWA	115,395	315	47	110

CAYMAN ISLANDS

ZF2MZ	**11,680,167**	**8162**	**138**	**441**

FRENCH SAINT MARTIN

FS/KC1F	**9,042,370**	**7388**	**123**	**392**

GRENADA

J37DX	**11,789,415**	**8914**	**127**	**434**

ASIA

JAPAN

JL1ZCG	**10,220,366**	**5568**	**166**	**480**
JE2YRD	**8,089,074**	**4673**	**159**	**443**
JA7YRR	**6,351,678**	**4382**	**143**	**358**
JA3YKC	**5,331,456**	**3504**	**151**	**383**
JA1YXP	1,238,277	1676	82	167
JH8YCT	**1,192,208**	**1616**	**97**	**180**
JA6YFL	172,928	322	72	121

EUROPE

BELGIUM

ON7LR	**10,398,388**	**6982**	**145**	**541**

BULGARIA

LZ1KVZ	**5,262,411**	**4413**	**150**	**477**

ENGLAND

GB2AA	**2,589,972**	**2708**	**114**	**348**

ESTONIA

ES6WV	**47,059**	**737**	**43**	**123**

EUROPEAN RUSSIA

R6L	**14,948,868**	**8563**	**183**	**659**

FEDERAL REP. OF GERMANY

DAØBV	**13,628,376**	**7419**	**168**	**688**
DLØCS	**13,502,920**	**7565**	**173**	**642**
DF3OG	1,482,088	1521	115	343

FINLAND

OH2BYS	20,979	71	41	70

HUNGARY

HA/DF2UU	37,778	163	36	83

ITALY

IQ3A	**24,875,479**	**11865**	**186**	**721**

LITHUANIA

LY2ZO	**9,215,418**	**6486**	**159**	**528**

NORWAY

LA3BL	193,584	527	53	169

SPAIN

EA1KI	**400,440**	**668**	**74**	**210**

SWEDEN

SKØUX	206,510	415	67	147

SWITZERLAND

HB9AJM	**2,125,650**	**1930**	**139**	**416**

YUGOSLAVIA

YT2B	**10,268,253**	**7051**	**145**	**512**
4N4C	3,108,404	2973	118	334

4U—VIENNA

4U1VIC	**6,862,800**	**6352**	**139**	**460**

OCEANIA

NEW ZEALAND

ZM2K	**5,899,276**	**4484**	**130**	**324**

PHILIPPINES

4D3HSP	**2,946,714**	**3108**	**118**	**208**

SAIPAN

KHØAM	**35,730,600**	**16309**	**179**	**565**

WESTERN SOMOA

5W1JJ	**22,285,168**	**11491**	**173**	**491**

SOUTH AMERICA

BRAZIL

ZX4V	**4,877,916**	**3940**	**112**	**316**

NETHERLAND ANTILLES

PJ1B	**57,610,400**	**19655**	**189**	**803**
PJ9W	**51,388,610**	**19137**	**179**	**731**

SINGLE OP ASSISTED

NORTH AMERICA

UNITED STATES

K1TO	**A**	**4,088,154**	**2156**	**148**	**506**
AG1C	**"**	**3,700,400**	**2020**	**143**	**495**
K1VR	"	2,625,952	1510	143	474
K1CC	"	2,392,590	1619	130	389
K1KP	"	1,965,925	1246	132	443
KA1SWJ	"	1,688,248	1143	127	435
WD1K	"	1,170,622	893	119	359
KA1ION	"	1,129,624	966	98	321
NO1I	"	1,114,771	814	113	384
KC8PE/1	"	1,080,280	839	113	339
WB1S	"	1,070,784	905	103	313
W1XS	"	994,422	863	98	320
K1JB	"	905,895	877	91	278
KC1EO	"	649,704	721	79	242
W1YN	"	604,176	644	79	249
WA1IML	"	512,928	654	81	207
WA1G	"	498,213	651	83	198
NY1V	"	484,840	521	89	251
NK1I	"	461,378	477	89	260
AB1U	"	342,016	467	73	183
N1DEA	"	271,649	403	66	191
KB1FJ	"	214,320	316	63	177
K1MBO	"	150,012	326	45	117
W1SD	"	140,267	231	70	153
NQ1K	"	124,440	222	60	144
N1GRM	"	15,525	74	24	51
N1FJ	"	1,287	20	14	19
K1IU	**28**	**647,622**	**1263**	**34**	**145**
N1HRA	"	53,045	197	32	71
NR1R	"	36,531	123	29	70
K1TR	**21**	**126,269**	**310**	**33**	**110**
K1BG	**3.7**	**10,065**	**65**	**15**	**46**
K1ZM/2	**A**	**4,405,350**	**2246**	**165**	**518**
WB2K	**"**	**2,805,712**	**1513**	**145**	**511**
W2GD	"	2,744,946	1491	152	505
N2MM	"	2,070,848	1213	141	467
WA2NHA	"	1,512,126	1172	104	358
NM2L	"	1,230,944	1047	116	300
W2HG	"	1,018,399	857	115	306
KF2U	"	883,650	744	105	325
WG2E	"	812,800	720	97	303
KD2YP	"	750,000	664	103	297
W2REH	"	596,410	578	92	273
WR2G	"	412,115	505	75	220
WM2D	"	355,104	459	77	197
N2AIF	"	238,700	323	84	191
NG2P	"	218,226	353	63	159
K2ZSY	"	100,920	251	45	100
NK2D	"	80,660	176	65	120
WA2E	"	34,430	120	36	74
WU2K	"	31,504	123	24	64
KN2Q	"	24,386	108	31	58
KE2CG	**28**	**186,816**	**496**	**31**	**108**
K2LE	"	111,544	272	34	112
WK2H	"	92,598	275	26	96
WB2TPS	"	70,440	221	29	91
KB2BBG	"	53,346	216	23	79
K3WW	**A**	**3,580,653**	**1861**	**146**	**531**
NX3A	**"**	**1,775,004**	**1392**	**112**	**340**
W3FV	"	1,545,180	1201	116	339
K3VW	"	1,519,368	1153	118	354
K3ND	"	1,492,619	990	134	407
KQ3F	"	1,453,078	1002	124	390
W3UM	"	1,249,755	900	126	367
N3II	"	1,204,231	871	114	383
N3RR	"	1,198,080	849	131	381
AA3B	"	1,084,810	931	100	315
K3ZA	"	1,033,406	884	106	333
NK3U	"	946,542	769	109	328
AD8J/3	"	856,639	850	99	272
N3BNA	"	719,946	668	111	312
KD3CN	"	715,884	731	80	273
N3NA	"	597,498	593	102	261
K3RL	"	593,580	566	105	285
NI3P	"	570,064	615	90	238
WB3CIW	"	431,745	573	68	201
AD3Z	"	427,936	470	103	241
NC3C	"	402,034	478	95	263
W3EVW	"	348,440	420	117	193
W3AZ	"	301,176	467	68	199
W3NX	"	295,812	380	87	210
KA3PLS	"	267,244	366	85	199
K3TLP	"	254,650	330	83	192
N3RC	"	162,540	273	64	146
KX3Q	"	123,200	203	66	154
K4JPD	**A**	**2,332,934**	**1597**	**146**	**405**
KB4SRE	**"**	**1,167,276**	**943**	**118**	**326**
WA4CTC	"	815,652	719	117	300
K8UNP/4	"	663,705	721	86	257
KM4EX	"	573,144	622	92	242
KØLUZ/4	"	514,386	504	97	272
KD4OM	"	182,880	274	74	166
WA4WTG	"	138,250	291	55	120
N4XMX	"	121,584	222	67	137
W4TMN	"	114,444	225	51	136
WA4KIL	"	58,826	162	46	88
W4LVM	"	40,608	146	39	69
KB4SSS	"	40,414	133	37	84
K4KUZ	"	23,028	77	45	69
KI4TZ	**28**	**154,808**	**370**	**33**	**115**
N4WYH	"	83,566	240	28	99
N4GVF	**21**	**748,028**	**1532**	**36**	**136**
N4HOH	**7**	**45,732**	**162**	**26**	**77**
KC4GR	**3.7**	**6,165**	**60**	**11**	**34**
KD5GD	**A**	**1,453,938**	**1295**	**110**	**316**
KI3L/5	**"**	**1,433,244**	**1090**	**131**	**367**
WF5E	"	828,036	793	114	282
NØIDR/5	"	527,459	601	81	242
			(Opr. WØVX)		
KI5GX	"	216,923	359	68	165
WBØNSA /5	"	210,429	352	71	156
N5ERC	**28**	**100,700**	**361**	**24**	**76**
N5OGX	"	82,602	318	26	91
KA5ZGK	"	64,542	357	25	68
NA4M/5	**21**	**347,442**	**781**	**36**	**122**
WB5UDX	"	323,974	783	33	113
N5IZY	"	66,875	245	26	81
N5IMO	"	52,234	232	24	67
KB5JJB	"	35,588	229	25	57
WK6V	**A**	**1,168,458**	**985**	**136**	**311**
N6ST	**"**	**1,083,350**	**846**	**127**	**343**
KT6V	"	1,058,049	855	126	321
VE3SUN /W6	"	755,790	787	100	254
AA6KX	"	605,578	600	121	273
N6CCL	"	556,110	648	98	235
N6EE	"	371,188	472	86	198
K6HHD	"	300,125	314	102	241
N6IP	"	205,572	339	75	147
N6OU	"	196,588	317	81	157
KK6GN	"	194,423	367	64	135
N6SRT	"	190,414	347	72	131
WB2CHO /6	"	189,696	276	80	167
WA8LLY /6	"	168,036	284	66	143
W6JL	"	135,103	315	52	115
WA6AUE	"	109,004	186	89	140
KI6X	"	70,623	151	68	103
AJ6V	"	31,696	117	45	67
KI6PG	"	19,840	94	31	49
N6AHV	"	2,090	22	17	21
KA6ING	**28**	**89,211**	**290**	**32**	**99**
K6YRA	"	84,162	188	37	132
W6HXW	"	65,169	197	29	88
KI6ZH	**21**	**96,878**	**288**	**29**	**89**
W8AEF /6	**14**	**64,148**	**223**	**29**	**87**
KI3V/7	**A**	**2,299,142**	**1501**	**143**	**419**
KY7M	**"**	**1,504,244**	**1267**	**124**	**310**
N7PJM	"	939,780	1005	100	245
KC7V	"	698,442	727	120	234
N7IRR	"	433,650	549	97	198
N7KZN	"	324,104	462	90	164
KA7CSE	"	183,744	385	63	113
WA7IIM	"	173,353	281	62	167
NB7N	**28**	**295,680**	**803**	**32**	**100**
AI7B	**21**	**896,234**	**1971**	**37**	**129**
W7WHY	"	164,682	474	32	94
K8MR	**A**	**2,853,600**	**1656**	**142**	**458**
WB8VPA	"	1,268,064	904	126	392
K8CX	"	1,259,248	1047	112	310
KB8S	"	1,096,500	928	102	323
N8BJQ	"	1,070,176	895	110	314
NG8D	"	1,052,688	1025	93	271
K8NZ	"	612,360	581	104	274
WD8IXE	"	579,396	643	84	234
KB8FJ	"	193,764	300	75	166
NR8Z	"	27,966	86	48	70
KK9V	**A**	**1,943,470**	**1303**	**133**	**412**
K9SD	**"**	**1,587,720**	**1116**	**136**	**388**
WW9Q	"	1,352,070	998	131	367
WE9R	"	1,338,818	1032	113	353
NE9U	"	850,773	799	108	273
WW9L	"	769,519	708	112	289
WV9Q	"	601,852	614	104	275
K9EC	"	520,026	554	102	237
NF9S	"	429,286	535	73	213
WD9GIG	"	406,363	398	96	287
KB9AIT	"	393,056	437	104	242
KE9I	"	357,161	492	88	171
KD9BC	"	77,714	155	58	124
K9PAJ	"	65,760	174	44	93
W9XT	**28**	**721,130**	**1382**	**34**	**151**
WB9GPF	"	242,392	523	35	129
K9JS	"	186,730	464	29	113
KØBFR/9	"	14,756	81	18	50
WB9TIY	**21**	**456,790**	**986**	**36**	**134**
K9OSH	"	124,352	335	33	101
K9FN	**14**	**132,354**	**298**	**37**	**125**
NØAT	**A**	**1,486,413**	**1012**	**135**	**386**
WØRLX	**"**	**1,331,304**	**1087**	**125**	**317**
NTØH	"	1,024,320	952	101	287
WØOSK	"	710,040	693	113	275
WB8ZRL /Ø	"	230,972	290	93	199
WBØZKG	"	66,000	151	57	108
KC9AL/Ø	**28**	**203,832**	**501**	**34**	**115**

CANADA

VE3VET	**A**	**531,810**	**657**	**83**	**228**

ASIA

JAPAN

JH6AXY	A	46,336	132	50	78
JJ1HTT	"	34,689	128	41	52
JH1DWM	**28**	**990,234**	**1948**	**37**	**137**
JA5EXW	"	581,856	1319	37	115
JAØVHI	"	97,152	369	26	66
JHØVPO	21	12,931	76	33	34
JF2BNG	7	6,100	47	19	31

EUROPE

ENGLAND

GØHSD	**A**	**2,810,784**	**2699**	**109**	**293**
GØMFO	"	1,756,120	1627	100	330

FEDERAL REP. OF GERMANY

DJ2YA	**A**	**3,645,988**	**2470**	**125**	**438**
DL1SBR	**"**	**2,563,575**	**2021**	**120**	**405**
DK3GI	"	2,036,380	1576	136	444
DL9RDW	"	123,704	312	60	128
DL4OK	"	92,316	321	42	105
DFØSSB	**28**	**1,256,266**	**2463**	**39**	**148**
			(Opr. DF9ZP)		
DL6LAU	"	684,560	1539	37	135
DL1EK	"	173,972	549	28	94
DK8FD	**21**	**914,913**	**1998**	**39**	**138**
DL6FBL	**7**	**393,384**	**1501**	**32**	**116**

FINLAND

OH1MDR	**A**	**333,405**	**755**	**71**	**208**
OH1GI	"	273,745	601	64	201

FRANCE

FD1OZF	**A**	**643,983**	**830**	**101**	**190**
F1MAA	"	121,095	301	62	133

NORWAY

LA9VDA	**14**	**43,688**	**354**	**22**	**64**

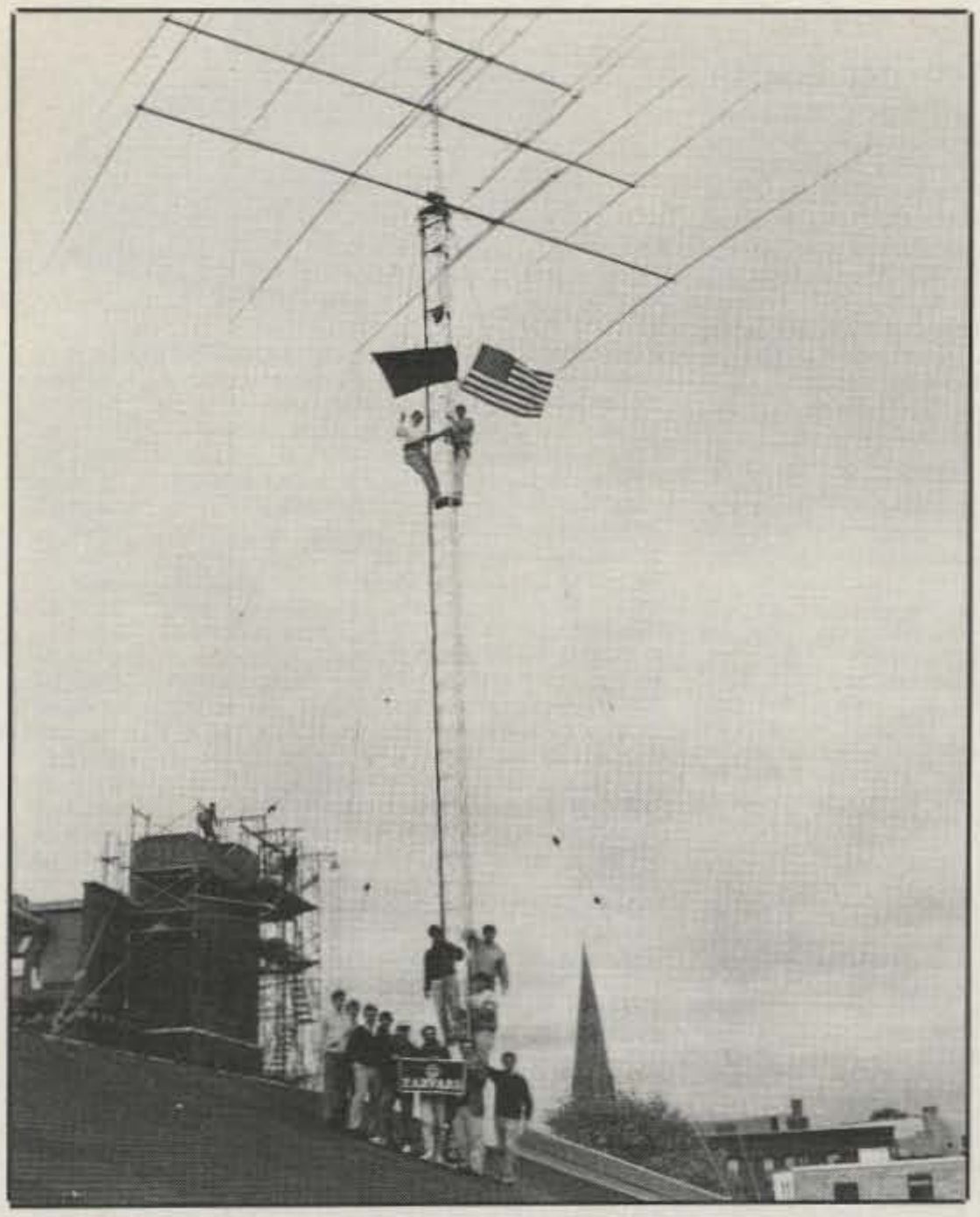
SWEDEN

SM3SGP	**A**	**1,152,112**	**1302**	**95**	**287**

QRP

WORLD

KR2Q	**A**	**1,248,207**	**1069**	**106**	**305**
4M1G	**"**	**1,144,827**	**1239**	**88**	**239**
K5RX	**"**	**1,103,513**	**888**	**120**	**323**
YU2TY	**"**	**739,112**	**819**	**95**	**275**
KN1M	**"**	**606,816**	**715**	**77**	**224**
WA2UUK	**"**	**584,684**	**672**	**86**	**227**
F1BEG	**"**	**556,920**	**786**	**83**	**257**
KD2TT	**"**	**531,286**	**673**	**72**	**202**
W5VGX	**"**	**498,980**	**607**	**94**	**211**
K2WK	**"**	**422,177**	**519**	**79**	**208**
HB9ADD	**"**	**410,992**	**630**	**82**	**190**
K5IID	"	365,312	509	78	178
K3WS	"	338,283	413	97	200
KZ5Q	"	317,604	422	72	194
AB4LX	"	242,088	337	79	185
OH5NHI	**"**	**229,918**	**498**	**62**	**177**
SMØDJZ	**"**	**224,840**	**499**	**60**	**160**
N1AFC	"	176,315	347	47	132
EA1GT	**"**	**171,600**	**492**	**57**	**143**
UV3DCR	**"**	**139,920**	**505**	**44**	**132**
W4DEC	"	138,073	296	46	123
LZ3RR	**"**	**134,734**	**324**	**63**	**139**
W6YVK/7	"	118,555	269	49	82
KR7L	"	107,970	308	42	80
W7PQE	"	90,909	283	35	76



Harvard, that center of knowledge, teaches cooperation between the USSR and the USA as a joint team made up of Soviet and US amateurs fired up W1AF.

JA2JSF's QRP effort gets some special help from Mt. Fuji in the background.

Guest operator SP5DDJ (right) found an interested new contester in Alex, 9V1XR.

IS0LYN	**	**90,270**	**243**	**52**	**110**
IK0CPS	**	**67,326**	**267**	**30**	**68**
XE2HWB	**	**66,660**	**260**	**40**	**70**
KC1BS	**	53,856	159	35	97
VK3RF	**	**51,620**	**169**	**51**	**65**
IK3NAA	**	50,048	279	27	65
YU1KN	**	46,860	211	42	100
UA9UDV	**	**45,540**	**232**	**35**	**76**
NM1K	**	43,665	130	42	81
UB3MP	**	**42,462**	**244**	**34**	**92**
W8QZA/6	**	38,413	126	40	67
UA1WFP	**	34,762	259	24	67
RB5QW	**	26,736	140	35	69
WD8QJC	**	24,817	124	28	55
RW3AH	**	21,614	83	45	56
VE7HR	**	**21,168**	**392**	**28**	**26**
SM0BYD	**	18,909	95	34	65
Y62JD	**	**18,768**	**152**	**23**	**46**
YU4XA	**	18,000	91	29	43
SP2GUC	**	**17,466**	**94**	**29**	**42**
Y23TL	**	9,660	139	14	56
Y22XC	**	8,250	134	9	46
G4SNR	**	4,995	49	21	24
Y22BT	**	4,430	99	20	23
WZ2T	**	1,280	50	16	16
PY2IAX	**	1,000	45	13	15
N6BFM/4	**28**	**327,928**	**633**	**34**	**145**
JR3RWB	**	**274,052**	**747**	**33**	**98**
FB0X	**	**201,240**	**661**	**33**	**96**
			(Opr. FB1MUX)		
K7GEX	**	**197,694**	**547**	**34**	**92**
N4KG	**	197,424	481	31	113
JA1TLK	**	181,104	564	32	80
EA3FQV	**	**168,302**	**731**	**25**	**78**
GJ3YHU	**	**163,511**	**522**	**28**	**85**
KD2UF	**	129,735	337	32	103
JF3LOP	**	119,600	377	33	82
UA9MJW	**	**105,472**	**158**	**8**	**32**
UA0FZ	**	**101,673**	**381**	**32**	**67**
RB5CC	**	**100,540**	**423**	**29**	**81**
UA3ADN	**	**77,062**	**378**	**28**	**78**
GM4ELV	**	**69,68**	**332**	**24**	**67**
UA3MHJ	**	66,834	506	24	55
SP5FKW	**	**56,515**	**294**	**22**	**67**
RA3DX	**	52,170	224	23	65
G4MET	**	**50,745**	**271**	**24**	**61**
ED1EPB	**	**44,822**	**269**	**20**	**53**
UV3DPP	**	34,160	300	21	41
EA3FHT	**	32,214	200	21	38
RB5QPS	**	27,792	250	20	52
UB5VDA	**	23,777	195	22	52
UM8MAA	**	**22,480**	**107**	**23**	**57**
LU2DW	**	**21,978**	**125**	**22**	**44**
UV3DMZ	**	21,828	182	20	45
NL7PJ	**	**13,497**	**155**	**13**	**20**
K9PNG	**	12,768	81	18	39
I3MDU	**	12,599	112	12	31
PY2ORF	**	**10,800**	**113**	**11**	**13**
UP2BSD	**	10,721	67	19	52
RA6ASB	**	8,836	80	17	45
YO3AIS	**	**7,254**	**83**	**15**	**44**
VE7EKS	**	7,101	111	11	16
UB5FBG	**	4,788	86	10	18
UB5ZME	**	4,284	62	9	19
WA7NWL	**	1,495	23	10	13
PA3FDW	**	1,488	124	12	16
RA3LDF	**	1,300	134	10	15
KE0KB	**21**	**62,608**	**212**	**29**	**75**
EA3DXD	**	**58,712**	**324**	**19**	**63**
UB4IM	**	**52,432**	**229**	**30**	**83**
SP2UUU	**	**40,896**	**264**	**20**	**52**
SM5CCT	**	**40,887**	**300**	**18**	**59**
W6CN	**	**39,442**	**171**	**27**	**55**
YT1T	**	**37,620**	**346**	**14**	**52**
KB5CTQ	**	15,687	98	20	43
LY3PBG	**	**14,076**	**147**	**16**	**35**
DU1CHD /6	**	**13,509**	**87**	**22**	**35**
UA9MT	**	**5,890**	**74**	**13**	**25**
KA1UJ	**14**	**66,761**	**235**	**23**	**78**
VE6SH	**	**53,037**	**268**	**23**	**60**
RV3DS	**	**23,364**	**214**	**17**	**49**
SP5CJQ	**	**20,631**	**205**	**16**	**53**
I0KHP	**	**20,085**	**187**	**14**	**51**
KA1CZF	**	13,572	84	17	41
DK7IH	**	**13,166**	**85**	**15**	**43**
JA2JSF	**	**12,155**	**82**	**21**	**34**
EA2BTO	**	**8,235**	**102**	**10**	**35**
YO5CUQ	**	6,095	77	10	32
SP9JCN	**	3,344	83	7	31
ZP5HHS	**	1,824	42	10	14
UA4LC	**7**	**76,131**	**395**	**29**	**79**
YO5OBA	**	**8,250**	**138**	**11**	**39**
JG7LBN	**	12	2	2	2
SP4GFG	**3.7**	**5,217**	**131**	**13**	**25**
JI7GBI	**	230	12	5	5
YU4AU	**1.8**	**4,847**	**129**	**5**	**32**
UM8MDX	**	**1,449**	**25**	**7**	**16**
KI0G	**	1,008	17	6	6
UV6LRW	**	285	11	5	10

CHECK LOGS

Our thanks to the following stations who sent in checklogs: 9Q5TE, AI6Z, CE1YI, CE3ZI, CS0CDP, CT1BY, CT1DJE, CX2PI, DJ0MBF, DJ3VC, DL2SDQ, EA1CYL, EA1DVY, EA2BOT, EA2BXJ, EA3CVI, EA3DKF, EA3FIM, EA3FYD, EA3GCV, EA5BZS, EA5EGT, EA5SS, EA5UB, EA7/EA5EGD, EA7DLC, EA7DLD, EA7DUD, EA7FZR, EA7TK, EA8YG, EC1CZU, EC5CON, ED5CGU, ED5CXL, ES1RRM, ES2RMP, ES6EA, ES6W/YU5AU, F11COA, F6GQS, G/0Z7SM, G3OBB, GM0AVR, HL9TY, IT9ZGY, JA9BOH, JF1SQC, JT1-184, JY9SR, K1ER/0, K6FM, K6FM, K9PNG, KA0KHE, KG7AY, KJ4EK, KT2D/0, LA0BX, LA1FW, LA1HCA, LA2DDA, LA2IZ, LA2OG, LA2OH, LA2PC, LA3JT, LA3WBA, LA4BQ, LA4OGA, LA4RQ, LA5OGA, LA5RBA, LA6PBA, LA8LA, LA8XM, LA9FFA, LA9HF, LA9NM, LA9OI, LY1BYK, LY2BAG, LY2BPO, LZ1KBG, LZ1KVZ, LZ10Q, LZ3BS, N0GOS, N4XPE, N5OIL, N8LBI, OE6IMD, OH0MLG, OH0NJ, OH1PY, OH2/ES2RR, OH2AA, OH2BNP, OH2DW, OH2FQ, OH2KU, OH2NBC, OH2VO, OH3BI, OH3HF, OH3HS, OH3TT, OH3WR, OH2AD/5, OH5FA, OH5MMG, OH5PT, OH5WL, OH7AA, OH7TO, OK1ALW, OK1TW, OK2PLH, OK2SG, OM2BJR, OM6AD, ON5FV, OZ1BUR, OZ1LEE, OZ2TH, OZ6IC, OZ7BW, OZ7FI, OZ7JU, OZ9RU, PA0CYW, PA0RWS, PA0ZGD, PA2NJN, PA2SWL, PA3CWR, PT2NP, PY3BD, PY4KB, RA1AI, RA1WO, RA3AGN, RA3ALA, RA3DDU, RA3DJA, RA3DPD, RA3DSK, RA3GJ, RA3NC, RA3OOC, RA3ZM, RA4PIO, RA4PKA, RA4PKI, RA4PKL, RA4YM, RA6LA, RA9JB, RB5CL, RB5DX, RB5HY, RB5LJX, RB5UU, RL7AC, RV6AF, RV6LD, RW3DM, RZ4PWO, RZ9UWH, SK0LM, SL5ZYB, SM0CSX, SM0MC, SM4POD, SM4SET, SM5CVC, SM5DAC, SM5EMR, SM5GA, SM5SVL, SM5UF, SM6BSK, SM6BWQ, SM6NJK, SM7CNA, SM7EJ, SP2AHD/A, SP2DWA, SP2ERZ, SP3BVI, SP3CDQ, SP3KCK, SP3RAV, SP4AS, SP4GDC, SP4PIN, SP5ENA, SP5ILO, SP5NOG, SP5UAF, SP6CZ, SP6FIB, SP6HTQ, SP6TGD, SP7-1240-LD, SP9AHB, SP9DFH, SP9JMA, SP9PRO, UA0BBS, UA0QBQ, UA0QCA, UA0ZDD, UA2FEA, UA2FGG, UA3AHA, UA3MFY, UA3PB, UA3QLJ, UA3QOQ, UA3SBJ, UA3XBB, UA4ATB, UA4CDL, UA4HRZ, UA4PKN, UA4UDC, UA4ZA, UA6HON, UA6LBP, UA6LQZ, UA6WCQ, UA9AKW, UA9JFR, UA9LAC, UA9LFI, UA9OS, UB4CO, UB4LWC, UB4LXD, UB4MXE, UB4QZZ, UB5ECE, UB5IID, UB5IPN, UB5LOQ, UB5QFJ, UB5QJA, UB5VAP, UB5XAN, UC1AWZ, UC2AJW, UC2CEI, UC2LB, UL7FCW, UL7JHP, UL8BWO, UO5ODC, UQ2GRX/A, UT4UH, UV3DRU, UV3DTJ, UV3NB, UV6HFG, UV6HP, UV9FG, UW0CF, UW3RR, UW6HDP, UW9CL, UW9UD, UW9UE, UW9YM, UZ1AWT, UZ10WZ, UZ3MWD, UZ3QZR, UZ3RZZ, UZ3SWX, UZ4AXN, UZ4FWJ, UZ4HWS, UZ4YWY, UZ6HWE, UZ6HXK, UZ6LWW, UZ9FZO, UZ9FZO, UZ9LWE, UZ9SWR, UZ9YWA, VE1RJ, VE2LJ, VE3WAJ, VE3XO, VE4AAU, VK5AKY, VP8ON, W5CWQ, W6BMP, W7EYR, W7WHY, WB4HJH, WB4RUA, WL7AFD, Y22XF/P, Y23AC, Y25SA, Y26XF, Y28WG, Y35WF, Y53YN, Y54TO, Y54WM, Y66YF, Y67OG, Y75YL, YO2QY, YO6ADM, YO7LCD, YO8AII, YO8ROO, YU3XU, YZ90S, Z21BL, ZP5XHM.

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20 Channel • 5 Watt • Handheld Transceiver
Frequency range: 148-174 MHz. continuous coverage. Will also work 134-148 MHz. with reduced performance.
The *RELM* RSP500B-A is our most popular programmable 5 watt, 20 channel handheld transceiver. You can scan 20 channels at up to 40 channels per second. It includes CTCSS tone and digital coded squelch. Snap on batteries give you plenty of power. Additional features such as time-out timer, busy-channel lockout, cloning, plug-in programming and IBM PC compatability are standard. It is F.C.C. type accepted for data transmission and D.O.C. approved. We recommend also ordering the **BC45** rapid charge 1½ hour desk battery charger for $99.95, a deluxe leather case **LC45** for $48.95 and an external speaker microphone with clip **SM45** for $59.95. Since this radio is programmed with an external programmer, be sure to also order one **PM45** at $74.95 for your radio system.

NEW! RELM® UC102/UC202

List price $128.33/**CE price $79.95/SPECIAL**
CEI understands that all agencies want excellent communications capability, but most departments are strapped for funds. To help, CEI now offers a special package deal on the RELM UC102 one watt transceiver. You get a UC102 handheld transceiver on 154.5700 MHz., flexible antenna, battery charger and battery pack for only $79.95. If you want even more power, order the RELM **UC202** two watt transceiver for $114.95.

NEW! RELM® RH256NB-A

List price $449.95/**CE price $299.95/SPECIAL**
16 Channel • 25 Watt Transceiver • Priority Time-out timer • Off Hook Priority Channel
The *RELM* RH256NB is the updated version of the popular RELM RH256B sixteen-channel VHF land mobile transceiver. The radio technician maintaining your radio system can store up to 16 frequencies without an external programming tool. All radios come with CTCSS tone and scanning capabilities. This transceiver even has a priority function. Be sure to order one set of programming instructions, part # **PI256N** for $10.00 and a service manual, part # **SMRH256N** for $24.95 for the RH256NB. A 60 Watt VHF 150-162 MHz. version called the **RH606B** is available for $429.95. A UHF 15 watt, 16 channel similar version of this radio called the **LMU15B-A** is also available and covers 450-482 MHz. for only $339.95. An external programming unit **SPM2** for $49.95 is needed for programming the LMU15B UHF transceiver.

NEW! RELM® LMV2548B-A

List price $423.33/**CE price $289.95/SPECIAL**
48 Channel • 25 Watt Transceiver • Priority
RELM's new LMV2548B gives you up to 48 channels which can be organized into 4 separate scan areas for convenient grouping of channels and improved communications efficiency. With an external programmer, your radio technician can reprogram this radio in minutes with the **PM100A** programmer for $99.95 without even opening the transceiver. A similar 16 channel, 60 watt unit called the **RMV60B** is available for $489.95. A low band version called the **RML60A** for 30-43.000 MHz. or the **RML60B** for 37-50.000 MHz. is also available for $489.95.

RELM® Programming Tools

If you are the dealer or radio technician maintaining your own radio system, you **must** order a programming tool to activate various transceivers. The **PCKIT010** for $149.95 is designed to program almost all RELM radios by interconnecting between a MS/DOS PC and the radio. The **PM100A** for $99.95 is designed to externally program the RMV60B, RML60A, RML60B and LMV2548 radios. The **SPM2** for $49.95 is for the LMV25B and LMU15B transceivers. The **RMP1** for $49.95 is for the RMU45B transceiver. *Programmers must be used with caution and only by qualified personnel because incorrect programming can cause severe interference and disruption to operating communications systems.*

★★★ *Uniden CB Radios* ★★★

The *Uniden* line of Citizens Band Radio transceivers is designed to give you emergency communications at a reasonable price. Uniden CB radios are so reliable they have a two year limited warranty.

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WASHINGTON-A *Uniden* 40 ch. SSB CB base... $209.95
PC122-A3 *Uniden* 40 channel SSB CB mobile ... $113.95
PC66A-A *Uniden* 40 channel CB Mobile $78.95
PRO510XL-A3 *Uniden* 40 channel CB Mobile $34.95
PRO520XL-A3 *Uniden* 40 channel CB Mobile $49.95
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RD9XL-A3 *Uniden* "micro" size radar detector ... $107.95
RD25-A *Uniden* visor mount radar detector..... $54.95

Bearcat® 200XLT-A

List price $509.95/**CE price $239.95/SPECIAL**
12-Band, 200 Channel • 800 MHz. Handheld Search • Limit • Hold • Priority • Lockout
Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The *Bearcat* 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 10 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the **BC 100XLT-A3** for only $179.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

Bearcat® 800XLT-A

List price $549.95/**CE price $239.95/SPECIAL**
12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz.
Now...nothing excluded in the 806-912 MHz band.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-A** is available for $178.95.

NEW! Uniden® MR8100-A

Call 313-996-8888 for special CEI pricing
12-Band, 100 Channel • Surveillance scanner
Bands: 29-54, 116-174, 406-512, 806-956 MHz.
The *Uniden* MR8100 surveillance scanner is different from all other scanners. Originally designed for intelligence agencies, fire departments and public safety use, this scanner offers a breakthrough of new and enhanced features. Scan speed is almost 100 channels per second. You get four digit readout past the decimal point. Complete coverage of 800 MHz. band when programmed with a personal computer. Alphanumeric designation of channels, separate speaker, backlit LCD display and more. To activate the many unique features of the Uniden MR8100 a computer interface program is available for $19.95. Due to manufacturers' territorial restrictions, the MR8100 is not available for *direct* shipment from CEI to CA, OR, WA, NV, ID or UT.

NEW! Ranger® RCI2950-A3

List price $549.95/**CE price $259.95/SPECIAL**
10 Meter Mobile Transceiver • Digital VFO Full Band Coverage • All-Mode Operation Backlit liquid crystal display • Repeater Splits RIT • 10 Programmable Memory Positions
Frequency Coverage: 28.0000 MHz. to 29.6999 MHz.
The *Ranger* RCI2950 Mobile 10 Meter Transceiver has everything you need for amateur radio communications. The RF power control feature in the RCI2950 allows you to adjust the RF output power continuously from 1 watt through a full 25 watts output on USB, LSB and CW modes. You get a noise blanker, roger beep, PA mode, mike gain, digital VFO, built-in S/RF/MOD/SWR meter. Frequency selections may be made from a switch on the microphone or the front panel. The RCI2950 gives you AM, FM, USB, LSB or CW operation. For technical info, call Ranger at 619-259-0287.

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BC147XLT-A *Bearcat* 16 ch. 10 band scanner $94.95
BC172XL-A *Bearcat* 20 ch. 11 band scanner..... $134.95
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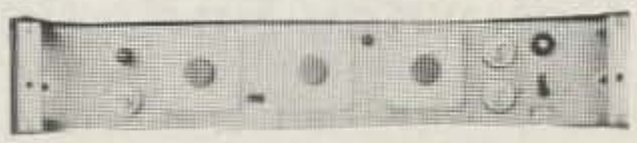

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- SWITCHABLE X1, X10; RUGGED PROBE
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Includes sprung hook, 6" ground lead, BNC adaptor, IC test tip, trimmer tool, and storage pouch.

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- FREQUENCY: 100 kHz TO 110 MHz
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Additional features include a large, easy to read meter. Input impedance of 10 MΩ. Also includes dB scales. Another feature of this unit is its' ability to be used as a high-gain amplifier. Supplies are limited to quantities on hand, so call now!

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All owners of TEK 560, 561, 564 & 565 Oscilloscopes - Here is the deal of a lifetime!

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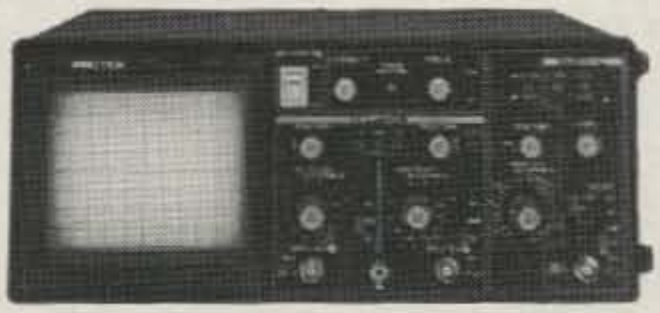

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CIRCLE 67 ON READER SERVICE CARD

Announcing:

The 1991 CQ World-Wide DX Contest

Phone: October 26–27 & C.W.: November 23–24
Starts 0000 GMT Saturday Ends 2400 GMT Sunday

I. OBJECTIVE: For amateurs around the world to contact other amateurs in as many zones and countries as possible.

II. BANDS: All bands, 1.8 through 28 MHz, except for WARC bands.

III. TYPE OF COMPETITION:

1. **Single Operator** (single band and all band).

a. Single Operator. Single operator stations are those at which one person performs all of the operating, logging, and spotting functions. **Only one signal is allowed at any one time.** The use of DX spotting nets or any other form of DX alerting assistance places the station in the Single Operated Assisted category.

b. **Low Power.** Same as 1(a) except that the output power shall not exceed 100 watts.

c. QRPp. Power must not exceed 5 watts output. Stations in this category will be competing only with other QRPp stations for awards.

d. Single Operator Assisted. Single operator stations are those at which one person performs all of the operating and logging functions. The use of DX spotting nets or any other form of DX alerting assistance *is* allowed. The operator can change bands at any time.

2. **Multi-Operator** (all band operation only).

a. Single Transmitter, only one transmitter and one band permitted during the same time period (defined as 10 minutes). *Exception: One—and only one—other band may be used during the same time period if—and only if—the station worked is a new multiplier. Logs found in violation of the ten-minute rule will be automatically reclassified as multi-multi to reflect their actual status.*

b. Multi-Transmitter (no limit to transmitters **but only one signal and running station allowed per band).**

c. *All transmitters must be located within a 500 meter diameter or within the property limits of the station licensee's address, whichever is greater. All antennas must be physically connected by wires to the transmitters and receivers.*

3. **Team Contesting.** A team consists of any five radio amateurs operating in the single operator category. A person can be on only one team per mode. Competing on a team will not prevent any team member from submitting his personal score for a radio club. A team score will be the sum of all the team member scores. SSB and CW teams are totally separate. That is, a member of an SSB team can be on a totally different CW team. A list of a team's members must be received at *CQ* Headquarters by the time the contest begins. Mail or FAX the list to *CQ*, Att: Team Contest, 76 North Broadway, Hicksville, NY 11801 U.S.A.; FAX 516-681-2926. Awards will be given to the top teams on each mode.

IV. NUMBER EXCHANGE: Phone: RS report plus zone (i.e., 5705). C.W.: RST report plus zone (i.e., 57905).

A station in a zone or country different than that indicated by its call sign is required to sign portable.

V. MULTIPLIER: Two types of multiplier will be used.

1. A multiplier of one (1) for each different zone contacted on each band.

2. A multiplier of one (1) for each different country contacted on each band.

Stations are permitted to contact their own country and zone for multiplier credit. The *CQ* Zone Map, DXCC country list, WAE country list, and WAC boundaries are standards.

VI. POINTS: 1. Contacts between stations on different continents are worth three (3) points.

2. Contacts between stations on the same continent but different countries, one (1) point. *Exception:* For North American stations *only*, contacts between stations within the North American boundaries count two (2) points.

3. Contacts between stations in the same country are permitted for zone or country multiplier credit but have zero (0) point value.

VII. SCORING: All stations: the final score is the result of the total QSO points multiplied by the sum of your zone and country multiplier.

Example: 1000 QSO points × 100 multiplier (30 Zones + 70 Countries) = 100,000 (final score).

VIII. AWARDS: First place certificates will be awarded in each category listed under Sec. III in every participating country and in each call area of the United States, Canada, European Russia, Asiatic USSR, Czechoslovakia, and Japan.

All scores will be published. To be eligible for an award, a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must operate a minimum of 24 hours. A single-band log is eligible for a single-band award *only*. If a log contains more than one band it will be judged as an all-band entry, unless specified otherwise.

In countries or sections where the returns justify, 2nd and 3rd place awards will be made.

All certificates and plaques will be issued to the licensee of the station used.

IX. TROPHIES & PLAQUES (Donors)

PHONE

Single Operator, All Band

World—Dave Rosen, K2GM—WA2RAU Memorial
World—Single Operator Assisted—Richard Newell, AK1A
World—QRPp—CQ Magazine
U.S.A.—Potomac Valley R.C.—KC8C Memorial
Carib./C.A.—Alex M. Kasevich, VP2MM
Europe—Potomac Valley R.C.—W4BVV Memorial
Africa—Gordon Marshall, W6RR
Asia—Japan CQ Publishing Company Ltd.
Japan—Japan Crazy Contesters Club
Oceania—Northern California DX Club
South America—David Novoa, KP4AM/W4

Single Operator, Single Band

World—28 MHz—Joel Chalmers, KG6DX
World—21 MHz—CQ Magazine
World—14 MHz—North Jersey DX Assn.—K2HLB Memorial
World—7 MHz—Fred Laun, K3ZO—K7ZZ Memorial
World—3.8 MHz—Fred Capossela, K6SSS
World—1.8 MHz—W1WY Memorial—14270 Gang
U.S.A.—28 MHz —Donald Thomas, N6DT
U.S.A.—21 MHz—Bill Gioia, K2EK
U.S.A.—14 MHz—Southern California DX Club
U.S.A.—7 MHz—Stanley Cohen, WD8QDQ
U.S.A.—3.8 MHz—Arnold Tamchin, W2HCW
Carib./C.A.—Pedro Piza, Jr., NP4A—KP4ES Memorial
Europe—28 MHz—Chod Harris, VP2ML

New Analog Breakthrough!

A Voice Recorder in a *Single Chip!*

*The ISD Single Chip Voice Recorder– includes everything you need to record and playback a voice message. It needs only +5V DC to use!**

The ISD Single Chip Voice Recorder utilizes new analog recording and playback technology that:

- stores up to 20 seconds of natural, human voice
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- needs no crystal reference oscillator
- eliminates need for additional ICs

These are just a few of the unlimited applications:

CONTEST ANNUNCIATOR

Create your own **contest annunciator/DXer** voice messages. Now all the elements of voice storage and playback reside on a single chip. Simply connect the chip output to your transceiver's microphone input and you are ready to go.

"RADIO NOTEPAD"

Record a transmission on your **"analog voice storage (AVS) unit."** With a flip of a switch, record and playback rare DX and other contacts. Replay transmissions that are QRM'ed until the message is understood.

VOICE MESSAGES

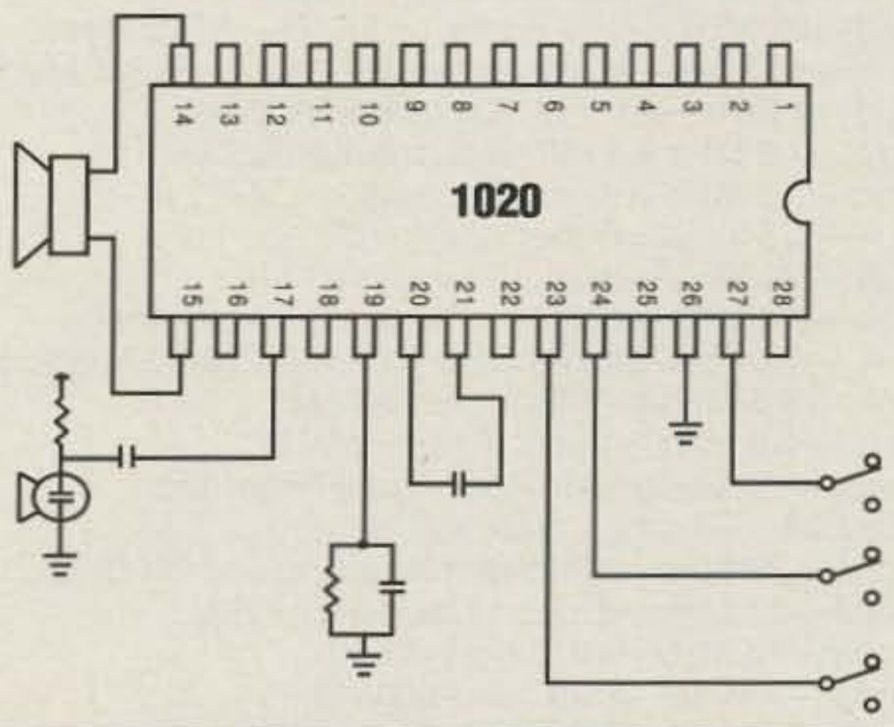
Hook up a microphone to the chip and **record your own voice messages for repeater identification and annunciation.** The chip is non-volatile. Zero current required to maintain message–ideal for portable applications.

"Non-volatile analog storage semiconductor technology is the most significant breakthrough to occur in the industry in ten years"

David Aigel

President, ISD
WA6TJM

Shown is the ISD 1020 chip and typical external circuit to allow single chip analog recording and playback.



*ISD chips eliminate cumbersome and expensive analog-to-digital and digital-to-analog conversion steps by offering direct analog input, analog storage and analog output. A single-chip solution in a 28-pin DIP package. A system can be built with one chip, a microphone, a speaker, a few standard off-the-shelf components and +5 volt DC power source.

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CIRCLE 129 ON READER SERVICE CARD

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Europe—7 MHz—Roger Burt, N4ZC
Japan—28 MHz—Take Yokoyama, JL1BLW
Japan—21 MHz—DX Family Foundation

Multi-Operator, Single Transmitter
World—So. Calif. DX Club—W6AM Memorial
U.S.A.—Carolina DX Association
Europe—Bob Cox, K3EST
Carib./C.A.—K3NA and KN3T

Multi-Operator, Multi-Transmitter
World—W6QHS and KK6QM
U.S.A.—K4VX/Ø Operators
Europe—Finnish Amateur Radio League
Japan—Nippon Television Network Corp.

Contest Expeditions
World—Single Opr.—Stuart Meyer, W2GHK
World—Multi-Opr.—The German CDXG & SDXG (DJ3NG & DJ4EI Memorial)

CW

Single Operator, All Band
World—Albert Kahn, K4FW—W9IOP Memorial
World—Single Operator Assisted—Richard Newell, AK1A
World—QRPp—Gene Walsh, N2AA
U.S.A.—Frankford Radio Club
Canada—Canadian DX Association
Carib./C.A.—Larry Brockman, N6AR
Europe—Edward Bissell, W3AU
Africa—Gordon Marshall, W6RR
Asia—Japan CQ Publishing Company Ltd.
Japan—Japan Crazy Contesters Club
Oceania—Maui Amateur Radio Club
So. Amer.—Venezuela DX Club

Single Operator, Single Band
World—28 MHz—Joel Chalmers, KG6DX
World—21 MHz—Don Busick, K5AAD—N5JJ Memorial
World—14 MHz—North Jersey DX Assn.—W2JT Memorial
World—7 MHz—Alex M. Kasevich, VP2MM
World—3.5 MHz—Fred Capossela, K6SSS
World—1.8 MHz—Kenneth Byers, Jr., K4TEA
U.S.A.—28 MHz—Robert Clark, K6JYO
U.S.A.—21 MHz—Wayne Carroll, W4MPY
U.S.A.—14 MHz—Northern Illinois DX Association
U.S.A.—7 MHz—Jan Perkins, N6AW—W6AM Memorial
U.S.A.—3.5 MHz—N7BG and AA7FM
U.S.A.—1.8 MHz—Peter Hutter, WW2Y
Canada—Canadian Amateur Radio Federation
Carib./C.A.—Thomas Wall, K2TW
Europe—28 MHz—Southern New England DX Club
Europe—21 MHz—Robert Naumann, KR2J
Europe—14 MHz—Al Slater, G3FXB
Europe—7 MHz—K1CC and W1WEF
Japan—21 MHz—DX Family Foundation

Multi-Operator, Single Transmitter
World—Anthony Susen, W3AOH
U.S.A.—Douglas Zwiebel, KR2Q
Canada—Eastern Canadian DX Assn.
Carib./C.A.—Ralph Bellas, Jr., K9ZO
Europe—Friends of K3AO—K3AO Memorial

Multi-Operator, Multi-Transmitter
World—Hazard Reeves, K2GL Memorial
World—SSB/CW Combined—Ehrhorn Technological Operations
U.S.A.—Jim Rafferty, N6RJ
Europe—Finnish Amateur Radio League
Japan—Nippon Television Network Corp.

Contest Expeditions
World—Single-Opr.—Yankee Clipper Contest Club
World—Multi-Opr.—Bill Schneider, K2TT

Special—Single Operator Awards
World—All Band—CW—Most QSOs—KV4AA Memorial (From the 14270 kHz Group)

Club
World—SSB/CW —CQ Magazine
Non-USA—SSB/CW—No. Calif. Contest Club—N6AUV Memorial

A station winning a World Trophy will not be considered for a sub-area award. That Trophy will be awarded to the runner-up of that area.

X. CLUB COMPETITION:

1. The club must be a local group and not a national organization.

2. Participation is limited to members operating within a local geographic area defined as within a 275 km radius from center of club area (except for DXpeditions especially organized for operation in the contest; club contributions of DXpedition scores are percentaged to the number of club members on the DXpedition).

3. To be listed, a minimum of 3 logs must be received from a club and an officer of the club must submit a list of participating members and their scores, both on phone and c.w.

XI. LOG INSTRUCTIONS:

1. All times must be in GMT.

2. All sent and received exchanges are to be logged.

3. Indicate zone and country multiplier only the FIRST TIME it is worked on each band.

4. Logs must be checked for duplicate contacts, correct QSO points and multipliers. Submitted logs must have duplicate contacts clearly shown.

5. IBM-compatible disks (MS-DOS compatible, ASCII file, or K1EA CT.Bin file) are encouraged. Disks **must** be accompanied by a paper log.

6. Use a separate sheet for each band.

7. Each entry must be accompanied by a summary sheet showing all scoring information, category of competition, contestant's name and address in BLOCK LETTERS, and a signed declaration that all contest rules and regulations for amateur radio in the country of operation have been observed.

8. Sample log and summary sheets and zone maps are available from *CQ*. A *large* self-addressed envelope with sufficient postage or IRC's must accompany your request.

If official forms are not available, make up your own 80 contacts to the page on 8½″ × 11″ paper.

9. All entrants are required to submit cross-check sheets for each band on which 200 or more QSOs were made. All other entrants are encouraged to submit cross-check sheets.

10. Duplicate contacts and broken calls penalty: up to 1%—three (3) additional contacts removed; 1% to 3%—ten (10) additional contacts removed; over 3% is grounds for possible disqualification. **Exception: If your paper log is accompanied by a disk (MS-DOS compatible; an ASCII file; or K1EA CT.Bin file), the penalty will be reduced to 2 and 5, respectively.**

11. QRPp and low power stations must indicate same on their summary sheets and state the actual maximum power output used, with a signed declaration.

XII. DISQUALIFICATION: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest; unsportsmanlike conduct; taking credit for excessive duplicate contacts; unverifiable QSOs; or unverifiable multipliers will be deemed sufficient cause for disqualification. (Incorrectly logged calls will be counted as unverifiable contacts.)

An entrant whose log is deemed by the Committee to contain a large number of discrepancies may be disqualified from eligibility for an award, both as a participant operator or station, for one year. If an operator is disqualified a second time within 5 years, he will be ineligible for any *CQ* contest awards for 3 years.

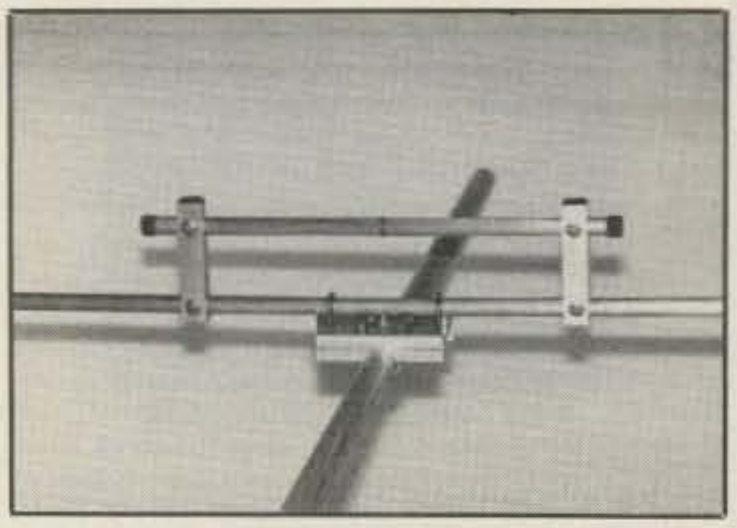
The use of nonamateur means such as telephones, telegrams, etc., to elicit contacts or multipliers **during** a contest is unsportsmanlike and the entry is subject to disqualification.

Actions and decisions of the *CQ* Contest Committee are official and final.

XIII. DEADLINE: All entries must be postmarked NO LATER than December 1, 1991 for the Phone section and January 15, 1992 for the CW section. An extension may be given if requested. Indicate phone or CW on the envelope.

Both phone and CW logs should be sent to *CQ* Magazine, 76 North Broadway, Hicksville, NY 11801.

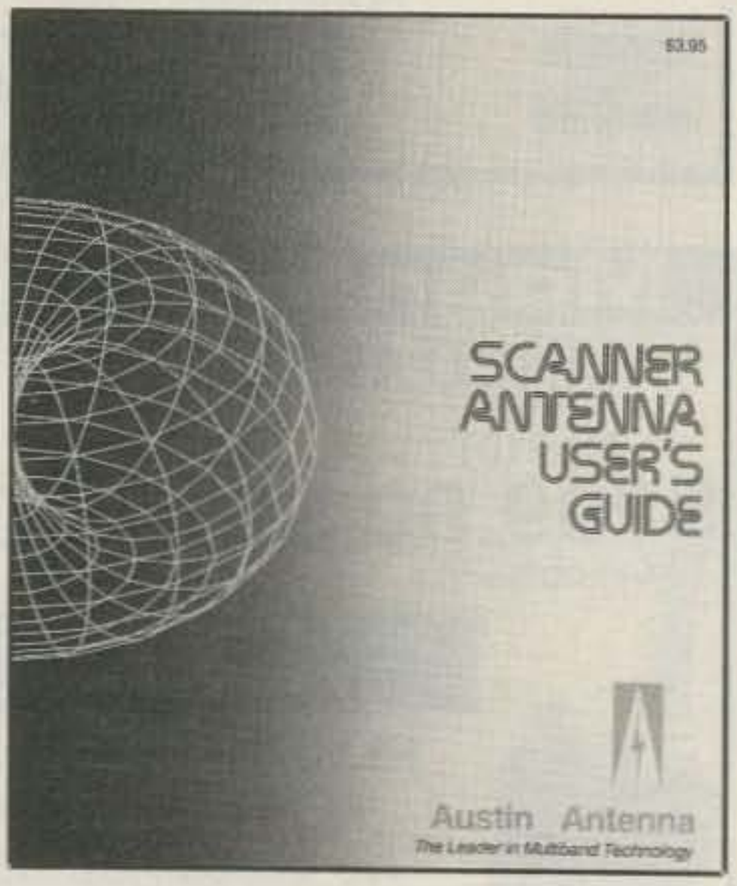
CQ SHOWCASE



Ham-Pro Feed System

Ham-Pro's new feed system supplies both sides of a grounded driven element through a rectangular loop at its mechanical and electrical center with equal power, regardless of frequency. The resulting VSWR bandwidth is about three times that of a conventional fed dipole. The grounded driven element or dipole only responds to the induced RF dipole currents, resulting in extremely quiet reception, maker says. According to Ham-Pro, RFI and TVI are greatly reduced, and harmonic response is reduced by more than 30 dB.

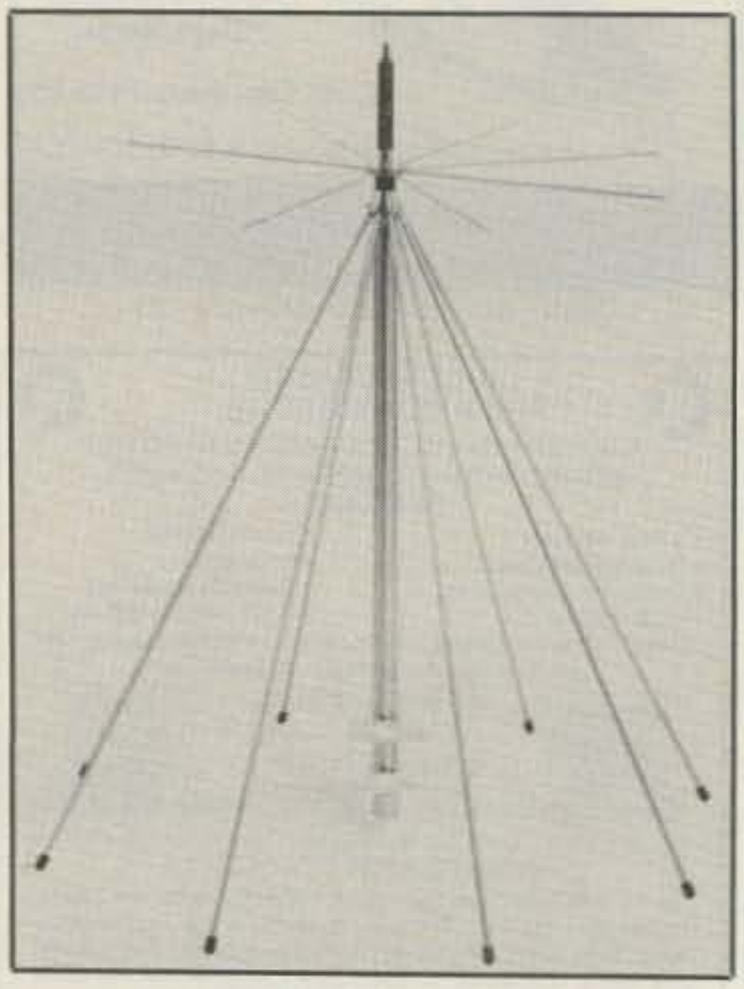
The firm's current line includes monobanders for 20, 15, 10, and 6 meters, plus the 144, 220, and 432 MHz VHF bands. For more information, contact Ham-Pro Antennas, div. of Kopps Corp., 6199-C Warehouse Way, Sacramento, CA 95826 (1-800-879-7569), or circle number 105 on the reader service card.



Austin Antenna Scanner Antenna Guide

The "Scanner Antenna User's Guide," available from Austin Antenna, gives the broadband receiver and scanner user valuable information about what to look for and know about antennas for these devices. Included is material on resonance, electromagnetic field, impedance, and gain, with separate sections devoted to scanner/receiver antennas and multiband antennas. Austin's own line of antennas is also covered.

The nine-page booklet is available for $1.00 from Austin Antenna, 10 Main St., Gonic, NH 03839 (603-335-6339).



ACE Wide-Band Transmit And Receive Antenna

ACE Communications has introduced a new wide-band transmit and receive antenna that covers 100 kHz to 1.3 GHz. The unit is 51 inches in height, and design is of the discone type, featuring 8 horizontal radials, 8 diagonal radials, and a single vertical top whip element. Transmit and receive characteristics are flat within 2 dB over the entire range of 25–1300 MHz. The input power rating is 200 watts and the impedance is 50 ohms. N-type and BNC connectors plus 50 feet of coax are supplied with the unit.

Suggested retail of the DA-301 is $99.50. For more information, contact ACE Communications, 10707 East 106th St., Indianapolis, IN 46256 (317-842-7115), or circle number 104 on the reader service card.

j•Com HamBase™ Database & Retrieval Software

The HamBase™ database and retrieval software from j•Com allows users of IBM-compatible and Macintosh computers to instantly retrieve the name, address, license class, and year of birth of any licensed US amateur by entering the callsign on their computer. With the click of a key or mouse, the name and address are instantly printed on labels or QSL cards in clear, readable type. If you have a hard disk drive, the files are easily installed and access to the data is virtually instantaneous. If you don't have a hard disk, HamBase™ can still be used.

The program is available for the PC on seventeen 5¼ inch 1.2M diskettes for $69.95, and fourteen 3½ 1.44M diskettes for $79.95, or on

twenty-five 800K Macintoch diskettes for $79.95. HamBase™ may be purchased from amateur radio dealers or directly from j•Com, P.O. Box 194, Ben Lomond, CA 95005 (408-335-9120), or for more information circle number 106 on the reader service card. (Purchasers of the 1991 version will receive a coupon worth $20 when purchasing the 1992 HamBase™ available in January 1992.)

Yaesu FT-5200 and FT-6200 Dual-Band Mobiles

The ultra-compact FT-5200 (144 and 440 MHz) and FT-6200 (440 MHz and 1.2 GHz) dual-band mobiles have a unique security feature in that the front control panel can easily be removed from the transceiver using a simple latch mechanism without tools and placed in a pocket when leaving the car. An optional separation kit (YSK-1L) allows the front control panel to be mounted anywhere in the car, such as on the dash, and the transceiver to be installed underneath a seat, in the glove compartment, or in the trunk. The units also include built-in antenna duplexer, full-frequency dual LCD, 8-level automatic display/key lighting dimmer, dual external speaker jacks (one for each band), and more. A selection of optional accessories is available.

The FT-5200's suggested retail price is $719.00. For more information, contact Yaesu USA, 17210 Edwards Road, Cerritos, CA 90701.

Muscle Products Corp. MO-10 Moist-Out

Muscle Products Corp. has announced the availability of its demoisturant and corrosion preventative MO-10 Moist-Out, which removes water from circuits and circuit boards while preventing corrosion, and is a light lubricant and penetrant with the ability to reject and repel dust. MO-10 also removes corrosion and corrosion bridges from PC boards after a light spray and brush application and prohibits further corrosion from taking place. Its dielectric strength is rated at 45 kv.

MO-10 is available in 16 oz. pump spray bottles ($6.39 suggested retail), 5 gallon pails, and 55 gallon drums. Muscle Products will also extend a 10% discount on all orders, for a limited time only, if the customer states they "Saw It in CQ" (plus shipping and handling). MO-10 is also safe for use on all insulation and PC board applications. For more information or orders, contact Muscle Products, 188 Freeport Road, Butler, PA 16001 (1-800-227-7049 [US] or 412-283-0567 and ask for George Fennell, N3EQE), or circle number 102 on the reader service card.

Some of us know about antennas. Some of us think we know about antennas. Most of us would like to learn more about antennas.

Let's Talk Antennas—Part I

BY LEW McCOY*, W1ICP

Probably nothing is more important to the successful operation of an amateur radio station than having the correct (and best possible) antenna. You can build or buy the most expensive receiving and transmitting equipment, but such equipment will be severely restricted without a good antenna system. On the other hand, a good-performing antenna system need not be expensive.

What you really need to know is how to tell a good system from a bad system, either before constructing a homebuilt one or buying a commercially built one. There are basic criteria governing all antennas. In this discussion let's start by going over some of these criteria.

Antenna Efficiency

Antenna efficiency is simply explained as getting the most radiation of your signal out of your antenna for what you put into it. I don't mean the power that comes out of your rig, but what actually goes into the antenna itself. This is best illustrated by an example that is shown with a common half-wavelength long dipole (fig. 1[B]). The impedance of a halfwave dipole in free space is approximately 70 ohms. Of this 70 ohms, usually 68 ohms is the radiation resistance, while 2 to 3 ohms are ohmic resistance. Let's assume we have 70 watts reaching the feedpoint of this dipole antenna. Of this 70 watts almost all of the power is radiated. We lose a small amount because of ohmic losses, but this is usually on the order of about 2 to 3 watts (the actual resistance of the wire and nearby objects) The rest of the power is radiated, meaning an antenna efficiency of over 90 percent.

Always keep one point about antennas in mind: The smaller an antenna is for a given frequency, the poorer the efficiency (and the lower the radiation resistance, which also means poorer efficiency). For example, an 80 meter mobile whip is a very inefficient antenna. Using our 70 watt example, only a very few watts will be radiated, and the majority of the power will be dissipated as heat in the ohmic losses, most likely in the frame and metal parts of the automobile. The amateurs who really do a good job on 80, if questioned closely, will admit to doing considerable grounding work on their vehicles.

Years ago I recall one amateur who reported into our Missouri phone net—and he always had one of the loudest signals. But the kicker is he was usually running mobile. He was always secretive about his methods, but through the use of some good old mountain "moon," a bunch of us got him thoroughly relaxed at an Ozark Mountain hamfest. He told us that he had carefully welded metal straps, grounding all parts of the frame together, connecting to the motor block, etc. He did this to reduce the ratio of ground losses to radiation efficiency. His signal more than proved to me that he knew what he was doing.

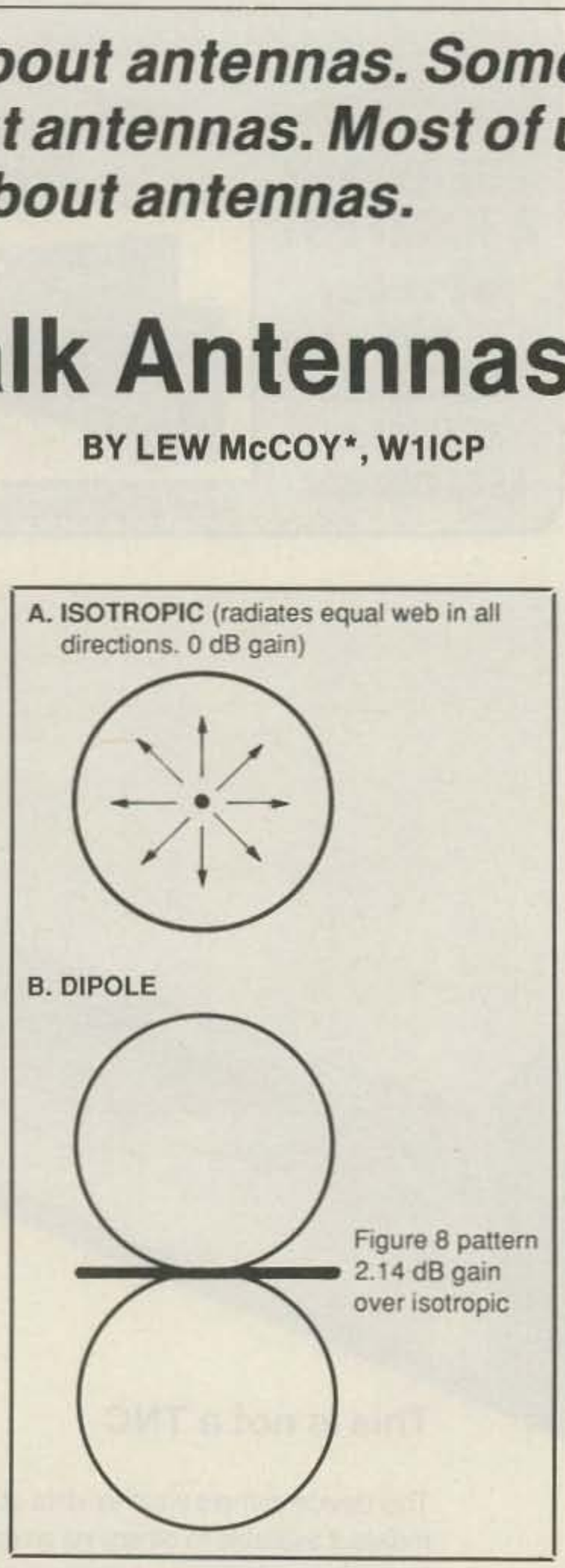


Fig. 1–(A) An isotropic radiator. Visualize it as a ball with radiation emanating equally in all directions. (B) represents a half-wavelength dipole antenna.

Gain

One of the criteria for measuring the worth of an antenna is the amount of gain the antenna will produce. Let me make one point clear. When we speak of antenna gain, we are not saying that the antenna will act as an amplifier. Simply, it is possible to shape the radiated signal so that more power is aimed or directed more in certain directions than in others. The terms that apply to directional antennas are forward gain, front-to-side rejection, and front-to-back rejection.

All antenna gain figures (or losses) are rated by decibels, or dB. Without going into a long discussion about decibels, it is simpler to keep a few facts about them in mind. A power increase of 3 dB means a power increase by a factor of two. In other words, if your signal increases by three decibels, it is twice as powerful. With 10 dB, an easy to remember number, the power factor is 10 times. If you had a beam antenna that had 10 dB gain in a given direction, it would be equivalent to increasing your power 10 times in that direction. The importance of gain figures when considering the building or purchase of an antenna can quickly be seen. Fig. 2 illustrates this beam pattern.

Every antenna will have certain patterns of radiation, putting more signal in some directions rather than others. By using certain types of antennas, it is possible to form these patterns, aiming more radio energy in some directions than in others. In order to measure gain, we need to set down a standard, meaning what is important to you, the reader, in being able to interpret the references used by the manufacturers of antennas.

Normally, there are two reference antennas used. One is an imaginary (that's correct; it isn't a real antenna, but is

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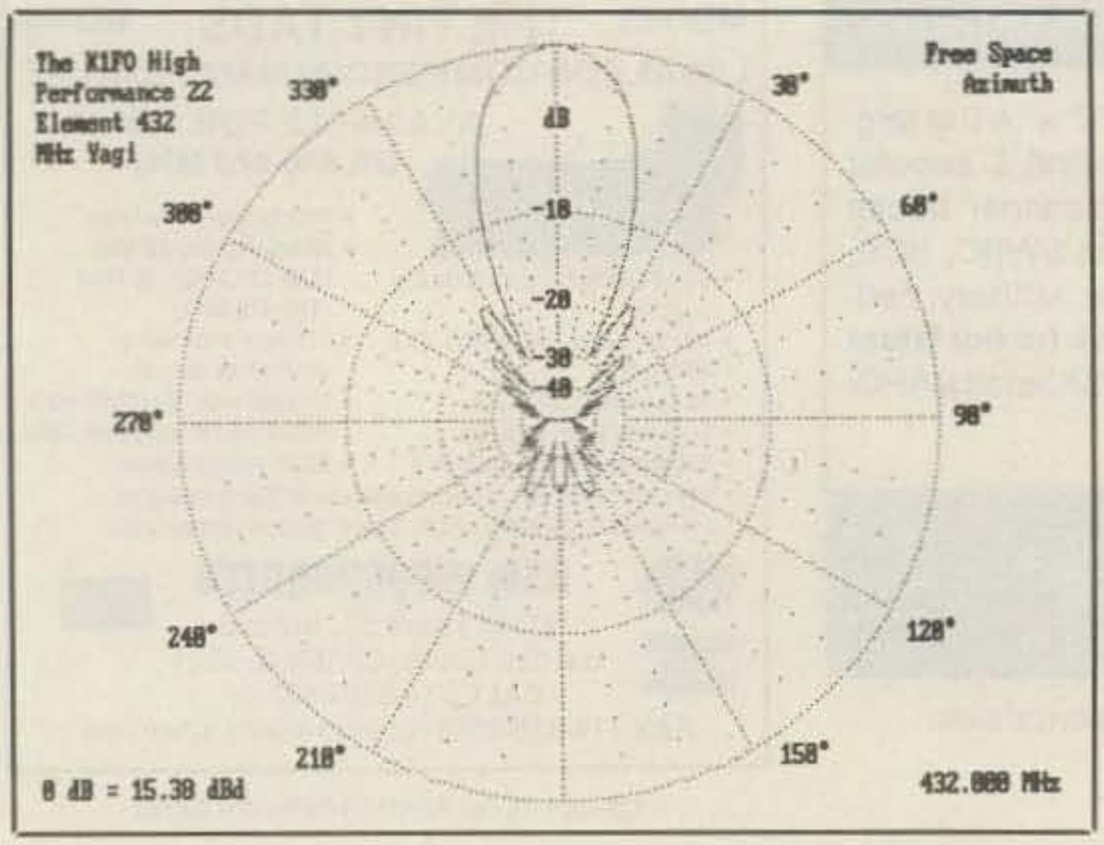


Fig. 2– This is a computer-derived pattern of a very high gain UHF beam. It is the horizontal pattern as viewed from above the antenna. Note how narrow beamwidth is. (Plot courtesy of K6STI [MN]).

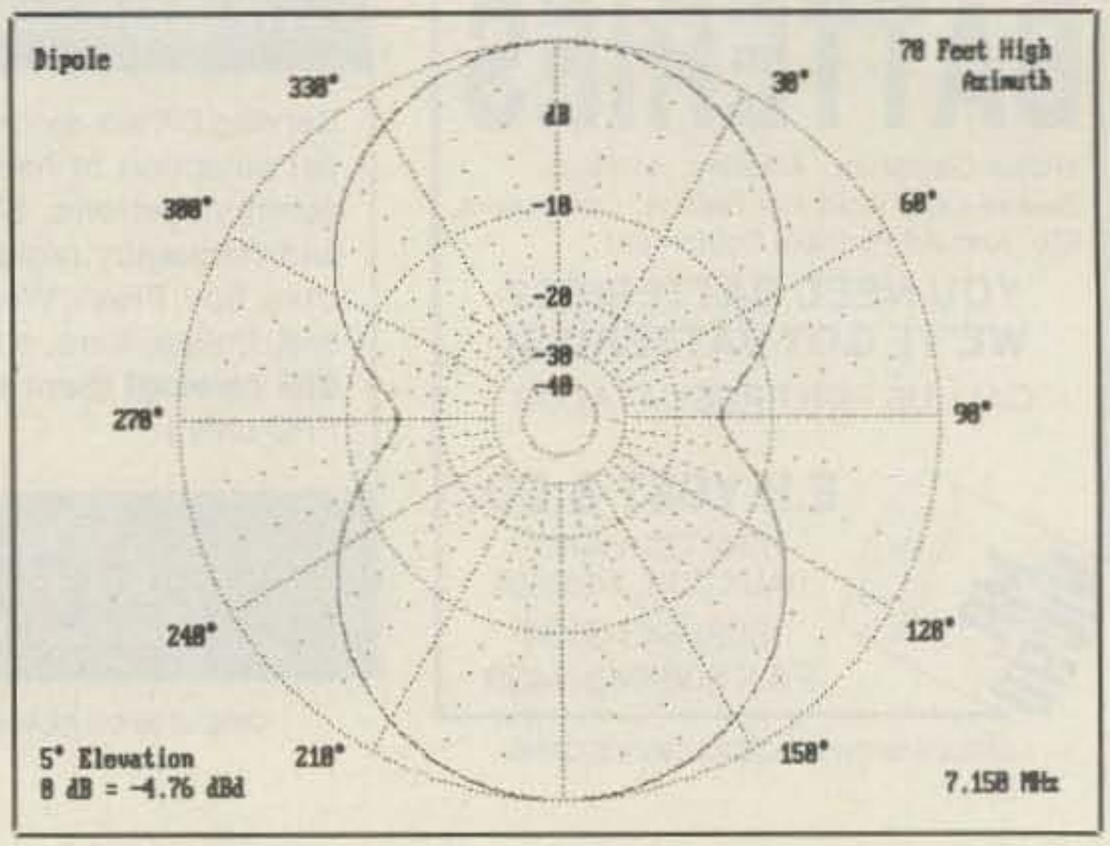


Fig. 3– This is the computer-derived pattern of a half-wavelength dipole as viewed from above the antenna (horizontal radiation). Note the two major lobes in both directions from the plane of the antenna. There is no radiation off the antenna ends.

strictly a theoretical one), and the other is a half-wavelength dipole (more on this in a moment). The theoretical antenna—the one which doesn't actually exist—is called an "isotropic" radiator. In theory it is an antenna that radiates equally well in all directions. Think of a ball of light, such as the sun, radiating equally well in *all* directions (even the sun doesn't actually do that!). (See fig. 1[A].) This type of antenna is called an *isotropic* radiator and has what is known as unity gain. For engineering purposes, the isotropic radiator is excellent for comparing other types of antennas. One other point here: As we have stated, gain is listed in decibels, and an isotropic radiator could be said to have zero decibel gain.

Next, for gain rating, is a half-wavelength dipole, which is an antenna that has two conductors of equal length. This is our other comparison antenna (see fig. 1 [B]). The dipole has a figure-8 pattern, with the two lobes broadside to the plane of the dipole. The dipole has a gain of 2.14 dB over an isotropic radiator. This gain is in two directions (figure-8 pattern) broadside to the antenna. Fig. 3 shows the computer pattern for the two main lobes.

Let's digress for a moment. When we shape the radiation pattern of an antenna, and we can do this in several ways, we can increase the gain of the transmitted or received signal to a certain degree. For example, as you can see, the pattern of the dipole is a figure-8. Actually, what we are showing is a cross-sectional view of the dipole. The isotropic at (A) is a round ball of radiation from its source at the center of the ball. On the other hand, a dipole has two primary circles of radiation—the figure-8 pattern, with the dipole at the center of the figure-8. Visualize two balls, of the same size, side by side. Our dipole would be at the point where the two balls meet. If we viewed these from above, we would have the figure-8. What the drawing shows is a section through these two balls. With the dipole we have actually shaped the pattern of signal, giving us two major lobes of energy, with little or no radiation off the ends of the dipole. One point that is a little difficult to illustrate is the actual dipole pattern for various heights above ground. We maintain a semblance of the figure-8 for all heights, but the actual radiation pattern changes in the sense that there is more radiation in certain vertical planes. This depends, however, on the height above real ground.

When antenna measurements are made or advertised by some antenna manufacturers, the gain is listed two ways—by dBI (dB gain over an isotropic) or dBD (gain over a dipole). The savvy purchaser would rightfully ask, "What is the difference?" Simple. The gain of a dipole over an isotropic is 2.14 dB. In this present world of big numbers, manufacturers compete against each other. Let's show you an example. A normal monoband three-element beam has a real-world gain of about 7 dB compared to a half-wave dipole. However, because there is no hard-and-fast standard, some manufacturers choose to compare their antennas to an isotropic and state that their three-element beam has a gain of 9.2 dB (the normal 7 dB plus the 2.14 of the isotropic). Don't misunderstand. The manufacturers are honest. It is just that you should understand the rating system. When you buy an antenna, you should question the gain figures as to exactly what they mean.

Usually, it is customary to base gain measurements using a half-wavelength dipole as a standard. Among antenna engineers and written discussions about antennas, the usual criteria is to compare gain against a dipole.

Many readers will be operating VHF and UHF. The preceding discussion primarily concerned the lower bands, 160 through 10 meters. You will still find the same general measurement standards at VHF/UHF, but with a slight change, particularly when dealing with vertically polarized antennas (verticals) used to operate through repeaters and so on. For VHF verticals the common standard of comparison among manufacturers here seems to be a one-quarter wavelength vertical. (Although I am not positive about this point.) The gain, or rather the loss, as measured from a half-wavelength dipole is –1.8 dB. The point I want to make here is that when reading gain figures, make sure you understand what those measurements actually mean. It is not unusual to see half-wavelength vertical antennas with gain ratings of 2 dB (of course, they are being compared to a quarter-wavelength antenna). From my above discussion it is obvious that a dipole cannot have a gain *over* a dipole. One other point that needs mentioning: The VHF and UHF gain for vertical antennas is usually meant as *omnidirectional* gain. We normally assume "omni" means in all directions, but actually the gain, while equal *around* the antenna, has a pattern that is *squashed,* or flattened, by the antenna to provide the gain. For example, a ⅝-wavelength long vertical has more low-angle gain than a quarter-wave dipole.

Beamwidth

Beamwidth (not to be confused with bandwidth) is another commonly quoted

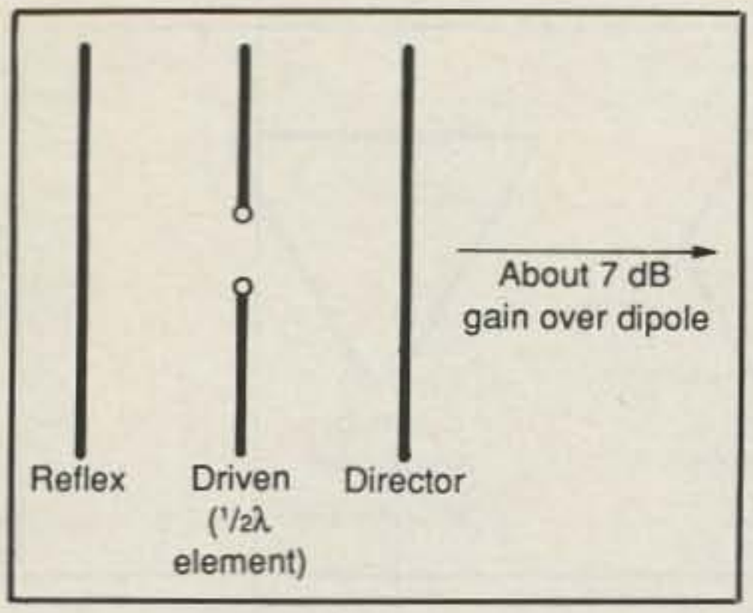


Fig. 4– This is the basic Yagi antenna in which the rear element (reflector) and the front element (director) are parasitically excited. Such an antenna provides on the order of 7 dB gain as compared to a dipole.

statistic when it comes to rating antennas. However, it is a figure a little more difficult to understand. The beamwidth of a directive antenna is the width, given in degrees, of the major radiation lobe between the two directions at which the relative radiated power is equal to one half its value at the peak of the lobe. These are referred to as half-power points. Another way to understand this is to assume we have a beam antenna with a major lobe of power. Let's also assume the maximum power we can measure is 100 milliwatts. As we go out from the center of this lobe, continuing our measurements, we reach a point of 50 milliwatts of power, or a "half power point," and we then do this on the opposite side of center until we reach 50 milliwatts. The angular distance, in degrees, provides us with the beamwidth of the antenna. This is a useful figure in amateur radio where rotatable beam antennas are used.

What all this mumbo jumbo means in simple language is how close we have to aim the beam in order to work or hear a given area. From practical experience, you will find that there is considerable leeway in aiming a normal three-element beam, and it turns out that it just is not too critical. However, with multi-element VHF/UHF arrays, it is a different story. The beamwidth is critical, so be aware (see fig. 3).

Bandwidth and SWR

One of the more important statistics with which we have to deal in understanding antennas is that of bandwidth ("band" not "beam") and SWR (standing-wave ratio). First, let's look at modern-day transmitters and receivers (transceivers) to understand why this is important.

Modern transceivers are designed to work into fixed loads or impedances. Very little leeway is allowed, because excessive mismatch between the load (the combination of the antenna and its feed line is the load) and the transceiver can cause destruction of the final amplifier transistors. Nearly all modern transceivers are designed to work into 50 ohm loads. We normally use 50 ohm impedance coaxial feed lines, but in order for a feed line to present a 50 ohm load to the transceiver, the line *must be matched* into a 50 ohm impedance antenna—and very few antennas work out to be exactly 50 ohms. This in turn means the antenna must be matched to 50 ohms with a matching device. This is another question the purchaser of an antenna must ask: How does the antenna attain a 50 ohm match and what is its bandwidth?

Just about every antenna maker will provide standing-wave ratio curves. However, for bandwidth information you may have to work that out for yourself. The usual method is to look at the SWR curve for a given band and figure at what frequencies the SWR drops below 2 to 1. Let's for example say your beam goes to 2 to 1 SWR at 14.2 MHz and stays below 2 to 1 up to 14.3 MHz. That means the useful bandwidth would be 2 to 1 for 100 kHz. (Most transceivers will handle a 2 to 1 mismatch without shutting down.)

There are certain points that should be mentioned here which we probably have to call "the facts of life." In going through nearly all of the manuals that come with modern transceivers, the instructions point out that if the mismatch exceeds 1.5 to 1, the user is quite likely to be unable to load the transmitter to full power. Most of the manufacturers of such equipment suggest the use of a Transmatch or tuning network to permit proper loading.

One other point that should be made clear to you, the neophyte purchaser, is that all modern transceivers are designed this way. There are no exceptions. It is true that some of these units have optional built-in matching networks called Transmatches or antenna tuners, but these cost extra, so just be aware that the situation exists. And almost without exception, there are no antennas designed today that will exactly match or appear to be 50 ohms on all amateur frequencies.

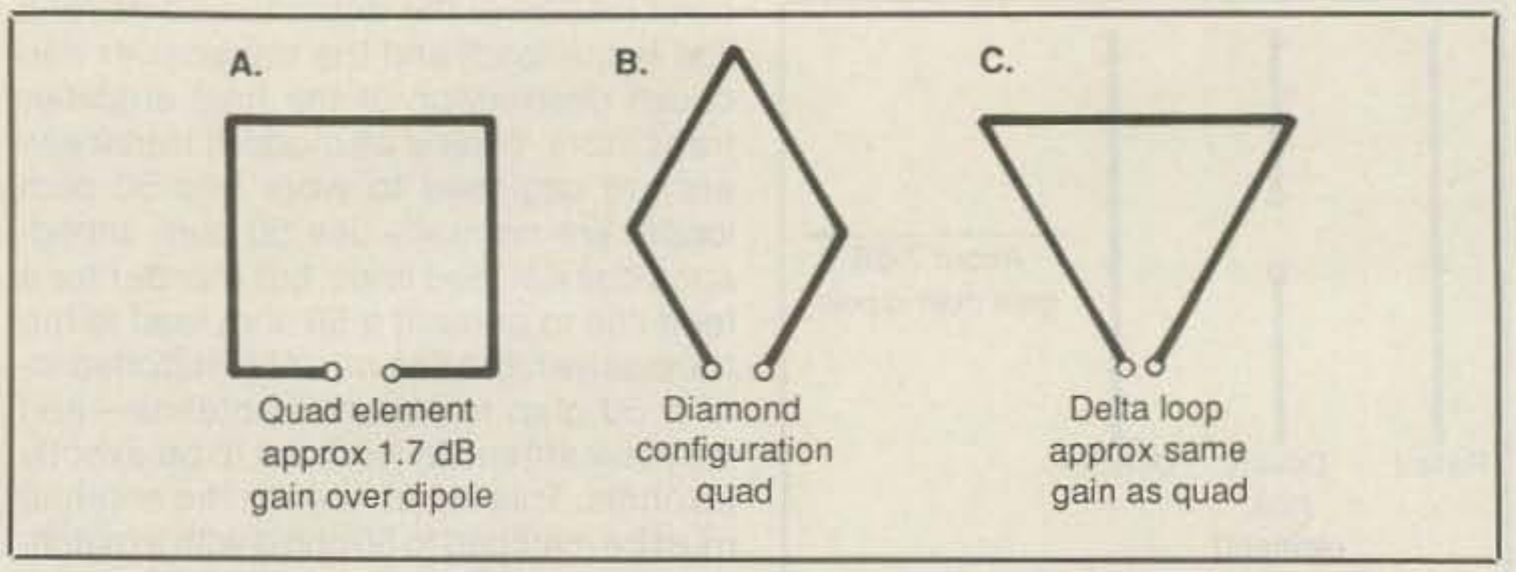


Fig. 5–(A) and (B) are the typical configurations for the Quad antenna invented by Clarence Moore, W9HCF. Keep in mind that these are full-wavelength antennas. Because of this and other factors, they exhibit more gain than a half-wavelength dipole. The Delta Loop antenna at (C) is another very popular antenna.

Standing-Wave Ratio (SWR)

The commonly used feed line these days is 50 ohm coaxial cable. The 50 ohm figure is called the characteristic impedance of the line, and it is determined by the size of the conductors used in the construction of the line, the spacing between these conductors, and the composition of the dielectric material used to insulate the conductors. For any given coaxial line, the impedance is a fixed value, and nothing we can do will change that impedance.

The impedance of an antenna will depend on many, many factors, including the type of antenna, its size, its height above conducting ground, its proximity to nearby objects, and so on. When the feed line is attached to the feed point of the antenna, the two impedances—that of the line and that of the antenna—are joined. When power is fed to the line, a ratio of maximum voltage (or current) to minimum voltage is set up. This is called the standing-wave ratio (SWR). When both the antenna impedance is 50 ohms and the feed line is 50 ohms, the ratio is 1 to 1 (the ideal condition). However, with *any* antenna, the impedance will change as the frequency is changed. This means the SWR will increase. For example, if the impedance of the antenna goes to 100 ohms, the SWR becomes 2 to 1 (100 divided by 50), and so on.

It isn't easy to put hard-and-fast figures on antennas for the prospective purchaser. As pointed out earlier, modern equipment does not allow much leeway when dealing with mismatches. The circuits built in to protect the final-amplifier transistors from burning out due to operating under less than idea conditions are fairly stringent in limits. In other words, the final-amplifier stage must see a 50 ohm load or matched condition. If, for example, the transceiver sees a 100 ohm load (SWR of 2 to 1), the amplifier will tend to shut itself off.

This leads us, as purchasers, to look for antennas that have reasonable bandwidth. The word "reasonable" is meaningless unless we put a limit on what we can expect. This, in turn, leads us to the discussion of actual antennas. There are many, many different types of antennas available. The prospective purchaser should really decide what his or her goal is going to be and proceed from there. We will attempt to cover the field as much as possible to assist you.

Beam Antennas

Earlier we discussed "shaping" the signal that radiates from an antenna to obtain gain. Many years ago a scientist named Dr. Yagi discovered the concept of applying power to one element, a dipole antenna (see fig. 4), and then adding another element behind or in front of the driven element. This had the effect of shaping the radiated signal, providing gain in one direction and rejecting signals in the opposite direction (this last being called the "front-to-back ratio"). Yagi's design used the concept of "parasitically" exciting all but the driven element, the one with the feed line attached. There are many types of beam antennas available for the buyer. Let's first discuss only monoband beams—antennas designed for single-band use.

Regardless of what you may read in advertising, there are hard-and-fast gain figures that can be applied to monoband beams. These figures have been accumulated over the years, and they are the work of many antenna engineers and laboratories, and what is of importance, they all agree about gain within a fraction of a decibel. Keep in mind that we are only discussing monoband beams. Later we will go into multiband systems.

All of the gain figures given will be based in measurements against a dipole, dBD. The most basic figure is that of a three-element monoband Yagi beam. Maximum gain will be approximately seven decibels dBd (decibels compared to a dipole). The word *approximate* is used because we have seen accurate measurements showing as much as 7.6 dB, but it should be noted that fractional dB figures are difficult to prove, much less measure. As an aside, 7 dB is a power ratio of slightly more than 8, or to look at it another way, if you were running 100 watts from your transmitter to a 7 dB gain beam, it would the equivalent of slightly more than an 800 watt power increase in the desired direction. In practice, this is only a gain of slightly more than one S unit when it comes to receiving, but the amateur should keep in mind that this is a considerable improvement in receiving. In fact, sometimes it is the difference between being heard and not being heard. In a beam antenna, the front-to-side and front-to-back can be a real boon. For example, my present beam (and I might add others I have had) in some instances can reduce a signal on 20 meters from an S9 down to zero off the back. Keep in mind, though, that front-to-back ratios are not for *all* angles. I like to use the term "attack" angle for the back signals. There is, or are, angles of radiation coming into your beam that can be attenuated more than others.

Many amateurs mistakenly assume that if a 3-element beam produces 7 dB gain, then by doubling the size to 6 elements they will get twice the gain, or 14 dB gain. Not so. Generally speaking, if we double the size of the antenna, we will gain 3 dB (that's not bad, though, because 3 dB doubles our power again!) There is no hedging on this rule. Doubling the size of the array or beam increases the gain by 3 dB (or doubles the power).

You must realize that there are limits in obtaining gain in this manner. Antenna sizes can become very unwieldy very quickly. Also, on VHF and UHF, where beams are physically small, some rather high gain figures can be obtained, but at some point, the signal losses in the phasing and harnessing lines become prohibitive.

Yagi antennas are the most common of the beams, but there are others the buyer may wish to consider. Another very popular antenna is the Quad or Delta loop beam. Fig. 5 shows some of the configurations of these antennas.

The Quad or Delta Loop differs in several ways from a Yagi-type beam. In the first place, the driven element of the Quad or Delta is a full wavelength in size as opposed to the Yagi, which is a half wavelength. It is almost axiomatic in antenna theory that the larger an antenna is the better it is. The Quad and Delta Loop have a larger effective aperture (some amateurs call it "capture area") and hence, more gain. A single Quad or Delta element will have about 2 dB gain over a dipole. When a Quad or Delta reflector element is added, the gain of the two elements will be on the order of 7 dB, about the same as a 3-element Yagi. I know I will get arguments from some antenna people but note that I used the word "about."

Additionally, Yagi elements are what are known as high Q elements, and are more critical as to spacing and coupling between each other as opposed to the low Q of Quad or Delta elements. Using lower Q elements provides a greater bandwidth. Also, if you are subjected to rain or snow static, the effect is much less pronounced on the Quad and Delta.

One last point worth mentioning: Many times it is desired to put more power into a lower beam angle from the antenna. This effect can be achieved by stacking two separate Yagis. However, the effect of stacking already exists in a Quad, and even more so in a Delta loop.

The above discussion does not mean that Yagis are better or worse performers than Quads or Deltas. Each have their features and advocates. In Part II, I will discuss multiband beams and wire antennas.

(To Be Continued) CQ

No, it's not "Star Wars" or even "Star Trek." It's amateur radio today. I'm sure that most of us were not aware of amateur radio laser communications, let alone world records. WA7LYI fills us in on how the world record was broken recently by members of the Bedlam Microwave Society.

New World Record Set For Amateur Radio Laser Communications—153.97 Miles

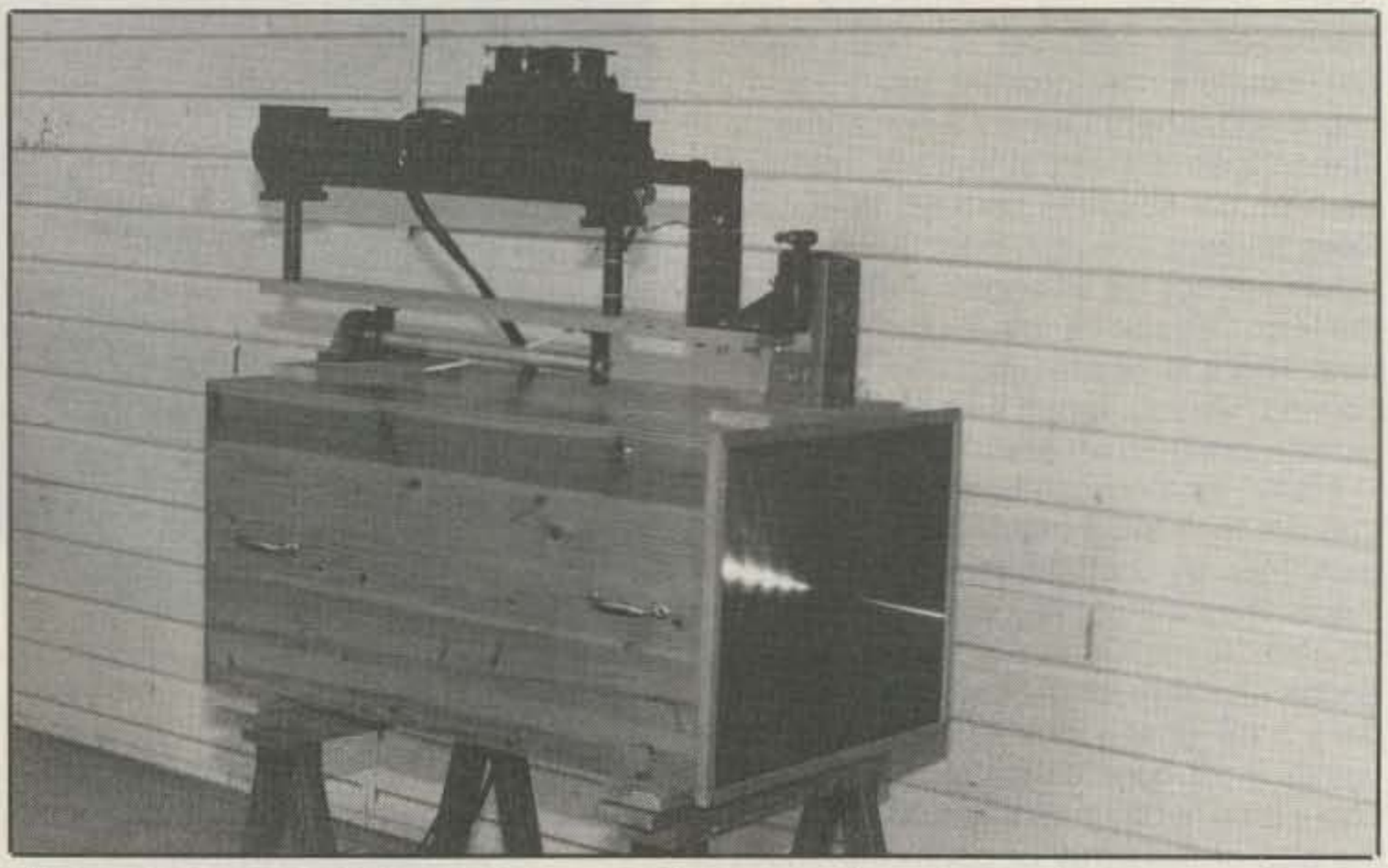
BY TERRY WILKINSON*, WA7LYI

On June 7, 1991 at 1700 hours local time myself, Terry Wilkinson, WA7LYI; Gary Judd, WB7SLY; and Bruce Ellefritz, N7PMO, arrived at Towers Mountain (elevation 7625), located 50 miles north of Phoenix. We were scheduled to set up laser communications with David Chase, KY7B, and Jim Vogler, WA7CJO, who were going to be located on a mountain top 150 miles to the south. Dave and Jim would be located on Mount Lemmon (elevation 9157), just north of Tucson Arizona. They were scheduled to arrive at their site at the University of Arizona observatory on Mount Lemmon during the afternoon of June 8, 1991.

It has been painstakingly learned from previous laser shots that aiming the exact heading required can be very difficult. We have found that on a mountaintop there is often little on which to calibrate for aiming purposes except the north star, and if you depend on the north star for calibration it's sure to be covered with clouds. It's also only good to an accuracy of 2 degrees or so. Setting up laser communications gives the expression "line of sight" a whole new meaning. If the path you have chosen is not absolutely line of sight, you are finished. There is nothing you can do. What is worse, "line of sight" can be very difficult to determine by looking at maps. Can a 7,000 foot mountain see over a 5,000 foot mountain that is 40 miles away? It's often hard to tell.

The normal procedure for establishing initial contact is to determine as closely as possible exactly where the other station is going to be, in both azimuth and elevation. At the closer distances binoculars are all that is needed. The micrometers on the laser are then set to the middle of their range, and the transceiver box is aimed as close as possible at the other station. At less than 30 miles it was common to be able to actually see the LASER beam pointed in your general direction, and give aiming directions to the other group. At longer distances the outgoing beam is visually aligned so that the apparent end of the outgoing beam covers the desired location. This could be the peak of the mountain, a hand-held spotlight, or some other recognizable feature.

At distances less than 40 miles it is fairly easy to use a hand-held spotlight for the initial alignment, provided that you are away from city lights and the other "station" has a very good idea of where to look. At less than 40 miles or so a high-powered photo-strobe was sometimes used for the initial alignment. We found



The equipment used is a pair of home-built "transceivers." The receivers consist of a large box with an 18 inch fresnell lense on the front that focuses its 324 square inches of light on a very sensitive photo-multiplier tube. The output from the photo-multiplier tube then goes to an op-amp and an audio filter. The audio filter is used to eliminate the 60 Hz buzz from all of the AC powered lights when operating anywhere around city lights. The gain of the photo-multiplier is adjustable. The detected audio signal is then sent to a speaker or earphones. The transmitters consist of a 15 MW helium cadmium laser mounted on top of the receiver box. The laser has a micrometer adjustment to .001 inch in both azimuth and elevation. The outgoing laser beam is "chopper" modulated by passing through a small fan, and a solenoid is used to interrupt the beam and send CW. The beam is also passed through a collimator that effectively makes it smaller for a given distance.

*3619 W. Crocus Drive, Phoenix, AZ 85023

that at the 50 miles plus distances the strobe was apparently too fast, and due to changing conditions in the atmosphere it could only be seen once in a while, and at the longer distances it could not be seen at all. We have tried several times to use a large mirror during the daytime to signal the other group our exact location (also known as "heliograph"), but just bringing the mirror along seems to bring bad luck in every form, and we have never been able to even try. From our 56 mile and 95 mile laser shots we also knew that mountains can look remarkably similar from 50 miles or more away, and from various angles it is difficult to tell which is the tallest part of a mountain, especially if it is somewhere in a continuous range of mountains. I know those guys are on the very top of the mountain range, but which top is that?

We knew that in this case the mountains involved would not be visible because of the distance involved (150 miles). Located just south of Phoenix is a mountain used by 75% of the FM broadcast and television stations in the area. It is appropriately named South Mountain, and it is covered with very large towers that have lots of red lights that are visible for many miles. This mountain has been used in some way for almost every laser shot that we have ever done. David Chase, KY7B, has VUCC #1 for laser from this location.

Using the VK3UM Moonbounce program and topographical maps of each location, I calculated the bearing from Towers Mountain to both South Mountain and Mount Lemmon. I knew from previous laser shots that the lights on the towers on South Mountain would be visible from our location, and with the aid of a theodolite I was able to point our laser the calculated azimuth angle east of the towers on South Mountain. I later estimated this to be within one-half degree of the true bearing. We set up most of the laser equipment and waited for the second group to arrive the next day at their site. Our theodolite was set up about 30 feet behind and slightly above our laser, which allowed it to look directly down the beam with a minimum of parallax error.

Dave, KY7B, and Jim, WA7CJO, called on the radio as they were leaving Phoenix and heading for Tucson. It normally takes about two hours to drive to Tucson and another hour to drive up the mountain. The road to the top of Mount Lemmon is paved all the way and winds up the south side of the mountain. This meant that we would not hear from them again until they were on top. Six hours later we still had not heard a word from the guys, and as we watched the sun go down behind the trees, another chance to try the sun/mirror slipped away. I was so aggravated at that point that I would have smashed the mirror I brought, but that would have meant seven years of bad luck instead of the two-day variety we were used to from previous laser shots.

We knew from our previous operation at this observatory site that they do not allow vehicle lights, flashlights, or anything that even looks like a light after dark when the telescopes become operational. Setting up in total darkness was beginning to be a reality for Dave and Jim. That is if we ever heard from them again. Finally, with the sun already down and about 10 minutes of light left, the radio came alive with angry voices. Yes, they were on top of the mountain. No, they had not been kidnapped and held for ransom. As it turned out they had been waiting at the bottom of the mountain for hours. It seems that there was a forest fire on the lower part of Mount Lemmon, and the forest service was not letting anyone on the road up the mountain for at least five to six hours.

The first time we did a laser shot from Mount Lemmon, two members of our crew decided to play bumper cars at the bottom of the mountain. They ran into each other and wound up totally destroying one of the cars. The second encounter on Mount Lemmon, Jim Vogler and myself drove up the mountain in a driving thunderstorm, complete with lightning and hail. This time we were going to have the leftover smoke from the forest fire to shoot through. Just perfect for a laser shot. The words "Mount Lemmon" have taken on a whole new meaning for us.

Dave and Jim hurriedly unpacked and set up all of their gear with everything pointed our way, only to discover that they had forgotten which way was which. They had to move everything 30 feet or so, and then point to our "new" direction. After all was set up, we aimed our new 1,000,000 candlepower light and 400 watts of incandescent lights their way, and yes, they could see our lights in the darkness. After only five minutes of aiming, we could see their laser pointed at us! The beam was much higher in the sky than we had expected, but almost exactly on in azimuth. This process usually takes much longer, and it took several hours at the 95 mile laser shot. We quickly ran back and forth across the top of the mountain and determined that their beam was around 250 feet across, much wider than we had thought it would be. We speculated that the beam was being scattered by the atmosphere and all of the floating debris in it. The beam was also not nearly as strong as in our previous laser contacts partially due to the distance involved.

We observed that the beam was fading completely in and out at a fairly rapid rate. The beam was visible with the naked eye, but not by much. We had the guys move the micrometers on their laser back and forth in both azimuth and elevation, trying to peak up the signal, and we discovered

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several things. The micrometer adjustments to the beam were not nearly as critical as we had thought they would be. Our micrometers read out in .001 of an inch, and on our 95 mile shot it took about one-third of a turn to sweep all the way across the other station. This time the beam was visible for almost two full turns of the micrometer. The bad news was that there was not really any peak where it was the strongest.

We then set up our laser, and after a few minutes of adjustments they could also see our laser—just barely. After several minutes of laser adjustment and discussions, conditions worsened and the lasers were no longer visible with the naked eye. At this point the great sensitivity of the 18 inch square fresnell lense and the photo-multiplier tube was fully appreciated. Our receivers were still able to detect the modulated beam when it was there, even though it was not visible with the naked eye. Due to the rapid fading in and out, the CW was impossible to copy. The beam would practically disappear several times in a second. We waited for conditions to change, and it didn't take long.

The wind picked up, and Dave and Jim were advised by the nearby astronomers that there was a storm front moving in from nearby Mexico, along with high winds and possible lightning. They were also advised of the obvious—that this mountaintop was not the ideal place to be during a lightning storm. It is typical on these long-distance laser shots to have to wait until 2 or 3 AM for the air turbulence to subside and the winds to die down. This time it didn't look like we were going to get the chance.

Dave and I tried fast CW, very slow CW, and everything else we could think of, but the CW was just not readable with all the rapid fading. At times the air would be still momentarily, and the signal would actually get loud for about a second or so. Like it or not, we decided to wait an hour or more to see if conditions would improve, knowing that the guys on Mount Lemmon might have to abandon ship at any time.

On every previous laser shot we have done, even at 95 miles, the laser beam has always been at least plainly visible, if not bright. A speaker was always placed on top of the laser, and anyone who could copy Morse code could tell what was being said from 50 feet away. The rapid fading and poor conditions were very frustrating.

As midnight local time approached, weather conditions slowly got worse. Over the next hour or so we watched the stars slowly disappear from the southern sky as the clouds moved in. At about this time the observatory stopped operations and closed their domes due to the threatening weather. The weather conditions on the Mount Lemmon end amazingly did not get any worse. Unexpectedly, a slight wind appeared at our location from the north, and as we waited things started slowly to clear off. Finally, at about 2:30 AM local time things improved enough to attempt a contact. We had been attempting to send CW one way or the other every 30 minutes or so for the previous 5 hours just to test the conditions. Dave and I decided to attempt a moonbounce-style contact (both sets of calls, signal reports "o"s that full calls had been copied, and "r"s that everything preceding had been copied), so on went the earphones. Finally at 2:50 AM local time on June 8 the contact was completed. Conditions had improved just enough. According to the VK3UM moonbounce program, the distance covered was 153.97 miles. However, we had sweated blood on this one.

The seemingly insurmountable problems we encountered, and the bad luck that seems to follow us around like a black cloud, should not serve to deter other experimenters from attempting to break new ground. We encourage others to experiment and to pioneer new ideas.

In conclusion, I would like to thank Mr. Bill Lewis, and Mr. Steve Rinella of U.S. Forest Service, for allowing us permission to use both of the forest service sites. We would also like to thank Mr. John Ratje of the University of Arizona observatory group for allowing us to use the first-rate facilities at the observatory on Mount Lemmon. The assistance of people such as these makes the difficult task at hand that much easier. CQ

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Judging from the response to the original article, a lot of you want to take it one step further. W1FB shows us how to use our VFO project to drive some of the older rigs.

VFO Interfacing

Using Solid-State VFOs To Drive Vacuum-Tube Transmitters

BY DOUG DEMAW*, W1FB

My June 1991 *CQ* article concerning stable VFO design stimulated an unexpected reader response. Notable among the questions asked was "How can I interface a semiconductor-type VFO to the input of my older, tube-type transmitter?" It is a technique that I have taken for granted in recent years, not realizing that the less-experienced amateur might need guidance toward doing the job effectively. It seems that a number of amateurs are using old AM CW transmitters that either lack a VFO or contain one that is quite unstable. Certainly, a stable outboard solid-state VFO is capable of solving their problems. This article provides tips for using a solid-state VFO with a tube style of rig.

Some Limitations

It is important to understand that transmitter amplifiers have a low input and output impedance characteristic. Conversely, most vacuum tubes exhibit high input and output impedances (grounded-grid amplifiers being the exception). Although a semiconductor amplifier can produce significant output power, the voltage developed across, say, a 50 ohm load is relatively small. For example, a 1 watt transistor amplifier can produce an RMS voltage of 7 across 50 ohms. That same watt of power will provide 31.6 RMS volts across a 1000 ohm load. A vacuum-tube grid requires a fairly large voltage swing in order to excite the tube properly—30 to 50 volts is typical for a small triode or pentode. Fortunately, power is not needed in large measure to drive the grid

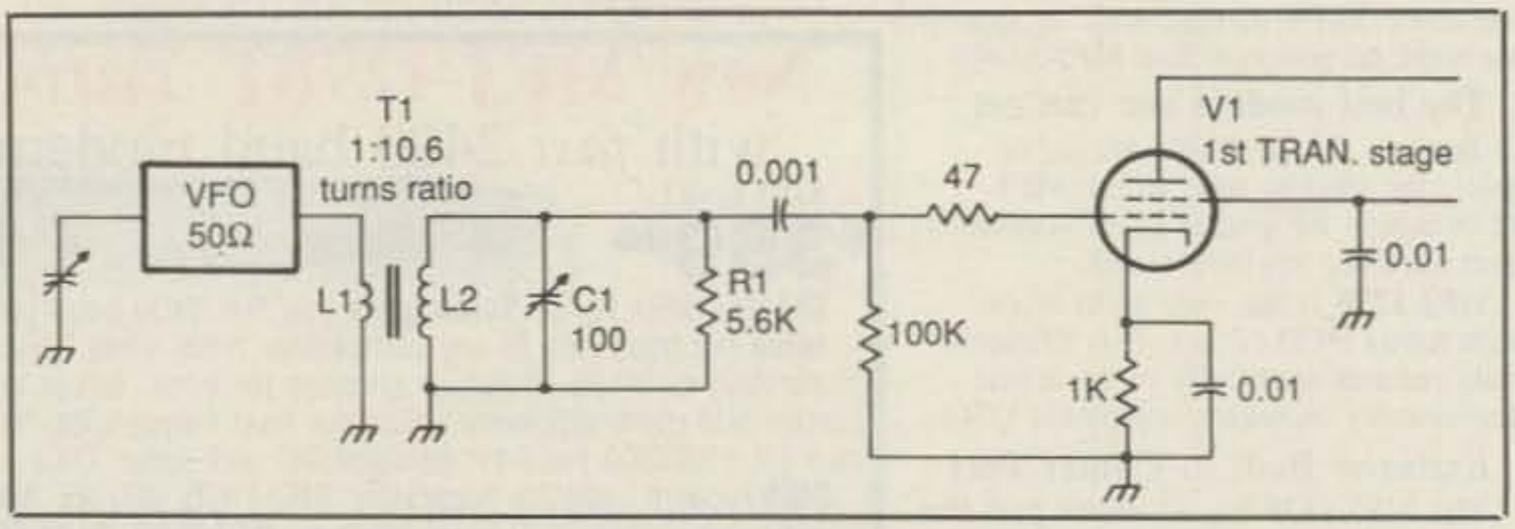

Fig. 1– A method for connecting a LO-Z solid-state VFO to a transmitter input stage that uses a tube. T1 is tuned to the operating frequency by C1. R1 provides a load for the VFO and broadens the response of the C1/L2 tuned circuit. A T1 step-up ratio is required to ensure ample voltage swing at the V1 grid.

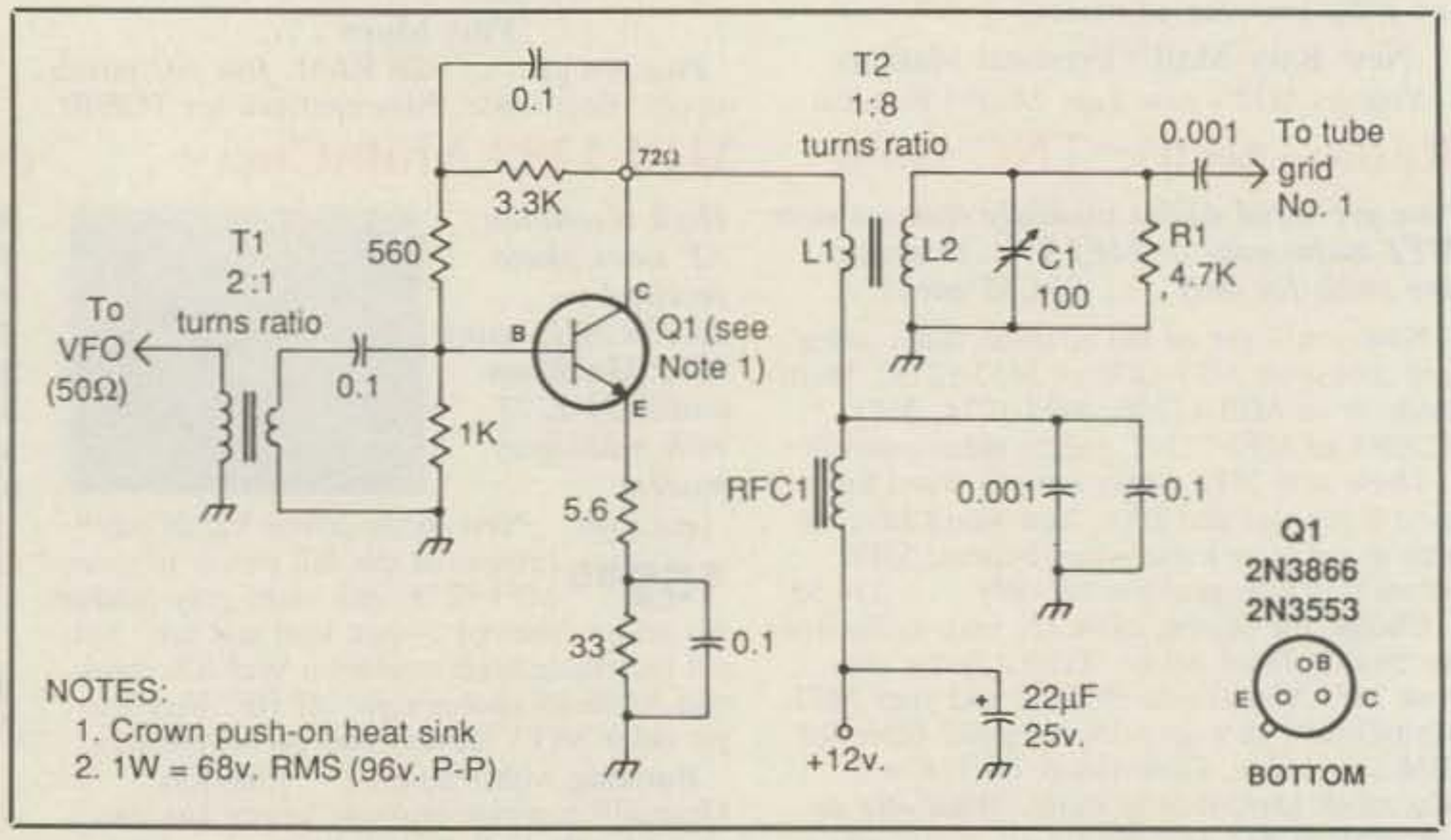

Fig. 2– A solid-state VFO amplifier that can produce up to 1 watt of output with 75 mw or greater driving power. C1 and L2 are tuned to the operating frequency. T1 has 12 primary turns of no. 26 enameled wire on an Amidon Associates FT-50-43 ferrite toroid. The secondary has 6 turns of no. 26 enameled wire. R1 is a 1 watt carbon resistor. RFC1 has 8 turns of no. 26 enameled wire on an Amidon FT-23-43 ferrite toroid. T2 is wound for the operating frequency.

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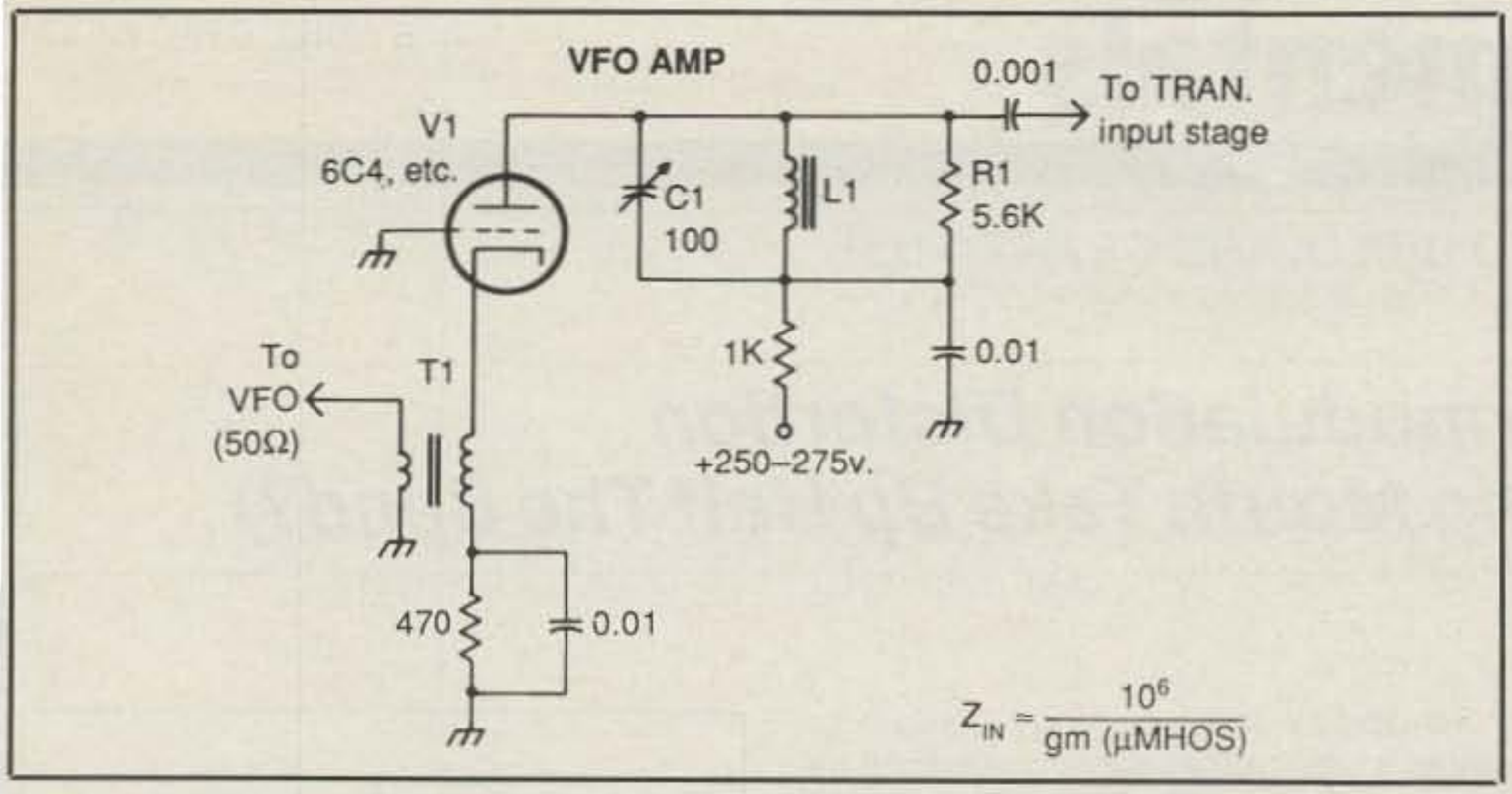

Fig. 3– A grounded-grid tube amplifier for boosting the VFO output power. The turns ratio of T1 is based on the equation, once the gm in μmhos for V1 is determined from a tube manual. C1 tunes L1 to the operating frequency.

of a low-level tube amplifier. Therefore, with correct interfacing methods we can use a solid-state VFO to provide an operating frequency for a tube transmitter or receiver.

Maximum power transfer cannot occur in any electrical circuit unless unlike impedances arre matched by some means. The most common approach to this requirement is the employment of a tuned or untuned matching transformer, although capacitive voltage dividers are also suitable in some circuits. An untuned, broadband transformer at the output of a solid-state amplifier is seldom practical in terms of spectral purity. This is because semiconductor amplifiers generate high levels of harmonic current by means of envelope distortion and nonlinear parametric action in the transistor junction.

Transistors are much worse than vacuum tubes in this regard. It is not unusual to find the second and third harmonics at the transistor collector (untuned output network) only 10 to 15 dB down from the peak output of the desired frequency. Harmonic filters are almost mandatory at the output of transistor amplifiers. Therefore, if you use a broadband matching transformer between a solid-state amplifier and a tube grid, a harmonic filter should be included in the line. Alternatively, you may use a tuned (narrow band) matching transformer to interface your solid-state VFO to your tube rig. This will minimize the transfer of unwanted harmonic currents.

Practical Matching Methods

Fig. 1 shows one method of connecting a solid-state VFO to a vacuum tube. If V1 is arranged as a crystal oscillator, you will need to remove the feedback capacitors and use the stage as an amplifier. If not, V1 may self-oscillate when the VFO is connected to it. L1 is a low-Z link that couples the VFO to the C1/L2 tuned circuit, which is peaked at the desired operating frequency. L2 may be a slug-tuned inductor and C1 can be a fixed-value capacitor. R1 lowers the Q of L2 and establishes a 5.6K ohm load for the VFO. R1 broadens the tuned-circuit response to lessen the need to retune it when QSYing from one end of the band to the other. I described a VFO with sufficient output power to permit you to use the fig. 1 circuit (see June 1991 *CQ*). This circuit needs an amplifier after it, such as the circuits shown in figs. 2 and 3.

Fig. 2 shows a class A linear amplifier that is suitable for elevating the VFO output power to 1 watt. A 2N3866, 2N1553, or MPS-U02 may be used for Q1. Any high fT NPN transistor that is similar to those listed will work in this circuit. Alternately, you may use four 2N2222As or 2N4400s in parallel for Q1.

T1 in fig. 2 is a 4:1 broadband transformer that matches a 50 ohm VFO to Q1. The impedance ratio should be increased to 10:1 for VFOs that have a 500 ohm output impedance. This calls for a 7:1 turns ratio. C1 and L2 form a tuned circuit for the operating frequency. R1 broadens the frequency response of the tuned circuit and provides a workable load for Q1. An impedance step-up of 1:8 is required for T2, owing to the Q1 collector impedance of 72 ohms.

You may wish to consider the fig. 3 circuit if you're disposed to using tubes as amplifiers. This grounded-grid amplifier may be used between the solid-state VFO and the input stage of your tube-type transmitter. The equation in the diagram, based on the transconductance of the tube used, provides a close approximation of the input impedance of the V1 cathode. A broadband matching transformer (T1) is used at the amplifier input, whereas a tuned circuit (C1/L1) is utilized at the amplifier output port.

You will need to develop your own tuned-circuit values. The C-to-L ratio of the tuned circuits is not critical provided you adhere to the impedance ratios specified. C1 in the tuned circuits can be a 100 or 150 pF variable capacitor for the bands from 1.8 to 7 MHz. Use a 50 or 75 pF variable from 10 MHz through the 10 meter band.

VFO Isolation Is Important

Your solid-state VFO should be contained in its own shielded box. Keep this unit outboard from the tube transmitter because the heat within the transmitter cabinet will surely cause long-term drift. A shielded enclosure for the VFO is important in the interest of preventing stray RF from entering the VFO circuit. Stray RF currents can disrupt VFO performance, which may result in frequency jumping and drift. I suggest also that you use shielded cable for the +12 volt power leads that connect to the VFO. Likewise for the on-off control lead for the VFO.

In Summary

The information I have provided here is anything but profound. These tips should, however, head you down the road of success when you mate your solid-state VFO to your tube rig. CQ

Radio FUNdamentals

BY BILL ORR, W6SAI

THINGS TO LEARN, PROJECTS TO BUILD, AND GEAR TO USE

Intermodulation Distortion (Or Why Does Big Mouth Take Up Half The Band?)

You have all heard Big Mouth, I'm sure. He's got a loud signal with plenty of speech processing. You can hear kids yelling in the background, the sound of passing cars, and other miscellaneous loud noises. When he stops speaking (if he ever does), your S-meter hangs at about half signal strength, buoyed up by the background racket, which sounds like a wind tunnel. Big Mouth is happy. He has lots of processing and he knows his signal is LOUD.

Well . . . perhaps. The "all-knobs-to-the-right" syndrome will probably never be eliminated from the amateur bands. More audio, more processing, that's the way to a big signal! Let the listener beware!

This may be an ego trip for Big Mouth, but he is a headache to the other unfortunate occupants of the band. His signal is unpleasant to listen to. In addition to the raspy, noisy audio, Big Mouth has splatter ("buckshot") on his signal that spreads out on both sides, making life miserable for amateurs operating near his frequency.

Big Mouth doesn't know (or doesn't care) that all SSB transmitters have an overload point. Operating beyond this point won't make the signal louder or more readable. It just takes up more space on the dial and actually wastes useful power in the splatter!

Observing The Transmitter With A Spectrum Analyzer

Transmitter overload by Big Mouth produces intermodulation distortion (IMD). This noxious form of distortion is created whenever a complex signal (such as the voice, which is composed of many audio tones) overloads an amplifier or mixer stage of a transmitter. A CW signal, on the other hand, is a single-frequency entity and does not create IMD (fig. 1). This is a representation of an unkeyed CW signal viewed in the frequency domain. The X-axis represents frequency; the Y-axis represents signal amplitude. The signal is constant at 14.2 MHz.

48 Campbell Lane, Menlo Park, CA 94025

To display the frequency domain requires a device that can discriminate between frequencies while measuring the power level at each one. The spectrum analyzer is one instrument that will accomplish this. Simply, it is a receiver coupled to an oscilloscope. A block diagram of a basic analyzer is shown in fig. 2. It consists of a highly selective (narrow passband) receiver which is electronically tuned in frequency by means of a sawtooth voltage applied to the horizontal deflection plates of the cathode ray tube. A plot of frequency versus amplitude is displayed. The screen of the analyzer is calibrated to provide meaningful information. In this case, the vertical plot (Y-axis) represents watts output of the transmitter and the horizontal plot (X-axis) represents frequency in kHz. The picture is of a 100 watt CW signal viewed over a span of 10 kHz.

In real life the analyzer picture of a CW carrier is a bit more complex than the idealized representation of fig. 1. Photo A shows the CW signal of a popular 100 watt transceiver, as seen on a spectrum analyzer. Each horizontal division represents 1 kHz, so the picture displays 10 kHz (left to right) centered on 14.2 MHz. The vertical divisions represent amplitude.

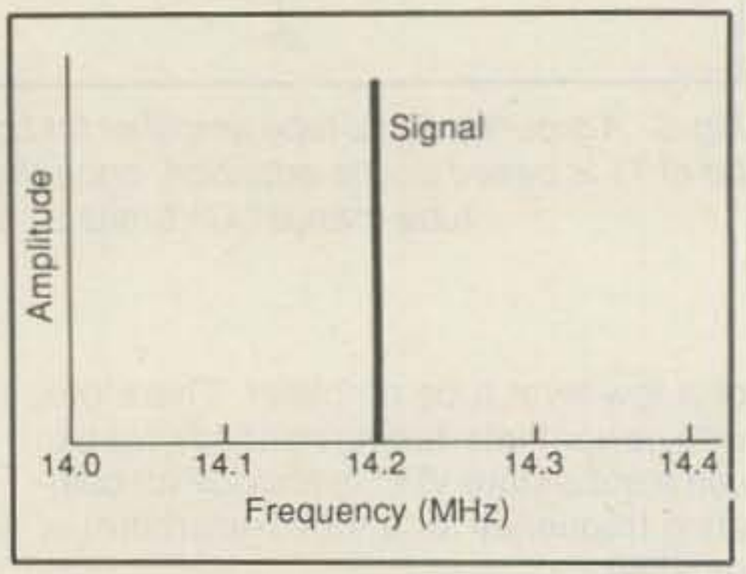

Fig. 1– An unkeyed CW signal viewed in the frequency domain. The X-axis represents frequency; the Y-axis is amplitude (signal strength). The signal is constant at 14.2 MHz.

The picture tells us a lot about this signal. Note that close in to the carrier, at the base of the plot, the trace widens out before it drops into the background noise.

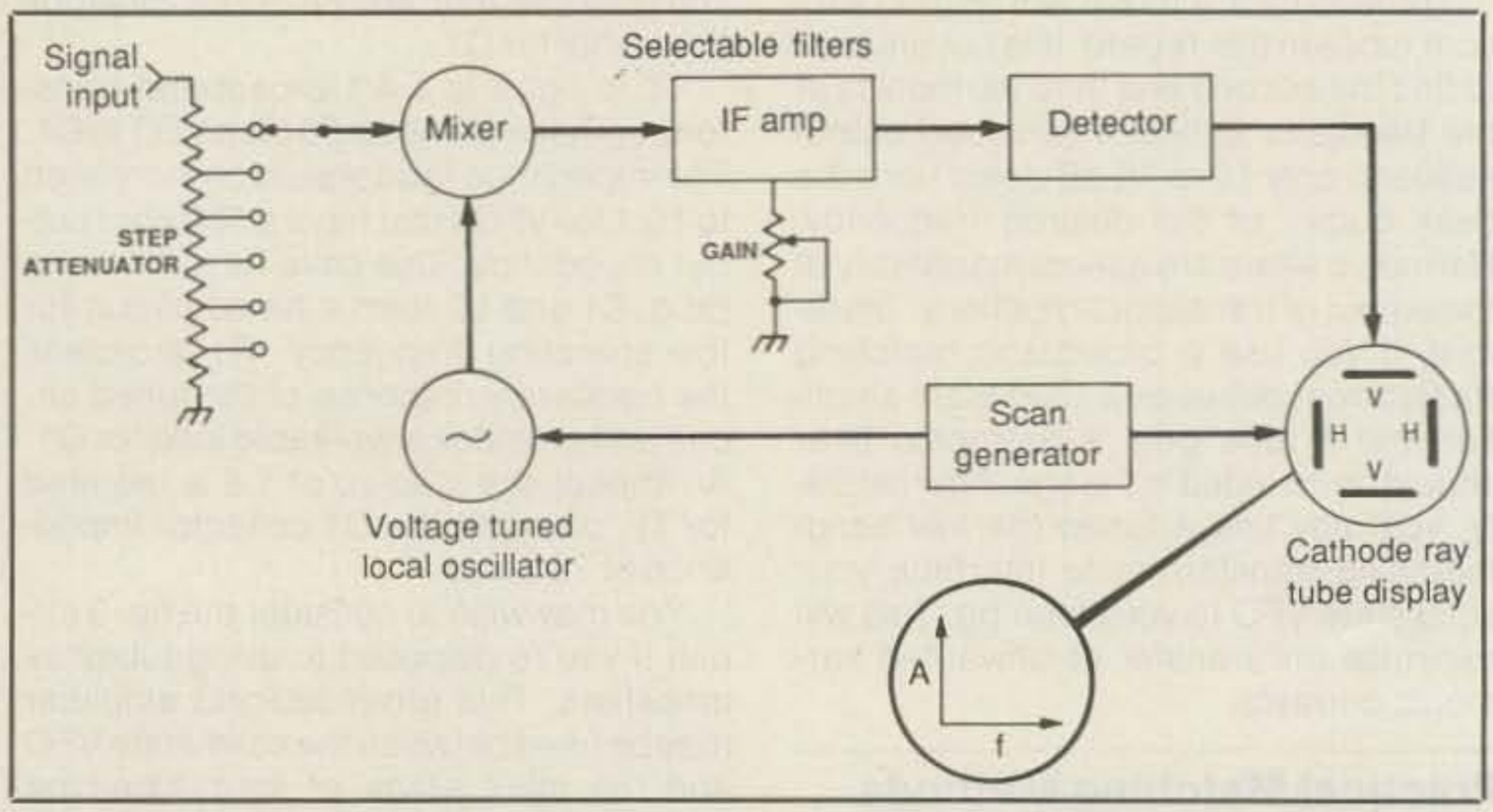

Fig. 2– Block diagram of a simple spectrum analyzer. It is a highly selective receiver coupled to an oscilloscope. The input signal is attenuated to the proper level and mixed to an intermediate frequency. The IF amplifier has adjustable gain and a selection of narrow-band filters. The receiver's local oscillator is electronically swept in frequency by a sawtooth control wave created in the scan generator. Output of the detector is applied to the vertical deflection plates of a cathode-ray tube while the sweep signal is applied to the horizontal plates. A frequency vs. amplitude plot is displayed.

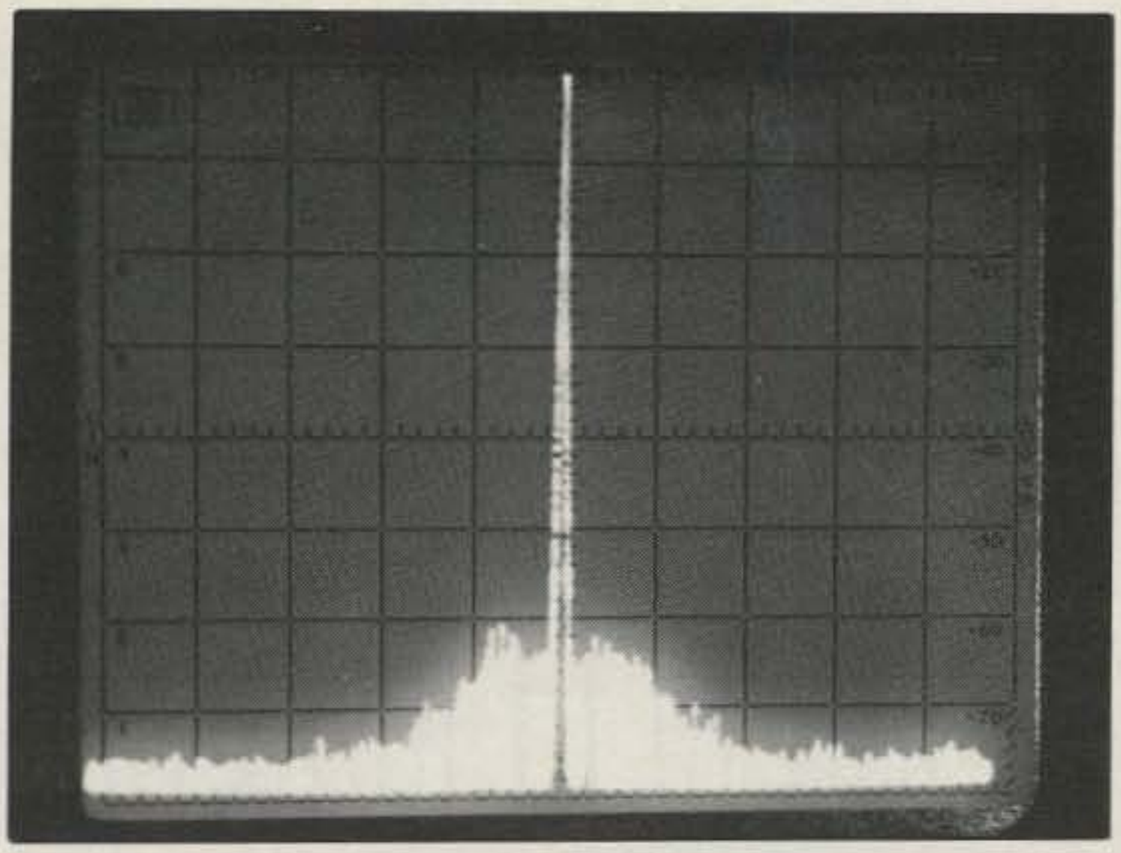

Photo A– An analyzer picture of the signal represented in fig. 1. Each horizontal division represents one kiloHertz; the vertical divisions represent signal amplitude. Notice the broadening of the signal at the base. This represents "white noise" generated by the transmitter. It can be heard as a hiss on each side of the signal, dropping into the background noise about 2 kHz each side of the signal.

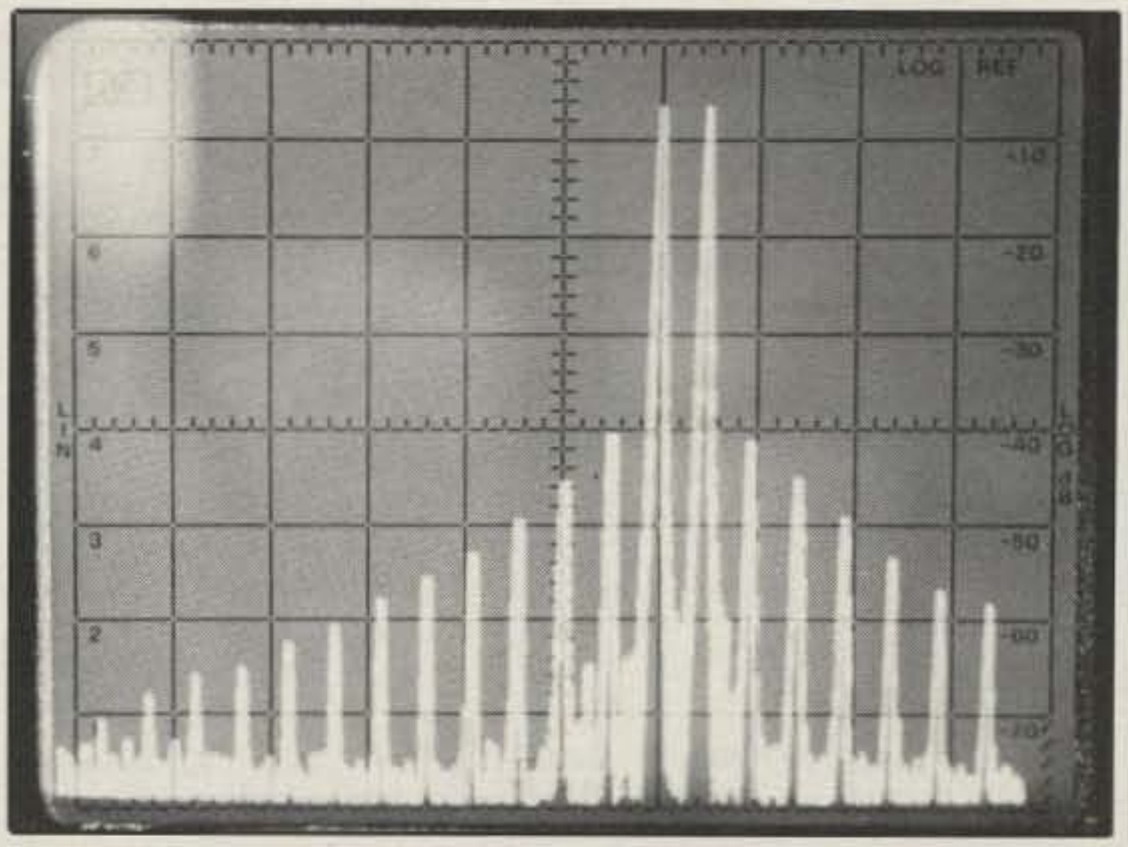

Photo B– A representation of a modern transceiver incorporating RF feedback. The third-order products are down 34 dB below the two tones, and the higher order products are reduced accordingly. Nearby amateurs would still notice close-in hash from intermodulation distortion. Commercial exciters (costing ten times as much) can better this condition by 20 to 40 dB across the passband.

This broadening represents "white noise" on the signal. The noise is generated in the mixing and amplifying circuits of the transceiver. It is the job of the designer of the equipment to reduce this noxious product to a minimum. In this case, the noise drops into the background about 2 kHz from the carrier. This is a rather "clean" signal. Nearby operators can hear the white noise as a rushing sound close to the carrier that follows the transmitter keying. Older transceivers often have white-noise sidebands that spread out over the whole band, driving nearby amateurs crazy.

To make matters worse, some receivers generate white noise when overloaded. This makes it risky to accuse a nearby amateur of clogging you up with white noise, when it may be your receiver that is generating the problem!

Viewing an SSB Signal

The spectrum analyzer is a valuable tool for examining an SSB signal. The amount of intermodulation distortion can clearly be seen on the screen of the analyzer as spurious signals. A perfect SSB signal does not exist; all transmitters have some degree of IMD. The goal is to hold IMD to the lowest possible level.

In a nutshell, this is how a transmitter is tested for IMD. Let's look at some of the details. Fig. 3 shows a simplified block diagram of a test setup for analyzing an SSB signal. The industry-standard audio test signal is composed of two equal amplitude tones. (One tone is insufficient to produce IMD. More than two tones result in so many intermodulation products that analysis is confusing. I'll spare you the ugly mathematics that relate the intermodulation products to the audio tones.)

Any two audio tones that pass through the filter system of the transmitter are satisfactory; many experimenters use 700 Hz and 1900 Hz. In any event, the tones should not be harmonically related.

Two-tone audio generators are not complicated, and several small transistorized models have been shown in various publications and handbooks. The requirements of the generator are that the tones are isolated from each other (the generators do not "see" each other) and that they have very low distortion products.

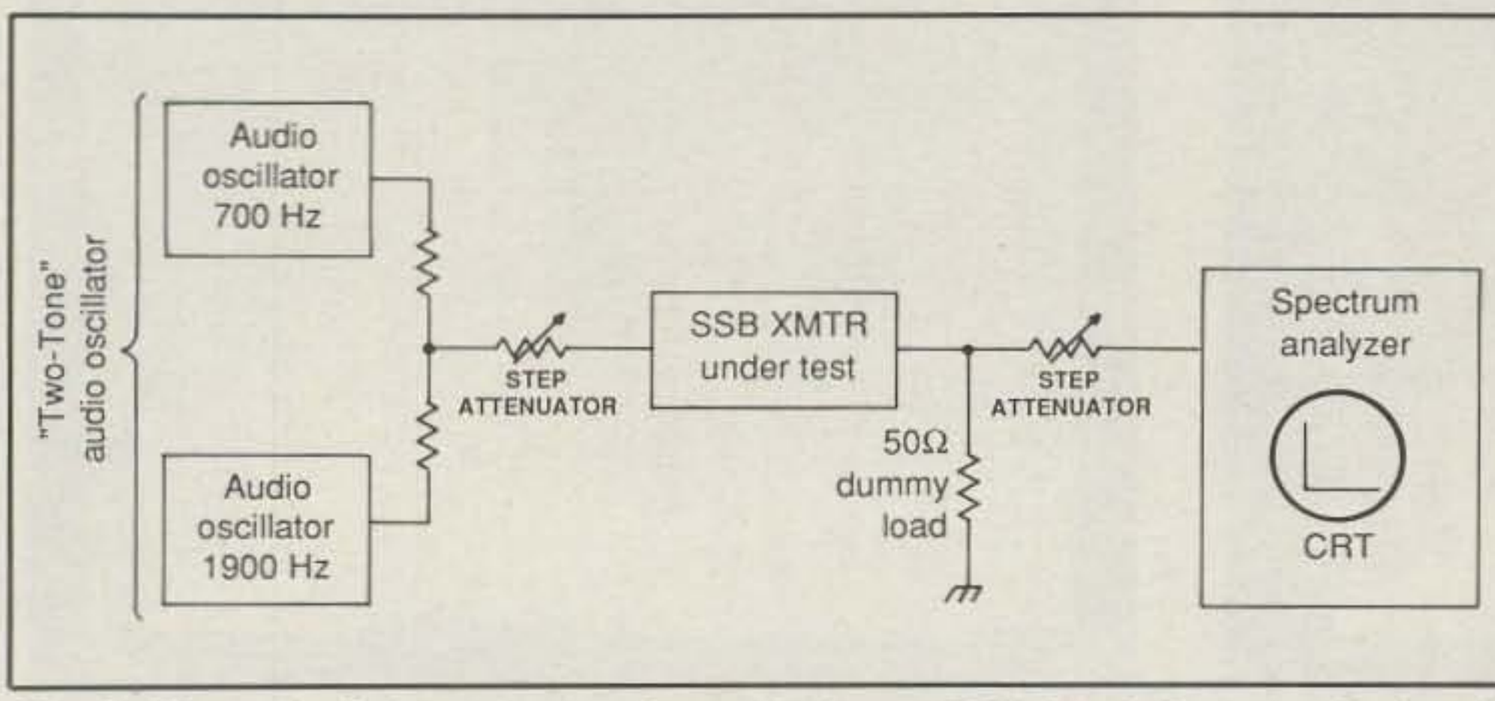

Fig. 3– Diagram of the test setup for analyzing an SSB signal. Two standard audio tones are injected into the transmitter via the mic jack. Level of the tones is set to provide the desired transmitter power output. The transmitter is operated into a dummy load and a small sample is injected into the analyzer. If the transmitter is perfect, the analyzer will show a true representation of the two tones in the frequency domain.

Analyzer Presentation

The easiest test signal is to say "hello, test" into the microphone. But since individual voices vary and it is not easy to maintain a constant audio level and view the voice in a meaningful way on the analyzer, the standard two-tone test signal is employed. If there is no IMD in the transmitter, the output signal is a replica of the two tones, raised to the carrier frequency of the transmitter (fig. 4). This is a representation of a commercial SSB transmitter, driven by a two-tone RF signal; the tones are separated by 2 kHz. The test signal is created by using a combination of 3000 Hz and 5000 Hz audio tones introduced into the microphone jack of the transmitter. The transmitter suppressed carrier frequency is 14,200 kHz. Upper

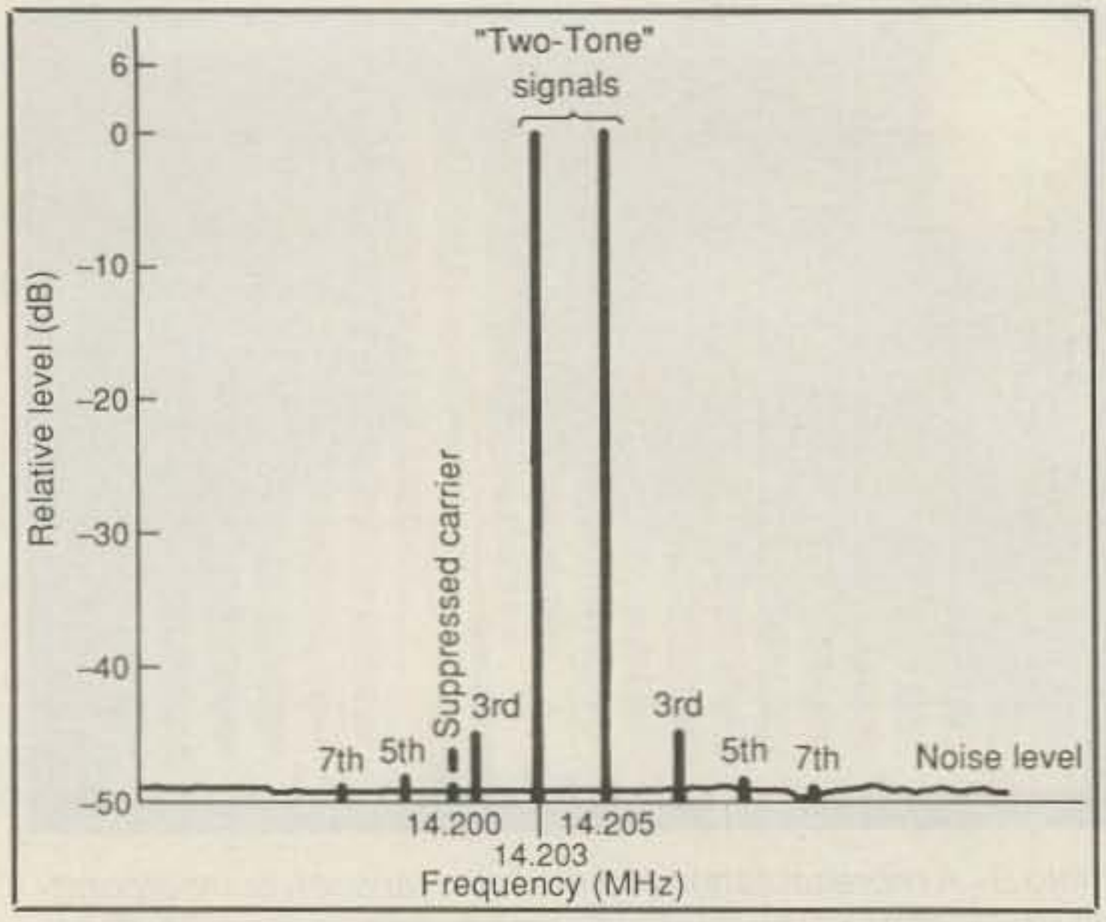

Fig. 4– An analyzer presentation of a transmitter driven by a two-tone signal. The two tones are shown as separate RF signals (upper sideband). The suppressed carrier (down 45 dB from the level of the tones) is shown, plus the intermodulation products (spurious signals) of the tones. The unwanted products are caused by transmitter nonlinearity and fall symmetrically each side of the test signals. The third-order products are suppressed 45 dB below the test tones, and the fifth-order products are "down" 48 dB. The seventh-order products are so weak they are almost in the background noise. Higher order products (ninth, eleventh, etc.) cannot be observed in this test.

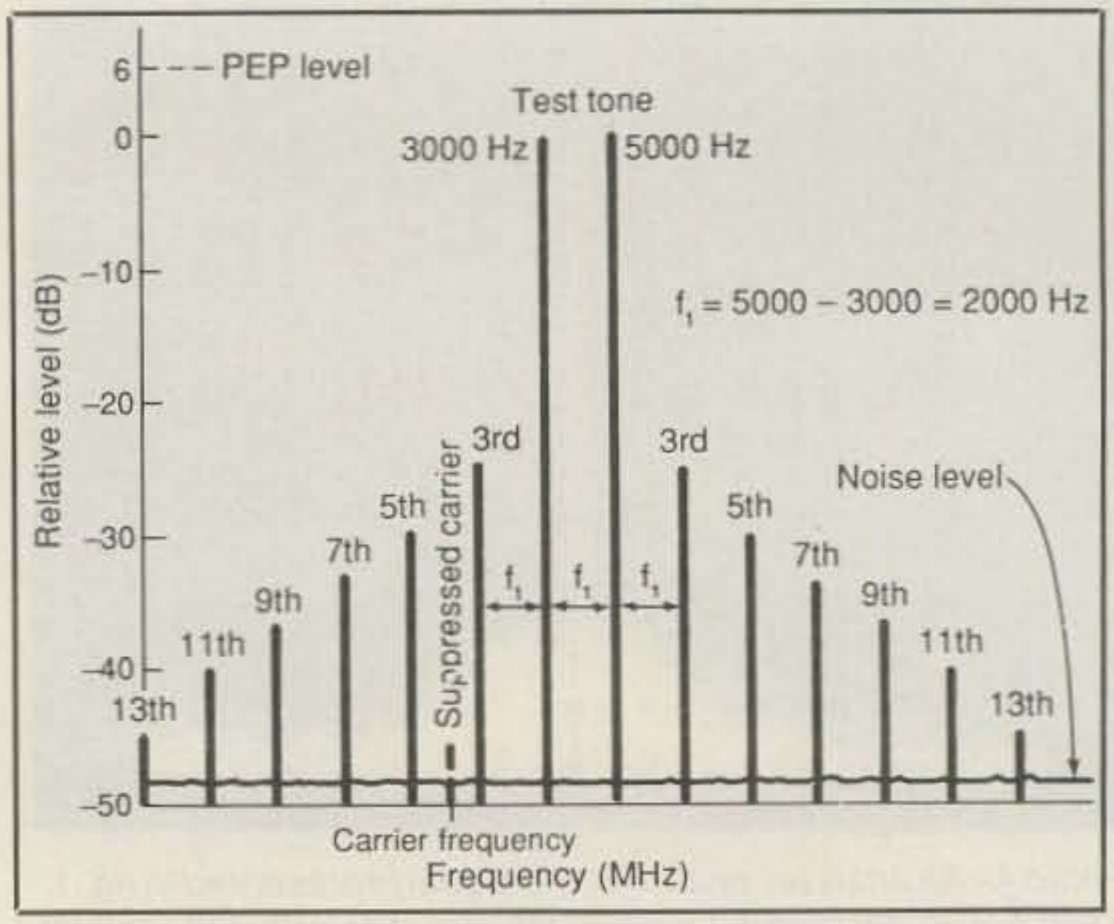

Fig. 5– A representation of a typical 100 watt SSB signal (USB). The two test tones are 2000 Hz apart, so the spurious odd-order products are also 2000 Hz (2 kHz) apart. The thirteenth-order products are down only 45 dB from the two tones. They are about 12 kHz away from the tones. If the received signal of this transmitter is 20 dB over S-9, the thirteenth-order products could easily be heard by nearby amateurs, and the signal would have "splatter" over a 28 to 30 kHz range! This example is representative of many of the transmitters on the air today.

sideband is used, and the resulting RF signals are at 14,203 kHz and 14,205 kHz. The separation between the RF signals is 2 kHz, just as in the case of the audio signals.

In real life the analyzer picture may be complicated. If the transmitter has IMD, is out of adjustment (too much drive or too little loading), undesired signals (spurious products) are generated which are within the transmitter passband or very near to the transmitted signal. A representation of a two-tone test signal showing transmitter IMD is shown in fig. 5. A number of spurious frequency pairs are visible. The pairs adjacent to the test signal are called third-order distortion products; the next outer pair are fifth-order products spaced equally outside the third-order pair; the next pair are seventh-order; and so on. They are so-named because of their mathematical relationship to each other. Many of the spurious products are so small in amplitude they may be ignored in amateur practice. A photo of a well-behaved, 100 watt transmitter is shown in photo B. The third-order prod-

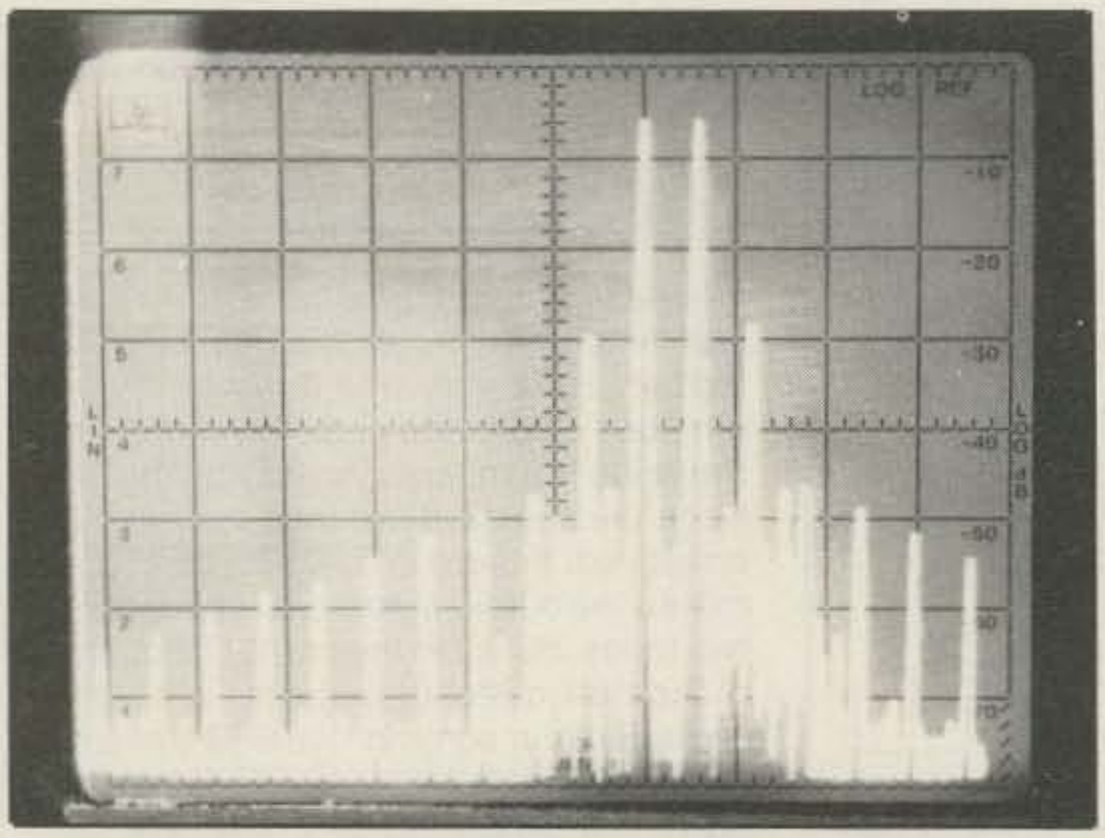

Photo C– Spectrum analyzer photo of 100 watt transmitter operating with speech compression. Close-in intermodulation products rise. Other mixing products, close to the two-tone signal, can be seen. These are caused by the compression, and when voice is transmitted it tends to be harsh and raspy.

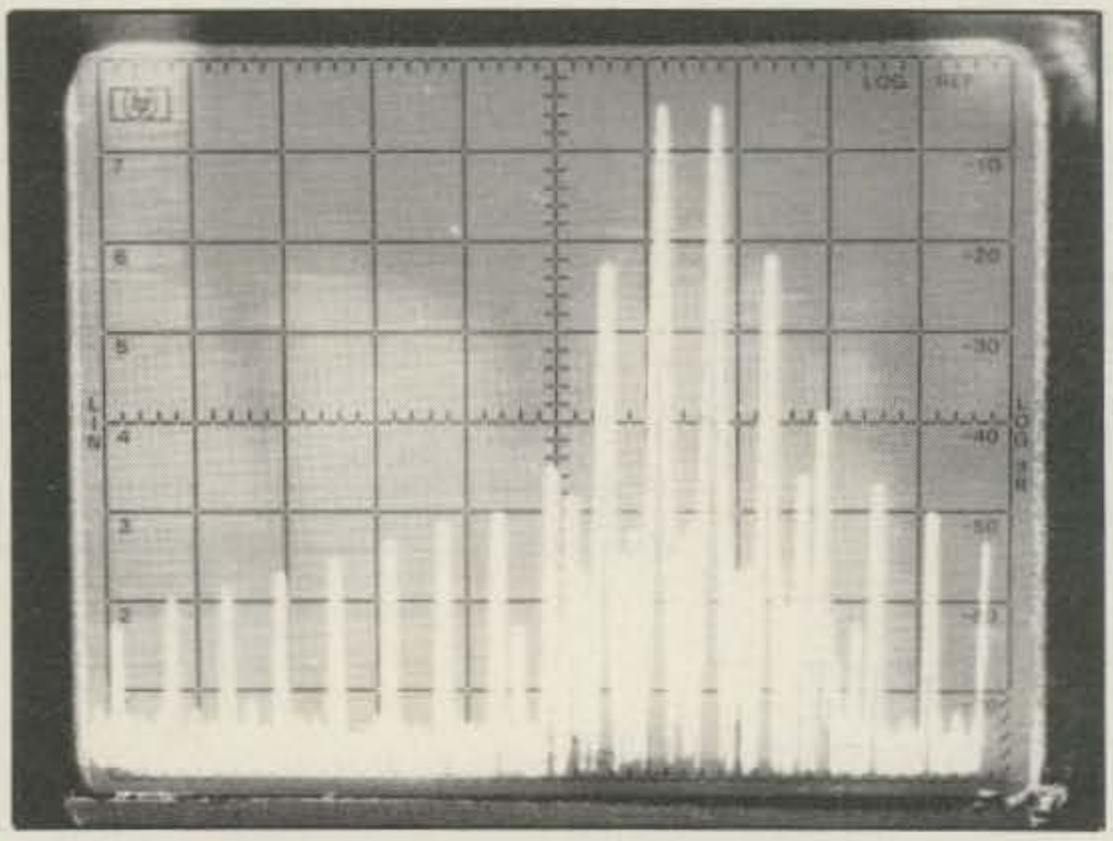

Photo D– A high level of compression boosts close-in intermodulation products and increases spurious products. Too much audio gain, too much compression combine to distort the voice and broaden the signal. (All photos courtesy of W6GNX and taken on a Hewlett-Packard 141-T analyzer.)

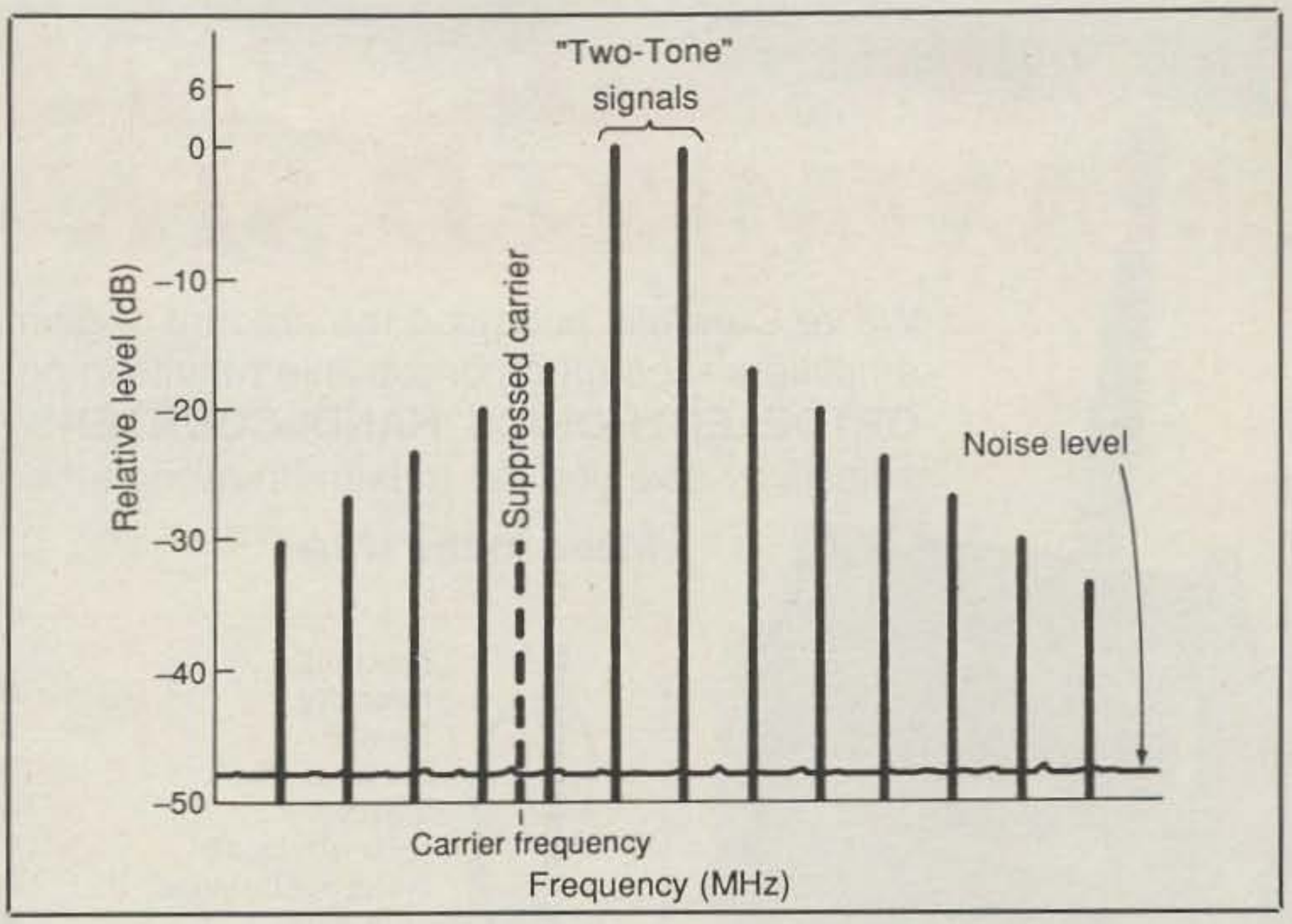

Fig. 6– An older transmitter using sweep tubes with no RF feedback. Intermodulation products are high and carrier suppression is poor. Improperly loaded, or over-driven, this transmitter can disrupt nearby frequencies for miles around.

ucts (those nearest to the two-tone test signal) are reduced 34 dB below the tones. The fifth-order products are down 40 dB. The higher order products drop off gradually until they drop into the noise at about 68 dB below the level of the two tones.

(In passing it should be noted that as the transmitter power is divided between the two tones, the PEP level is 6 dB above that of the tones. The top of the screen, therefore, represents the PEP level.) Older transceivers, especially those using sweep tubes and no RF feedback, present a bleak picture (fig. 6). This represents a transmitter with a pair of 6LQ6s in the amplifier. Note the high level of IMD products! A well-trained ear does not need a spectrum analyzer to pick out one of these transmitters, especially when it is being driven hard, with a lot of speech processing!

Regardless of the type of transceiver, by using a spectrum analyzer the operator can adjust the transmitter for best IMD performance, holding the two tones at constant amplitude and checking the amplitude of the odd-order products. (In some cases, the adjustment is merely turning down the audio gain or processing control!)

Photo C shows a transmitter operating with a small amount of speech compression. Power output is held at 100 watts PEP. Note that the third-order IMD products have risen 10 dB, as compared to those in photo B. Other mixing products close to the two tones have also risen, and the result is that the observer notices distortion in the transmitted signal. If a voice were used instead of the test signal, it would sound raspy.

Photo D shows a high level of compression. Third-order products are only about 16 dB below the two tones. A voice signal would sound "rough" with this amount of speech processing. Note that the higher order products have risen by about 6 dB, as compared to no compression. No doubt local amateurs will notice the difference in terms of close-in splatter. Even a modern transceiver, as good as it is, cannot withstand the effects of overdriving. Too much audio gain, combined with excessive processing, produces the results shown in fig. 6. This is a picture of why Big Mouth sounds so bad!

The cure is simple. If Big Mouth turns down his gain, his transceiver is not overloaded. If he turns down his processing, the higher-order intermodulation products quickly drop to tolerable levels. The problem is to convince him to do these simple cures!

Checking for IMD With Your Receiver

It is nice to have a spectrum analyzer, and this subject will be discussed later. However, if you have a modern transceiver, you can investigate the IMD of a received signal by just flipping sidebands, watching your S-meter, and simultaneously listening to the distortion products falling in the opposite sideband.

As an example, my good friend W6GNX has a Kenwood TS-950SD transceiver incorporating digital signal pro-

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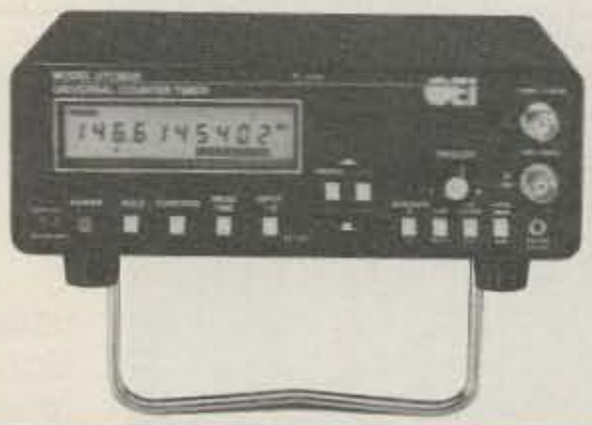

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cessing. I have a similar transceiver. Our signals on 40 meters usually run about 40 dB over S9 at each other's station. When I switch sidebands on my TS-950SD, the signal of W6GNX drops into the background noise. I have to listen very carefully to hear faint, low-frequency noises that indicate low-level IMD falling into his unwanted sideband.

On the other hand, about the same distance away in a different direction is Big Mouth, operating an old sweep-tube-type transceiver with "all knobs to the right." Listening to his opposite sideband on the TS-950S reveals plenty of "garbage," down only about two S-units from the meter reading on his operating sideband! Splatter extends out nearly 30 kHz on both sides of his signal. Lucky for me, he is moving away in a few weeks. I feel sorry for the amateurs near his new QTH!

Observations on IMD

Rough rules of performance can be outlined as far as IMD goes. These rules are based upon countless observations on various SSB transmitters. Older rigs using sweep tubes (6LQ6, etc.) have IMD third-order figures in the −21 to −26 dB range (measured from PEP). That's not very good, judged by today's standards. Other rigs using 6146-type tubes exhibit IMD ranges falling between −24 and −28 dB below PEP. The famous Collins S-line (which incorporates RF feedback) can better these figures by about 4 to 6 dB. That's very good for a tube-type exciter.

Solid-state rigs seem to run from −34 dB to −40 dB third-order products, depending upon the amount of RF feedback used and the voltage applied to the amplifier stages. That's good performance for equipment falling in the price that amateurs can afford!

Of course, when Big Mouth operates any of these rigs, all bets are off!

Your Very Own Spectrum Analyzer—Why Not?

It is comforting and very instructive to own a spectrum analyzer. You'll learn a lot about your transmitter if you have an analyzer. The stumbling block is the price. A good commercial analyzer, new, costs well over $15K. Sometimes a used or surplus one can be picked up for around $4K. In the case of such a complex device, my suggestion is to test it out thoroughly before you buy it. Alignment and repair can be a problem!

The best buy for the amateur with a lean purse is a surplus military spectrum analyzer. One such instrument that has been available for a few hundred dollars is the Navy TS-1379A/U analyzer. Also available on the surplus market is the Navy SG-376A/U two-tone generator. The former is an upgraded, solid-state version of the older Panoramic SB-12 analyzer, long an industry standard. While not equal to a Hewlett-Packard 141-T analyzer, the Navy instrument will do a good job for amateur gear. IMD measurements made with the TS-1379A/U compare favorably with a more expensive instrument, within the limitations of the Navy analyzer.

A lot of TS-1379A/U's were floating around a few years ago. Tucker Surplus Store and Fair Radio Sales still have them from time to time. If you are lucky, you can find one in a fleamarket for a lot less than the going surplus price. Buying one is money well spent. Make sure you get a manual and the cathode ray tube (CRT) is operational. The TS-1379A/U has built-in test oscillators that allow you to check it out in a few moments. Along with the two-tone generator, the analyzer will allow you to check out Big Mouth's rig, if he will let you do it!

Thanks to "Tiff," W6GNX, for the use of his HP-141T analyzer and camera for the IMD tests and photos used in this article.

The Dead-Band Quiz

Well! No wonder I don't hear readers of this column on the air! They are all glued to the boob-tube, watching old black-and-white movies! I was bombarded with replies to my June quiz about the movie *Key Largo* starring Humphrey Bogart, Lauren Bacall, and Edward G. Robinson (plus other great stars) and the events aboard the *Santana*.

Thanks to Joe, 4Z4JW, who correctly identified *The Third Man* movie, but whose reply must have traveled very slowly by camel from Israel to California! And thanks to Peter Marsh for his discussion of telephone interference!

A New Dead-Band Quiz

Obviously, I have been too easy on my readers. How about this one? These are the ending lines of the book. For obvious reasons, I have left the name of the hero blank:

"—— missed the dawn. He boarded a TWA 747 that left Dulles on time, at 7:05 A.M. The sky was overcast, and when the aircraft burst through the cloud layer into sunlight, —— did something he had never done before. For the first time in his life —— —— fell asleep on an airplane."

What is the book (recently made into a movie) and what is the name of the hero?

Good luck, and "until the next time, when, possibly you may tune again, keep the Old Maestro always in your dreams . . . ." (Who said that?)

73, Bill, W6SAI

PACKET USER'S NOTEBOOK

BY BUCK ROGERS, K4ABT

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

Viva la SouthNet!

At the SouthNet Packet Conference in June I witnessed the results of the new No-Code license. As a matter of fact, most of the No-Coders I met were in a test session *upgrading* to a higher class license.

The SouthNet Packet Conference was well received by the digital community, as there were several hundred more in attendance this year than last year. AEA, PacComm, MFJ, Alinco, and other companies that are into the digital swing were also there. The SouthNet was a good conference this year with speakers and demonstrations in almost every field of digital communications.

There was an especially good session with the Georgia Radio Amateur Packet Enthusiast Society (GRAPES) presented by Dennis Barrow, WB4GQX, and Doug Drye, KD4NC. The 56 kB network they have worked with for the last five years is beginning to grow in the southeast. It is moving toward becoming a trunking system which can be fed from the 9600 kB backbones and users.

I hope to have more about SouthNet later, if and when I receive the photos of the SouthNet Packet Conference. The photographer who took pictures must have forgotten me, as I've not received the pictures that were to be in this month's installment of the "Packet User's Notebook." I hope to have some photos of the 1991 SouthNet later.

P.O. Box 158673, Nashville, TN 37215

It's Really Happening

We are witnessing the beginning of a new era in amateur radio. This event is occurring, for the most part, in the digital medium of our hobby. The No-Code license is allowing more and more computer-minded persons to enter the ranks of amateur radio. As a direct result of this new entry-level license, we digital longtime users can be the tutors of the new amateur.

There is a lot to look forward to, inasmuch as the manufacturers are taking note of the sudden increase in the number of digital practitioners. If they govern themselves accordingly, however late, the OEMs will surely be compensated for the efforts they direct toward the digital community.

It's Time To Look At The Basics

The last time we saw an upsurge in our ranks was when FM repeaters became popular. Before that, it was the advent of single-sideband technology that created renewed interest. The first time I can recall a sudden increase in the ranks of amateur radio was in the early 1950s when the Novice license was born.

From a recent on-the-air study I conducted, and from some of the letters I've received recently, I'm fully convinced that we need to revisit some of the basic elements of our packet hobby.

There are many newcomers to packet radio who are attempting to "roll their own" packet stations. Through no fault of theirs, the new packeteer will wire the new Terminal Node Controllers (TNCs) to the computer, and by following the con-

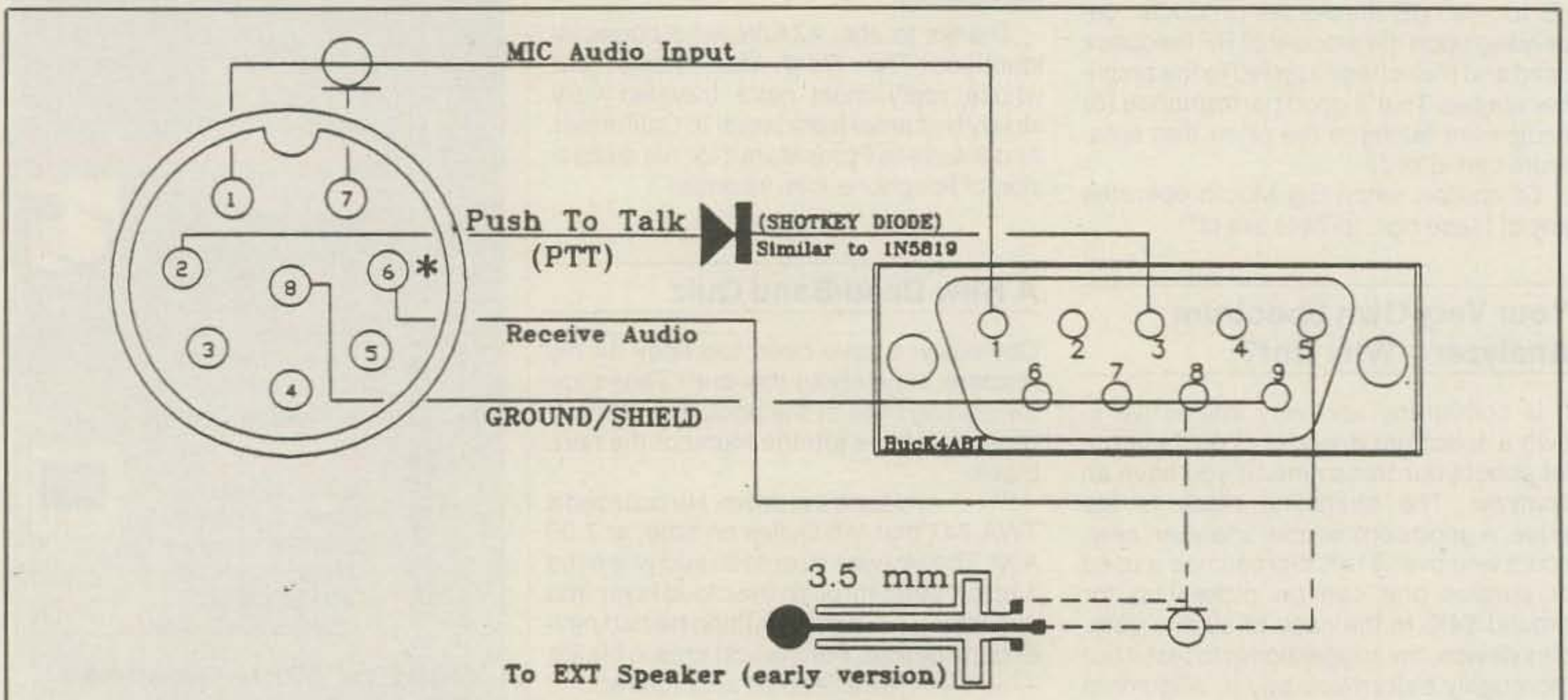

Fig. 1– For the Notebook: Alinco DR-110T and DR-112 to Kantronics KAM, KPC-2, KPC-4, KPC-2400. Later versions of the Alinco Data Radio (DR) series may have receive audio present at pin 6 of the mic connector. Check the DR-110T owner's manual for this feature. The Alinco DR-110T and DR-112 use true FM techniques.

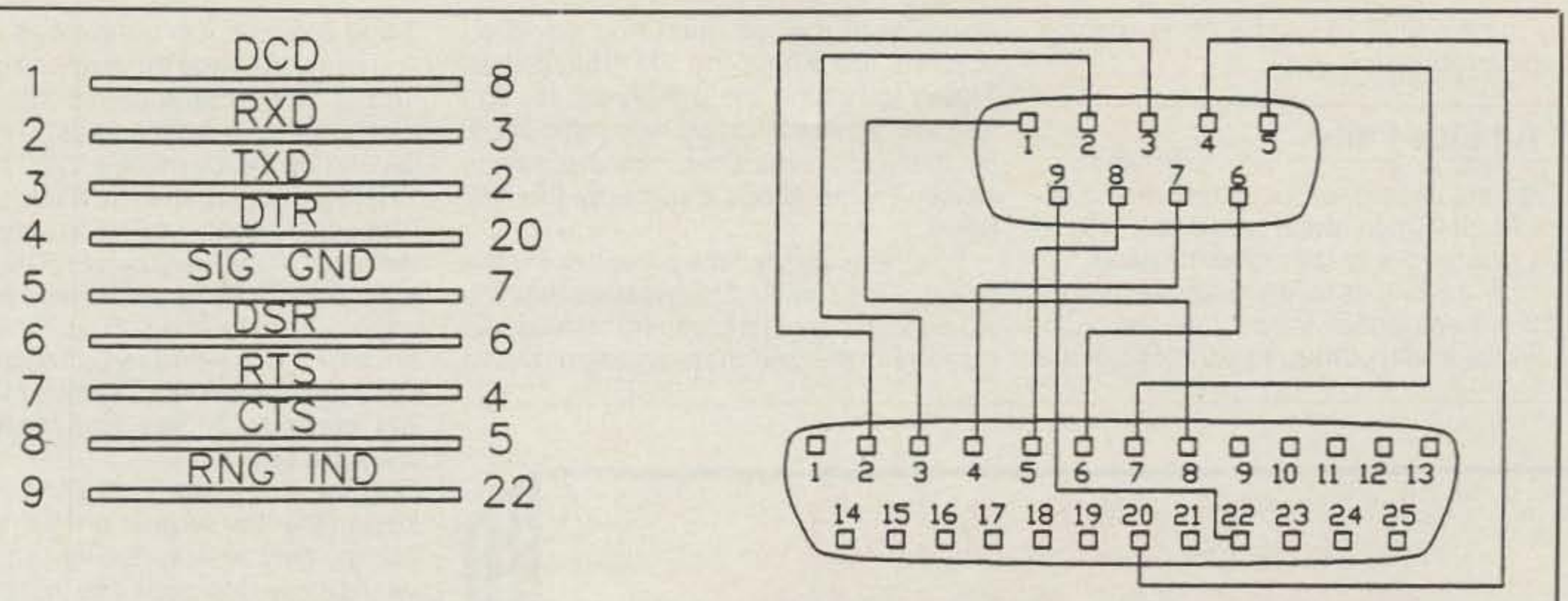

Fig. 2– For the Notebook: DB25 to DB9 adapter used to interface late-model PC to earlier DB25 type ports.

necting scheme in the TNC manual, he or she will next make the connections to the transceiver input connector.

In a rush to put the new packet station on the air, the new packeteer often fails to check the amount of transmit audio (AFSK) from the TNC to the transceiver. With some TNCs this level may be too low, but with others it may be too high.

Since the majority of packet operations begin on VHF, the controller is inputed to an FM transceiver.

More Is Not Always "Better"

The reason this problem exists in the first place is because most transceiver manufacturers have not considered the fact that many of their new models are being used for data communications.

The next generation of test equipment needed in the ham shack is an item called a "deviation meter." There are lots of manufacturers of deviation meters. However, the cost of the product is restrictive, and too, it is often manufactured as an integral part of a larger piece of test equipment that supports a combined deviation meter, tone generator, frequency meter/counter, and power meter. All this is rolled into one very expensive master station test monitor.

So often I hear this remark, but in the form of a complaint: "I can print the other station, but I can't connect to it."

Here comes the scenario. The new packeteer has everything connected as specified in the manual and is now printing packets from other packet stations. As the streams of data flow across the screen, this same new packeteer wishes to connect to a station or BBS that has been spotted on the frequency. The incoming signal is good, and the print is perfect.

Now comes the moment of truth. The new packeteer has the manual handy and the connect routine down to perfection. Why shouldn't it be perfect? He or she has read the book and watched friend Steve down the street do it a hundred or more times.

The connect request is typed in and the <**enter**> key is pressed:

C K4ABT <enter>

After about 40 seconds and ten tries (default RETry) the screen deposits the following:

Retry Exceeded
***** DISCONNECTED >**

The important TNC parameters are checked again to be sure they are correct: **TXDelay** is 35, **DWait** is 16, **FRack** is 4, and since the computer-to-TNC connection is using hardware hand-shaking, **XFLo** and **FLOw** are set to **OFF**. Everything seems to be set correctly.

A quick telephone call to a nearby packeteer, and we are on the way to finding the problem. The nearby packeteer listens on the same frequency while the new packeteer tries the connect in the same order as before. This time the nearby packeteer notices the audio is louder than other stations in the area. There is also some "hash" or maybe it is distortion present in the transmitted audio from the new station. The problem has been identified, but the cure is not a simple one!

The problem lies with the fact that too much deviation, and possibly too much speech amplification, is taking place inside the transceiver. Yes, the two are different, yet they both can cause a common problem. Too much of either speech amplification or deviation can cause the above problem.

Lyle Johnson, WA7GXD, recently made a suggestion in the "Packet Status Register" that a standard should be set so that audio voltage to an amateur FM transceiver audio input would be set for 2 volts peak-to-peak input using a 2 kHz tone. The result would be three kHz of transmitter deviation. The idea is a good one, but. . . . Good luck, Lyle. I hope you are successful with the manufacturer "listening posts."

As a matter of interest, I spoke with Heather Johnson, N7DZU, and she tells me that Lyle and some others at TAPR are working on an inexpensive deviation me-

ter to help alleviate some of our packet audio problems.

If All Else Fails

If you are unable to locate the proud owner of a deviation meter, then look next to the local two-way radio service shop.

It is advisable to have knowledge of which component inside the TNC controls the audio output. In addition, locate where both the mic gain and deviation controls are within the FM transceiver. This is to reduce the time spent looking for them while at the two-way radio shop. By minimizing the time, you are saving money (some shops charge by the half hour).

In either case, tell the person doing the setup of the TNC and transceiver that you would like to have a clean transmit audio signal with the deviation running between 3 and 3½ kHz. *Do not exceed 4 kHz*, or you have defeated the purpose of all your efforts. The reference modulating tone can be taken from the (most) TNC (in the CAL mode), or by using a 2200 Hz tone.

If the latter is used, the audio should be rechecked when the TNC is connected to the input of the transceiver. The TNC level more than likely will have to be adjusted to match the level of the 2.2 kHz reference tone that was used in lieu of the TNC **CAL** tone(s). **Do not readjust the internal controls of the transceiver after they are set!**

There are some VHF FM transceiver kits on the market that are being assembled by new amateurs. Even an old-timer would have fun with one of these new boxes. From those I've heard on the FM voice repeaters lately, they leave something to be desired.

A new ham near here had just finished one of these jewels and was trying to get someone to talk to him. In desperation he gave a CQ on the frequency. I was able to understand enough of his words to give him a call and get my telephone number through to him so we could get together on the land-line. The audio was so muffled that it was almost unintelligible.

Soon we were talking on the telephone. I asked what kind of radio he was using. His reply in a proud voice was "It's a kit that I just built." As it turns out, there were two of these new amateurs. Both had received their licenses the same week, both had ordered identical transceiver kits, and both radios were exhibiting the same symptom.

It took all of 20 minutes of testing to administer a short-term cure. We had the first of these unshielded (seems the kit is sold without a cabinet) VHF rigs sounding better. The problem was resolved by turning down the transceiver internal "mic gain" control.

The next day Bob took the transceiver to a shop in Nashville. The technician set the deviation control to the correct level by using a deviation meter. Bob has a much better sounding signal than the first time he went on the air. He is even happier now with his kit-built transceiver (and you did a good solder job, too, Bob).

Finally, if the transceiver you are using for packet operation doubles as the voice transceiver, then it would be wise to have the microphone handy when you are setting the deviation. The voice level can be optimized with the level settings of the TNC. In my case, the radios I use are dedicated to packet and operate exclusively in a data environment.

If I must choose, then I make sure the level control is set to favor data. Voice operation is secondary. If the audio is tailored for data, then in most cases voice operation will sound better, too.

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CIRCLE 48 ON READER SERVICE CARD

VHF PLUS

BY JOE LYNCH, N6CL

ALL ABOUT THE WORLD ABOVE HF

Reporting on Activities of Those Shorter Wavelengths

This month I want to thank all of you who have expressed support for this column. I really appreciate all the material you have supplied for it. I have news coming from everywhere. I want to thank Harry Schools, KA3B, who supplied me with most of his recently published newsletters. I also want to thank John Carter, KØIFL, for sending me copies of his recent issues of his terrestrial and EME newsletters. Now let's get to the news.

Let's start this month's column right off with some exciting news about a new world record! On June 8 at around 3 AM local time Dave Chase, KY7B, and Terry Wilkinson, WA7LYI, set a new laser record of just under 154 miles. With this record, they broke their old one of 95 miles. Dave was operating from Mount Lemmon (DM42ok) at an elevation of 9157 feet. Jim Volger, WA7CJO, assisted him. Terry was operating from Towers Mountain (DM34tf) at an elevation of 7625 feet. Gary Judd, WB7SLY, and Bruce Ellefritz, N7PMO, assisted him. They operated on 442 nanometers (or around 668 kGHz), in the deep blue (visible) light range. They used about fifteen mW, employing HeCd (helium-cadmium) lasers. The QSO took over 5 hours to complete because clouds and heat and smoke from a forest fire kept blocking the path. Their mode of transmission was CW and they used EME protocol to complete the contact. More fascinating information can be found in their article in this issue.

Dave says that they will try to beat this record this month, hopefully doubling it. Terry says that after the record is established they will try to bounce the laser off cloud formations. Can the moon be that far away? You will read the results of their tests in this column.

As mentioned in the sidebar last month, on June 4 the ARRL petitioned the FCC for 216–220 MHz for use by the Amateur Radio Service on a secondary basis. According to ARRL Official Bulletin No. 22: "Operation would be limited to fixed, point-to-point circuits, and would be coordinated so as to avoid interference to primary occupants including maritime mobile. Attached to the petition were engineering studies showing that limited amateur use of the band was compatible with present and other proposed users, and with television broadcasting in the adjacent band. This access to 216 to 220 MHz is sought as a partial substitute for the band 220 to 222 MHz, recently reallocated to land mobile."

In an interview I had with Perry Williams, W1UED, of the League, he advised me that the petition requested the maximum power output of 50 watts and prohibition of repeater operations. He also stated that the ARRL has filed comments on the TV answer-back petition that requests a half megaHertz around 218 MHz. He feels the engineering studies supplied with the ARRL petition would show that the new amateur service would be compatible with the existing services and the proposed new answer-back service. He further stated that the primary purpose of the petition is to establish high-speed point-to-point packet communications.

If this petition is successful, various coordinating concerns can develop a national band plan that will move some of the packet operations to the new band. This accord could release spectrum between 222 and 225 MHz for nationally coordinated weak signal work. Stay tuned.

Regarding the old 220 to 222 MHz amateur band, there may be a bit of poetic justice brewing over it. According to a report aired on "Newsline" (an amateur radio news service transmitted on repeaters across the country), UPS may never get the use of 220 to 222 MHz. The report indicated that over 50,000 applications have been received to date. The report also stated that there were an additional 50,000 applications "in the works." Since there has been such a volumn of interested applicants, the FCC is considering awarding the spectrum by lottery. If that happens, UPS's chances of receiving a license will be as equal as all other applicants.

The other item I mentioned in the sidebar was the reports of very good openings on VHF due to tropo scatter, aurora, and sporadic-E. DXpedition organizers contacted by me said that they enjoyed very good openings before, during, and shortly after the ARRL VHF QSO Party. Upon my return from Ham-Comm in Arlington, Texas on Sunday evening, June 9, I had a QSO with local W5NZS on 50.250 MHz. After we signed, I had a pile-up. Conditions were so wild and crazy that Randy, K5ZD, operating from K1TR, begged me to drive back down to EM14. I almost complied!. I found out later that the band had been hot for at least two hours earlier. If I had been mobiling from Arlington, well . . . George Jacobs is planning full coverage of the Sun's activity in his November "Propagation" column.

The excellent propagation showed up in most of the June DXpedition reports I received. Among the ones I obtained are: WA4VCC and company to VP9, N6CW to XE2, the joint N6XQ and N6CA trip to XE2, KB4CRT to 6Y5, and KA3B to FS.

WA4VCC and company to VP9. Using the call WA4VCC/VP9, AA4SC, K4MQG, AA4R, and WA4VCC and their wives operated for several days surrounding the VHF QSO Party in early June. Ted reported that they made over 650 QSOs, including four on 2 meter tropo scatter (contacting W4ZD, K4CKS, K4HJE, and WB4TWX). They also made several contacts on OSCAR, making many satellite users happy.

N6CW to XE2. Terry and Ann Baxter left San Diego and headed south through thirteen grid squares for a fishing trip in Baja also on days surrounding the VHF QSO Party. Upon completion of his trip, Terry had made 427 QSOs on 6 and 3 tropo QSOs on 2. He was successful in making contacts from DL36, DL37, DL38, DL39, DL45, DL46, and DM10, with most of his activity coming from DL36 and DL45.

Upon my return from choir practice, I heard Terry booming in from DL45. I helped him work the last one of three VE3's, whose first hops were landing on EM15. Terry reported some confusion over his callsign, XE2N6CW. He stated that the license form showed the callsign "XE2-N6CW" and that it was simpler to say "XE2N6CW" than "XE2 hyphen N6CW." He further said that since there was no fraction bar printed on the license, "XE2/N6CW" was not correct. Wow! I expect that clears up the confusion, at least for Don Search.

N6XQ and N6CA to XE2. While Terry and Ann were on the road through Baja, N6XQ and N6CA also headed south through Baja. Their combined efforts netted about 275 QSOs, with six on 144 MHz, two on 432 MHz, three on 1296 MHz, and

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the remaining on 50 MHz. Jack reported an unusual opening on tropo to Phoenix from DL28, a path over a couple of mountain ranges. Jack left his van in La Paz and planned to fly down to retrieve it during July. While down there Jack planned to put XE2HWB/B on the air from XE2HWB's QTH in DL44. The beacon should be running around 3 watts, using a dipole and operating on either 50.005 MHz or 50.054 MHz. If you didn't work Jack on the way down, maybe you got him on his return trip.

KB4CRT to 6Y5. John headed to Jamaica for several days surrounding the VHF QSO Party. He took an ICOM 575A with a brick and a three-element portable beam for 6 meters. He operated the 575 barefoot with a dipole on 10 meters. He made a total of 64 QSOs on 6 and made quite a few happy operating on 10 when 6 was dead.

KA3B to FS. Harry's report from French Saint Martin was not quite as exciting. He made a total of 26 QSOs, all on 6 meters. Well, word has it that at least Harry had fun at the nude beach! Maybe that's what kept his QSO count down.

At least one report on aurora came to my attention. Gene Zimmerman, W3ZZ, reported openings during several days in June. He remarked that while the openings were not particularly intense, they were regular. He recounted at least one opening into EM13, working WB5LUA.

Earlier, I mentioned my returning from Ham-Comm. "What is Ham-Comm?" you ask. Well, it is just the southwest's biggest amateur radio convention. It was at the Arlington, Texas Convention Center, and dealers came from *everywhere*. The fleamarket was overflowing, and there were seminars for *everyone*. The featured speaker (and banquet speaker) was Linda Godwin, N5RAX, a mission specialist on the "Atlantis," the shuttle recently flown for mission STS-37. That flight was unique because it contained an "all ham" crew.

Linda gave an excellent slide presentation, and told of the experience of being DX in space and working the pile-ups. She said there are several other astronauts studying for their amateur licenses. She also stated that as the crew of this mission get separately put on future missions, the door will open for more amateur radio activity on coming flights.

Among the seminars for *everyone* was one for the microwave enthusiasts. The North Texas Microwave Society presented a three-part seminar. The first part, presented by Kent Britian, WA5VJB, concerned building a cheap Doppler radar. He demonstrated a Gunn diode operating around 10.525 GHz, showing the reflectivity of many items, including glass and fiberglass. He spoke of the relative ease of getting the parts needed (used grocery store and department store door openers and burglar alarms). He said there were many ways to make sure the radar was working properly.

He admitted that one of his checks including turning it on at an 18-wheeler somewhere on I-35 in Kansas. He said that the results were a bit spectacular, watching the trucker trying to make a quick slowdown. (Kent wanted me to say something about 18 skid marks on the pavement. I just can't do that, Kent, not in this column.) Kent has prepared a very informative paper on homebrewing a Doppler radar that he will be happy to mail to you for a large SASE sent to Kent Britian, 1626 Vineyard, Grand Prairie, TX 75052.

Following his presentation, Kent fielded questions from the audience. Among the subjects addressed was DXing on 10 GHz. Kent stated that one should throw out all one has learned about 10 GHz being limited to line of sight. He stated that with 25 to 50 watts on CW or SSB, one can regularly complete QSOs of greater than 150 miles. Hum, sounds like 40 meters!

Frank Perkins, WB5IPM, presented the second part of the seminar. He discussed several sources of public-domain software that apply to microwave work. He will send you a list if you send him an SASE to Frank Perkins, 2010 Arborcrest, Arlington, TX 76012.

Robert Skegg, W5/G3ZGO, conducted the final portion of the program. He had a very interesting slide show documenting early work on 10 GHz in Great Britian. Specifically, he walked us through the adventures of being the first in the UK to make a QSO more than 150 km in distance.

The seminar was standing room only and repeated the following day for the enthusiasts who weren't able to make the first one.

While we are on the subject of microwave, I want to mention the annual Microwave Update Conference held October 17–20 at the La Quinta Inn in Arlington, Texas. Registration fee is $35.00 paid before September 20 and $40.00 if paid after the 20th. The fee includes an ARRL published $12.00 Conference Proceedings. Mail your checks to Al Ward, 2375 Forest Grove Estates Rd., Allen, TX 75002 and make them payable to North Texas Microwave Society. Several programs are planned, from construction to contesting. Among those scheduled to speak are: Keith Pugh, W5IU (AMSAT); Jim Volger, WA7CJO, of the Bedlam Microwave Society in Arizona (10 GHz EME); Barry Malowanchuk, VE4MA (PA's for 3456 MHz); Dave Meier, N4MW (EME and Beacons); Paul Rinaldo, W4RI, *QST* editor (ARRL and WARC 92); and many others. I should be there Saturday until after the banquet. I hope to see you there.

A couple of new beams have come to my attention. Joe Reisert, W1JR, of Cushcraft, introduced two new beams for 144 MHz at Dayton. The most popular was the new boomer, the 17B2. This 17-element, 31 foot long antenna replaces the 4218XL.

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Joe had it measured during the antenna gain measurement tests conducted at Dayton. It came in an impressive second place. It measured 14.0 dBd and lost by only 0.15 dB to a homebrew modified K1FO 19-element, 35 foot boomer presented by W8ULC. The other new one is the 13B2, a 13-element beam designed to replace the 215WB.

Among some of the improvements the 17B2 has are: tapering in spacing and length, single element reflector (as Joe says, "Let Trigons be bygones."), a T-match balanced feed with a weatherproof built-in balun, an "N" connector, and new, stronger boom mounts. Joe told me in an interview that both antennas were designed close enough to their predecessors that they can be used with them in stacked arrays. I hope to have a review of one or both of these antennas in a future issue.

While we are on the subject of antennas, I recently bought an HF quad from Lightning Bolt antennas based on the review done by Lew McCoy (see *CQ*, August 1990, page 64). I have since found out from the owner, Mike Duddy, WB3ECM, that he will supply a kit for the 2-element triband quad which will also make it usable as a 3-element quad on 50 MHz. He will supply the parts for the new driven element and the wire clamps to add the director and reflector to the existing driven element and reflector, respectively, for around $60, plus shipping to your QTH. His Lightning Bolt quad ad is in the classified section of this issue. I must say that my quad (up only 33 feet) is quite a performer, and I am looking forward to modifying it for 6 meters.

Current Contests

The ARRL September VHF QSO Party will be the weekend of September 14–16. It has a different emphasis than the June QSO Party because of the type of propagation found during this time of year. Six meters takes on a new light because much of the sporadic-E has gone away. Weather-affected propagation on the higher frequencies is generally the rule as we get into the early fall.

There is one other factor to consider for this particular contest weekend. It is something that will kill good propagation every time. It is such a strong influence that all other negative components combined will not match the problems this obstacle produces. This dilemma is none other than a good nationally televised college football game on Saturday and a good nationally televised pro game on Sunday. When these two forces combine, there is no need to check for the band opening because there is no one there to work. If you can stay away from football, check John Dorr's column for a summary of the rules and send an SASE with two units of first-class postage to the ARRL for logs and entry forms.

The second half of the ARRL 10 GHz Cumulative Contest is September 21–22. Check with the ARRL for full rules for this fun little contest.

Finally, if you think you have troubles, consider the plight of Louis Anciaux, KG6UH/DU1. You may remember Louis from his former call, WB6NMT, and his former company, Lunar Electronics. He wrote to Harry Schools, KA3B, that he has to contend with broadband white noise with a signal strength of S9 on 6 meters from a solid-state television transmitter located 15 *miles* from him. If that is not enough, recently a telephone extender device showed up on 50.1 MHz that with an amplifier and an antenna is 50 dB over at Louis's QTH. On one opening to Australia the VK's were copying it S9!

As I say in my section manager's column, "That's not all the news, but that's all the room for all the news." Next month I will have a survey for you to consider. I want to know what changes in rules you might want to see in the CQ WW VHF WPX Contest. I also want to see if there is interest in a VHF WPX or VHF county award program. Additionally, I hope to have an interview with a well-known Central American VHF enthusiast in the can and to give a report on my possible trip to TI6 (EK80). See you on those shorter wavelengths. 73, Joe, N6CL

The MM-3 Morse Machine is...

The Ultimate Keyer!

Without a doubt, the MM-3 Morse Machine from AEA is the ultimate keyer. Whether you're a contester, DX chaser or ragchewer, there is *no better memory keyer available*.

Just look at these memory keyer features:

- 20 "soft-partitioned" memories (8K standard, expandable to 32K).
- Complete adjustability of your Morse signal – dot & dash length, letter & word spacing, and more.
- Straight, Bug, Iambic, and Curtis A&B™ keying modes so you can use the MM-3 just like you've used other keyers in the past.
- Enter commands via the keypad or from a computer through the MM-3's serial port (optional).
- Automatic serial number generation and insertion.
- Paddle reverse command to accommodate different types of paddles.
- Common command list on the front panel for quick and easy operation.
- Real-time or automatic memory spacing.

In addition to these features, the MM-3 is also a full-fledged Morse trainer with four training modes:

- DX Contest Simulator — practice realistic CW contesting without going on the air!
- QSO Simulator — practice realistic rag-chews without going on the air. Great tune-up for license class upgrades.
- Random four-letter word generation with increasing speed.
- Random letter generation.

With a computer, you can check your copy or download a specialized training session into the MM-3's memory!

These are only some of the best features of the MM-3.

To find out more, see your AEA Authorized Dealer or call the AEA InfoLine at 1-800-432-7388.

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AWARDS

BY DOROTHY JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The story of the month for September is:

John W. Luxford, ZL2BCX
USA-CA All Counties #629
All 20M SSB, 7-7-89

"I was licensed in 1952, but first played with radio in 1937 by building a crystal set. I sat for the amateur radio ticket examination just before World War II, but as war was with us and all hams were off the air for the duration, I did not sit again for the examination and take out my license until June 1952.

"I started county hunting on April 9, 1982 with a contact with WB7ESS in Thomas County, Kansas, and finished All Counties with N0COL in Marlboro, South Carolina on May 14, 1989. A remarkable thing was that the first and last contacts were made with a time difference of only about one hour—0328 versus 0424 hours.

"Looking through the earlier logs, I see several calls that were active at the end of my quest for number 3076. I would say there were many times I became frustrated when net control said, 'I hear a weak one,' and no one tried to help net control. However, I realize that stateside QRM is a factor, having operated both mobile and fixed station in the USA myself.

"On my first visit to a county hunter's convention in 1984 I met a lot of people I had talked with on the net. A major problem developed as a certain well-known ham offered to take me to the airport, but they had to travel some miles off the interstate. At the junction they asked if I was going to stop over enroute west, to which I replied that I did not have time. This brought the rejoinder that they couldn't make the airport and I'd have to walk. The outcome was that I did not walk to the airport, and I did stop over enroute west.

"Another frustration was receiving requests for county confirmations when I had not been in the county, or had not run the county. One or two of these requests were from bootleggers, I am sure. However, I think the biggest thrill to come out of all the long hours of listening was to hear the response when I made that last contact with N0COL. The final cream on the cake came at the convention in Abilene, Texas when my USA-CA All Counties award was announced by Don, WA0LKL, at the banquet.

"More thrills were to come on this trip as I motored to South Carolina with N0EYK, the designated driver, and K7AYC, the 'garbage man.' We went into Moorehouse County, Louisiana just at dark, but three people never saw the county line marker. Traveling those back country roads I was sure we were going to end up in a cotton field or rice field. The road got so narrow that two vehicles couldn't pass, so we decided we must be in the county and ran it for AK8A's last in Louisiana. While we were running the county, two dogs came by to inspect our vehicle and then wandered down the road to keep watch. Where the dogs came from we never knew, as there seemed to be no houses anywhere near. After several miles on our return to the interstate highway we found the county line marker.

"The next thing to happen occurred at a rest area on the Alabama/Mississippi border where the driver and I visited the rest rooms while the designated 'garbage man' disposed of the refuse. The two former arrived back at the vehicle before the 'garbage man,' and the driver took off. Enough said on that one, but we did have a good laugh about it. Then we were enroute through Alabama from Pensicola, Florida, where we had a visit with Hud, KB4FU, when we worked N9DEH who was traveling north through Georgia. We eventually had an eyeball QSO at a truck stop in Atlanta. It was then on to South Carolina and the QTH/Mobile QSL Bureau of N0CKN and N0COL to end a wonderful trip. Thanks, Kathleen and Roger.

"As seemed the custom at the Mobile QSL Bureau, a DO was held, attended by the locals, where we met more voices and were able to say a personal thank you. After nearly a week with Gwen and Jerry, I flew to Chicago and went to visit with Paula, N8EMV, and Steve, AK8A. Another party was the order of the day, once again meeting many I had talked with in the quest for county #3076. It was then a flying visit to San Francisco and Los Angeles and on to Hawaii, where I put out the county of Hawaii on the net. Thus, after a grand trip, convention, and parties, I returned home with fond memories of five weeks of joy.

"Since returning home I have pursued second time around and the Master County Hunters Award (aka Bingo). To all the many who helped the first time around, and to name any would be unjust to those not named, a big thank you. A special thank you goes to Gwen, N0COL, who is doing and has done a marvelous job for me as QSL Manager.

"See you all on the County Hunters Net.—73, John, ZL2BCX."

333 South Lincoln Ave., Mundelein, IL 60060

USA-CA Special Honor Roll

Lester M. Flake, K8KIR
USA-CA All Counties #709
All CW, 5-2-91

Richard L. Sine, KB3WN
USA-CA All Counties #710
Mixed, 5-4-91

Lee Mortimer, W3RWJ
USA-CA All Counties #711
All SSB, 5-23-91

USA-CA Honor Roll

3000			**1000**		
K8KIR		738	W7KSK		1176
KB3WN		739	WK3Z		1177
W3RWJ		740	AA6MQ		1178
			AA6MR		1179
2500			W3RWJ		1180
KB3WN		820	N4SMH		1181
WA2CNJ		821			
W3RWJ		822	**500**		
			KB3WN		2517
2000			W4USW		2518
KB3WN		894	WM9H		2519
W3RWJ		895	RT4UA		2520
			W7KSK		2521
1500			AA6MQ		2522
KB3WN		984	AA6MR		2523
W7KSK		985	KA1FUE		2524
W3RWJ		986	W3RWJ		2525
N4SMH		987			

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 nonsubscribers it is $10.00. Initial application must be submitted in the USA-CA Record Book, which may be obtained from CQ Communications, 76 North Broadway, Hicksville, NY 11801 USA 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 an SASE to Dorothy Johnson, WB9RCY, USA-CA Custodian, 333 South Lincoln Avenue, Mundelein, IL 60060 USA. DX stations must include extra postage for airmail reply.

Awards Issued

Lester M. Flake, K8KIR, completed all of his paperwork and claimed USA-CA All Counties #709, and USA-CA 3000 #738, All CW, dated 5-2-91.

Richard L. Sine, KB3WN, filed a complete set of confirmed county contacts and received USA-CA All Counties #710,

...The Perfect Solution

If you're living in an area with antenna restrictions, if you're tired of hassling with huge multi element yagis or if you're just looking for a compact, rugged, easy-to-use portable antenna that really *works*, the 150 watt IsoLoop 10-30 (MHz) HF Antenna is the Perfect Solution to your antenna problems.

The IsoLoop 10-30 has been redesigned to provide greater durability, lower SWR and extended frequency coverage. Because the loop is isolated from the feedline, your radiated power goes into the antenna, not into the shack. Efficiency is maximized because the new design has no mechanical joints and no assembly is required. **No ground plane or antenna tuner needed!**

The IsoLoop comes fully assembled complete with LC-2 Loop Controller (including signal strength LEDs) and 50 feet of control cable in a UPS shippable package.

This HF antenna goes where few others have gone before!

See the IsoLoop 10-30 today at your favorite AEA dealer.

For a complete specification sheet on this or any other AEA product, call the toll-free AEA Info-Line at 1-800-432-8873.

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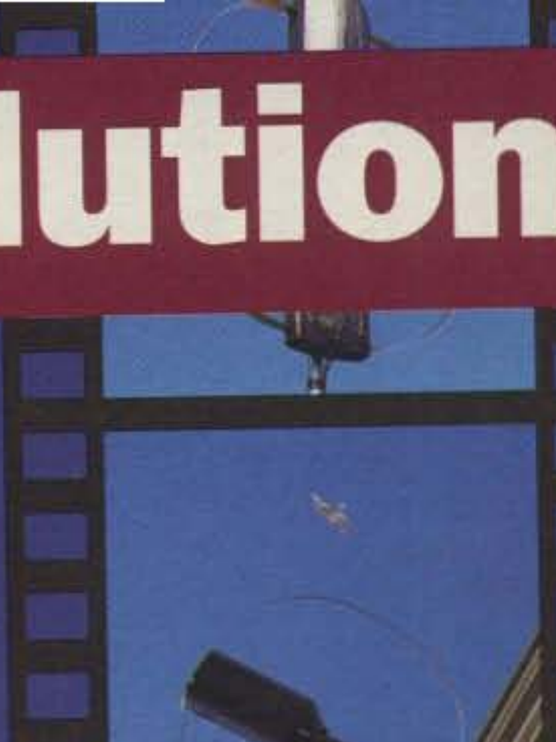
Loop Controller.



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A Few Expert Opinions...

"...The most important performance aspects of any transceiver are ease of use and basic receiver performance. The FT-1000 excels at both...The FT-1000...has a very strong receiver; it has the best overall performance and the highest third order input intercept of any commercial radio ever tested in the ARRL lab...The FT-1000 needs little for me to consider it the ultimate contesting and DXing machine available today..."

—QST Magazine

"The FT-1000 is an excellent top flight transceiver in all respects. It has all the features one would expect in a radio of this class...Of all the top of the range models..., the FT-1000 is the friendliest to use. The ergonomics has been well thought out with simple and obvious control of all functions..."

—Radio Communications (U.K.)

"The FT-1000 is indeed a fascinating new generation of HF transceiver... The receiver side is very impressive. The sensitivity, dynamic range, and selectivity figures are more than adequate for today's needs..."

—CQ Magazine

"Until now a RF output power of 100 watts applied as the norm for semi-conductor component shortwave transceivers; some newer high class units offered 150 watts. The FT-1000 is set for a maximum RF output of 200 watts. During normal SSB and CW use the power transformer remains hand warm—an improvement over the past when a transformer would occasionally 'burn up'..."

—cq DL (Germany)

"The biggest attraction of the FT-1000 is the very quiet receiver. In a side-by-side comparison between the FT-1000, the ICOM IC-781, the ICOM IC-765, and the Kenwood TS-950, the FT-1000 came out the winner by a long shot... when comparing its receiver to those found in current equipment of the like monetary value from other manufacturers, the FT-1000 beats all."

—73 Magazine

FT-1000

Direct Digital Synthesis (DDS), two ten-bit DDS plus three 8-bit DDS for fast lock-up time and lower noise than other traditional PLL systems.

High RF Power Output, continuously adjustable output from 20 to a full 200 watts for that extra edge in pileups.

Dual Receive, allows simultaneous reception of two different frequencies utilizing two tuning knobs for easy spotting. And with optional BPF-1 module allows crossband dual receive.

100 Memories, a detented rotary selector can be independently tuned or mode of IF filter selection can be changed directly, like a VFO.

Digital Voice Storage (DVS-2), option provides instant playback of 16-second receive memory, plus two 8-second "CQ Contest" messages on transmit.

Automatic Antenna Tuner, built-in quick-response antenna tuner matches SWRs up to 3:1 on the amateur bands and includes 39 tuner-setting memories for quick band changes.

CW Spot, provides audible tone for aligning transmit signal precisely on incoming signals without transmitting.

CW Audio Peaking Filter, provides additional selecting on CW for weak-signal work. On/Off status is held in memory.

High Dynamic Range, features four high-IDSS JFET up-conversion first mixer for receiver strong signal handling.

Multimode Selection on Packet/RTTY, for maximum flexibility packet mode toggles LSB/FM while RTTY toggles LSB/USB.

IF Shift and Variable Bandwidth Controls provide intermediate bandwidths with adjustable center frequency for no-compromise interference rejection.

Front Panel RX Antenna Selector allows quick switching to your Beverage or loop receiving antenna.

Dual Mode Noise Blanker for automobile ignition noise or Woodpecker suppression.

All-Mode Squelch for silent monitoring between contacts.

Wide Variety of Cascaded Filter Selections, SSB/CW filter selections from 2.4 kHz to 250 Hz in both 2nd and 3rd IF sections.

Stereo Dual Receive, operator may select either mixed or stereo dual receive (one channel in each ear). Stereo headphones required.

BPF-1 Module (optional on std. model), don't be restricted to inband spotting only!

RF Speech Processor for extra punch in the big pile-ups.

Flywheel-Effect Main and Sub-VFO Tuning Dials, main dial includes finger hole for easy tuning.

Temperature-Compensated Crystal Oscillator factory installed in model FT-1000D, for extremely high stability in critical applications.

One-Year Limited Warranty on all Amateur Radio Products
Specifications subject to change without notice.

YAESU
Performance without compromise.℠

USA-CA 3000 #739, USA-CA 2500 #820, USA-CA 2000 #894, USA-CA 1500 #984, USA-CA 1000 #1175, and USA-CA 500 #2517, Mixed, dated 5-4-91.

Lee Mortimer, W3RWJ, also did it all in one big step claiming USA-CA All Counties #711, USA-CA 3000 #740, USA-CA 2500 #822, USA-CA 2000 #895, USA-CA 1500 #986, USA-CA 1000 #1180, and USA-CA 500 #2525, All SSB, dated 5-23-91.

Ray E. Skrabut, WA2CNJ, took another step in building his good record by claiming USA-CA 2500 #821, All 20M SSB, dated 5-16-91.

Ronald D. Fitch, W7KSK, got off to a good start in his quest, receiving USA-CA 1500 #985, USA-CA 1000 #1176, and USA-CA 500 #2521, Mixed, dated 5-11-91.

Roger W. Parks, N4SMH, updated his good record by claiming USA-CA 1500 #987, and USA-CA 1000 #1181, All SSB, dated 5-25-91.

Barney Quinn, WK3Z, received USA-CA 1000 #1177, Mixed, dated 5-12-91

Hugh G. Stocks, AA6MQ, filed his application for USA-CA 1000 #1178, and USA-CA 500 #2522, All SSB, dated 5-14-91.

Linda Stocks, AA6MR, claimed USA-CA 1000 #1179, and USA-CA 500 #2523, Mixed, dated, 5-14-91.

USA-CA 500 certificates went to:

Richard L. Sine, KB3WN, USA-CA 500 #2517, Mixed, 5-4-91.

Robert B. Miller, W4USW, USA-CA 500 #2518, Mixed, 5-4-91.

Gene Schneider, WM9H, USA-CA 500 #2519, Mixed, 5-11-91.

Nicholas S. Mironov, RT4UA, USA-CA #2520, Mixed, 5-11-91.

Ronald D. Fitch, W7KSK, USA-CA 500 #2521, Mixed, 5-11-91.

Hugh G. Stocks, AA6MQ, USA-CA 500 #2522, All SSB, 5-14-91.

Linda Stocks, AA6MR, USA-CA 500 #2523, Mixed, 5-14-91.

Ralph E. Hicks, KA1FUE, USA-CA 500 #2524, All 10M SSB, 5-18-91.

Lee Mortimer, W3RWJ, USA-CA 500 #2525, All SSB, 5-23-91.

John, ZL2BCX, USA-CA All Counties #629, generates his good signal with this neat installation in New Zealand.

Awards Available

West Siberia Collector's Club Awards. The West Siberia Collecter's Club, founded by Igor V. Suprunov, UA9MFW, the club president, is described as "the club for everybody who's collecting anything." The club offers a series of thirteen awards (wall plaques) as described below. All contacts have to be confirmed with QSLs to qualify for the awards. The fee for each plaque is $10, or 18 IRCs. Send verified applications (no QSLs), requests for further information, etc., to Igor V. Suprunov, WSCC, P.O. Box 3360, Omsk, 644020, USSR. The club advises packaging and sealing applications very carefully.

Symbol of the West Siberia Collector's Club. Igor V. Suprunov, UA9MFW, is the president/founder.

Callsigns of radio amateurs/WSCC members are as follows: UZ9MWA (WSCC #5), UA9MJA (19); UB5TFB (52); UA9MJC (27), UV6LEC (47); A61AD (34); RA9UHE (51), DL8JE (56), N7KRE (62); UA9MKF (35); UA9MKG (31); DL2BCH (54); UZ9MWJ (48), UL8IWJ (42), UB4JFJ (44); UA9MIK (38); UA9MJM (21), UA9MCM (41); UA9MHN (39); UA9MKO (26), PY1UFO (36); UA9MKQ (25), UL7VBQ (33); UA9NS (10), RA9MAS (18), WF2S (60); VE6RGT (43), G2FRT (56); UA9MBV (6), UA9MRV (9); UA9MFW (1), UA9MLW (3), UA0AMW (28); UA9MGX (13), UA9MEX (22), UA9MJX (29), UB5YDX (46), G0DBX (57); UA9MIY (2); UZ9MZZ (40); SWLs UA9-146-20 (1), UA9-146-33 (9), UA9-146-376 (20), UA9-146-1980 (24), UA9-146-121 (29), UA9-146-4 (30), UA9-130-1246 (32), UL7-030-16 (33), UF6-012-454 (37), UA0-103-46 (53), NL-10260 (58).

The club also publishes a bi-monthly bulletin called the "WSCC Round Table," which is very popular in Russian programs.

Hepard Pryze. This wall plaque is 110 × 180 mm. Three classes are offered in different colored versions.

The applicant has to be as fast on the amateur bands as Hepard. Any QSOs (SWLs) with any correspondents (except your QTH) are valid for this plaque: Bronze Class—60 QSOs in one hour; Silver Class—80 QSOs/hour; Gold Class—100 QSOs/hour. Use one mode only for this plaque (SSB, CW, packet, etc.).

Night Hunter Award. Wall plaque 110 × 180 mm. Earn 200 points for QSOs (SWLs) during one night period in the interval 0000 hours to 0500 local time as follows: Each station in your own DXCC territory is valid for one point; each station of another DXCC territory is valid for 3 points.

Moreover, if you use the 160 meter band only, you must contact two different continents (including your own continent). If you use the 160 and 80 meter bands, you must contact three different continents. If you use any other bands, you must contact four continents (including your own continent).

Enter in your application the points and the local time for each QSO. At the end of the application, show the number of contacts with different continents (two, three, or four—in accordance with the bands used).

Ice Crown. A wall plaque 110 × 180 mm. Earn 10 points for each confirmed QSO (SWL) with an ARS located in non-continental territories over the North Circle and in the ice continent as follows:

Each QSO with the correspondent at an Arctic island (including Greenland, Jan Mayen, Svalbard, and Russian and Canadian Arctic islands) is valid for one point.

Each QSO with Antarctica and Antarctic territories is valid for two points.

Each QSO with Arctic drift bases, planes, ships, etc., ice prospecting machines, and bases is valid for three points.

Each QSO with Arctic and Antarctic ski expeditions is valid for four points.

Ice Crown Top. This eight-angle wall plaque (110 × 180 mm maximum dimensions) is for individual licensed hams only—no SWLs or club stations. Earn 25 points in accordance with the rules for the Ice Crown award.

Corsair. A wall plaque 110 × 180 mm. Make 5 confirmed QSOs (SWLs) with naval amateur radio stations (/MM). Two or more QSOs with one ARS may be used for the award if the station operated from different water basins—e.g., UA9NN/MM Black Sea; UA9NN/MM Mediterranean Sea, etc.

Any QSOs with marine amateur radio club members are valid for the award also. In this case write on your application the name of the club and membership number of your correspondent—e.g., DL8JE—MF RUNDE #279.

UFO. This is an eight-angle wall plaque, 110 × 180 mm maximum dimensions. Earn 100 points for confirmed QSOs (SWLs) as follows:

QSOs via satellites (Oscar, RS, etc.)

FLYWEIGHT BODY with HEAVYWEIGHT FEATURES

Alinco's New DJ-F1/F4T Realized Super Compact Body and Plenty of Features including:

*40 Memory Channels store Frequency, Shift direction, Split operation Setting, Tone encoder/Tone decoder setting (with optional Tone squelch unit), DSQ setting, Tone frequency and Offset frequency independently.

*Digital Signal Display and Memory Function

The DJ-F1T/F4T has special memory channels for transmitting, receiving, and store "Two Digit" DTMF Tones, for communication messages. This feature allows for the DJ-F1T/F4T to receive a "Two Digit" message and display it at any later time, at the convenience of the operator.

*Wide Band Receiving range

F1T:140-170MHz(AM Mode 118-136MHz after modification)
F4T:430-460MHz

*Battery Pack Lock
*Pager and Code Squelch
*Triple Stage Selective Power Output
*5W Output Power with Optional Battery Pack EBP-18N
*8 Scan Modes
*Programmable VFO Range Function
*Battery Save Function
*Six Channel Steps - 5, 10, 12.5, 15, 20, and 25KHz
*Priority Function (Dual Watch)
*Automatic Power Off (Programmable Timed)
*Automatic Dialer Function
*Illuminated DTMF Keypad
*Many Optional Accessories such as:

EMS-8:Remote Control Speaker/Mic.
EME-11:Earphone/Mic. with PTT/VOX
EME-10:Headset with PTT/VOX
EJ-2U:Tone squelch Unit
EDC-33:Quick Charger (Compatible with standard battery pack)

and many more. . . . .

DJ-F1T

DJ-S4T

DJ-S1T/S4T is Simple Type and Low-Priced But Offers Features such as:

*5W Output Power with Optional Battery Pack EBP-18N
*Triple Stage Slective Power Output
*Dry Cell Battery Case Lock
*Programmable VFO Range Function
*Frequency Lock, PTT Lock Function
*One Touch Squelch De-Activation Function
*8 Scan Modes
*Wide Band Receiving Range

Available Features with Optional DTMF Unit (DJ-10U) and DTMF Keypad (ESK-1) Include:

*Pager and Code Squelch
*Digital Signal Display and Memory Function
*Automatic dialer Function
*Many Optional Accessories Available

•Specifications

Frequency Range:
DJ-F1T/S1T
TX:144-148MHz
RX:140-170MHz (AM Mode 118-136MHz after Modification)
DJ-F4T/S4T
TX:440-450MHz
RX:430-460MHz

Output Power:
* with Battery Pack EBP-16N (Standard for F1T/F4T)
Hi:2W(F1T/S1T) 1.5W(F4T/S4T)
Mid:1W Low:0.1W
* with Optional Battery Pack EBP-18N
Hi:5W Mid:1W Low:0.1W
* at 9V
Hi:2.5W(F1T/S1T) 2W(F4T/S4T)
Mid:1W Low:0.1W

Weight:
DJ-F1T/F4T Approx.:13.2 oz.: with Standard Battery Pack
DJ-S1T/S4T Approx.:13 oz.: with Dry Battery case

Dimensions:
4.3(H) × 2.1(W) × 1.5(D) inch (Without Projections)

Specifications and features are guaranteed for amateur bands only and subject to change without notice.

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TORRANCE, CALIFORNIA 90501
Phone: 213-618-8616
FAX : 213-618-8758

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CIRCLE 10 ON READER SERVICE CARD

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High Quality Power Supplies

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PS304

Daiwa power supplies use the latest hi-tech circuitry and components providing reliable, regulated DC Power. Short circuit protection protects the power supply in the event of accidental shorting. Crowbar protection protects your rig in the unlikely event of power supply failure. All Daiwa Power Supplies are 120V 50/60 Hz, 220V 50/60 Hz also available.

Model	PS120M	PS140II	PS304	RS3080	RS40X
Voltage (VDC)	3-15	13.8	1-15	1-15	1-15
Current (ICS)	12	14	30	33	40
Current (Cont.)	9.2	12	24	30	32
Ripple (Max)	3mV	3mV	3mV	3mV	3mV
Regulation	1%	1%	1%	1%	1%
Cooling Fan	NO	NO	NO	YES	YES
Size (inches)	5×4×9	5×4×9	7×6×9	7×6×9.5	11×5.5×9
Weight (lbs)	11	11	18	21	22

Cross Needle SWR/Power Meters for All Bands

NS-660PA

Model	Freq. Range Int. Sensor	Forward Power	Connectors
NS-660A/PA	1.8-150 MHz	30/300 W/3 kW	SO-239
NS-663BM/BN*	140-525 MHz	30/300 W	SO-239/N type
DP-810	1.8-150 MHz	0-1.5 kW	SO-239
DP-820/N	140-525 MHz	0-150 W	SO-239/N type
DP-830	1.8-525 MHz	0-1.5 kW/0-15 W	SO239/N type
CN-101	1.8-150 MHz	15/150 W/1.5 kW	SO-239
CN-103	140-525 MHz	20/200 W	SO-239/N

MOBILE/BASE CROSS NEEDLE SWR/POWER METERS

CN-460M

CN-520

Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-410M*	3.5-150 MHz	15/150 W	SO-239
CN-460M*	140-450 MHz	15/150 W	SO-239
CN-465M*	140-450 MHz	15/75 W	SO-239
CN-520**	1.8-60 MHz	200 W/2 Kw	SO-239

*Back lit with mobile bracket **Optional mobile bracket available

DAIWA Coaxial Switches

	CS-201 2 Position	CS-201G II 2 Position	CS-401 4 Position	CS-401G 4 Position
Frequency:	500 MHz	1.3 GHz	800 MHz	800 MHz
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Isolation:	+60 dB	+60 dB	+50 dB	+50 dB
Power Rating:	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW

Insertion Loss: All models less than 0.2 dB

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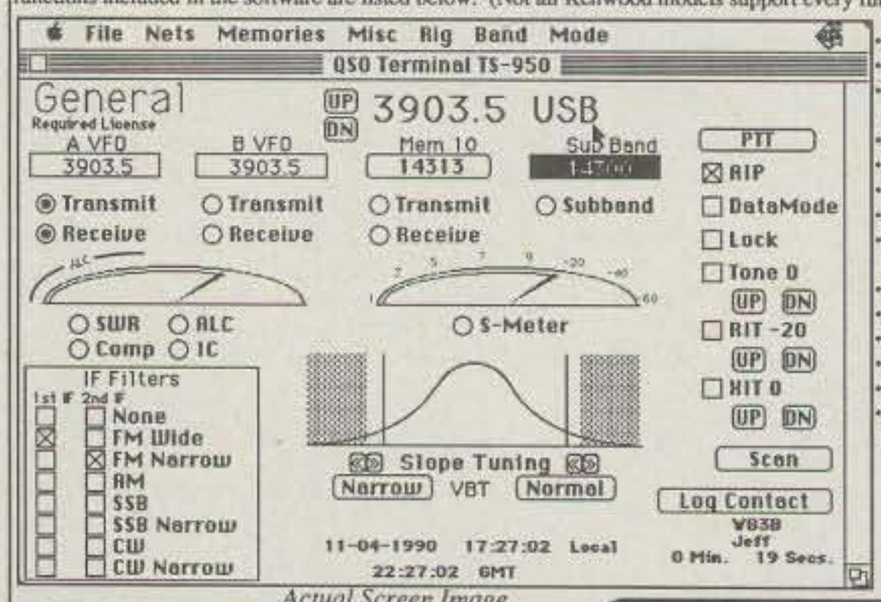

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with any correspondents are valid for 5 points.

QSOs with amateur radio stations of space centers, museums, exhibitions, memorial callsigns devoted to any space-research anniversary, etc., and spacemen/amateur radio operators (during their sojourn on earth), and QSOs with amateur radio members of any UFO research committee or amateur society are valid for 25 points.

EME QSOs are valid for 50 points.

QSOs with amateur radio stations aboard spaceships are valid for 75 points.

QSOs with expeditions to anomal zones (the expedition has to do some kind of UFO research or observation); also QSOs with special callsigns devoted to any events of UFO-problem research, amateur radio stations of UFO exhibitions, scientific congresses, and conferences about this subject.

QSOs with amateur radio operators who are heads of UFO research amateur societies (clubs) are valid for 100 points.

Note: If you are interested in any kind of UFO research and observation by radio amateurs (or are a member of such a society already), WSCC asks that you contact Igor V. Suprunov, UA9MFW, WSCC president/founder and head of the family UFO Research Group. The group consists of UA9MFW (contact valid for 100 points in accordance with the UFO Award rules); UA9NS, father; UA9MLW, wife; and UA9MRV, younger brother with whom QSOs are valid for 25 points each. The group has plans to found an international amateur radio UFO Observation Society.

The following seven colorful plaques and special awards make up the "V" Program Awards. All of V-Program plaques are 110 × 110 mm with different colored backgrounds ranging from simple one-color designs to more complex multi-color and/or repetitive print designs of the WSCC symbol. A complete set of the seven plaques is designed to be assembled into a composite 440 × 440 mm in the shape of the letter V.

WSCC Plaque. Qualification for this award requires 25 confirmed contacts (SWLs) with different stations in western Siberia ("U" Oblast numbers: 099 (UA9Y), 100 (UA9Z), 130 (UA9U), 145 (UA9O), 146 (UA9M,N), 158 (UA9H), 161 (UA9L), 162 (UA9J), 163 (UA9K). The last letters of the callsigns must be such so as to make up the phrase "WEST SIBERIA COLLECTORS CLUB" (example—UA9N**W**, UZ9YW**E**, UZ9OW**S**, UZ9MW**T**, etc.).

WSCC SSB. Receive 10 QSL cards from any WSCC members (cards from WSCC-SWL members are also valid) for SSB contacts. The same station may be used on two or more bands.

WSCC CW. The rules for WSCC SSB are applicable, but with CW contacts.

WSCC 100. Earn 100 points for QSOs (SWLs) with WSCC members in accordance with the following rules:

Each QSL (also cards from SWLs) is valid for one point.

Each oblast of Russia where a WSCC member is located is valid for one point as a *multiplier*.

Each DXCC territory (except Russia) of a WSCC member's QTH is valid for two points as a multiplier.

Example: 10 QSLs from WSCC members, 8 of them located in different Russian oblasts and the QTH of one in the Ukraine; therefore, 10 × (8+2) = 10 × 10 = 100.

WSCC 200. Earn 200 points for QSOs with licensed amateur members of WSCC in accordance with the following:

On the 160 meter band—160 points;

On the 80 meter band—80 points, etc. (HF bands only).

Two or more QSOs with the same station on different bands are valid.

WSCC SWL. Receive 30 QSL cards from West Siberia SWLs. SWL calls in Russia include the oblast number—e.g., UA9-146-020 is in oblast #146, Omsk, Western Siberia, the three digits following UA9 being the oblast number. See the rules for WSCC Plaque for the West Siberia oblast numbers.

A QSL from an SWL-WSCC member, from any possible DXCC territory, is valid for 10 QSLs.

The rules for SWLs are: 30 QSLs from West Siberian amateurs; QSL from West Siberian amateur/WSCC member is valid for 10 QSLs.

WSCC CM (Contest Meet). Receive 3 CFM QSOs (SWLs) with WSCC members in any contest(s) during a one-year period. Include in your application the contest(s) name(s) and the control numbers received form the WSCC members.

"V" Program Award. WSCC will send this award to all-seven-plaque owners as a special memorial souvenir. It is free.

73, Dorothy, WB9RCY

The USA-CA Award

The Story of County Hunting, Pt. II

By Arnie Bachmann, K9DCJ

This second installment will record happenings during the 1970s. I will mention a few names and calls and hope I will be pardoned for leaving many calls out of this article. It is unintentional. I will also include some of the rules that are not well known, but are, however, essential to the proper completion of the USA-CA Program.

The dates I show persons receiving credit for their county steps are as of the date the announcement was made in the Awards column, so the actual dates can be as much as three months earlier.

The first mini convention I have record of was at Jackson, Mississippi on March 8 and 9, 1969. On July 4, 1969, another get-together was held at Mountain Home,

Arkansas. Another group assembled at Omaha, Nebraska in November 1969 at the Holiday Inn. On November 14–16, 1969 a group called the "East Coast Chapter of the Independent County Hunters met at the Holiday Inn at Fayetteville. On July 3–5, 1970 the Independent County Hunter Networks Convention was held at Knoxville, Tennessee. Another Independent County Hunters group gathered on October 17 and 18, 1970 at the Holiday Inn in West Memphis, Arkansas.

There were some smaller meetings of County Hunters, one being at the home of Win, WA2QNW, on November 25, 1970. A County Hunter Picnic was held March 23, 1971 and hosted by Jerry, W2KXL. The Valley Forge mini was held July 13, 1974, and another was held in Mystic, Connecticut on October 18 and 19, 1974.

This is probably the appropriate place to note the changes in the total number of countries for the All Counties award. On January 1, 1963 Princess Anne County, Virginia was taken into the City of Virginia Beach, which is now Isle of Wight County, Virginia. The City of South Norfolk and Norfolk County, Virginia merged to form the Independent City of Chesapeake. Then the awards column stated that Princess Anne and Norfolk will count for Nansemond County, Virginia. In September 1969 the County of Ormsby, Nevada was taken into Carson City, Nevada. Carson City is now an Independent City.

The many county changes caused much confusion, but Ed Hopper, W2GT, who was then USA-CA Custodian, assured all applicants that they would get the plaque and award regardless of the number of counties.

As of July 1972 the County of Nansemond, Virginia became the Independent City Nansemond and was then absorbed into Isle of Wight County. In January 1974 Nansemond was absorbed by the Independent City of Suffolk. At that time Suffolk became the fourth largest city in area in the United States, 430 square miles.

The Awards Column in the May 1973 *CQ* magazine listed the following: "A confirmation (and only ONCE per city) from an Independent City can be used for a county it touches, NOT a county that is across any water or any county that is separated from it by a bay, county, etc."

One quick comment on the mobile/portable rule: Many are calling their operation mobile while using their equipment inside a building and running coax to connect to the vehicle antenna. This is considered portable; the vehicle cannot be driven away without disconnecting anything.

At the end of the 1970s a total of 262 people had received the All Counties Award; 274 had 3000 counties; 338 had 2500 counties; 384 had 2000 counties; 439 had 1500 counties; 559 had 1000 counties; and 1385 had 500 counties.

More next month—Arnie, K9DCJ.

Announcing *(from p. 9)*

Schaumburg, Illinois; Schaumburg ARC; 1500–2100Z Sept. 1; 7.291, 14.291, 21.291, 28.391. For certificate send QSL to SARC, P.O. Box 68251, Schaumburg, IL 60168-0251.

N0DN, from first anniversary of Gateway To Ham Radio Club; Valley Park, Missouri; 1400–2400Z Sept. 8; lower 25 kHz General 40, 20, 15 meter phone and upper 25 kHz 10 meter Novice subband. For QSL send QSL and SASE to Gateway To Ham Radio Club, N0DN, 10 Ann Ave., Valley Park, MO 63088.

NR0A, from 125th anniversary of Norfolk, Nebraska; Elkhorn Valley ARC; 1400–2200Z Sept. 28 and 1700–2200Z Sept. 29; 14.250, 21.350, 28.450 plus or minus QRM and 146.73 repeater. For QSL send SASE to Elkhorn Valley ARC, P.O. Box 1033, Norfolk, NE 68702-1033.

XO3IG, from 100th anniversary of St. Clair River Tunnel, Lambton County ARC (Sarnia, Ontario) and Eastern Michigan ARC (Port Huron, Michigan); 1400–2330Z Sept. 19–22; 80, 40, 20, 15, 10, 2 meters. QSL via VE3IG.

•The following hamfests, etc., are slated for September:

Sept. 1, **Central Indiana Hamfest/Computerfair,** Indiana State Fairgrounds, Indianapolis, IN. Contact Central Indiana Hamfest, c/o Leo Doyle, KE9TS, P.O. Box 20158, Indianapolis, IN 46220 (317-251-9833).

Sept. 7, **Welland County ARC Ham Radio & Computer Fleamarket,** Bethel Community Centre, Port Colborne, Ontario, Canada. Contact Dave Green, VE3EOQ, 416-788-9926.

Sept. 7, **Washburn Radio Club 'Fest 1991,** Whiting Fieldhouse, Washburn University, Topeka, KS. Contact Washburn Radio Club, c/o Rob Nall, WV0S, 2612 SW Arrowhead Rd., Topeka, KS 66614 (913-272-3559 evenings). (Exams.)

Sept. 7, **La Porte County Summer Hamfest,** La Porte County Fairgrounds, La Porte, IN. Contact Gene Ward, KD9VB, 219-785-4295.

Sept. 7, **Radio Assn. of Erie Hamfest,** Rainbow Gardens, Erie, PA. Contact Eric, N3HUM, 814-474-2120. (VE exams 8 AM; handicapped accessible.)

Sept. 7, **W3PIE Uniontown ARC Gabfest,** club location, Old Pittsburgh Road, Uniontown, PA. Contact John T. Cermak, WB3DOD, P.O. Box 433, Republic, PA 15475 (412-246-2870).

Sept. 8, **Ozarks ARS Club Congress and Swapfest,** Monett City Park, Monett, MO. Contact Ozarks ARS, P.O. Box 327, Aurora, MO 65605 (417-678-3375).

Sept. 8, **South Eastern Mass. ARA Hamfest & Fleamarket,** club grounds, Donald Street, South Dartmouth, MA. Contact Michael Enos, P.O. Box 9064, North Dartmouth, MA 02747. (VE exams.)

Sept. 8, **Findlay Hamfest,** Hancock County Fairgrounds, East Sandusky at Fishlock, Findlay, OH. Contact Findlay Radio Club, Box 587, Findlay, OH 45840.

Sept. 8, **Shawnee ARA Hamfest,** Southeastern Illinois College, east of Harrisburg, IL. Contact Bill Lockin, W9KAC, RR 2 Box 332, Benton, IL 62812. (Exams 9 AM.)

Sept. 8, **Butler County ARA Hamfest,** Butler County Farm Show Grounds, Roe Airport, Butler, PA. Contact WA3BVQ, RD 5 Box 8815, Slippery Rock, PA 16057.

Sept. 15, **Contoocook Valley RC Fall Fleamarket,** Contoocook, NH. Contact WA1WOK, 603-746-5090.

Sept. 15, **Twenty Over Nine RC Hamfest,** Mahoning County JVS, Canfield, OH. Contact Ron Stoddard, 42 S. Whitney Ave., Youngstown, OH 44509.

Sept. 15, **Lanierland ARC Hamfest,** Georgia Mountain Center, Gainesville, GA. Contact Rick Coker, AB4GS, 5417 Raintree Trace, Oakwood, GA 30566 (404-967-2087).

Sept. 15, **Hall of Science Hamfest,** Hall of Science parking lot, Flushing Meadow Park, Queens, NY. Contact Steve Greenbaum, WB2KDG, 718-898-5599 evenings.

Sept. 15, **Columbia-Montour ARC Hamfest,** Beach Haven carnival grounds, Beach Haven, PA. Contact Dave, WC3A, 717-752-6851.

Sept. 20–22, **1991 ARRL Dakota Division Convention,** Watertown Ramkota Inn, Watertown, SD. Contact Jerry Hegg, KZ0E, 605-886-6929 days, 605-886-7151 evenings.

Sept. 21, **Rhode Island Amateur FM Repeater Service Auction and Fleamarket,** VFW Post 6342, Forestdale, RI. Contact Rick Fairweather, K1KYI, P.O. Box 591, Harrisville, RI 02830 (401-567-0232 7–8 PM).

Sept. 21, **Fall Foliage Hamfest & Fleamarket,** National Guard Armory, Berlin, VT. Contact Gregg Carbin, N1HHX, 14 Vine St., Barre, VT 05641 (802-479-5216). (VE exams 1 PM.)

Sept. 21, **Fort Venango Mike & Key Club Ham Auctionfest,** Venango County 4-H Fairgrounds, between Polk and Franklin, PA. Contact Jim Clinefelter, N3BAT, 814-437-1781.

Sept. 21, **Kenrucky Lake Hamfest,** Gilbertsville Elementary School, Gilbertsville, KY. Contact Kentucky Lake Hamfest, P.O. Box 534, Benton, KY 42025. (VE exams 9 AM.)

Sept. 21–22, **Tusco ARC Computer/Hamfest,** Monroe Mall, New Philadelphia, OH. Contact Howard Blind, KD8KF, 216-364-5258.

Sept. 21–22, **Virginia Beach Hamfest & Computer Show,** Virginia Beach Pavilion & Convention Center, Virginia Beach, VA. Contact Manny Steiner, K4DOR, 3512 Olympia lane, Virginia Beach, VA 23452 (804-340-6105).

Sept. 21–22, **Radio Expo 91,** Evanston, IL. Contact Radio Expo, Box 1532, Evanston, IL 60204 (262-6773).

Sept. 21–22, **Anchorage ARC Hamfest & Electronic Fleamarket,** Anchorage, AK. Contact Anchorage ARC, P.O. Box 101987, Anchorage, AK 99510-1987.

Sept. 21–22, **Peoria Superfest 91 & Computer Show,** Exposition Gardens, Peoria, IL. Contact Peoria Area ARC, P.O. Box 3508, Peoria, IL 61612-3508 (309-685-6698). (VE exams Sunday 10 AM.)

(Continued on p. 140)

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205BAS	5 El 20m Beam	Call!

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ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

BY KARL T. THURBER, JR., W8FX

Special Delivery

This month we'll begin with a deep scoop into the W8FX mailbag. Let's get started.

Special Delivery

X-Beam Notes de W4RNL. L.B. Cebik, W4RNL, corresponded with us on several occasions regarding X-beams and the work of antenna experimenters such as W2EEY, VK2ABQ/G3ONC, and W9PNE. In W4RNL's view, if the X-beam's basic design actually is a feasible one with good performance, it could represent a good compromise for amateurs with limited space and resources. Its compact design and light weight are pluses, as are its reasonable match to coax, forward gain, and directivity.

To briefly review, descriptions of the X-beam have appeared in the *ARRL Antenna Compendium*, Vol. 1, the 1991 *ARRL Handbook*, and other publications. The antenna design is basically that of a two-element Yagi. Performance is broadband, yielding 5 to 6 dBd gain, and exhibiting a 15 to 18 dB front-to-back (F/B) ratio. The antenna consists of four arms and four wire loading "tails." Since there is no boom, the X-beam usually is mounted horizontally much like a cubical quad lying on its side.

W4RNL decided to model the X-beam designs of Brice Anderson, W9PNE, which appeared in the *Compendium*, using the ELNEC V2.03 antenna analysis and modeling software. W4RNL examined several designs, including X-beams optimized for the best direct match to 50 ohm coax, maximum F/B ratio, and maximum gain. Here's a brief summary of what he tentatively found based on computer analysis:

1. W9PNE's dimensions (as shown in the *ARRL Antenna Compendium*, Vol. 1, p. 65) are well-chosen and result in an excellent compromise between antenna performance (gain and F/B ratio) and direct match to 50 ohm coax.

2. Regardless of the method used for obtaining match, ratio, or gain, the impedance figures are comparable within all three groups. Best match occurs with a resistive component in the high 30 ohm area, while best F/B models have an impedance in the mid-20s and best gain models have an impedance in the low teens.

3. Using the best match to 50 ohm coax as a criterion for design is fine, but it isn't the only route: best match antennas have lower gain and F/B ratios than the other groups.

4. The maximum gain models may not be the best ones for amateur use due to the very low feedpoint impedances and the loss of a good deal of the F/B ratio.

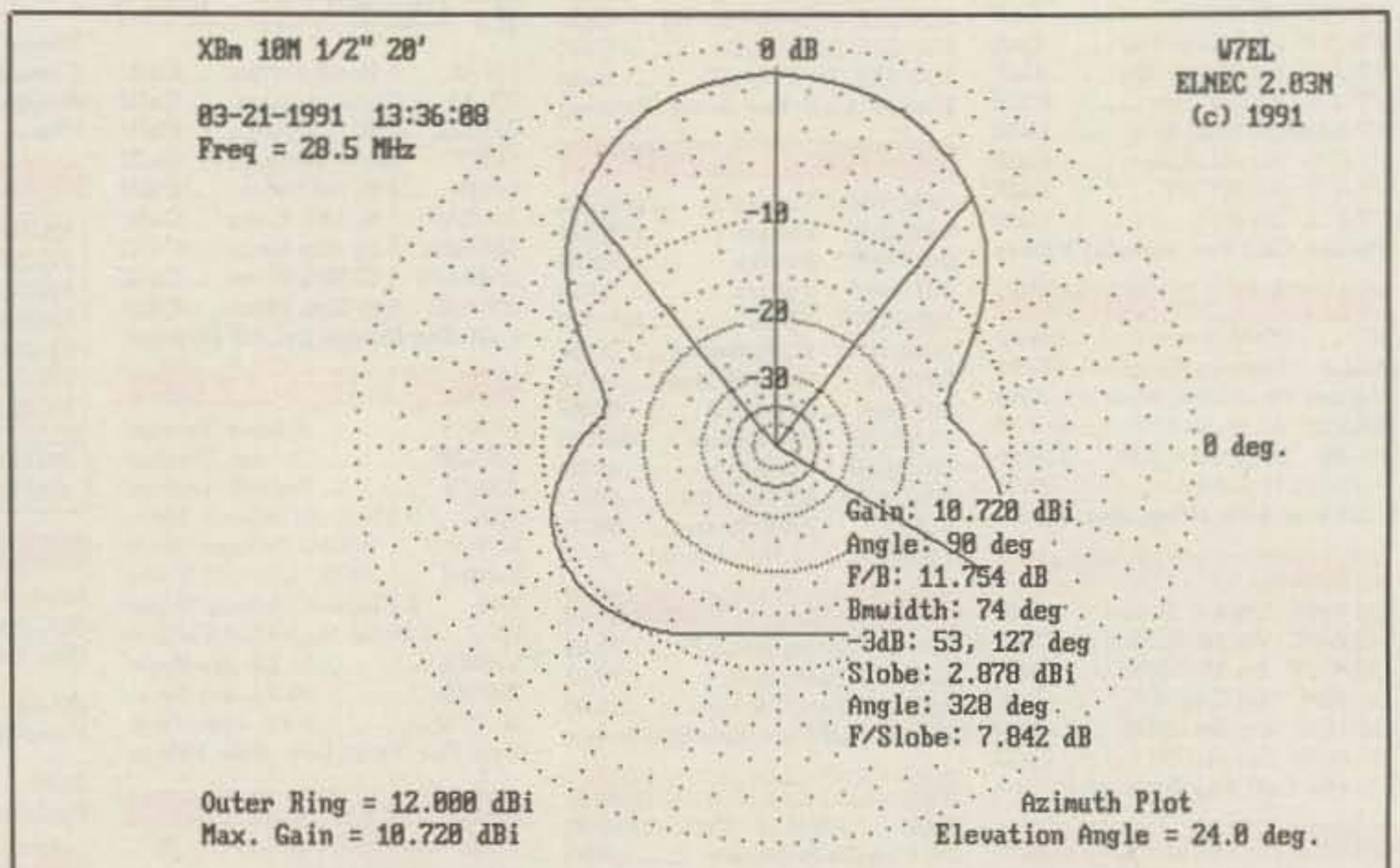
5. The maximum F/B ratio models may be the easiest ones to tune up. Since their impedances are all in the mid-20s, a quarter-wave matching section will provide a good match so that if one trims the wire loading "tails" for lowest SWR at the center frequency, good gain and F/B ratio should result.

6. If amateurs want to build a successful X-beam, they should change the usual tune-up procedure of pruning wires shorter. The best procedure would be to start with the wire tails slightly short and systematically lengthen them, keeping a 6 inch difference in director and driven element tail lengths.

7. It's best to avoid models that require inductive loading of either the director or driven element, given the losses associated with inductors. However, capacitively loaded models have good possibilities.

8. Descriptions of the X-beam pattern vary from that roughly of a Yagi to that of a cardioid microphone; the patterns transition as one moves from best match to maximum gain. The X- beam minor lobes are always there so that even maximum F/B ratio models have quartering rear lobes that can receive considerable QRM.

Bearing in mind that this analysis is tentative, and that further modeling (not to mention on-the-air testing) is necessary, W4RNL concludes that "the X-beam can be a very effec-



W7EL ELNEC 2.03N XBm 10M 1/2" 20'		03-21-1991 13:36:08
Azimuth plot Elev angle = 24.0 deg Outer ring = 12.000 dBi Reference = 0 dBi	Frequency = 28.5 MHz Ant Ht = 20.000 ft Wire Loss: Aluminum Rstvty = 4E-08 Rel Perm = 1	Max Gain = 10.720 dBi Source 1 impedance = 38.585 - J 12.131 SWR (50 ohm) = 1.458 (75 ohm) = 2.012
68 Wires Wire 1: 1 segment Length = 1.115 ft 1 source No loads DE tail 3.79' DIR tail 3.29'	Real ground 1 medium, 0 radials Medium 1: Cond = 2.000E-03 Di Const = 1.500E+01	Gain: 10.720 dBi Angle: 90 deg F/B: 11.754 dB Bmwidth: 74 deg -3dB: 53, 127 deg Slobe: 2.878 dBi Angle: 328 deg F/Slobe: 7.842 dB

Fig. 1–Shown here is the result L.B. Cebik, W4RNL, obtained when he modeled the basic W9PNE X-Beam on 10 meters at a modeling height of 20 feet using the ELNEC V2.03 antenna analysis and modeling program. This is but one of the models W4RNL tried among various configurations that sought either best direct match to 50 ohm coax, maximum F/B ratio, or maximum gain. Note that the gain figures here are in dBi and thus are referenced to an isotropic source: a dipole with the constants W4RNL used shows an 8 dBi "gain."

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tive two-element beam that is light, simple, cheap, and relatively easy to build and maintain. However, all claims for better than two-element Yagi performance (except, possibly, for F/B ratio) seem unwarranted. But a two-element beam is still a very useful antenna."

Fig. 1 shows W4RNL's ELNEC modeling of the basic W9PNE X-beam at 20 feet.

A Matter of History. Dan Umberger, W8ZCQ, wrote that while it doesn't make a heck of a lot of difference, back in the October 1990 column I referenced a center-fed antenna with open-wire feeders as a "Zepp." In reality, he notes, if the antenna is fed in the center with openwire feeders, it's properly a center-fed Hertz.

Dan flipped open the 1937 *ARRL Handbook*, which (on p. 306) states "Probably the most popular type of Hertz antenna with tuned feeders is the Zeppelin or 'Zepp' antenna, so called because of its early use on Zeppelin airships. The Zepp is a Hertz antenna with one wire of the tuned feed line connected to one end of the antenna. The other feed wire is left floating. The antenna is therefore voltage-fed from the transmission line. . . ."

Another antenna that's been wrongly named, in his view, is the Delta Loop, which he indicates is not truly a recently developed antenna. Dan states that its proper name is the Bellini-Tosi, which is described in some detail in Elmer E. Bucher's book, *Practical Wireless Telegraphy*, third revised edition, 1918.

Thanks for the good-natured needling, Dan. At least it lets us know that someone is actually *reading* what we write!

Some Thoughts on End-Fed Antennas. The comments made by Harry K. Wolf, W6NKT, in last October's column about the relatively limited frequency coverage of most antennas prompted one reader to write to us about his experiences with end-fed antennas. After a lifetime of working with and relying on centerfed wire antennas for HF work, reader George Brennert, W2CUA, told us that his move to a new QTH made it virtually impossible to properly install a centerfed antenna. He would have to make a 135 foot, end-fed singlewire work.

After considerable experimentation and some serious bouts with TVI and some grounding problems, here's some of what he learned from his particular situation (I don't necessarily endorse all of the "lessons learned" in all situations, but nevertheless recognize that they were right for George):

1. An end-fed singlewire can be one of the best and least costly antennas for multiband use.

2. You don't have to run the antenna in an absolutely straight line. While you shouldn't bend the flattop back on itself, George feels that some bends fill in the gaps in the radiation pattern to some extent.

3. Terminate the antenna outside of the hamshack and run a short length of coax from the antenna tuner to it to keep RF outside the shack as much as possible.

4. Ground the coax shield at the antenna end of the run.

5. Use one radial per band, but don't let the radials touch the ground, since you want them to act as counterpoises.

George also found that he had to experiment with his equipment grounding setup and ended up using a rather complicated "capacitive grounding system" involving his rig, tuner, and power supply. Theory to the wind, George now finds that he can operate effectively from his new QTH with good results and minimal TVI—and of course that's what counts most to him.

More on Attic Antennas. Larry V. East, W1HUE/7, didn't think that my recounting of a 20-year-old experience trying to run a full KW into a dipole in the close environment of a townhouse (*CQ*, September 1990) was smart. In fact, he's surprised that I didn't end up making more than a neighbor's bedroom light glow.

Larry asserts that from his own experience, with some care and a reasonable power level (100 watts or less), an attic dipole can be very effective. He's used dipoles mounted in attics for several years—most recently a three-band (10/15/20 meter) trap dipole in a Connecticut townhouse. He found that if he limited the output power to about 50 watts, he caused no problems to any of his neighbors' telephones, TVs, or other electronic devices and appliances. However, he did experience some problems with RF entering the power wiring to his own living unit. This required the simple RFI suppression technique of installing line filters on his TV, VCR, and hi-fi amplifier, plus filters in the speaker leads of the amplifier. As far as he knows, none of his neighbors had any idea that an amateur lived in the same building after three years of operation in which he snagged over 150 countries (110 countries running 5 watts or less) and made good showings in several DX contests running QRP.

Potpourri de K6URI. Mike Zane, K6URI, wrote to tell us that following up on previous correspondence, he decided to install a 130 foot multiband centerfed dipole using open-wire ladderline, a Radio Works current-type balun, and a 6 foot length of RG-213 to an MT-3000A antenna tuner. On-the-air results were quite good.

He found the centerfed antenna easy to tune up on all bands with low SWR on the link between the antenna tuner and the transmitter. The only band on which he could not get an acceptable match was 30 meters. Mike also made use of a Palomar Engineers "Tuner-Tuner"™ to establish initial antenna tuner control settings prior to fine tuning.

Changing the subject, Mike also pointed to the good results he'd obtained with some amateur radio software orders he placed with Ham-Soft (P.O. Box 2525, Morgan City, LA 70381), which features IBM PC public-domain and shareware software. Mike's particularly enthused with HYPERLOG, a very fast and easy to use general-purpose logger that has extensive configuration options and outstanding context sensitive help.

New Aussie Antenna. Jerry L. Bartachek, KDØCA, sent us a "skreed" (photocopy of an advertisement) for the Black C.T.W. (Continuous Traveling Wave) 1.8–30 MHz HF antennas that Peter Barretto, VK6PB, forwarded to him. Jerry rightfully wonders what the theory of operation is for the broadband Inverted Vee and vertical kits, and the "black box" matching unit. So do I!

Despite the unusual claims made in the Black ad, Jerry says that VK6PB has one of the antennas set up in the vertical mode and likes its performance, using it with good results on the lower HF bands. Jerry maintains a weekly AMTOR sked with Peter, who has tried the Black vertical over the path. Jerry says it's usually down about two or three S-units from Peter's three-element triband Yagi.

Have any of our readers had firsthand experience with the Black C.T.W., either the Inverted Vee or vertical? If so, let us know more of the antenna's technical details and its on-the-air performance. We're curious.

Name that Antenna. E. Grant Kundert, Jr., KBØHRG, wrote to tell us that he had purchased a "third hand" three-element beam and is trying to identify it as to band (11 or 10 meters) and manufacturer.

From the measurements that Grant supplied, it appears to be an 11 meter CB model. When he received it, the longest element was the driven element, but when he reassembled it he made it the reflector. Unfortunately, there was no way to identify the antenna's manufacturer as far as either of us could tell.

Often 11 meter CB Yagis appear on the market locally. There's nothing inherently wrong in buying an 11 meter CB antenna, as it usually can be shortened slightly for operation on any part of the 10 meter band. Knowing the manufacturer or even possessing the original assembly and instruction manual isn't all that important, since most Yagis are sufficiently standardized such that you can find a similar design with dimensional information by searching through standard references such as the *ARRL Antenna Book* and the *ARRL Handbook*. It's a good idea to double-check the antenna's dimensions and matching network anyway, since many CB users are nontechnical and may have improperly assembled the antenna—as Grant found with the one that he purchased.

Thanks for Writing! That's all the room we have this time for sharing correspondence. But thanks to the others who recently wrote to us, including Gary L. Bayer, KF8BW; Alain Bourassa, VE2MTV; Charlie Wenzel; Joseph Midler; and Roger E. Bessmer. Keep those letters coming, and please include an SASE or IRCs if you desire a personal reply.

Software Topix

IONSOUND Update. In the July and December 1990 columns we described IONSOUND™, a comprehensive and sophisticated HF ionospheric propagation prediction and "RF link quality assessment" program for the IBM PC and compatibles. To review, the program is a state-of-the-art software tool for predicting MF/HF/VHF (1.8–54 MHz) ionospheric propagation to any part of the world. The menu-driven program is supplied with a detailed operating manual on disk and support is provided for CGA, EGA, VGA, and Hercules graphics. Separate versions of the program are intended for coprocessor and non-coprocessor equipped PCs.

Recently the program's author, Jacob Handwerker, W1FM, sent me a copy of the latest version (V3.19, likely higher by now) and a summary of recent changes to the program. Some of the main program changes include support for the Hercules graphics adapter; improved color selection capability; use of predefined locations for latitude and longitude selection; ability of the user to independently set the height of the E- and F-layers in the program; addition of a Curtain array choice to the Yagi, dipole, vertical, and log-periodic/rhombic selections; and an upgraded frequency selection menu. Other IONSOUND improvements include additions to the tabular summary output to incorporate Maximum Critical

```
          ***** TRANSMIT LOCATION SELECTION MENU *****

TO INPUT AN ARBITRARY TRANSMIT LOCATION      0
          TO SELECT:  ALASKA                 1
          TO SELECT:  AUSTRALIA              2
          TO SELECT:  CENTRAL ASIA           3
          TO SELECT:  EAST COAST (USA)       4
          TO SELECT:  EASTERN EUROPE         5
          TO SELECT:  HAWAII                 6
          TO SELECT:  JAPAN                  7
          TO SELECT:  MIDWEST (USA)          8
          TO SELECT:  PUERTO RICO            9
          TO SELECT:  SOUTH AMERICA          10
          TO SELECT:  SOUTH PACIFIC          11
          TO SELECT:  SOUTHERN AFRICA        12
          TO SELECT:  WEST COAST (USA)       13
          TO SELECT:  WESTERN EUROPE         14

     ENTER TRANSMITTER SELECTION 0-14  <0>
```

Fig. 2– IONSOUND transmit location selection menu. The selection of latitudes and longitudes has been augmented by including predefined locations corresponding to those shown in QST's "How's DX" column. These selections make it easy to compute IONSOUND predictions for comparison with MUF predictions derived from IONCAP. A total of 14 choices are independently available for the transmitter location, in addition to selection of any arbitrary location. A similar menu is available to facilitate receiver location selection.

Fig. 3– IONSOUND transmit and receive antenna selection menu. These selections represent typical antenna/gain combinations that you can use to predict propagation performance; you may input your own gain if you like. This menu now includes the selection of a Curtain array; this antenna choice is useful for shortwave broadcast predictions and for military applications. In addition to the Curtain array, the Yagi selection now produces a more realistic vertical elevation pattern corresponding to operation over ground instead of free space.

```
ENTER THE LETTER CODE FOR THE FOLLOWING TRANSMIT ANTENNA OR GAIN


1)  10 DB GAIN YAGI-UDA ARRAY (OVER GROUND):                          Y
2)  2.15 DB GAIN VERTICAL MONOPOLE (OVER GROUND):                     V
3)  5.2 DB GAIN HORIZONTAL OR VERTICAL DIPOLE (HT=1/2 WAVE):          D
4)  7 TO 12 DB VAR. GAIN (1.8-30 MHZ) LOG PERIODIC & RHOMBIC:         L
5)  23 TO 28 DB VARIABLE GAIN (1.8-30 MHZ) CURTAIN ARRAY:             C
6)  -40 TO +40 DB: CHOOSE YOUR OWN ISOTROPIC GAIN:                    G
                   ENTER CHOICE <DEFAULT = 0 DB ISOTROPIC>:
```

Vertical Frequency (MCFV) and Maximum Critical Oblique Frequency (MCFO) calculations; and considerable expansion of the program's main menu functions, among others.

IONSOUND is priced at $29.95 plus $3 shipping and handling ($5 outside North America). For more information, contact Jacob Handwerker, W1FM, 17 Pine Knoll Road, Lexington, MA 02173.

Fig. 2 shows the IONSOUND Transmit Location Selection Menu, while fig. 3 depicts the IONSOUND Transmit and Receive Antenna Selection Menu.

CwDrill. Christian Aymon, HB9DBC, sent us a copy of his CwDrill program for the IBM PC, which he wrote in Turbo Pascal. CwDrill is different from many code practice programs in that first it is highly interactive, and second the required paddle (which controls the program) is directly connected to the serial port of the PC (you must make up the connecting cable).

The program's menu-oriented style makes CwDrill quite user friendly. Main menu choices include the Skill Drill, the main CwDrill exercise that also contains several sub-menus; keying practice; copying practice; setting of default parameters; color selection; and language (French, English, or German). A very convenient feature is that if several different individuals use the program, each can have his or her own configuration file.

The program is available on 3.5 inch diskette for U.S. $20 from Christian Aymon, HB9DBC, Aymon & Co., 1376 Goumoens-la-Ville, Switzerland.

SCORPIO. Ashton ITC has introduced a new product called Shortwave Computer Operated Radio Plus I/O, abbreviated SCORPIO. The new product is designed to integrate some of the most common tasks for which a computer is used by SWLs and radio monitors. Among other features, SCORPIO allows the user to selectively scan many Kenwood, ICOM, and Ten-Tec receivers based on a flexible database search while simultaneously printing and capturing data from an optionally connect standalone all-mode terminal unit.

Some of the many SCORPIO features include the combining of radio control, logging, and terminal functions in a single program; intelligent log scanning by type, location, ID, mode, and frequency; automatic insertion of frequency, mode, time, and date into the log database; an AutoLog function to build a database automatically from received signal "hits"; sophisticated log search capabilities; print or capture of digital data (RTTY, SITOR, packet, CW, etc.); log-based scanning using specified search criteria; and sorting of logs by various criteria. Other features include mouse compatibility; ASCII import and export capability; selective loading of the radio's memory; ability to run other programs while SCORPIO is in memory; and the capability to control the radio and change tuning unit modes with simple key presses or mouse clicks.

A very interesting feature is the ability of the program to make use of optional database libraries. Ashton ITC makes several of these available separately for about $20. One very useful database library they offer is the English Language Shortwave Broadcast Library. It includes over 1900 entries encompassing all known English-language shortwave broadcasts and enables sorting, printing, searching, and scanning with SCORPIO.

SCORPIO is available directly from the manufacturer and is priced at $89.95. (A related amateur radio oriented product is Aries-2, the Amateur Radio Integrated Entry System, that we described in the January 1991 column. It's available at the same price.)

For more information, contact Ashton ITC, P.O. Box 830, Dandridge, TN 37725.

PROCOMM PLUS 2.0. Probably most of our readers are familiar with PROCOMM, which has been widely distributed for several years as an inexpensive shareware communications terminal program as well as a slick, commercial product called PROCOMM PLUS. My own introduction to PROCOMM came from working with early shareware versions to communicate with landline bulletin-board systems (BBSes). Eventually I received an evaluation copy of PROCOMM PLUS, which I discussed in the September 1989 issue.

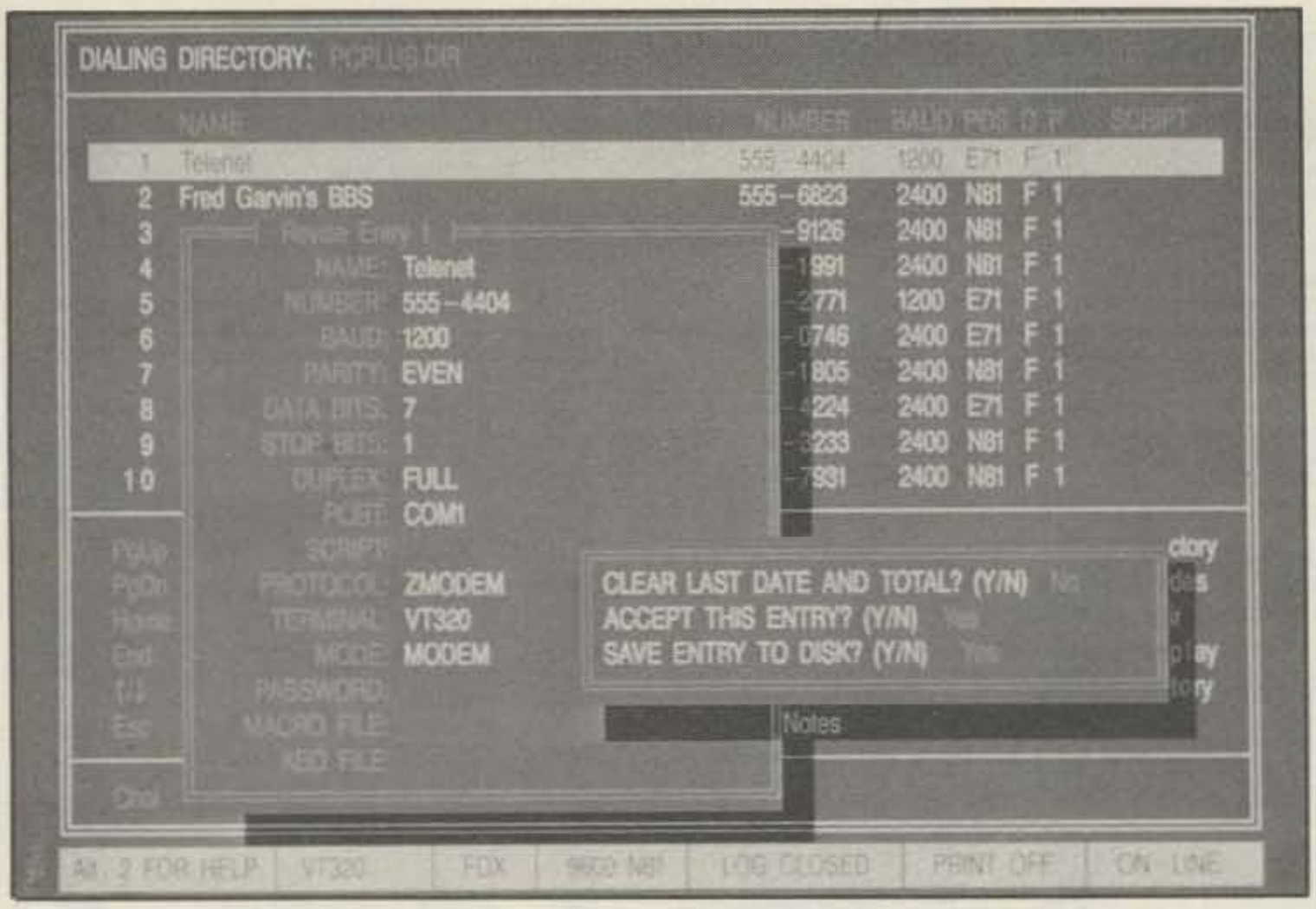
While new versions of competing communications programs such as Telix and Mirror III have given PROCOMM and PROCOMM PLUS a run for their money, the inherently intuitive nature of the programs makes it quite simple to get almost any task done. Their easy-to-use nature has reportedly made them the best-selling communications terminal software in the world, and many amateurs use them for packet work as well as for landline communications.

Frankly, after recently reviewing a copy of Mirror III V2.0, which offered many new features that clearly rivaled those of the older PROCOMM PLUS 1.1B, I wondered if PROCOMM PLUS was in need of a tweak-up. It may have been; the new version arrived with many improvements that restored my confidence in PROCOMM.

What's new? Some of the new and/or improved features include additional internal protocols, such as raw ASCII for transparent ASCII transfers and almost everybody's favorite, ZMODEM; new terminal emulations, bringing the number of emulations handled to 33; and the addition of nearly 100 new commands to the ASPECT script language, the scripts of which are now compiled for faster execution.

Other major improvements include an enhanced dialing directory that lets you sort your directory entries in five different ways and jot notes about an entry in an associated text file; 132-column support; toggling between different video modes; an enhanced host mode that lets you add your own custom screens, menus, and file listings; full mouse support; and a filename clipboard that lets you "cut" filenames directly from a BBS listing or directory and then paste the filenames to the remote computer for downloading. In addition, the old keyboard macros have been replaced with so-called "Meta keys" that not only send text strings, but can also run external programs and ASPECT scripts with a single keystroke.

Did I like the new version? You bet. The abili-



The PROCOMM PLUS dialing directory is a sort of address book that stores the numbers of the computers you call. Each dialing directory can store up to 200 entries that you can easily revise. (Photo courtesy DataStorm Technologies, Inc.)

ty to toggle between different video modes on my VGA display was welcomed, as was the handy filename clipboard that makes downloading of multiple files a snap. I also liked the fact that the ZMODEM protocol finally was incorporated into the program as an internal protocol. This meant that you no longer had to set up batch files to call up ZMODEM as an external protocol, though the program still lets you work with three user-defined external protocols. On the negative side, while the new compiled scripts run like greased lightning, testing and debugging them is a little more involved since you need to test run the compiled version but must edit the uncompiled version. Thus, an option to run uncompiled scripts would be useful.

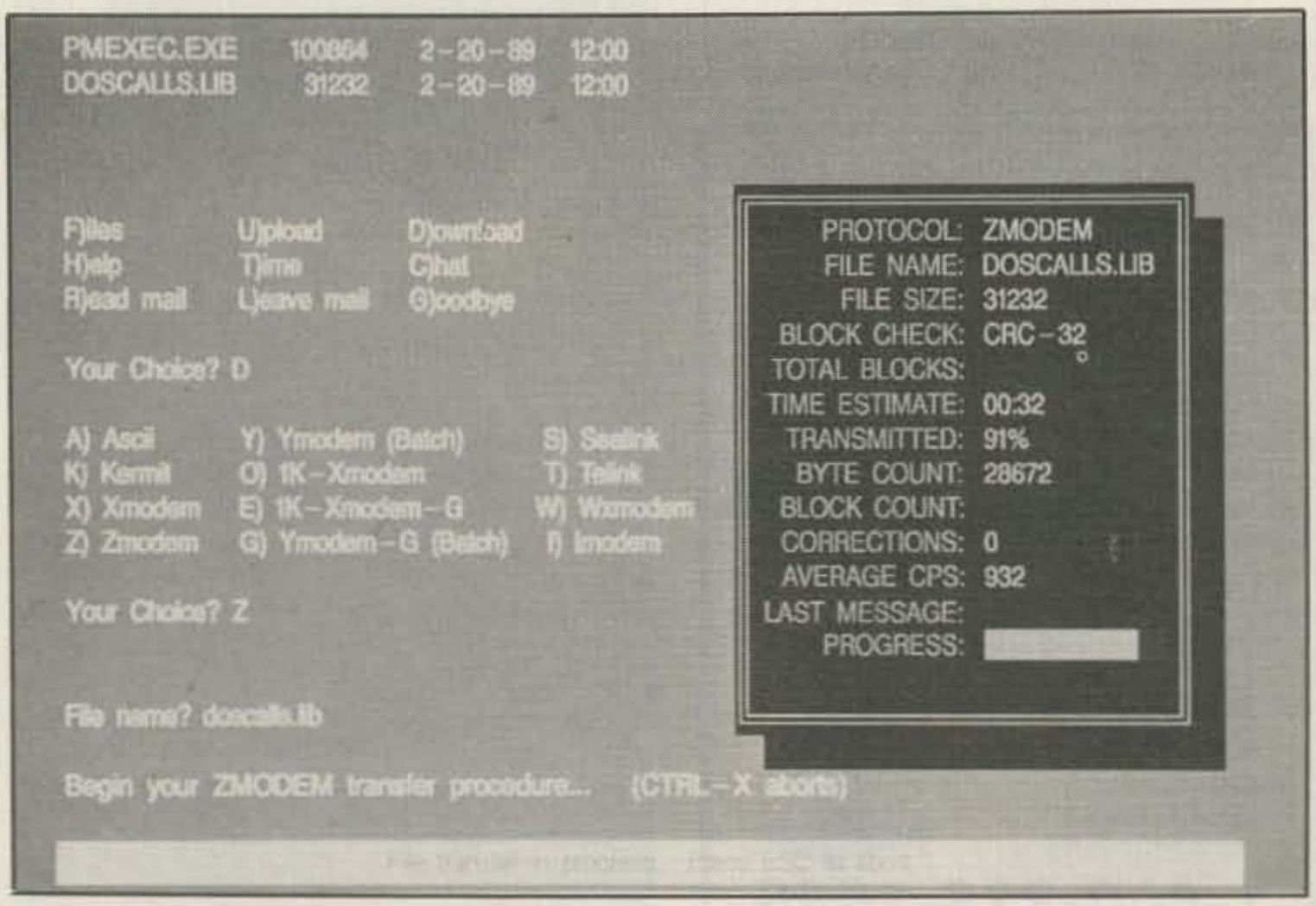
Fortunately, PROCOMM PLUS 2.0 is still reasonably priced, now listing for $119 retail, though PROCOMM PLUS owners can upgrade for only $39. For more information, contact DataStorm Technologies, Inc., 3212 Lemone Blvd., P.O. Box 1471, Columbia, MO 65205.

CheckIt Update. In the August 1990 column we examined CheckIt®, billed as an all-in-one diagnostic program that helps provide "quality assurance" for your PC. As we noted at that time, the menu-driven program produces on-screen and printed reports of your exact hardware configuration and the system resources it's using. You can also use it to test the system's hardware and display standard "benchmarks" which measure key aspects of your system's performance and power. As such, it's a useful tool to quickly determine a system's configuration, implement hardware and software upgrades, and troubleshoot problems.

Recently, I received a copy of the new release, CheckIt 3.0. It builds upon the testing and reporting capabilities introduced in V2.1. Some of the new features include support for DOS 4.0 and the 80486 processor; a new memory map that's handy to discover hidden memory conflicts; an expanded "RAM Error Dialog" that helps identify the exact location of a bad chip, memory bank, or problem RAM board; a series of floppy drive mechanics tests to check out drive alignment and mechanical functions; and a "Customizable Tools Menu" that lets you set up and execute DOS programs from within CheckIt as though they were part of the program. Other new features include a virus detection utility (from another manufacturer) that's capable of identifying over 200 different kinds of PC viruses; improved benchmark comparison graphics that display the PC's performance against a standard PC-XT; and an expanded test summary report.

I found the new release to be outstanding, particularly the Customizable Tools Menu that let me run some of my favorite diagnostic-related utility programs without leaving CheckIt. Although the program is relatively expensive at $149, upgrades to V3.0 are reasonably priced at $25.

For more information, contact TouchStone Software Corporation, 2130 Main St., Suite 250, Huntington Beach, CA 92648.



PROCOMM PLUS has a number of features that help simplify and automate the downloading and uploading of software. Here PROCOMM PLUS displays a window that lets you monitor the status and progress of the file transfer. (Photo courtesy DataStorm Technologies, Inc.)

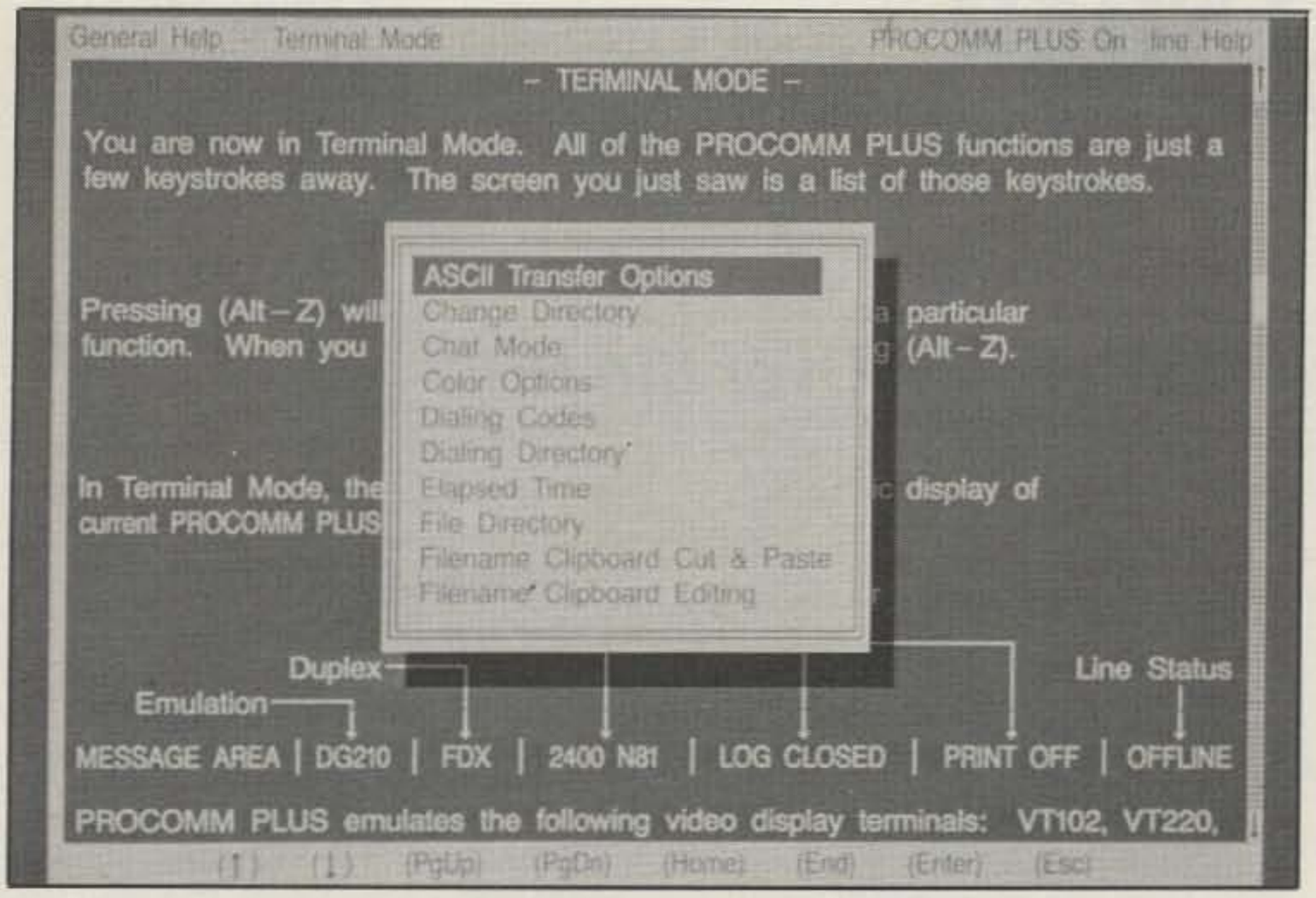
Short Bursts

On Joining a Computer User Group. My first computer was an 8K Commodore PET, purchased around 1979, which for some reason didn't "turn me on" to computers. My second computer, as anyone who followed the column from 1982 on knows, was the little Commodore VIC-20 color computer with its mighty 5K RAM, purchased in mid-1982. The Vic was followed a few months later by the then-amazing Commodore 64. But I'll never forget the lonely feeling of trying to get these machines (and their "master") up to speed, especially when there were few if any local dealers and almost no experienced users around who could answer simple questions. In the early days of personal computing the term "user group" was in few users' vocabularies, including my own.

Many people, radio amateurs included, know very little about computers when they first purchase one. Worse, they're often frustrated with the computer's documentation, which frequently is poorly written, but which they must understand before they can actually do something productive with their PC.

While the only real way to become proficient on a PC is to actually use the computer, user groups help users to better understand their systems and to improve their ability to use them by sharing knowledge and learning from one another.

All user group members were beginners at one time and have faced much the same problems and questions as the new user. User group meetings are opportunities to meet oth-



Context sensitive help is available from almost anywhere in PROCOMM PLUS. The help facility always "knows what you're doing" and can display help for the current task. Here a pop-up menu of some of the available help topics is displayed. (Photo courtesy DataStorm Technologies, Inc.)

First published in late 1988 and now into V3.0, CheckIt is a software utility that's billed as an all-in-one PC diagnostic package. It reports on your PC's exact configuration, runs diagnostic tests, and measures performance using standard benchmarks. CheckIt can be operated by people with nontechnical backgrounds. (Photo courtesy TouchStone Software Corporation)

ers with the same type hardware and software. There are user groups for most computers and operating systems. The user group often can provide answers which could take hours to find in the computer's documentation or in other books, if at all.

In addition to answering your questions, user groups can provide several other benefits. These include obtaining reduced prices in group purchases; finding information on where the best hardware and software buys are; tutorial classes at low or no cost; discounts from vendors; firsthand reports and reviews on hardware and software; and good access to shareware and public-domain software if the user group has a software library. Also, special interest groups (SIGs) provide users with an opportunity to meet with others who have similar, specialized computing interests.

The special programs often featured at user group meetings are usually of general interest and benefit all members. Most user groups publish a newsletter which typically contains helpful information, ideas, tips, and advice from local members and from other user groups. At the bottom line, a user group is an excellent way for you to help realize the potential of your machine. *(Adapted from a flyer published by the Huntsville PC User Group, Inc.)*

CQ 1991 Antenna Buyer's Guide. I can't claim any hand in its production this year, but the *CQ 1991 Antenna Buyer's Guide* nevertheless is a winner. The 128-page directory, edited by Pete O'Dell, WB2D, is chock full of specs and prices on hundreds of amateur radio antennas, rotators, and accessories. HF, VHF, and UHF base, mobile, and portable antennas are all covered. In addition, there are three very good feature articles between its covers —articles on using "invisible antennas" for tough operating locations, choosing the right antenna for DX, and successfully applying for antenna tower building permits. The *1991 Guide* is available for $4.95 from the CQ Bookstore in Greenville, NH (phone 1-800-457-7373).

A Note to Shareware Authors. If you're a writer of amateur radio shareware software and want me to take a look at your offering via the column, great. Bear in mind that it usually takes quite some time to work a review or even a brief mention into the column. Also, there's no need to update me on every minor software revision: wait until there is a *major* rewrite of the software. Above all, please include a *printed* copy of the documentation, complete instructions on how prospective users can obtain the software, and its price, including upgrades.

Also, if you can send along good, reproducible screen dumps of key program menus and other screens, please do so. These are helpful in explaining and illustrating your program for readers. And, if you have a logger or other type of database program, including a small sample database speeds review. Thanks!

Wrapping It Up

That's all for this time, guys and gals. Next time more Antennas and Accessories topics of current interest. See you then.

Overheard: Carried to an extreme, Murphy's Law would have it that if a series of events can possibly get fouled up, the foul-up will occur in the worst possible sequence!

73, Karl, W8FX

CONTEST CALENDAR

BY JOHN DORR, K1AR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

When Are Contesters Over the Hill?

As my 35th birthday has come and gone, a recurring question comes to mind: When do contesters officially go "over the hill"? When pondering this topic, I always end up feeling amazed at some competitors' staying power. In practice there are two classes of experienced operators: the true old-timers and those who simply look the part (usually from years of operating every small contest known to man).

Contesters get a peek at the age of their fellow compatriots at least twice a year by operating in the All Asian SSB/CW Contest. You may recall the 59(9)XX exchange, where "XX" is your current age. I'm always amused by the casual participant trying to help a UA9 by sending 599001 four or five times in a row. Always wondered how they were able to send so fast at such a young age. While tuning the bands (because you certainly can't run anyone in that contest from my part of the world!), I enjoy matching ages to operating style/ability. For example, at 75, ole HZ1HZ is really hanging in there! Wouldn't it be nice if we were so lucky to have similar resiliency at his age! Another angle is to listen to some of our "ole acquaintances" and gasp "is he really that old?"

The other end of the spectrum is the youth. Aren't you astonished when you hear one of the USSR club stations being used by an incredibly fast operator sending 59916?

So I wonder, is there anything to the opinion that contesters slow down as their age advances? The optimist says that changes in our operating abilities come from the time/physical pressures caused by increased family and business commitments as we enter our 30s and 40s. A more realistic view is that we've probably lost the edge off our hearing caused by years of receivers blasting signals through our headphones. Nevertheless, some of the finest operators in the world are not in their 20s, but rather are 50 years old and up! Next time you feel like you're slowing down, take a look at

2 Baldwin Street, Windham, NH 03087

Calendar of Events

Aug.	24-25	Empire State QSO Party
Sept.	1	Bulgarian DX Contest
Sept.	4-5	YLRL Howdy Days
Sept.	7	North American CW Sprint
Sept.	14	North American SSB Sprint
Sept.	14-15	Worked All Europe SSB
Sept.	14-15	All Asian SSB Contest
Sept.	14-15	Scandinavian CW Contest
Sept.	14-16	ARRL VHF QSO Party
Sept.	21-22	Washington State QSO Party
Sept.	21-22	Scandinavian SSB Contest
Sept.	27-29	Europe for QRP Weekend
Sept.	**28-29**	**CQ WW RTTY Contest**
Sept.	28-29	Idaho State QSO Party
Oct.	5-6	VK/ZL/Oceania CW DX
Oct.	5-6	California QSO Party
Oct.	5-13	Wyoming QSO Roundup
Oct.	12-13	VK/ZL/Oceania SSB DX
Oct.	12-13	Discovery of The New World
Oct.	13-14	Illinois QSO Party
Oct.	19-20	Worked All Germany Contest
Oct.	**26-27**	**CQ WW SSB DX Contest**
Nov.	2-4	ARRL CW Sweepstakes
Nov.	9-10	WAEDC RTTY DX Contest
Nov.	16-18	ARRL SSB Sweepstakes
Nov.	**23-24**	**CQ WW DX CW Contest**

Table I. Like me, you have a long way to go before *you* are over the hill!

Contest Survey

This month I am probing into the contester's mind by investigating many of the questions that we are facing in today's modern age of contest operating. I hope you find the results to be as enlightening as I expect them to be! (See the survey in this column.)

Closing Comments

I thoroughly enjoy seeing the results from the surveys run in this column. Please try to take a few minutes and send me your thoughts.

It's hard to believe that another CQ WW is upon us. Best of luck to everyone participating!

As always, the deadline for the December issue is October 1st.

73, John, K1AR

Bulgarian DX Contest

0000Z to 2400Z Sunday, Sept. 1

The Bulgarian Federation of Radio Amateurs holds this activity the first Sunday in September each year. It's on CW only, all five bands, 10–80 meters, using the IARU Region 1 band plan.

Classes: "A"—Single operator, all band. "B"—Single operator, single band. "C"—Multi-operator, all band, single transmitter. "D"—SWL.

Exchange: RST and ITU Zone.

Points: QSOs with LZ stations, 6 points. With other stations in the same continent, 1 point. In other continents, 3 points.

SWLs must show calls of both stations heard. Score 3 points if both exchange numbers are copied; 1 point if only 1 is copied.

Multiplier: Total ITU Zones worked on each band.

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

Awards: Classes "A" and "C"—cups and medals to the three top world scorers and medals to the three continental leaders in each continent. Class "B"—medals to the top three scorers on each band in the world. Class "D"—medals to top three.

Logs: Use a separate sheet for each band, a summary sheet showing the scoring, and the usual signed declaration.

Mailing deadline is 30 days after the end of the contest to: Central Radio Club, P.O. Box 830, 100 Sofia, Bulgaria.

Logs may also include applications for the many BFRA awards: NRB, W-100-LZ, 5 Bands LZ, W-28-Z, Black Sea, and Sofia awards.

YLRL "Howdy Days"

1400Z Wed. to 1359Z Thurs., Sept. 4–5

This event is sponsored by the YLRL and is open to all women operators worldwide. All bands and modes are allowed and a station may be worked once on each band/mode for credit.

Exchange: YLRL or non-YLRL member.

Points: Two points for member sta-

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The Over-The-Hill Contester

- You find yourself checking into nets during the contest rather than firing up 2 kHz below them.
- You find yourself receiving unsolicited RTTY QSL cards.
- You need to take a sleep break on Friday nights, too!
- The objects on your operating desk begin moving before the contest starts (not afterwards, as it was in the old days).
- You are well on your way to Worked All Counties.
- You find yourself asking DX stations during the contest about their IOTA (Islands on the Air) number.
- You have begun collecting 10-10 numbers.
- You fall into a state of total confusion when more than one station is calling you during a run.
- You find yourself running around and calling people during Saturday morning on 15 meters from W3LPL.
- You have begun answering your incoming bureau SWL cards.
- You discover that you need to take an off-time during the North American Sprint; even when you're operating, you can't figure it out anyway!
- The appeal of fighting for the band edge has left you because you have to keep looking up the frequency in your *ARRL Handbook*.
- You read the Section Manager's reports ahead of the DX Contest results in October *QST*.
- You have a compelling desire to alphabetize your QSL card collection.
- You attend your local contest club meeting and the new contesters don't know who you are.
- You are ready to report your final score on 80 meters after the contest, but can't remember the correct frequency.
- You find yourself asking guys for their QSL information and filling out the card before moving on to the next guy.
- You've lost K1EA's home telephone number.
- You even have trouble copying guys on 10 meters through the QRN.
- Your contest exchanges include phrases such as "when last heard" or "X-ray Baker, make your call."
- You start the contest late and can't remember whether it's the SSB or CW weekend. Worse, even after tuning the bands, you still can't tell!
- The pace of Field Day operating has worn you out before sunset.
- Novices QSY in the middle of your QSOs rather than taking the time to try and work you during the Novice Roundup.
- You fight with your operating team to get the 1296 MHz position at a K1TR/3 VHF Contest multi-multi.

Table I- Knowing when you're an "over-the-hill contester."

tions and one point for non-members. There are no multipliers. Logs must indicate date, time, band, callsigns worked, and operating breaks.

Bands: CW—3540–3570, 7040–7070, 14040–14070, 21120–21150, 28180–28210. SSB—3940–3970, 7240–7270, 14250–14280, 21380–21410, 28380–21410.

Awards: Top-scoring YLRL member will receive her choice of a YLRL pin, charm, or stationery. Non-YLRL members will receive a one-year membership in the YLRL.

The usual contest disqualification criteria apply. Logs must be sent by October 6, 1990 to: Dana Tramba, N0FYQ, RR 1, Box 213, Peck, KS 67120.

North American "Sprint"

CW: Sept. 7 SSB: Sept. 14
Sunday 0000Z to 0359Z (Sat. night)

This is the fall edition of the "Sprint" run by the National Contest Journal. As the name implies, it's a shorty, only four hours long.

North Americans will be contacting other North American stations as well as stations in other countries, single operator only. North American boundaries are as defined by the rules used in the *CQ* WW DX Contest.

Exchange: Call, QSO no., name, and QTH (state, Canadian area, or country).

Scoring: Multiply total QSOs by the sum of states, Canadian areas, and other North American countries worked for your final score. (U.S. and VE not countries; KH6 not a state.) There are eight Canadian multipliers: VE1/VO1/VO2, VE2–VE7, VY1/VE8. Non-North American countries do not count as a multiplier.

Frequencies: Three bands only: 80, 40, and 20 meters. CW—3540, 7040, 14040. SSB—3850, 7225, 14250. (Plus or minus QRM.)

Awards: A trophy to the highest scoring entrant. Certificates to the top scorer in each U. S. call area, Canada, and other North American country. Also to the ten top scores, to each member of the winning team, and the highest scoring entrant on each team.

Team competition is limited to a maximum of 10 operators as a single unit. Precontest registration is required for each team before the start of the contest—with WN4KKN for CW and K7GM for SSB.

There are other detailed rules, a special QSY rule, disqualifying penalties, etc. I suggest you write to WN4KKN or K7GM if you do not have a copy of the NCJ.

Entries must be received no later than 30 days after the end of each "Sprint." The CW go to: Trey Garlough, WN4KKN, 331 Walnut, Santa Cruz, CA 95060. The SSB go to: Rick Niswander, K7GM, 2906 Cortez Court, College Station, TX 77840.

ARRL VHF QSO Party

1800Z Sat. to 0300Z Mon., Sept. 14–16

All bands 50 MHz and up can be used for this one. The August issue of *QST* should have had all the details.

It is recommended that you send for official summary and log sheets. A large SASE will get you a supply. Address your request to the ARRL VHF Party, 225 Main St., Newington, CT 06111.

Washington State Salmon Run

1200Z Sat., Sep. 21–0700Z Sun., Sep. 22
1200–2400Z Sun., Sept. 22

This state QSO party has reappeared under the sponsorship of the Western Washington DX Club and is open to amateurs worldwide on SSB and CW.

Classes: Single or Multi operator, Single Transmitter. Also, entrants may operate QRP or low power (100 watts or less) on SSB, CW, or mixed mode.

Exchange: RS(T) and QTH (State/Province/DXCC Country or Washington State county).

Scoring: Count 2 points for SSB and 3 points for CW. QSOs with CW Novice/Technicians are worth 6 points. The multipliers are Washington counties (maximum 39) or States/Provinces/DXCC Countries for Washington state stations. Credit multipliers only once per mode regardless of band. Stations can be worked on multiple bands.

Scoring: Final score is total QSO points times multiplier. Low-power stations multiply score by 2 and QRP by 3.

Frequencies: CW—1805, 3560, 7045, 14060, 21060, 28060. SSB—1815, 3925, 7260, 14280, 21380, 28380. Novices—3700, 7125, 21150, 28160.

Awards: The highest scores in each DX country and US call area will receive a package of Pacific Northwest smoked salmon. Certificates will be available for other category winners. A participation

Contesting Survey: Inside the Mind of Today's Contester

Your Callsign (optional): Contesting Experience (years):

1. In a few words, what is the single most important issue facing contesting today (e.g., lack of new blood, ethics, etc.)?

   _____

   _____

2. Do you think the sport of contesting will continue to improve over time, or have we seen the best?

   ☐ YES ☐ NO

3. What is the age of the youngest and oldest contester that you personally know? (Approximate answer is acceptable.)

   Youngest: _____ Oldest: _____

4. As you have grown older, what has changed about your ability to operate?

   a. _____

   b. _____

   c. _____

5. Are experienced contesters doing anything about bringing more youth into contesting?

   ☐ YES ☐ NO

6. Is contesting an asset or a liability for amateur radio?

   ☐ Asset ☐ Liability

7. Has the integration of technology into contesting gone too far?

   ☐ YES ☐ NO

8. Do you feel the competitive nature of contesters is germane to other areas of life (e.g., career, other hobbies, relationships)?

   ☐ YES ☐ NO

9. In one sentence, what has been your most memorable contest experience (e.g., participating in the last multi-multi operation at W2PV)?

   _____

   _____

10. What other hobbies do you enjoy outside of contesting/amateur radio?

    a. _____

    b. _____

11. What percentage of your vacation/holiday time do you use for contesting and related activities (e.g., antenna work, DXpeditions, etc.)?

    ☐ less than 10% ☐ 25–50% ☐ greater than 90%

    ☐ 10–25% ☐ 50–90%

12. Do you use some form of computer support while operating?

    ☐ YES ☐ NO

13. Given the right set of circumstances (e.g., best station, access to good operators to learn from, QTH), can most anyone eventually win the Single Operator category in a major DX contest?

    ☐ YES ☐ NO

Comments: (use additional sheet if necessary)

_____

Return survey to:

John Dorr, K1AR, 2 Baldwin Street, Windham, NH 03087 USA

Deadline: November 20, 1991

certificate will be awarded to each log submitted (50 QSOs [US], 25 QSOs [DX], 100 QSOs [Washington State] minimum).

The mailing deadline for logs is October 21st. Logs can be sent to: Western Washington DX Club, W7FR, Box 224, Mercer Island, WA 98040.

Scandinavian Contest

C.W.: Sept. 21-22 Phone: Sept. 28-29
1500Z Saturday to 1800Z Sunday

It's the world working the Scandinavians in this the 32nd Scandinavian Activity Contest (SAC). The same staion may be worked on each band for QSO and multiplier credit.

The prefixes used in Scandinavia are: LA, LB, LG, LJ (Norway); JW (Svalbard & Bear Is.); JX (Jan Mayen); OF, OG, OH, OI (Finland); OHØ (Aland Is.); OHØM (Market Reef); OX (Greenland); OY (Faroe Is.); OZ (Denmark); SJ, SK, SL, SM (Sweden); TF (Iceland).

Bands: 3.5, 7, 14, 21, 28 MHz according to IARU band plans; 3560/3600, 3650/3700, 14060/14125, and 14300/14350 kHz should be kept free of contest activity.

Classes: Single operator and multi-operator single transmitter, all band only. Multi-operator must remain on the same band for at least 10 minutes. Also QRP single operator (maximum of 10 watts output) and SWL (only SAC stations may be logged).

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

Points: European stations score 1 point for each SAC contact. Non-Europeans score 1 point on 14, 21, and 28 MHz, and 3 points on 3.5 and 7 MHz.

Multiplier: Each call area in the above list of SAC countries worked on each band (call areas, *not* prefixes).

Final Score: The sum of QSO points from all bands times the sum of the multiplier from each band. Scoring for SWL's same as above.

Awards: Certificates to the winning station in each class, both CW and phone, in each country and each U.S.A. call area. QRP stations will be listed in one common list. The non-SAC SWL winner will be awarded. Plaques to the top-scoring station in each continent.

The usual disqualification criteria will be observed. Include a summary sheet and a dupe sheet for logs with more than 200 QSOs, and a signed declaration. Logs may also be submitted on MS-DOS formatted diskettes. Mailing deadline is October 31st and this year logs go to Harri Mantila, OH6YF, PL 30, Teuva, SF-64701 Finland.

Europe for QRP Weekend

1600Z Fri., Sep. 27–2359Z Sun., Sep. 29

This QRP extravaganza is jointly sponsored by the G and OK National QRP clubs and is designed to promote low-power contesting.

Classes: Single operator, CW only.

Exchange: RST, power output, and operator name. The full exchange must be copied for a valid QSO.

Scoring: Europeans count 1 point for each QSO within Europe. QSOs outside Europe are worth 3 points. Asiatic USSR stations credit 1 point within their area and 3 points outside of Asiatic USSR. Final score is total number of QSO points. There are no multipliers.

Frequencies: 3560, 7030, 14060, 21060, and 28060 kHz.

Awards: Merit certificates will be issued to the top four scoring stations from each continent.

The mailing deadline for logs is October 30th. Logs should be sent to: P. Doudera, OK1CZ, Ul baterie 1, 16200 Praha, 6, Czechoslovakia.

CQ WW RTTY Contest

0000Z Sat. to 2400Z Sun., Sept. 28–29

This is the fifth annual RTTY Contest organized by *CQ*, and from the response to last year's contest, it has become one of the major RTTY competitions.

Bands: All five bands, 10 through 80 meters.

Classes: Single operator, single and all band, and single-op assisted all band only. Multi-operator, single transmitter, all band only.

Keep in mind that single operators are limited to 30 hours out of the 48-hour contest period. Off times may not be less than 3 hours in length. Multi-operator stations can operate the full 48 hours.

Exchange: RST, state or VE area, and *CQ* zone for stations within the 48 continental U.S. states and 13 Canadian areas. All others send RST and *CQ* zone.

Points: One for contacts within own country. Two for contacts outside own country but same continent. Three for contacts outside own continent.

Multiplier: One for each state (48) and VE area (13). One for each DX country (ARRL and WAE list). One for each CQ zone (40). All of the above on each band.

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

Awards: Plaques to the first-place winners in each of the operator classes. Certificates to second and third place. And certificates to the first-place finisher in each DX country.

Complete and detailed rules were published in the August issue of *CQ* and should be reviewed for more detailed information.

The standard *CQ* log and summary sheets are recommended. It will make you scoring much easier. Sample forms are available from *CQ*. Include a large SASE (or IRC) with your request.

All entries must be postmarked no later than December 1st. An extension may be given upon a written request.

Logs go to: *CQ* RTTY Contest, ATT: Roy Gould KT1N, P.O. Box DX, Stow, MA 01775 USA. Requests for log forms go to: *CQ* Magazine, 76 N. Broadway, Hicksville, NY 11801.

Idaho State QSO Party

1800Z Sat. to 1759Z Sun., Sept. 28–29

The Idaho State QSO Party, sponsored by the Eagle Rock Amateur Radio Club, is an excellent operating event designed to promote activity from this rare state. Non-Idaho stations work Idaho operators. Idaho stations may work anyone. Stations may be worked once per band/mode and mobiles/portables that change counties may be worked again for QSO credit.

Exchange: RS(T) and QTH (County for ID stations, State/Province/DXCC country for others).

Frequencies: SSB—3875, 7230, 14280, 21325, 28400 kHz. CW—1810, 3550, 7050, 7125, 14050, 21150, 28050, 28350 kHz.

Scoring: Each Idaho county is a multiplier (44 total). Score 2 points for a CW QSO, 1 point for SSB, and 5 points for any Novice/Technician contact regardless of mode. Final score is total QSO points times multiplier.

Awards: Certificates will be awarded to the high scorer from Idaho, U.S. State, and DXCC Country. In addition there will be a plaque to the overall high scorer. Logs are to be postmarked by October 26, 1991 and should be sent to: Doug Jenson, N7JAM, Eagle Rock Amateur Radio Club, P.O. Box 2415, Idaho Falls, ID 83402. If you want the final results, include an SASE with your entry.

California QSO Party

1600Z Sat. to 2200Z Sun., Oct. 5–6

This year's party is again being sponsored by the Northern California Contest Club. All efforts are being made to activate all CA counties and make this the most successful of all state parties.

Operating time is limited to 24 out of the 30-hour contest period for single operator stations. Multi-operators may use the full 30 hours. Off times must be at least 15 minutes and clearly indicated in the log.

The same station may be worked on each band and mode, and CA stations may contact other in-state stations for QSO and multiplier credit. CA mobiles may be worked in each county change.

Exchange: QSO no. and QTH. County for CA stations; state, province, or DX country for others.

Scoring: Two points for phone contacts; 3 points on CW.

Multiplier: CA stations use states (50) and VE call areas (8). VO/VE1–7 and VY1/VE8. Out-of-state use CA counties (maximum of 58).

Final Score: Total QSO points times the sum of the multiplier.

Frequencies: 160 meters through 2 meters, except WARC bands. CW—1805 and 40 kHz up from band edge. Phone—1815, 3850, 7230, 14250, 21300, 28450. Novice–10 kHz up from edge of Novice bands and 28450.

Try CW on the half hours, 147.54 at 2000, 0000, 0400Z, 160 at 0500Z, and 80 at 0300 and 0700Z.

Awards: Certificates to the highest scoring single operator in each state, province, and country. Also each CA county and stations scoring 100 or more QSOs.

Trophies galore. Single operator, top three out-of-state, and CA top three. Also CA county expedition, and a special award for the CA and out-of-state stations making the most CW QSOs. Multi-single and multi-multi winners in CA and county expedition. The CA mobile team making the most QSOs. And the top scorer outside the United States and Canada, high-scoring low-power entry (less than 200 watts). A Special Award of a personalized bottle of California wine goes to the top 20 single operators in CA and 20 out of state. And to the top-scoring Novice/Tech entry, both in CA and out of state.

Include a summary sheet showing the scoring, etc., a dupe sheet if you make more than 200 QSOs, and a large SASE for a copy of the results.

Mailing deadline is November 15th and entries go to: NCCC c/o Gary Caldwell, WA6VEF, Box 8014-56, Blaine, WA 98230.

A contest paperwork packet containing log, summary sheet, contest records, county abbreviations, and Special Awards List is available by sending a large SASE to WA6AUE.

WASHINGTON READOUT

BY FREDERICK O. MAIA, W5YI

REGULATORY HAPPENINGS FROM THE WORLD OF AMATEUR RADIO

Amateur Radio Interest Is At A Fever Pitch!

People from all over want to know what it takes to become an amateur radio operator now that the FCC has eliminated the Morse code requirement at the entry level. We have been getting a steady stream of inquiring letters on the subject from readers. This month we will respond to those letters by giving you an overview of the Amateur Service and how you may participate. It is really quite easy.

In a nutshell, amateur radio is a hobby —a leisure-time recreational activity for people interested in electronics and communication. You don't need any previous experience or knowledge to become a ham. Although some beginners attend amateur radio classes conducted by local radio clubs, most teach themselves through self-study. Due to modern equipment and technology, the qualifications needed to become an amateur radio operator are a lot less than they used to be. No longer do you need to know the Morse code or how to build your gear. There are certain things you *must* know, however.

Amateur radio exists in virtually every country of the world. It is the oldest service administered by the Federal Communications Commission, an independent government agency. The earliest radio pioneers were, of course, amateurs, since practical applications of wireless transmissions had yet to be discovered.

Wireline telegraph systems were the primary long-distance communications means in the late 1800s. Global cooperation eventually became a necessity to facilitate exchange of telegraph messages between different nations. The age of radio is considered to have begun about the turn of the century when Marconi discharged spark signals which were received across the English Channel, and later between England and Newfoundland. In 1906 the International Telegraph Union added radio to its responsibilities to help alleviate wireless interference.

As a result of the 1912 London World Radio Conference, the United States took steps to assume control of all radio transmissions. New laws regulated wireless radio and provided for government licensing of all stations. Amateurs no longer would be able to operate on radio wavelengths shorter than 200 meters.

Fifteen years later the nations of the world agreed on its first frequency allocations, including those of the Amateur Radio Service. Since it was known that radio signals also radiated somewhat on multiples of the transmitting frequency, the Amateur Service was assigned bands which were multiples of the 160 meter band. This ensured that all superfluous signals would fall in the higher frequency amateur bands and not interfere with other radio services.

The Federal Communications Commission was created in 1934, when President Franklin Roosevelt signed the Communications Act into law This law regulated all wire and radio telecommunications. The amateur rules are spelled out in Part 97, Title 47, Code of Federal Regulations. Title 47 CFR covers telecommunications (available from W5YI for $2.95).

While today's CBer is only allowed one low-power transmission mode (AM-sideband is a form of amplitude modulation) on one band, amateurs enjoy many bands. In fact, 27 different frequency bands are allocated to the Amateur Service internationally beginning at 160 meters. This makes it possible for amateur radio operators to communicate with their counterparts located in all corners of the world, because different frequency bands have distinctive radio propagation characteristics (distance ranges).

Over two-million operators throughout the world exchange messages by voice, teleprinting, telegraphy, packet, facsimile, and television. Amateur radio is just that. The transmission of business communications is strictly prohibited and is cause for license revocation.

Operator License Required

In areas where the Amateur Service is regulated by the FCC, a government issued license or permit is required in order to be the control operator of an amateur station. These areas include our many island possessions throughout the world. You don't even have to be a U.S. citizen to qualify for an FCC-issued license.

Our government also recognizes the amateur license of many other nations and will issue a reciprocal operating permit to amateurs licensed in other countries. This allows foreign amateurs to operate their radios while visiting the United States or its possessions.

A special 1952 U.S./Canada treaty arrangement gives visiting amateurs the right to operate in the neighboring country without applying for a reciprocal permit. You simply identify your station with your assigned callsign and add the geographical suffix of the region in which you are transmitting. For example, I would use W5YI/VE2 while visiting Montreal. I would sign W5YI/VE3 in Toronto.

Frequency Sharing

All amateurs of a specific license class share the same bands, and it is very important that we take steps to preclude interference with other stations. Listen before you transmit. It is up to the amateur community to make the most effective use of our frequencies. Unlike other radio services, no frequency is assigned for the exclusive use of any amateur station. Amateurs and amateur organizations coordinate certain frequencies that are used for repeater operation to reduce cochannel interference.

It is also important that you read the Part 97 Rules summarizing the frequency-sharing requirements. There are certain geographical radio quiet zones in the United States where you may not operate on certain frequencies. This is to protect certain areas and radio services—such as along the Canadian border or at certain radio astronomy and military installations—from radio interference.

Be aware that all amateur spectrum above 144 MHz is shared with other services in our hemisphere. Other radio services (such as international shortwave broadcasting) in other parts of the world also share our amateur radio bands. Sometimes the U.S. Amateur Service has a primary right of access; sometimes it is secondary. A secondary radio service must not disrupt a primary user.

Amateur Equipment

Another feature unique to the Amateur Service is that licensed amateurs may design, construct, modify, and repair all of their equipment, because the FCC's equipment approval program generally

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101

does not apply to amateur station transmitters. There are special regulations that apply to amplifiers that might be used to boost signals in the 11 meter Citizen's Band.

Only licensed amateurs may build or modify a single external RF power amplifier that will be used on frequencies below 144 MHz. The FCC does not permit the commercial manufacture or distribution of any amplifier capable of amplifying a CB signal. The law says amateurs may sell such an amplifier only to another licensed amateur or to an equipment dealer who must further sell it to a licensed amateur.

Qualifying For A License

An examination must be passed to qualify for an amateur radio operator license. The degree of skill and knowledge in operating an amateur station the examinee can demonstrate to volunteer examiners (VEs) determine the class of operator license for which the examinee is qualified. This is known as the incentive system of amateur radio licensing.

There are two examination systems. The less formal Novice testing program requires two General class or higher level volunteer examiners. The more formal VEC System requires three VEs who must hold Advanced or amateur Extra licenses.

Although a person may initially qualify for any of the five grades of operator class, either the Technician or the Novice operator class is the ideal way to become involved quickly in amateur radio. After gaining more skill and knowledge, the licensee can advance to a higher class of operator license.

Codeless Technician Class

The requirement for the new Codeless Technician class license is a 55-question written examination consisting of Elements 2 and 3A. There is no Morse code requirement. Element 2 contains 30 multiple-choice questions. You must correctly answer 22 to pass. Element 3A requires answering 19 out of 25 questions. The questions cover FCC regulations, operating procedures, safety, and basic communications.

All questions are systematically selected by the VE from a pool of about 700 possible questions. These questions are all publicly known and widely published. If you do not pass both examinations needed to get your license, you get a credit slip (good for one year) for the test element passed. That means you will only have to retake the test element you failed.

The operating privileges of the new No-Code Technician class include all modes in the 6 meter and shorter wavelength amateur bands. This includes the popular 2 meter band, the amateur's social party line, and digital packet radio (automatic computer-to-computer) communications.

By using a radio modem (called a terminal node controller) you can send and receive messages directly at your computer using the free radio waves as your message highway rather than the expensive telephone lines. There are now more than 100,000 packet stations operating on the amateur airwaves!

The code-free amateur radio class has only been in existence since this past spring and has really revitalized amateur radio! Newcomers by the thousands are entering amateur radio at the Codeless Technician level. If you need study material for this new license class, it may be obtained from us, The W5YI Group.

The *Ham Radio No-Code Handbook* is $9.95 plus $2.00 shipping, and the *No-Code Ham Radio Education Package,* complete with IBM-compatible computer-aided instruction software, is $29.95 postpaid. (VISA and MasterCard: 1-800-669-9594 toll-free. We will even tell you the location of the nearest test session. Mail orders go to P.O. Box 565101, Dallas, TX 75356.)

New Codeless Technicians are normally assigned a Group "C" callsign. (Prefix letter "N" followed by a regional designator and three suffix letters. For example: N1AAA is a Group "C" callsign.) When all Group "C" callsigns are assigned, the FCC then allocates Group "D" calls; two prefix letters beginning with "K," a regional designator and three suffix letters. (KB1AAA is an example of a Group "D" callsign.) Your callsign must be transmitted periodically to identify your transmissions.

Additionally, a Codeless Technician operator license plus a Certificate of Successful Completion of Examination (CSCE) for passing a telegraphy examination (usually 5 words-per-minute) authorizes additional voice privileges in the 10 meter band and telegraphy in the 10, 15, 40, and 80 meter bands. A Codeless Technician who passes a Morse code test is known as a "Tech Plus" operator (for Technician plus code).

Novice Class

The Novice class is the entry level for persons, especially youngsters, who do not have the knowledge to pass the more difficult 25 question Element 3(A), but who can pass an elementary 30-question Element 2 and a Morse code examination.

Novice operating privileges include all mode types in segments of the 23 centimeter (1270–1295 MHz) and 1.25 meter (222.10–223.91 MHz band). Also included are teleprinting and voice emission privileges in a segment of the 10 meter band and code authority in the 10, 15, 40, and 80 meter bands. The station is assigned a Group callsign.

Other License Classes

The next step up the amateur radio license ladder is the General class operator. For the Technician class license holder the requirements are passing a 13 words-per-minute telegraphy examination, Element 1(B), and a 25-question written examination, Element 3(B). Examination credit is given for the General class written element when the applicant holds a Technician class operator license issued before March 21, 1987.

For the Novice class licensee the requirements are passing Elements 1(B), 3(A), and 3(B). The General class is authorized privileges in at least a segment of each Amateur Service frequency band. It is the favorite class of the DX (long distance) operator since it yields voice and CW privileges in the choice shortwave HF amateur bands.

Then comes the Advanced class. Another written examination, Element 4(A), is required. This license authorizes additional frequency privileges in the 75, 40, 20, and 15 meter bands. The station is eligible for a Group "B" callsign (two prefix letters, one regional designator, and two suffix letters).

The final step is Amateur Extra class operator. Only 10% of all amateur operators hold this class. Another written examination, Element 4(B), and 20 words-per-minute telegraphy skill, Element 1(C), are required. This license authorizes additional frequency privileges in the 80, 75, 40, 20, and 15 meter bands. This station is eligible for a shorter Group "A" callsign.

Volunteer Examiners

VEs are senior-level amateur operators in the community who volunteer their services. They provide information in the form of a public announcement as to when and where examination sessions are held. A testing fee is usually charged (currently $5.25) to reimburse examiners for costs associated with preparing, processing, and administering examinations.

Study aids are available from Amateur Service suppliers. The W5YI Group also distributes a complete line of low-cost study material for all amateur license classes. (VISA or MasterCard call toll free 1-800-669-W5YI [9594] if you need study material for any license class.)

Disabled Applicants

Volunteer Examiners are required to use special accommodative procedures to assist severely handicapped examinees. They administer the examination at a place convenient and comfortable for the examinee (even bedside).

For a deaf person, the dots and dashes may be sent to a vibrating surface or a flashing light. The VEs may read the questions to blind persons. They also may write for the examinee where necessary to do so. Any special needed equipment must be supplied by the applicant.

Where warranted, the VEs will pause in sending the telegraphy message after each sentence, each phrase, each word, or even each character to allow the disabled person additional time to absorb and interpret what was sent. Also, the VEs may substitute a sending test for a receiving test where the examinee's particular handicap precludes a receiving test.

Amateurs who cannot pass a 13 or 20 words-per-minute telegraphy examination because of physician-certified handicaps are excused from those examinations. To receive examination credit, the handicapped individual must already have qualified for a Novice class operator license by proving to the volunteer examiners that the applicant knows the required 43 Morse code characters at a speed of at least 5 words-per-minute. International law does not permit waivers of all Morse code tests.

The physician should execute a certification only when the nature of the individual's handicap is so severe as to prevent the passing of a 13 or 20 words-per-minute telegraphy examination. The certifying physician must be either an M.D. or a D.O. and be licensed to practice in the United States or its territories.

A special Physician's Certification of Disability form is available from the W5YI-VEC Office (P.O. Box 565101, Dallas, TX 75356). The individual must also sign a release permitting disclosure to the FCC of the medical information pertaining to the person's handicap.

73, Fred, W5YI

CIRCLE 90 ON READER SERVICE CARD

CIRCLE 73 ON READER SERVICE CARD

WORLD OF IDEAS

BY DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

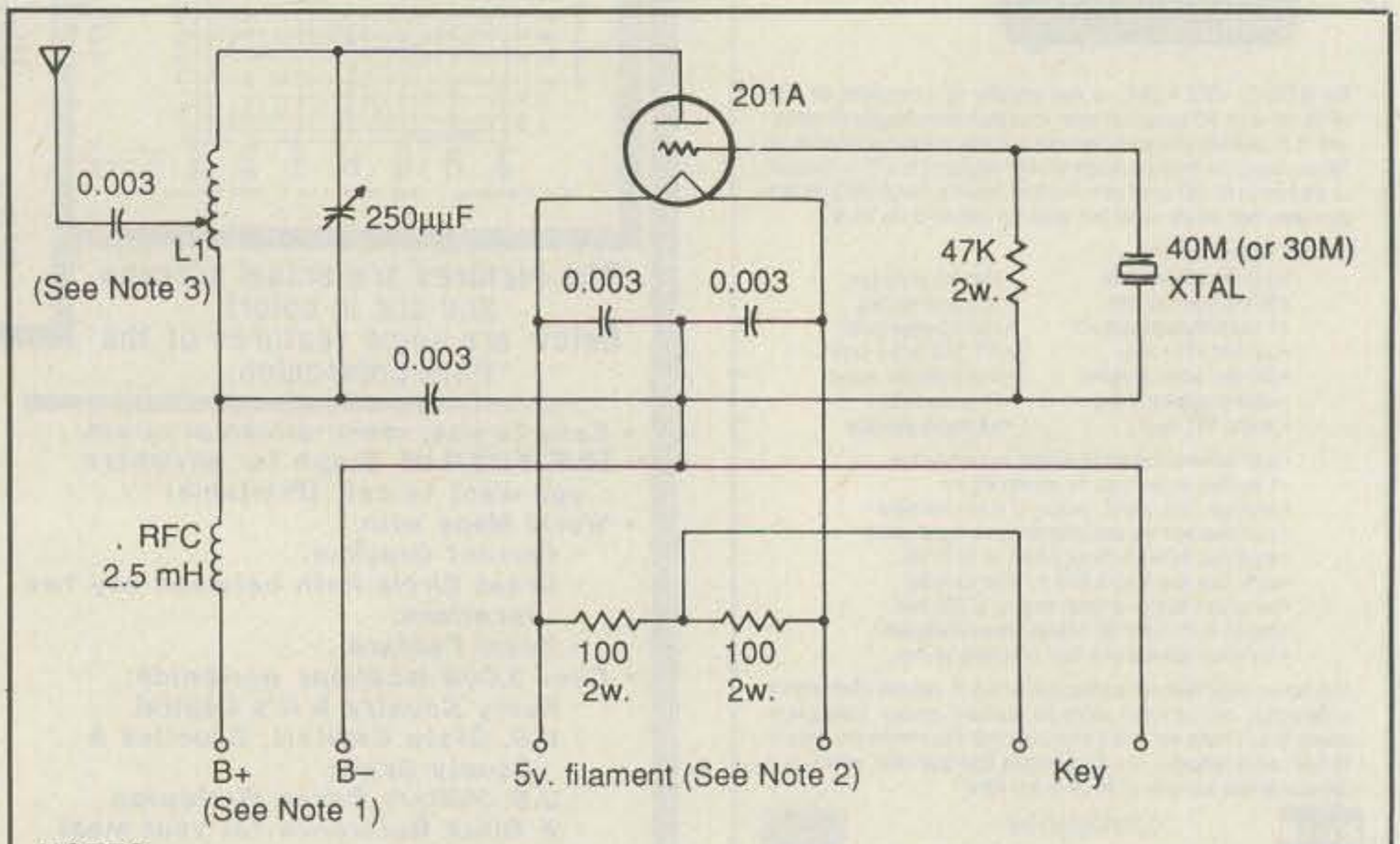
More Golden Oldies!

Heads up, gang. Your requests for more views of old-time rigs and easy-to-build transmitters have been heard and honored. We are taking another ride on the nostalgia special again this month. Our route is classic QRP, and it promises to be fun all the way! In fact, we are even bringing back a very popular name and transmitter many of us remember from our budding Novice days of the '50s: Don Stoner, W6TNS, and his "Space Spanner." Our slant on QRP, incidentally, is well founded. The simple designs of QRP units make great weekend projects, they produce minimum interference and maximum enjoyment, and they continuously prove the operator rather than the rig makes the difference.

Looking back through your letters and my off-the-air notes, I see many of you asked for details on a stand-alone one-tube transmitter and neat solid-state rig (built on a wood frame, no less!). Our "Transformerless Wonder" and "Semiconductor Space Spanner" answer those requests beautifully, plus we are also including a classic Hartley with a good "twist" for first-time builders—crystal control. All of our featured rigs work like champs on today's bands, and they are perfect for reliving those romantic days of yesteryear. Fire up your old HQ-100 or SX-99, and let's get rolling with some real radio fun!

Once again this column is overloaded and moving at a fast pace, but before we move into high gear, here is an interesting question that may become reality if there is sufficient interest. Would you like to see a classic rig (like those in past columns and this month's column) available today? In kit form or preassembled? As you read this column, note which transmitters and receivers appeal most to you, and what they should cost. Drop your note to me, I will pass it on to interested "manufacturers," and report the results here later. Incidentally, thanks to everyone for your immediate acceptance of my new book *Keys, Keys, Keys!* All of your kind words on the photos and stories are greatly appreciated, and *CQ*'s book store reports the books are going like crazy. Now that's exciting! Thanks!

4941 Scenic View Drive, Birmingham, AL 35210



NOTES:

1. I use 10 9v. batteries here.
2. I used a 6v. lantern battery with a wire wound resistor in series. Adjust to 5v. at filament connection.
3. L1 has 9 turns for 40m, 6 turns for 30m with antenna clip at approximately 2¼ turns, coils are stretched to 4" after winding.
4. Condenser and resistor values are what I used.

Fig. 1–Schematic diagram of the beautiful Crystal Hartley transmitter. (Details in text.)

Fig. 2– Front view of W8WVM's Crystal Hartley transmitter. Copper tank coil sits on beehive insulators, clip connects to antenna terminal on rear, tuning condenser is hidden by large dial, and crystal is in the right back corner. This beautiful gem runs 2 watts on 30 or 40 meters.

Upgrade faster with *MorseMan* Plus

Look what your fellow hams have been saying about MorseMan Plus:

- *"A slick commercial program that clearly ranks among the top Morse trainer programs I've laid my hands on"*, Karl Thurber, W8FX, **CQ Magazine** (March 1990)
- *"Morseman Plus is the slickest program to come along in a long time and I highly recommend it to those who want to learn Morse properly"*, Ike Kerschner, N3IK, **Monitoring Times** (May 1990)
- *"One of the top Morse Code trainers available"*, Gordon West, WB6NOA
- *"Thanks to your Morseman software, I just passed my Extra. Your program is wonderful!"* - KF8DS
- *"Using the program every night got my code speed up to 20 wpm and was able to pass the extra!"* - N6ZAE

Every day, we get letters and phone calls from satisfied users, telling us what ***Morseman Plus*** has done for them and their friends. We hear about the people who were unable to learn the code using tapes and other programs, but now have mastered it. We hear from the folks who couldn't pass their General or Extra code before, but with the aid of ***Morseman Plus*** they have reached their goal, and passed the higher speed test.

Morseman Plus is great for the newcomer as well as the experienced amateur. ***Morseman Plus*** will take you from no knowledge of the code, to as high as you wish to go, allowing you to go at your own pace and by using the tried and true advanced features, such as true random callsigns, ASCII text file transmission, random characters, simulated FCC/VEC CW exams, TRUE, *REALISTIC* random QSO's (just like listening to the rig!), full Farnsworth implementation and MUCH more!

Morseman Plus requires an IBM-PC, or compatible PC, with 300k RAM. (soon available for the Macintosh!)

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118 Anti-Virus utilities - McAfee's SCAN program - looks for 50+ know virii. Includes disinfectors.

170,171 ProComm - One of the best communications programs available. Works great w/ packet radio also.

683, 684 C Tutor (2 disks) - good introduction to C

726 Personal C Compiler - a very professional C compiler. Top notch MAKE facility, linker & examples.

727-730 DOSea - (4 disk set) - great hypertext tutorial on MS-DOS. For beginners and experts alike. (512k RAM req'd)

735 GTE's DOS Tutor - a fabulous graphically oriented DOS tutor. Very complete.

1069 Computer Buyer's Best Prices - A VERY detailed and complete database of info containing the lastest and best prices on PC's and all related hardware (no software listed).

1082 Ham Radio 2 - Packet-related - YAPP 2.0 and PackTalk terminal programs.

1084 Ham Radio 4 - programs for the ham. Counties, antenna design and more (requires BASIC)

1085 Ham Radio 5 - antenna analysis, RF engineering & HF/VHF propagation, Smith chart, CW decoder.

1086 Ham Radio 6 - Sunrise/Sunset predictions, RF/circuit analysis tools and tropo loss prediction.

1087 Ham Radio 7 - engineering programs, grid square calculation AND MORE! (some require GW-BASIC)

1089 Mapper - a top notch world map that shows grayline, MUF, shortpath, beam headings & more. (EGA/VGA req'd)

1090 MiniProp 2 - The king of propagation forecasting. Gives detailed conditions. Easy to use.

1091 TrakSAT - nice satellite tracking system with very good graphics, good documentation and satellite data

1092 PC-Track - A favorite EGA/VGA satellite tracker. Great graphics and easy to use.

1093 - Telemetry Decoders - programs to decode the telemetry signals from the new PACSATS. (req's TNC)

1094 - Icom Rig Control - a collection of programs to control your IC725/735, ect., with your PC.

1096 Radio Mods - a complete listing of several modifications to many popular scanners, HT's , ect.

1097 RD-SSTV - easy way to receive SSTV pictures with the PC. Hook up via serial port & speaker output.

1098 - FT767 Rig Control - control the FT757 & FT767 rigs.

1099 Kenwood Rig Control - control your TS440 and TS940 with your PC. Even works on the TS140.

1100 Icom R7000 control - PC control of the R7000 - even has logbook, frequency database and more.

1103 TS940 Spoiler - top notch PC control for the TS940

1110 DX Contest Logger - version 4.25 of the legendary K1EA contest logger.

1119-1120 Total Ham! (2 disks)- a popular multi-purpose, all-in-one utility program. Simultaneous logging, beam headings, awards, counties & record keeping. (hard drive req'd)

1121 Amateur Radio Logbook - a great little logbook program - Uses FAST indexing and generates full reports.

1122- LOG-EQF - top notch logging program that also controls the Kenwood line of radios. Latest version.

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1135 PackTALK PBBS - N3DFD's entry into the packet BBS wars! Has autofoward, RLI/MBL compatible

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1145 PK232 Terminal Program - two programs for the AEA PK232 TNC.

1148 AA4RE Multiconnect Packet BBS - top notch, very popular multiconnect packet BBS. A local favorite!

1148 PicPro/WeFAX - WeFax and packet pictures via your Kantronics TNC (EGA req'd for WeFAX)

1149 GeoClock - Real-Time grayline map of Earth. Like DX-Edge. (CGA/Herc) -for EGA/VGA version order #1150.

1156 SKYGlobe - EXCELLENT star "gazer" system. Shows 89 constellations plus MUCH more!

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1205 WX Radar Plotting - displays radar maps in color, just like on TV. Data can be entered or downloaded from NOAA or WeatherBANK. Even animates. (EGA/VGA req'd)

1249 World 29 - good world-view map system. Even allows you to zoom in on any location.

1320 PC Board Layout - good printed circuit board design & layout program. Prints to Espson or HPLJ printers

1322 CoreDBMS - full database of info for ferrite rod & toroid cores. Look up via #, size - even loss v. frequency.

1330 ACIRAN - AC Circuit analysis on a PC!

1331 PC-ECAP - linear circuit analysis w/ graphing

1801 The DX'er - nifty prog to provide DX beam headings, sunrise/sunset times, distance, MUF and much more.

1802 Ten-X - top notch 10-10 number manager. Runs as a TSR pop-up or as a regular program.

1810 APLink - concurrent AMTOR/Packet mailbox and PBBS, all in one package! Runs simultaneously on the same system! Great for HF boards and mailboxes.

1811-1815 Amateur License Prep (5 disk set) - David Barker's fantastic license preparation course. Novice thru Extra w/ the latest question pools and quizzes.

1840 Shuttle Tracker - high resolution shuttle tracking. Tracks real time or elapsed. Great graphics!

1896 Radio Mods 2 - the successor to our extremely popular disk 1096. Has listed modifications for several HF/VHF rigs and scanners.

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Ham Pack 1 - contains all ham radio disks (1082-1150, a total of 42 disks (some not listed above), plus the ***MorseMan Plus*** code trainer and the Expanded words disk. A total value of $157.90 for only $109.95 on 5.25" disks - a total savings of $47.95! (for 3.5" disks, add $30)

Ham Pack 2 - contains all ham radio disks (a 42 disk collection) without the ***Morseman Plus*** code trainer. A total value of $126 for only $94.95 - a total savings of $31.05! (for 3.5" disks, please add $30)

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- All disks are $3.50 each or $3 each for 10 or more. For 3.5" disks, add $1 per disk. US & Canada, please add $4 s/h per order - outside US/Canada add $9 per order for airmail.
- VISA/MC, checks (on US banks only) & MO accepted. **Minimum COD order is $30**
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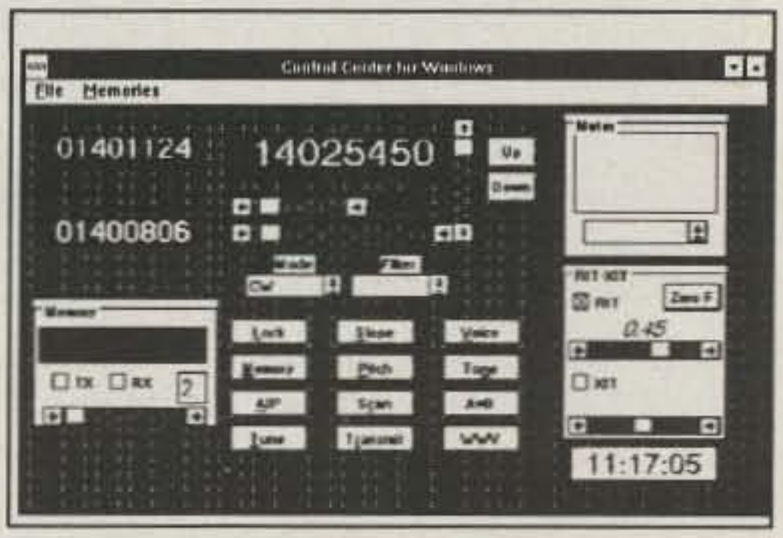

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Now you can control your interfaced Kenwood's functions with the ease of use of Windows, maintain your station and logging information with the fast, built-in ***Control Center Information Manager (CCIM)*** and run any other programs that you wish, taking full advantage of the multitasking features of Windows! **Control Center** will even run in the background, while maintaining a watch on your radio!

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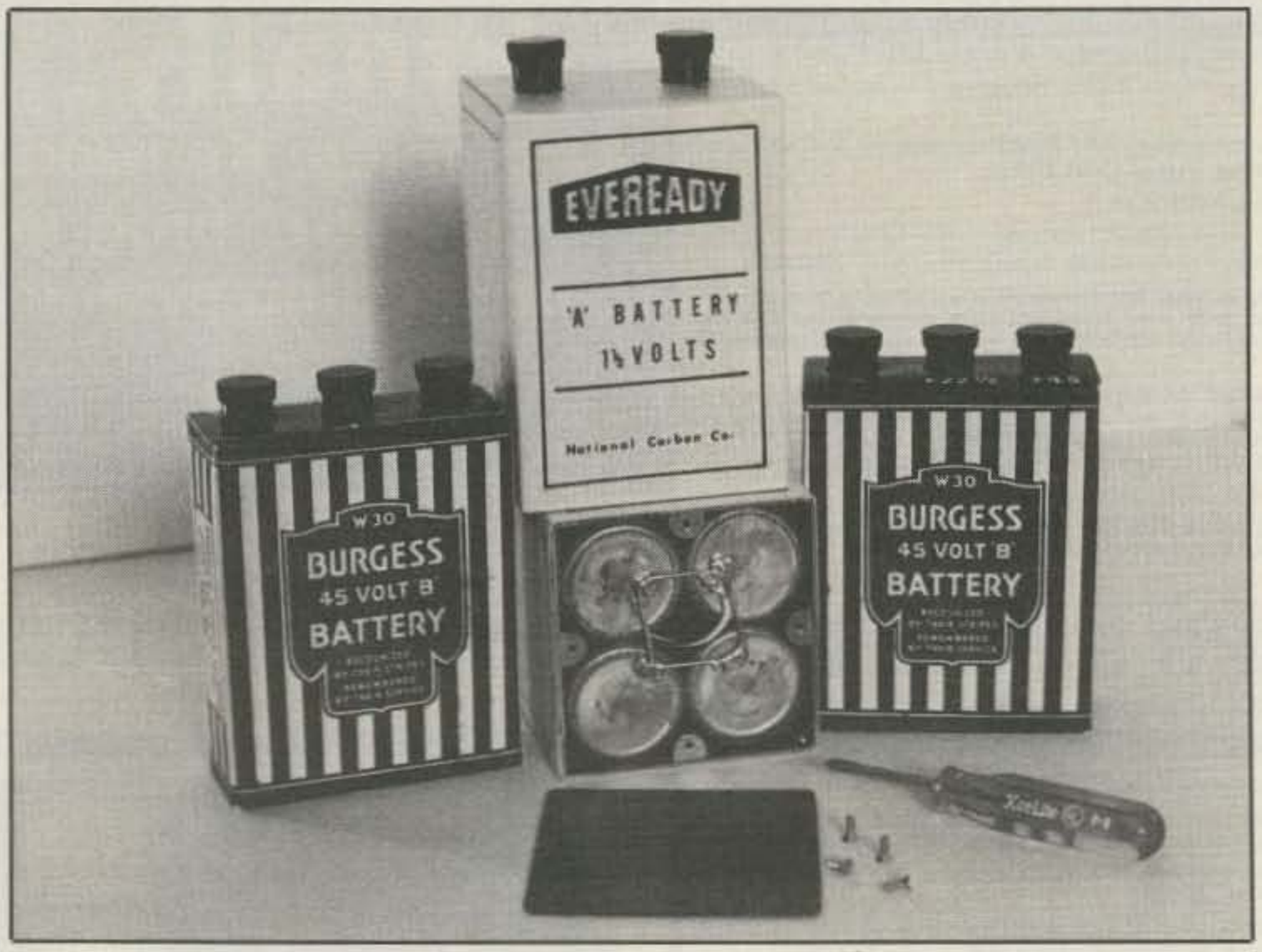


Fig. 3– Arnold Sayre's homebrewed batteries for Crystal Hartley and other rigs. Standard 1.5 and 9 volt batteries are mounted in cases with slip-off covers made with photocopies of original-era items.

That's enough soapboxing for this month, so let's get to the rigs!

The Crystal Hartley

Our first transmitter is compliments of Arnold Sayre, W8WVM (Route 7, Box 14, Buckhannon, WV 26201), and it is an improved/crystal-stabilized version of our classic Hartley featured in past columns. The schematic diagram is shown in fig. 1, and Arnold's completed rig is shown in fig. 2. Needless to say, W8WVM's workmanship is impeccable. The oak base has a fantastic glaze, the coil and wiring sparkle, and every component shines like new. Imagine using this little gem on the air today! We know you can't wait to build your own copy of this critter, so here are the details.

The plate coil (L1) is ¼ inch copper tubing wound with an inside diameter of 3 inches. Each end is flattened and drilled for mounting on the beehive insulators. A 9-turn coil is used for 40 meter operation, and a 6-turn coil is used for 30 meters. Both coils are stretched to 4 inches in length after winding, and alligator-clip-tapped at 2¼ turns from the "cold end" for the antenna (vary the tap position until you get maximum output into your long-wire or Windom antenna).

The plate tuning condenser should be a transmitting type. Any value between 150 and 250 mmFd should work fine. Arnold used .003 mFd bypass condensers in his version; I used .005 mFd, so there is also good leeway in this area. We heartily recommend old-style FT243 crystals (readily available today from JAN Crystals at 1-800-JAN-XTAL) because they can withstand some of this circuit's feedback abuse, and you can disassemble them for "home grinding." Surely you remember running quartz slabs in figure-8 patterns through a mix of Ajax and water to raise their frequency or rubbing them with pencil lead to lower their frequency (see July 1991 *CQ* for a refresher).

A genuine Radiotron UX201A tube is used in the little delight. These beautiful round-dome tubes are a mite scarce (and expensive), but such is the difference between classics and old junk. A more economical 45 tube can be substituted (its pin connections are the same, but filament voltage is only 2.5 volts), but hold the plate voltage below 150 volts. Otherwise, high grid current can fracture the crystal.

Total battery power is heavily recommended for this transmitter, or its CW note may sound like a buzz saw cutting through a pine knot. Use pure DC for best results! Fig. 3 shows how W8WVM accomplished this homebrewed battery trick. Five regular 9 volt batteries are mounted in each plastic case. Their "wrap-around covers" are poster board with Burgess and Eveready logos cut from old catalogs and glued in place. Press-on letters are included on the "A" battery, and old-style screw terminals are mounted on the tops. Completed covers are sprayed with plastic to retain the new look. Since the covers slide off, battery replacement is easy.

Before proceeding to our next transmitter, I must share some more views of W8WVM's creative genius. Fig. 4 shows Arnold's 1930-style station consisting of our Tri-Tetter transmitter (featured in March 1989 *CQ*) and Globe Trotter receiver (highlighted in February 1990 *CQ*). They are complemented with American Bell headphones and J-38 key, and Arnold says the setup works as good as it looks. If this complete setup was available in full kit form today, homebrewing would hit an all-time high! The Tri-Tetter runs 5 watts and uses plug-in coils for 40 and 30 meters. Arnold added an antenna

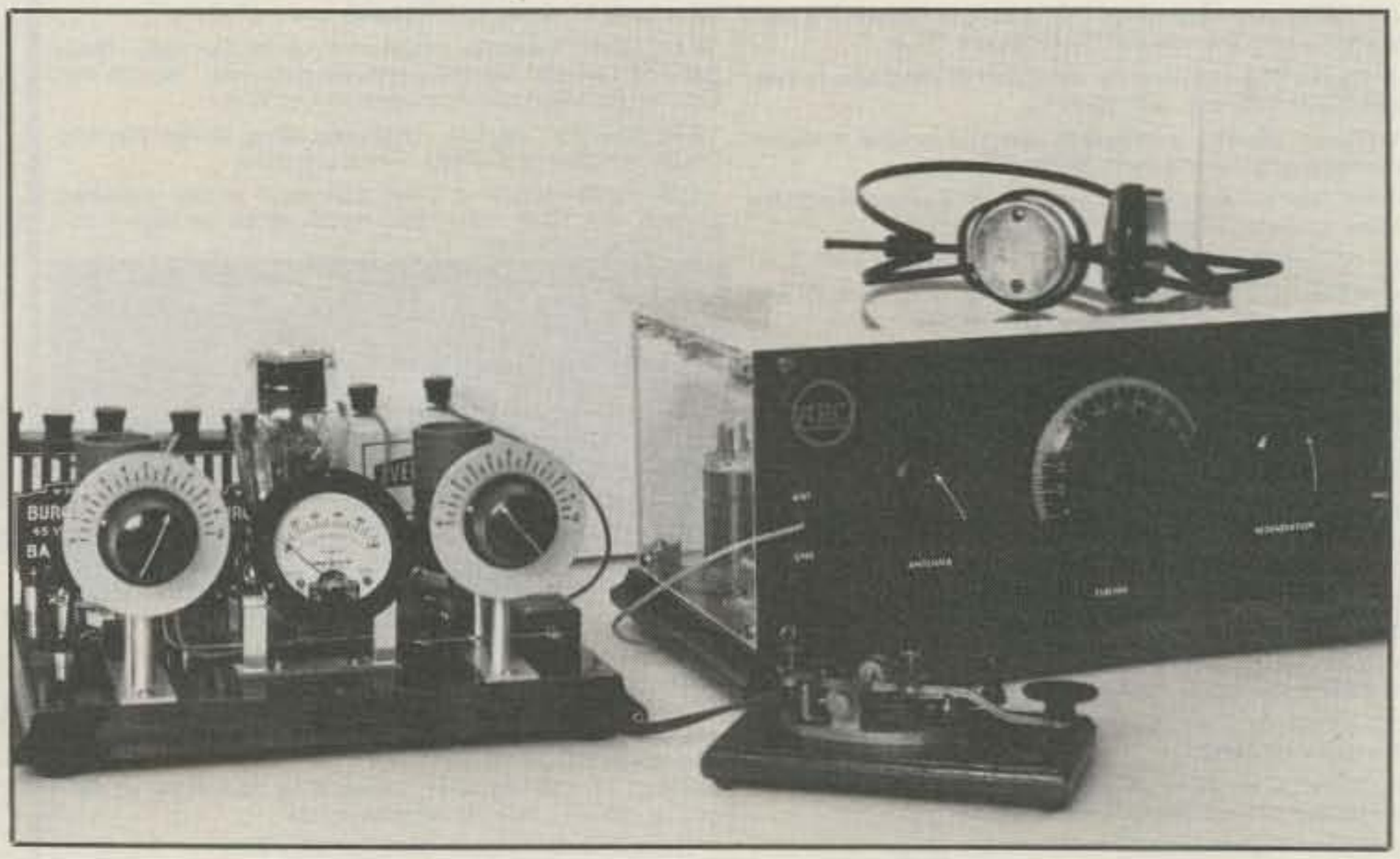


Fig. 4– This complete 1930s-style station was built by W8WVM in 1990. The Globe Trotter receiver on the right was featured in our February 1990 CQ column, and the Tri-Tetter transmitter on the left was highlighted in our March 1989 column. Now this is a real ham rig!

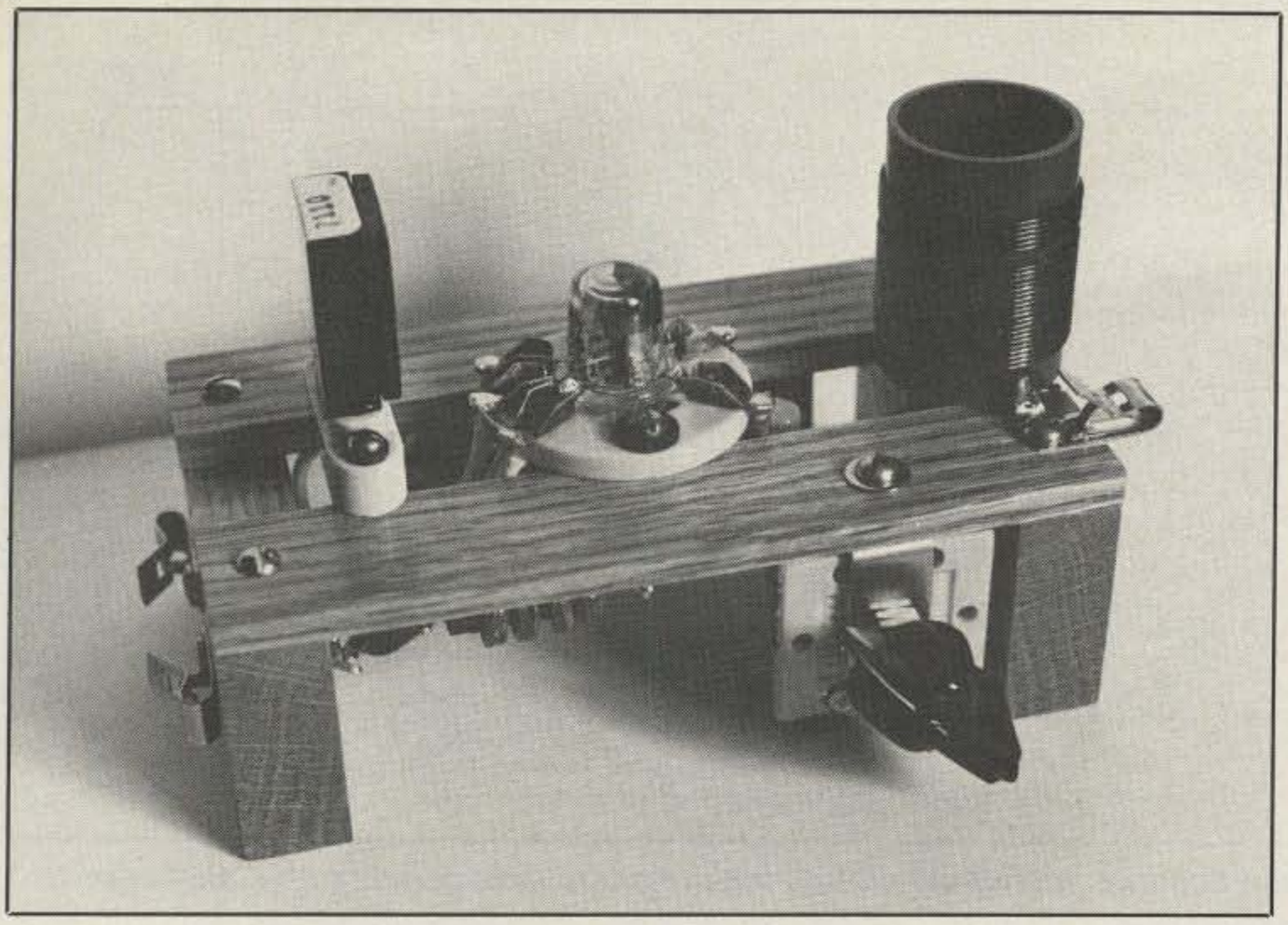


Fig. 5– W8WVM's 'Lil Buddy is a masterpiece that makes our original unit look sick!

current meter and loading condenser (365 mmFd in series with one antenna coil lead) to balance the layout. The homebrew dial plates are made with press-on numbers on aluminum sheets. Very nice!

Next is W8WVM's version of my 'Lil Buddy transmitter highlighted in March 1990 *CQ* (fig. 5). This 500 milliwatt type uses a 955 acorn tube obtained from Fair Radio. It is built on an oak frame finished in clear lacquer, and makes my original version look sick. Arnold sent me an oak frame so I could rebuild my version to look like his version of my version (say what?), but I am now hooked on the W6TNS "Space Spanner" and will probably use it for that rig. Then again, a well-built 'Lil Buddy is a neat 30 meter QRP rig. Moving right along . . .

The Transformerless Wonder

Okay, stout-hearted spendthrifts. Fig. 6 shows the perfect mate for your AC/DC S-38 receiver—the infamous Transformerless Wonder! Underwriters Laboratories would have a field day with this little 3 watt transmitter, so **do not** (I repeat, **do not**) assemble it on a metal chassis. Why? One side of a regular 115 volt AC line is at ground potential, and the other side is "hot" (115 volts between it and ground). Unless you assemble this little treasure on a wooden frame and use a floating ground, you stand a 50–50 chance of being zapped big-time! Never fear, as Dave has the ideal solution. Assemble this gem on the same 3″ × 3″ × 10″ wooden frame used for our "John Ruskin Special" described in March 1990 *CQ*. Make sure all AC wiring and B– leads are well insulated (including the key; notice one side connects to ground/115 volts AC), and enjoy a self-contained plug in-and-use transmitter that fits anywhere!

The key component in this transmitter is a 117N7GT dual-section tube. One section is the power supply's rectifier, the other section is the transmitter's power pentode, and the filament operates directly from 115 volts AC. You want this gem to have a good CW note, so do not skimp on filter capacitors; 150 to 250 mFd is a good choice. Tape them together and mount them between terminal strips screwed to the wood frame. Another terminal strip can serve as AC-cord connection points. Wrap it with tape to avoid exposure, and then simply plug the AC cord into an outlet to "switch on" the transmitter.

A slight amount of tinkering may be required for optimizing the plate coil, so several construction options are open to fit your available parts. If you have an old-time 1¼ or 1½ inch plug-in coil form, use number 18 or 22 enameled wire and wind 20 turns for 80 meters, 15 turns for 40 meters, or 12 turns for 30 meters. Space the turns to occupy 1½ inches on the form. The antenna pickup coil is 6 turns of similar wire, close wound, above or below the plate coil. After you get the transmitter perking, remove plate turns one at a time and retest until you get maximum output. If you do not have coil forms available, the regular bell wire and sucker-stick form/mount concept I used in the John Ruskin Special (see March 1990 *CQ*) works fine in this rig. That form's diameter is roughly 2 inches. A 10-turn plate coil and 5-turn antenna coil are used for 30 meters. Use our previous coil-form notes and your ingenuity to scale coils for other bands.

Tune-up of this transmitter is similar to the previously discussed Crystal Hartley. Simply tune the plate condenser for maximum output. If desired, a 100 or 365 mmFd variable can be series-connected with either antenna-coil lead. Loading then follows the usual pi-net procedure. You can also connect a VOM across key terminals for "dipping" and checking input power. Approximately 35 ma at resonance/dip is maximum loading.

Drop me a note when you get your 117N7 rig going. I would like to be your first 30 meter contact.

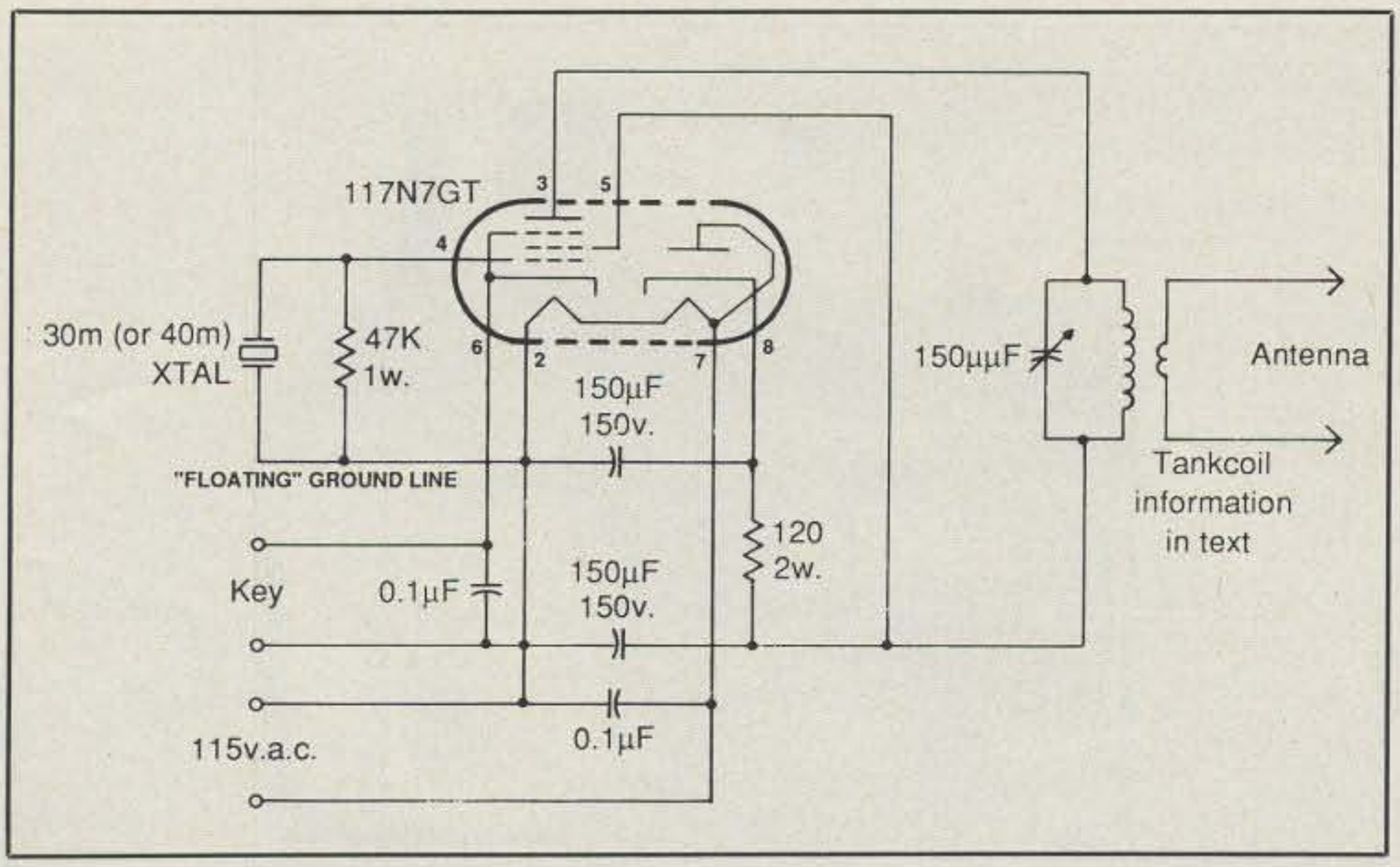


Fig. 6– Schematic diagram of the "Transformerless Wonder." Transmitter can be built on the same wood frame used for our Ruskin Special in March 1990 CQ.

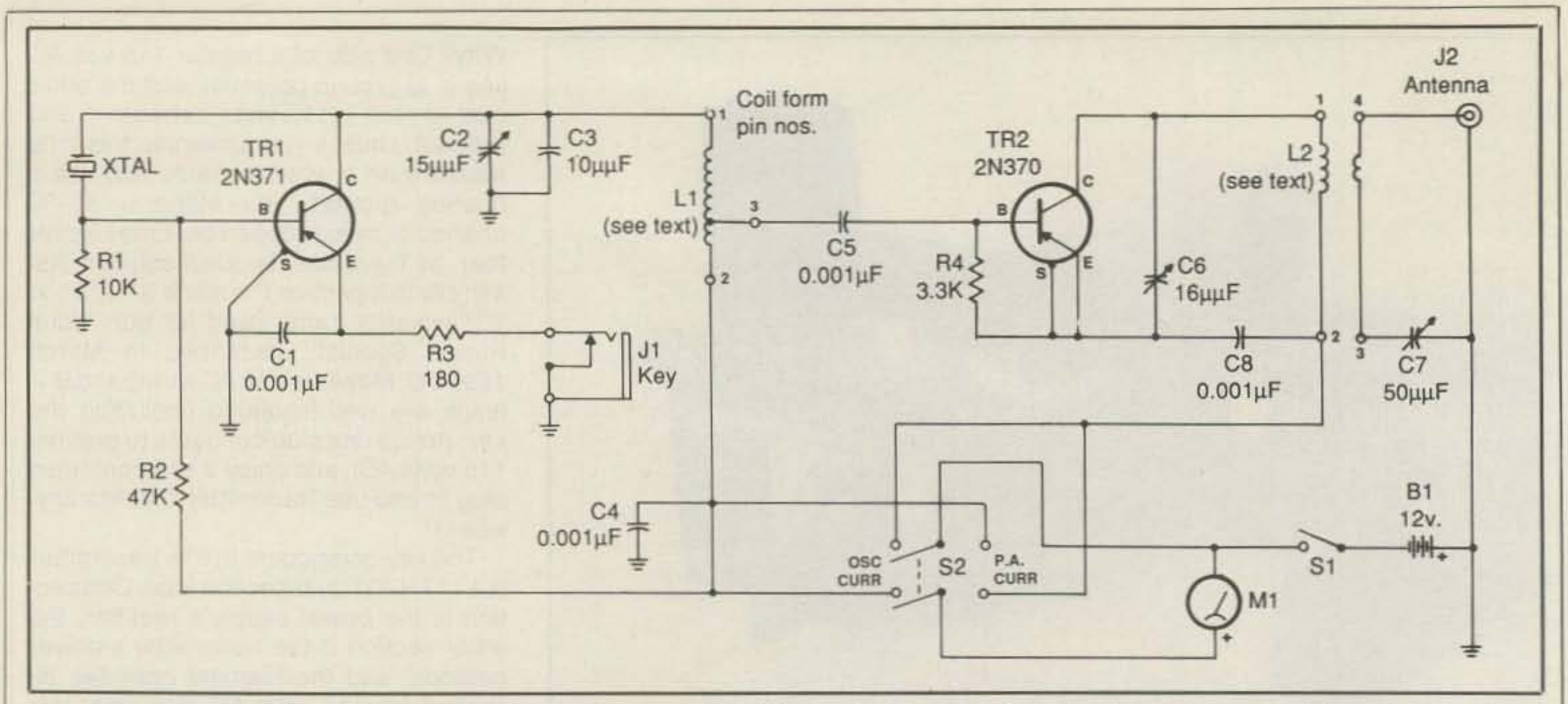


Fig. 7– Schematic of the Semiconductor Space Scanner. W6TNS classic was one of the first home brewed solid-state transmitters

The Semiconductor Space Spanner

If you were a budding Novice during the 1950s, you probably remember reading Don Stoner's description of his new-style solid-state transmitter in *Popular Electronics* magazine. This heart throb used a pair of PNP transistors to run 90 milliwatts on 15 meters, and W6TNS worked all continents with it. The schematic diagram of this little classic is shown in fig. 7, and its original-era (aged!) photo is in fig. 8. Don's original version was built on a 3″ × 6″ × 4″ chassis. Alternately, you can sacrifice some of its sex appeal and build it on a 'Lil Buddy wood frame (see March 1990 *CQ*). Mount the three tuning condensers vertically, put the meter and crystal socket on the front with angle bracket supports, and wire the transistors right by their leads.

Look at the SSS diagram, ignore the fancy meter switching (S2), and you will see this circuit is actually simple. A basic Pierce oscillator, current-limited by a 180 ohm resistor, is emitter-keyed. Its collector is tuned by a 10–25 pFd capacitor. (C2 and C3 could have been one capacitor. Evidently Don did not have a 25 pFd on hand.) Oscillator output couples through C5 to Q2's base (R4 is reverse bias—evidently class C). Q2's collector is tuned with C6, and C7 adjusts antenna loading. The meter switch simply reads Q1 current (bottom pole) while completing Q2's circuit (top pole), or Q2's current while completing Q1's circuit. Clever!

Now some notes for modern-day SSS builders. Finding good substitutes for the

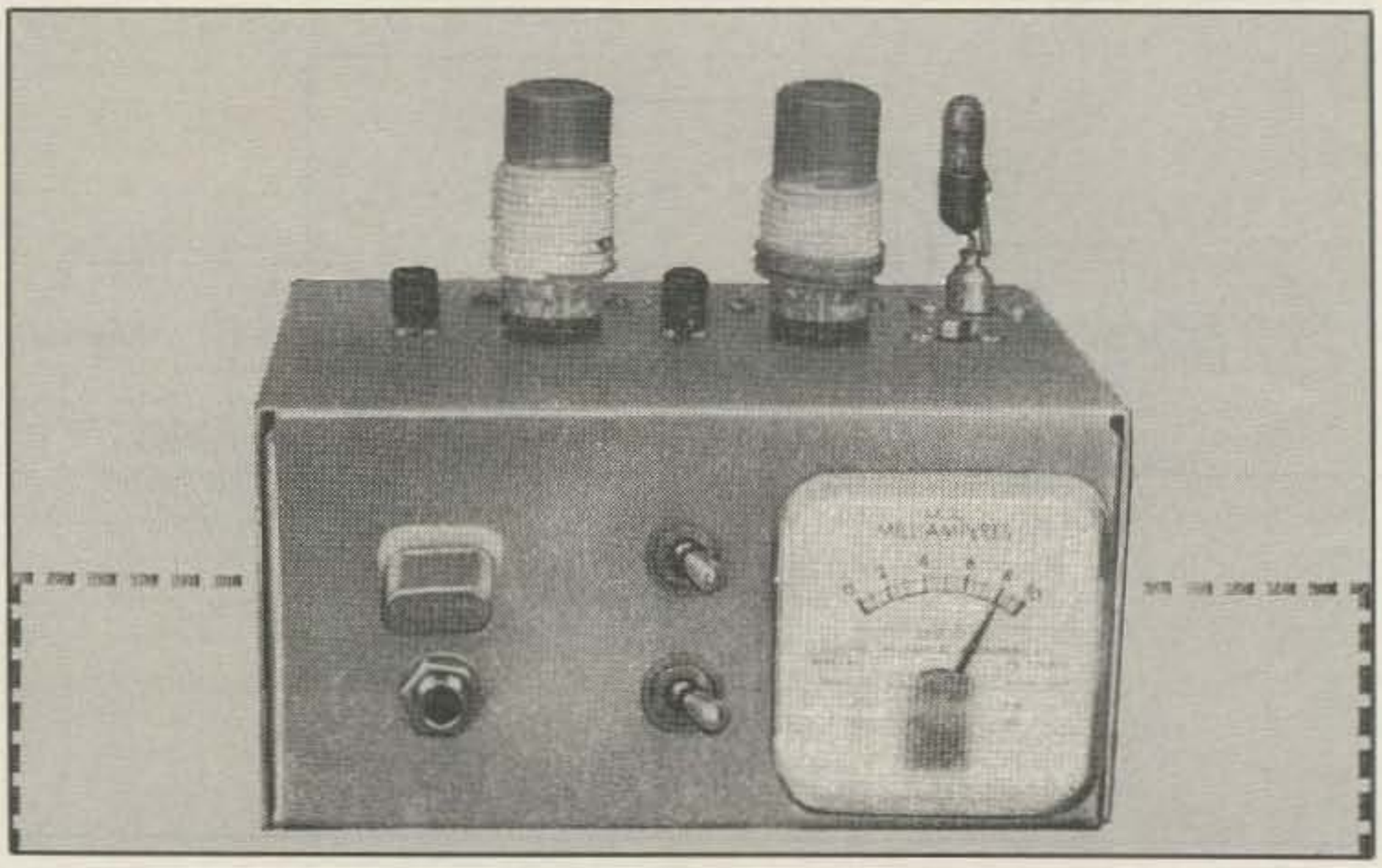


Fig. 8– Original-era (and yellowed with age!) picture of the Semiconductor Space Scanner. Truly '50s nostalgia at its best!

original 2N371 and 2N370 transistors is not easy today, as nearly all modern transmitters use NPNs. A good alternative for both is the 2N3906, or you can reverse the battery and use 2N2222, 2N3904, or 2N3866 transistors (our substitutes work for both stages).

All coils for the SSS are wound using number 20 plastic-covered hookup wire. The forms are ⅝ inch diameter by 1½ inch tall (use pill bottles glued to miniature tube plugs mating with similar sockets on the chassis). L1 and L2 are both 15 turns for 15 meters. Tap L1 at 3¾ turns from the bottom. For 10 or 12 meters L1 is 11 turns tapped 2¾ turns from the bottom, and L2 is 10 turns. For 17 meters L1 is 17 turns tapped at 4 turns, and L2 is 17 turns. Antenna coil L3 is wound in the same direction and over the bottom of L2. Wind 5 turns for 17 meters, 4¾ turns for 15, and 3¾ turns for 12/10 meters. Use an overtone crystal cut for one third your desired frequency in this rig (example: 7.020 MHz for 21.060 operation, 6.025 for 18.075, etc.). They are available from Jan Crystals.

Tune-up follows classic tube rig procedures. Connect your dipole or beam and adjust C2 for maximum power amplifier current, and then adjust C6 for a dip in power amplifier collector current. Increase coupling with C7, redip C6, and repeat until Q2 collector current is 8 or 9 ma. Alternately, all three capacitors can be tuned for maximum output as measured on a field strength meter or your receiver's S meter. Don had good luck with this gem during the '50s because "high power" signals were usually 100 watts. Today folks run 1000 watts. That's why I suggest WARC band operation: The "usual" power of 100 watts on 17 and 12 meters gives you a maximum ratio.

So how is W6TNS today? Don is alive and well, semi-retired, and he recently founded NARA, The National Amateur Radio Association (16541 Redmond Way, Suite 232, Redmond, WA 98052). This group's objective is to expose the "outside world" to amateur radio and usher curious onlookers into our great hobby. Don is doing this in the same "hand-holding manner" many of us recall from the '50s. Stoner is a fascinating individual, and I thoroughly enjoyed collaborating with him on reactivating the SSS. I am sure he would be delighted to hear from you when you get your own SSS on the air.

Once again we've overflowed available space. Until next time, I look forward to seeing you on 30 or 17 meters around dawn or dusk, or on 20 SSB some Sunday afternoon. I also still have some Wild Woody WARC keys to give to deserving friends. Finally, please remember to include an SASE with your letters and be patient for replies.

73, Dave, K4TWJ

BILL'S BASICS

BY BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Initial Operating Awards

Amateur radio operating achievements are recognized by more than 1000 certificates or plaques. This magazine devotes a monthly column exclusively to such operating awards. This article is intended to introduce new operators to awards beginners can quickly acquire. It is advisable to include a self-addressed, stamped, business-size (#10) envelope with your request for an award application.

Novice Century Club Award

CQ's Novice Century Club Award Program is intended to provide Novices with an additional incentive to operate and to exchange QSL cards. Contacts may all be on one band, or they may be on any combination of our U.S.A. Novice bands. Similarly, one mode or any combination of modes may be used. Contacts do not have to be just with other Novices. Contacts with all classes of domestic (U.S.A.) and foreign (DX) amateurs also count towards qualifying for this award.

After collecting the QSL cards which prove 100 Novice band contacts, request a Novice Century Club Award application from *CQ* Magazine, 76 North Broadway, Hicksville, NY 11801. The back side of this application has spaces in which the callsigns should be listed in sequence. It is best to use the sequence system used in the *Callbook*; arrange listing by callsign districts (one through zero) and with suffixes shown alphabetically for each district. Have two Technician or higher class licensees check your list against your received cards. If they agree that the list is correct, have both amateurs fill in the verification portion of your application and sign it. Mail your completed application to the Novice Century Club Award Manager, using the address shown above. There is no fee for this award.

Your numbered certificate will be mailed to you soon after your application is received. It is a nice 8½ by 11 inch award that is suitable for framing (see fig. 1). You may decide to hang your award in your shack, as others have done.

The Novice Century Club Award is only available to U.S.A. Novices.

45527 Third Street East, Lancaster, CA 93535-1802

Rag Chewers' Club Award

The starting date of the RCC is not readily available, but it appears to be in the late 1920s or the early 1930s. The RCC is intended to encourage longer contacts between amateurs to promote friendship and understanding. On-the-air conversations are referred to as "rag chewing," which provided the name for this award. An applicant just has to report the details of a contact which continued for at least 30 minutes. A business-size (#10) SASE (self-addressed, stamped envelope) must be sent to the ARRL (American Radio Relay League) with the applicant's contact report and RCC request. The ARRL's address is 225 Main Street, Newington, CT 06111. The RCC award has been issued during each of the last few years. About 90% of these awards go to domestic (U.S.A.) amateurs. The RCC award is issued by "The Old Sock," and this person's identity remains a closely guarded secret.

If you want to nominate someone else to receive the RCC certificate, send information to that person to make her/him aware of the availability of this award, plus its requirements. Do not submit a nomination to the ARRL on behalf of someone else. The applicant must submit her/his own request. RCC membership is open to all amateur radio licensees as a free service of the ARRL; you do not have to be a League member to obtain an RCC award. (See fig. 2.)

The TAD Award

The Ten American Districts (TAD) Award requires a lot more time and effort to earn than an RCC award. However, it is attainable to those who are just getting started on the air. It requires the applicant to provide proof (QSL cards or a verified list) of two-way contacts with other amateurs in each of the ten U.S.A. callsign districts (one through zero). This award was initiated during 1973, and more than 4300 TAD certificates have been issued. These awards have been sent to amateurs in all 50 states, plus amateurs in about 250 ARRL DXCC credit countries. It was initially believed that just U.S.A. Novices would be interested in acquiring TAD certificates, but most of them have been issued to DX (foreign) amateurs and General or higher U.S.A. licensees requesting special endorsements (code, voice, RTTY, packet, single band, YL, QRP, etc.).

Here are Diane, KB2KLV, and Thomas, KB2KRN, Pataki of Jamaica, New York. Their parents are Eva, WA2BAV, and George, WB2AQC. Diane is 18 years old and is a student at Barnard College of Columbia University. She frequently uses Spanish during contacts. Thomas is a 13-year-old high school student. Diane recently upgraded to Advanced and Thomas upgraded to Technician.

The TAD award is available to every amateur. You may submit QSL cards as proof of contacts, or you can send a list of contacts (verified by two unrelated amateurs) in lieu of cards. The list system is preferred. The cards are submitted, and they are returned to the applicant with the TAD certificate. Awards are issued the 19th day of each month. If a list (only) is used, each TAD award costs a domestic or foreign applicant $2.00 or $3.00, respectively. If cards are submitted, these

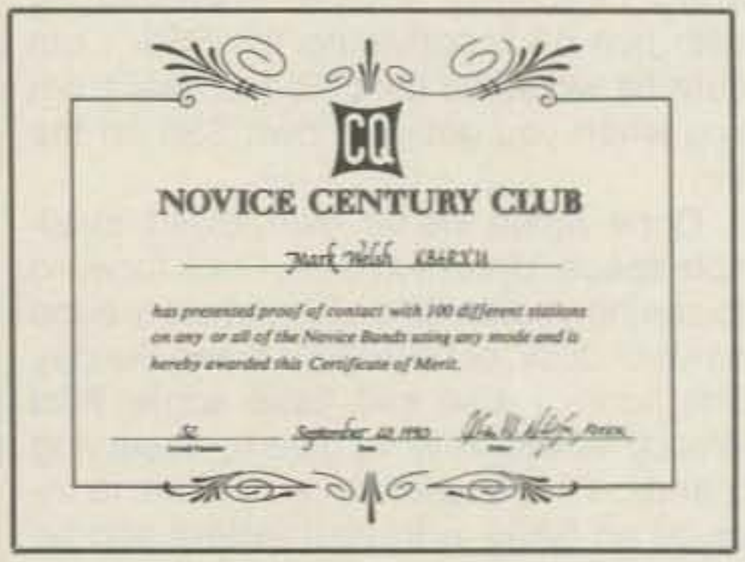
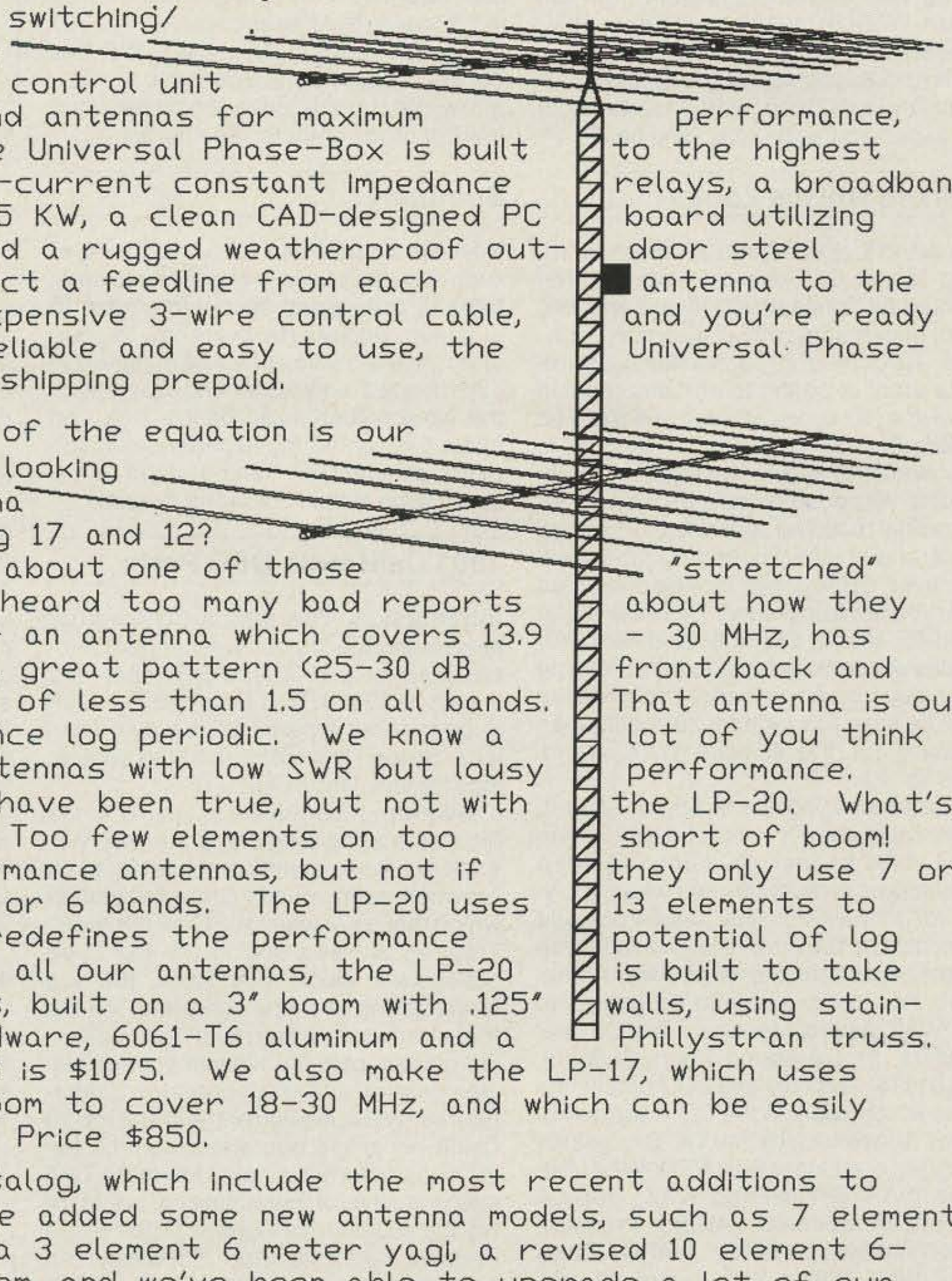


Fig. 1– The Novice Century Club award available from CQ magazine.

IMAGINE - A high-peformance 5-band stacked array, using only 2 antennas! You've heard about stacked arrays, you've heard them on the air, but you thought you just didn't have enough room to put one up. DX Eng. has two products which make stacked HF arrays possible for nearly everyone. Our newest product, the Universal Phase-Box (patent pending) allows multi-band antennas to be stacked, and operated as a stacked array or as individual antennas, on any band from 160 to 10. This unit, consisting of a remote switching/impedance matching unit, combined with an indoor control unit lets you stack multiband antennas for maximum performance, and makes it easy. The Universal Phase-Box is built to the highest standards, utilizing high-current constant impedance relays, a broadband transformer rated at 5 KW, a clean CAD-designed PC board utilizing strip-line technology and a rugged weatherproof out-door steel enclosure. Simply connect a feedline from each antenna to the remote unit, run an inexpensive 3-wire control cable, and you're ready to operate! Rugged, reliable and easy to use, the Universal Phase-Box is priced at $295, shipping prepaid.



THE OTHER HALF - of the equation is our LP-20. Have you been looking for a multi-band antenna to cover 20-10, including 17 and 12? Have you been thinking about one of those tribanders, but you've heard too many bad reports about how they "stretched" - 30 MHz, has really work? We offer an antenna which covers 13.9 - front/back and excellent gain (7.5 dBd), great pattern (25-30 dB That antenna is our front/side) and an SWR of less than 1.5 on all bands. lot of you think LP-20, a high-performance log periodic. We know a performance. logs are compromise antennas with low SWR but lousy the LP-20. What's In the past, that may have been true, but not with short of boom! wrong with most logs? Too few elements on too they only use 7 or Logs can be high peformance antennas, but not if 13 elements to 8 elements to cover 5 or 6 bands. The LP-20 uses potential of log cover 5 bands, and it redefines the performance is built to take periodic antennas. Like all our antennas, the LP-20 walls, using stain- the toughest conditions, built on a 3" boom with .125" less steel element hardware, 6061-T6 aluminum and a Phillystran truss. The price of the LP-20 is $1075. We also make the LP-17, which uses 10 elements on a 24' boom to cover 18-30 MHz, and which can be easily upgraded to an LP-20. Price $850.

We have a new catalog, which include the most recent additions to our product line. We've added some new antenna models, such as 7 element 10 and 15 meter yagis, a 3 element 6 meter yagi, a revised 10 element 6-meter yagi on a 48' boom, and we've been able to upgrade a lot of our current models. Our larger antennas now feature heavy-wall booms (.125") standard, and heavy-duty booms are an inexpensive option even with our smaller antennas. Our 40 meter yagis are now even more rugged, with elements starting at 2" OD by .125" wall, tapering to 1" tips! Call or write for our current catalog. Also, we now have a toll-free number for orders and catalog requests.

DX ENGINEERING, INC.

618 Spaulding Ave., Brownsville, Oregon 97327

(503) 466-3138 Orders / Catalog Requests (800) 373-0239 Fax (503) 935-4044

VISA

MasterCard

CIRCLE 173 ON READER SERVICE CARD

respective costs are $3.00 (U.S.A.) and $4.00 (DX).

Earning a TAD award is an achievement of which one should be proud. It is not easy to contact an amateur in each of the 50 states, and it can be very hard getting cards from all 50 states, as is required to obtain a Worked All States (WAS) award.

The TAD award is available from Bill Welsh, W6DDB, 45527 Third Street East, Lancaster, CA 93535-1802. Checks, cash, U.S.A. postage stamps, and International Reply Coupons (50 cents each) are accepted in payment. (See fig. 3.)

Worked Novice Zones

The world is divided into 40 zones, in regard to the *CQ* Awards Program. The Worked All Zones (WAZ) award requires proof of contacts with all 40 zones. However, Novices and Technicians just require proof of contacts with amateurs in 25 of the 40 zones to earn the Worked Novice Zones (WNZ) award. The WNZ is only available to U.S. Novices and Technicians. All contacts must be made prior to having received authorization to use General (or higher) operating privileges. However, applications may be submitted after you have upgraded. This award is issued for Mixed, CW only, and SSB only modes of operation. In addition, it can be endorsed for a single band. The WNZ can later be used as credit for 25 zones when applying for the 40-zone WAZ award. (See fig. 4.)

The processing fee is $5.00. All QSL cards must show a contact date of January 1, 1952 or later. *CQ* form 1479 (or a facsimile of it) must be used when applying for this award. QSL return postage must also be provided. Checks should be made payable to the WAZ Award Manager. Applications should be mailed to the WAZ Award Manager, Jim Dionne, K1MEM, 31 De Marco Road, Sudbury, MA 01776. The July 1991 *CQ* details the rules which apply to the *CQ* Awards Program. These include the CQ DX Awards Program and Honor Roll, RTTY WAZ, Satellite WAZ, Single-Band WAZ, USA-CA (American counties) Award Program, VPX (verified prefixes), WARC Bands WAZ, WNZ, WPNX, WPX Award of Excellence, WPX Awards Program and Honor Roll, 5-Band WAZ, and 160 Meter WAZ.

WPNX Award

This award is available to Novices (only) for contacting amateurs who have a total of 100 different amateur radio callsign prefixes. An application may be submitted after you have upgraded, but all contacts must have been made in the U.S. Novice bands prior to receiving higher operating privileges. The 100 prefixes used to obtain a WPNX Award may later be used when applying for the WPX Award. Applications should be sent to the WPX Award Manager Norm Koch, K6ZDL, 880 CR 13, Clovis, NM 88101. Details and an application form will be mailed to those who request them and who supply a self-addressed 4 by 9 inch envelope with double postage attached.

Each different letter(s) and number prefix combination counts toward earning this award. As examples, AB, AC, AD (etc.) count separately, and W5, W6, and W7 count separately. Licensees are likely to qualify for this award within their first few hundred contacts. (See fig. 5.)

Summary

New amateurs need to be informed of such awards. It is up to experienced amateurs to pass along such information to amateurs who are relatively new to operating. This is particularly true in regard to experienced amateurs who operate in the Novice/Technician bands. You can make their operating experiences much more pleasant by letting them know about such simple operating awards.

1991 California QSO Party

Introduction. This year's CQP will be held during the first full weekend of October. It starts at 1600 UTC 5 October, and it ends at 2200 UTC 6 October. The CQP is open to all amateurs, including Novices. Sixteen Novices submitted contest logs for last year's CQP.

Awards. A certificate is issued to the highest scoring single-operator entry in each California county, each state, each province, each country, and each station which makes at least 100 CQP contacts. Trophies are awarded to the top three out-of-state single operators, the top three California single operators, the top three multi-single and multi-multi California entries, plus the highest scoring single-operator and multi-operator California county DXpedition entries. The top 20 California single operators, and the top 20 non-California single operators, will each receive a personalized bottle of Northern California Contest Club Private Reserve California Wine. If one is not an adult, a nonalcoholic personalized award is substituted in lieu of a bottle of wine. Special trophies are awarded to the California and non-California amateurs who make the most code contacts, the single-operator (or team) with the most CQP contacts, the highest scoring low-power (200 watts or less) California and non-California Novice or Technician entries, the top DX (excluding Canada) scorer, and the top-scoring California club (15 entries minimum, with Northern and Southern California Contest Clubs ineligible).

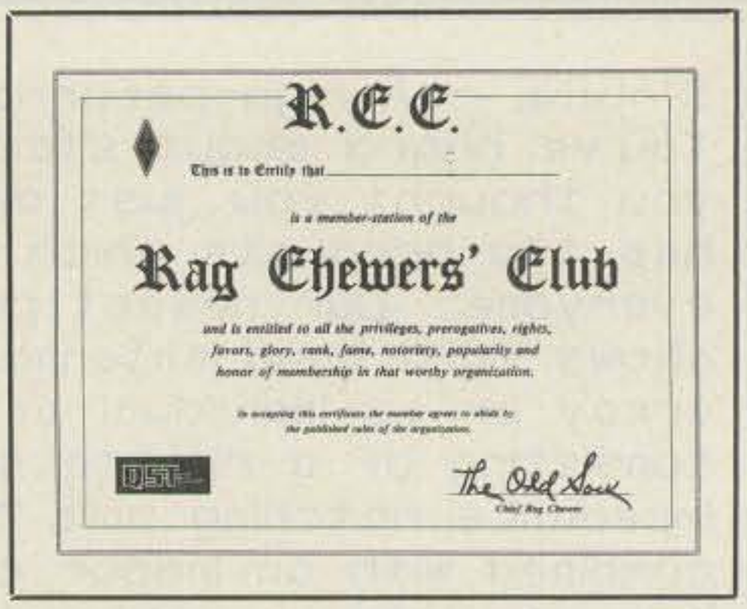
Deadline. Logs and summary sheets must be submitted by 15 November 1991 to Gary Caldwell, WA6VEF, P.O. Box 8014-56, Blaine, WA 98230. Entries showing more than 200 CQP contacts must be submitted in duplicate.

Exchanges. California stations send QSO numbers and counties. All others give QSO numbers and states/provinces/countries.

Frequencies. The Novice/Technician CQP code segment frequencies are 3685, 7110, 21100, and 28110 kHz. Their 10 meter voice frequency is 28450 kHz. One-sixty through 2 meters are used, excluding the WARC bands. CQP code frequencies (for General and above licensees) are 1805, 3540, 7040, 14040, 21040, and 28040 kHz, plus 50.04 and 144.04 MHz. The General (and above) CQP voice frequencies are 1815, 3850, 7230, 14250, 21300, and 28450 kHz. Try to make code contacts on the half hour. Try 147.54 MHz at 2000, 0000, and 0400 UTC. Try 160 meters at 0500 UTC. Try 80/75 meters at 0300 and 0700 UTC.

Material Available. If you want a CQP log, summary sheet, counties abbreviations list, and contest record, send your SASE and request to WA6VEF. If you want to receive CQP contest results, send a 9 by 12 inch SASE (or $1.00) to WA6VEF.

Multipliers. California amateurs have


R.C.C.

This is to Certify that _____

is a member-station of the

Rag Chewers' Club

and is entitled to all the privileges, prerogatives, rights, favors, glory, rank, fame, notoriety, popularity and honor of membership in that worthy organization.

In accepting this certificate the member agrees to abide by the published rules of the organization.

The Old Sock
Chief Rag Chewer

Fig. 2– The Rag Chewers' Club award available from the ARRL.


TEN AMERICAN DISTRICTS AWARD

AMATEUR RADIO STATION _____ HAS SUBMITTED SATISFACTORY PROOF OF TWO-WAY COMMUNICATIONS WITH STATIONS IN ALL TEN AMERICAN RADIO DISTRICTS.

TAD AWARD NUMBER _____ ISSUE DATE _____

SPECIAL OPERATING ACHIEVEMENT UNDER WHICH THIS AWARD WAS EARNED _____

_____ W6LS AWARD ADMINISTRATOR

Fig. 3– The Ten American Districts award available from W6DDB.

Fig. 4– The Worked Novice Zones (WNZ) award available from CQ magazine.

U.S.A. states, VO/VE1–7, and VY1/VE8 as multipliers, giving a possible maximum of 58. Non-California amateurs have a possible maximum of 58, the number of California counties. If a California station is located on a county line, credit may be claimed for any/all counties given in exchanges.

Points. Each completed code contact is worth 3 points. Each completed voice contact is worth 2 points.

Rules. Single-operator stations may not be operated more than 24 hours during this contest, and off times (15 minutes minimum) must be clearly marked in logs. Multi-operator stations may be operated the full 30 hours of the contest period. The same stations may be worked one time on voice and another time on code on the same band. The same stations may also be worked on more than one band. All CQP contacts must be simplex. Both single-operator and multi-operator stations are only allowed one transmitted signal. Except for on 160 meters, all code contacts must be made in the normal code segments of the bands.

Score. Simply multiply the number of QSO points (code and voice) times the number of multipliers (58 maximum).

Summary. This contest provides opportunities to work many California counties which are normally difficult to contact. All amateurs are invited to participate. This writer (W6DDB) will again operate in the CQP, primarily on the Novice CQP frequencies.

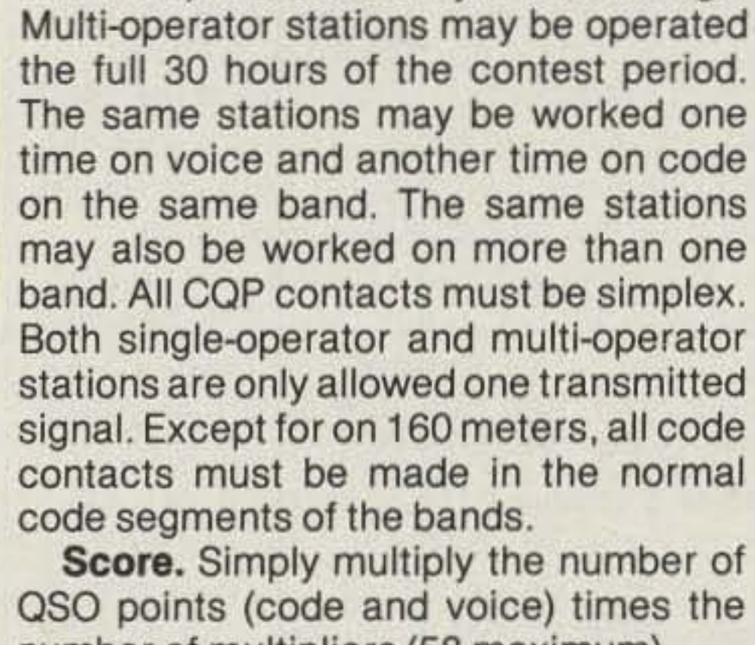


Fig. 5– The WPNX award available from CQ magazine.

Printed Aids

This column often contains my offer of a complete set of the material I have written which I distribute to licensing course students. Individuals are welcome to take advantage of that offer, and instructors are invited to duplicate items for distribution to their students. This standard set of printed material remains available at $15 prepaid. For a short time a much more complete set of printed material is being offered at $18 prepaid. The price difference covers the additional postage that is required to mail this heavier package. This larger set includes one of each item I give to students; it is not just the material which I have written.

10 Meter Band

My March 1991 *CQ* column suggested a switch in operating activities for Novices and Technicians who have been using SSB voice on the 10 meter band. That band promptly went bad, much to my sorrow. If you were turned off as the band dropped off, I hope you will read my referenced column and get active again on the air. Back issues are available from *CQ* magazine; I do not have them. If you prefer, you can send $1.00 and a self-addressed envelope to my California address to get a copy of my March article. That will cover reprint and mail costs. I hope this change in band conditions does not cause you to reduce your operating time. Try other bands and other modes. Also, do not abandon 10 meters too quickly. Listen below and above the Novice segment. If you hear activity in those portions of 10, you can make contacts in the Novice segment.

Handie-Talkie Battery

Quantum Instruments offers a battery which they say provides about four times the service capability of a standard battery pack. Details can be requested by writing to Quantum Instruments, Inc., 1075 Stewart Avenue, Garden City, NY 11530. Their telephone number is 516-222-0611 and their FAX number is 516-222-0569. ARRL affiliated clubs are offered a special 25% discount on one Quantum battery and adapter for use in public-service and emergency operations.

Hard-To-Find Accessories And Parts

The Radio Shack's Consumer Mail Center specializes in supplying items which can be hard to find in other places. Their cross-reference guide enables them to quickly locate required replacements. Batteries, ceramic cartridges, crystals, diodes, integrated circuits, printer ribbons, semiconductors, styli, transistors, and tubes are a portion of their stock. The 7000 nationwide Radio Shack, Radio Shack Computer Center, and participating dealer stores can handle orders via the Consumer Mail Center.

Ham Stuff Book

Walt Garrett, N0MAL, is president of the GAI Systems Group, P.O. Box 5832, St. Louis, MO 63134 (telephone 314-831-6464, FAX 314-895-3608). His *Ham Stuff* book is crammed with almost 400 pages of information which is extremely useful to all amateurs and is almost essential to new amateurs. It provides information about amateur radio accessories, antennas, computer software, power supplies, publications, and radios. It lists both obscure and well-known products. Data includes 1000 companies, 2500 telephone numbers, 5000 people, and 5000 products. This book provides the what, where, and who of amateur radio. The first part covers things to do. The second part details things to buy. The third part is a very complete directory. This book sells for $19.95, plus shipping and handling.

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

Penguin Islands: A New DXCC Country

The DXCC countries list increased by one in May, when the Penguin Islands were added to the list. The Penguin Islands are a group of 13 tiny islands lying just off the coast of Namibia V5. The islands are owned by the Republic of South Africa ZS.

The Penguin Island story dates back a couple of years. Bill Shipp, KC1AG, and Ian Sutherland, ZS1IS/ZS9A, were researching the status of Walvis Bay ZS1 for an ultimately successful New Country application for that South African enclave. In the process of their research, the two found references to the Penguin Islands. Shipp traveled to Walvis Bay in August 1989 for an operation as ZS1IS, while the application for new country status for Walvis was pending before the DX Advisory Committee (DXAC). While in Walvis, he gathered additional information about the Penguins, including interviews with local fishermen and officials. He also obtained detailed maps of the islands, which clearly showed that the islands belonged to South Africa.

Shipp also discovered that Hans Hannappel, DK9KX, was seeking similar information about the status of the Penguins. The two decided to pool their information and efforts, and jointly submit an application for new country status for the Penguins, a fine example of international cooperation.

Soon after the new country application was presented to the DXAC, DK9KX and five other amateurs staged the first-ever amateur operation from Seal Island. The July 1990 operation of DK9KX/ZS1, DL8CM/ZS1, and ZS9A/1 gave DXers their first chance to work this potential New One.

Meanwhile, the new-country application ran into some problems in the DXAC. The initial application provided evidence that the islands were possessions of South Africa, but the DXAC also wanted some indication from Namibia acknowledging this contention. Since it is nearly impossible to obtain an official document stating that the country has no legal claim on a disputed territory, this requirement appeared to be a major stumbling block. The applicants were up to the task, however. They applied for an amateur radio license for the Penguin Islands from Namibia. The Namibian authorities stated that they could not grant such a license, as the Penguins were South African territory! This was as close to an official admission of South African sovereignty as Namibia was likely to grant.

SEAL ISLAND, 26.35 S 15.09 E

- ❑ DK 9 KX / ZS 1 confirms 2 x SSB QSO's / ur SWL rprt
- ❑ DL 8 CM / ZS 1 confirms 2 x CW QSO's / ur SWL rprt
- ❑ ZS 9 A / 1 confirms 2xSSB/CW QSO's / ur SWL rprt

The DX Bulletin xxxxxxxxxxxxx

	DAY	GMT	RS(T)
3,5 mc	7.90		59(9)
7 mc	7.90		59(9)
14 mc	7.90		59(9)
21mc	7.90		59(9)
28 mc	7.90		59(9)
50 mc	7.90		59(9)

The Penguin Islands Group of South Africa
That these islands have been overlooked by DXers is surprising. This islands are, however, "real DX," and their appearance on the DXCC Countries List should provide challenges to DXers for generations to come. All are difficult to reach and operating conditions on them are extremely harsh. Those who have approached the islands from down wind also report that most can be smelled from many miles away.
Our special thanks got to **KC 1 AG** for his logistics and writing the application for separate **DXCC Country, DK 9 KD, DL 8 KAD and K 2 EWB, Fritzel Antennas Company, LIMA Electronics Köln, European DX Foundation.**
OP: DF 9 KH, DK 9 KX, DL 8 CM, V 51 DM, ZS 9 A, ZS 9 S

The QSL card from the first operation for the Penguin Islands, the newest DXCC country.

Another problem arose when some members of the DXAC wanted to review large-scale maps of the region. The application for separate country status for the Penguins was based on "separation by another DXCC country," Point 3(a) in the DXCC country criteria. The DXCC country of Namibia lies between the Penguins and the rest of South Africa. However, some DXAC members wondered if there might be other islands, rocks, etc., that were also under South African control along the Namibian coast, close enough to both the Penguins and to South Africa to negate the required 75-mile separation required in Point 3(a). The vote on new country status for the Penguins was delayed while the large maps were sent to the US and circulated among the DXAC members.

Meanwhile, Martti Laine, OH2BH, and three other amateurs made the second DXpedition to the Penguins in November 1990. The four DXers made 32,000 QSOs as ZS9Z/1.

Finally, in May 1991 the DXAC voted to recommend that the Penguin Islands be added to the DXCC countries list by a vote of 9 for, 5 against, and two abstentions. (Under DXAC rules abstentions count as negative votes in new-country applications, so the official vote was 9 to 7 in favor, the slimmest possible margin of approval.) Soon thereafter the ARRL Headquarters' Awards Committee voted unanimously to accept that DXAC recommendation, and the Penguins became the 323rd current DXCC country. Cards from the two Penguin Island operations can be sent for DXCC credit after September 1, 1991.

Although some of the Penguin Islands lie within easy reach of the city of Luderitz on the Namibian coast, the islands are as isolated as some DXCC countries hundreds of miles from the nearest land. The reason for this isolation is that the southern Namibian coast is one of the world's best gem-quality diamond-mining areas. Access to this region is very tightly controlled to eliminate diamond theft and smuggling. Anyone straying even a few meters off the road to Luderitz is subject to being shot on sight!

Penguin Island DXpeditioners need Namibian permission to pass through the restricted diamond area, and South African permission to land on the Penguins, which are now nature preserves. Potential DXpeditioners should also note that the extensive guano deposits on the Penguin Islands can often be smelled for miles downwind. The corrosive salt spray, very high winds, a difficult landing, and steep rocks make any Penguin Island operation a significant undertaking.

With the addition of the Penguin Islands to the DXCC list, the DXAC has now accepted 8 of the past 20 petitions for new countries over the past five years: Aruba P4, Western Sahara S0, Malyj Vysotskij Island 4J1FS, Rotuma 3D, Conway Reef 3D, Banaba T33, Walvis Bay ZS9, and Penguins ZS1. There are at least three more such applications under DXAC review at this time: Pratus Island BV, Holy House HV0HH, and Jarvis Island KH5J. An update on Pratus: The latest National Geographic Society map of China, dated July 1991, contains the following notation—"Since 1949 the Chinese Nationalists have administered Taiwan, a province of China, and the islands of Quemoy, Matsu, and **Pratus**" (emphasis added). This should boost the chances that Pratus is a separate DXCC country. More on the Jarvis Island petition in a later column.

Short Notes From All Over

Prefix Changes. The Australian Department of Telecommunications has agreed to issue VK9 callsigns that reflect the DXCC country of the operation. Licenses

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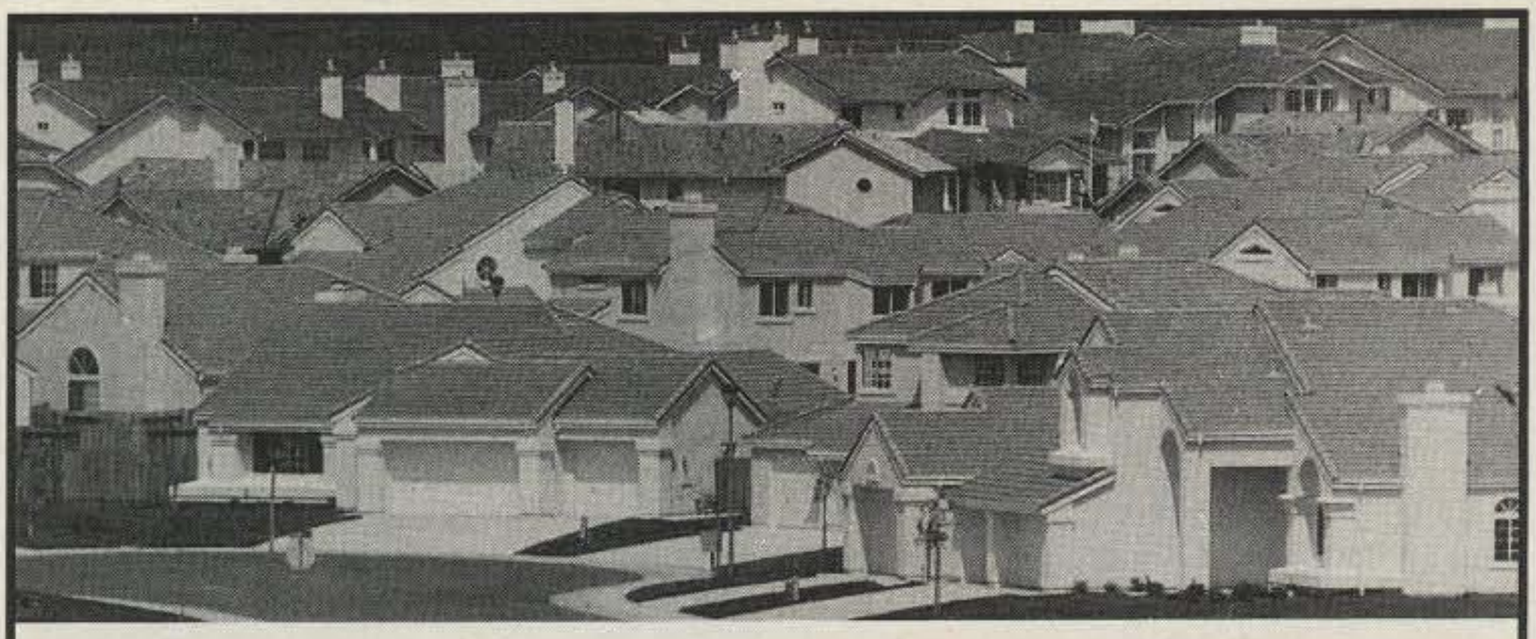

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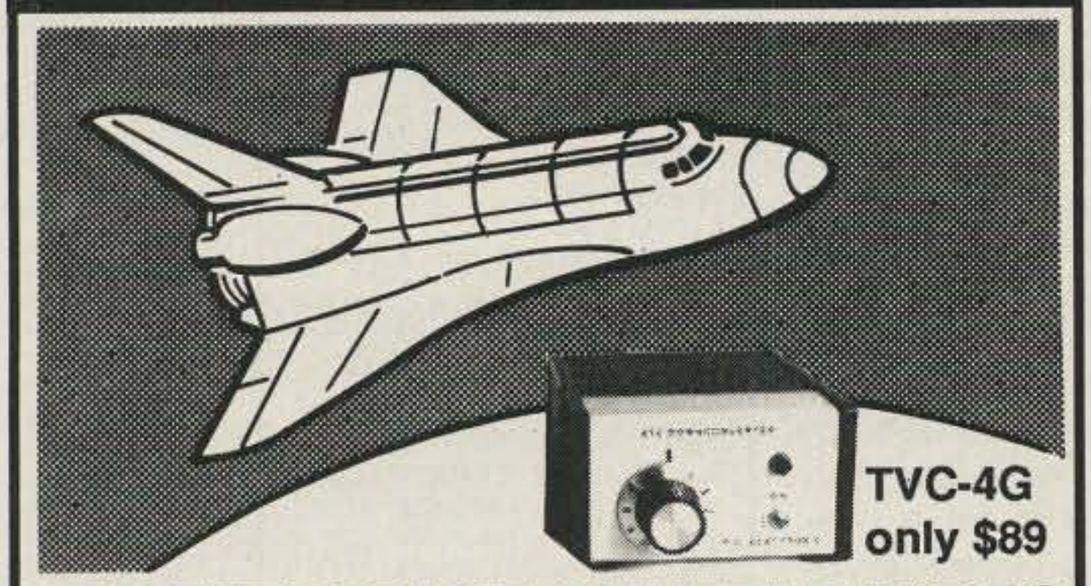

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Tom (W6ORG)
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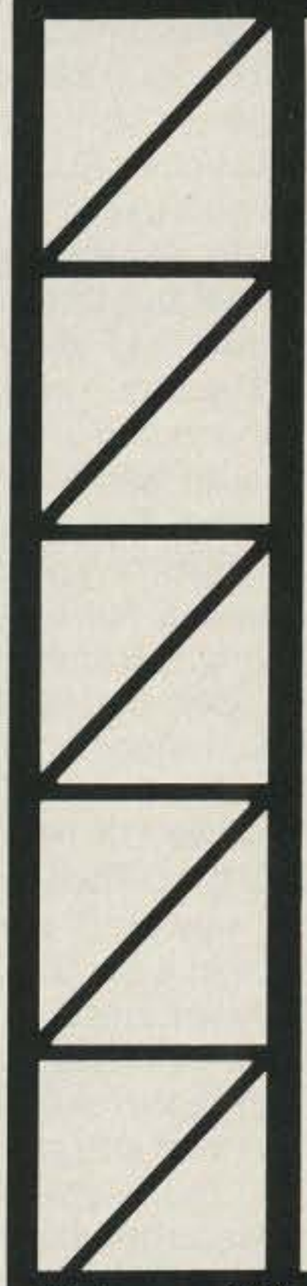
CIRCLE 54 ON READER SERVICE CARD

ATTENTION HAMS!



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CIRCLE 113 ON READER SERVICE CARD

The WPX Program

Mixed

1511 ..... AA7FL
1512 ..... JI2KXK
1513 ..... K5ALU

SSB

2242 ..... AA6AG
2243 ..... HL5BUV
2244 ..... YC3OSE
2245 ..... K2QZ
2246 ..... DL9MFH

CW

2694 ..... WB8NYV
2695 ..... AA6WJ
2696 ..... JT4BR

WPNX

264 ..... N2CKD

Endorsements

Mixed: 450 AA7FL, DL3ECK, I1-21171. 500 AA7FL, DL3ECK, I1-21171. 550 DL3ECK, I1-21171. 600 DL3ECK, I1-21171. 650 DL3ECK. 700 DL3ECK. 750 DL3ECK. 800 DL3ECK. 850 DE@DAQ, DL3ECK. 900 DE@DAQ, DL3ECK. 950 DE@DAQ, KF4FP, DL3ECK, SM3OJR. 1000 DE@DAQ, DL3ECK, SM3OJR. 1150 K5GOE.

SSB: 350 AA6AG, YC3OSE. 400 AA6AG, YC3OSE, WB4UHN. 450 AA6AG, YC3OSE, WB4UHN. 500 W9LCR. YC3OSE, WB4UHN. 550 YC3OSE. 600 YC3OSE. 650 YC3OSE. 700 YC3OSE. 750 YC3OSE. 800 JH6WMJ, YC3OSE, KB8DAE. 850 YC3OSE. 900 KU@A, YC3OSE. 950 KU@A, YC3OSE. 1000 NE8Q, HP6AYV. 1050 NE8Q, KP6AYV. 1050 HP6AYV, K5GOE. 1100 JR4NUN, K5GOE. 1150 JR4NUN.

CW: 350 JG2IGY. 450 W8EAO. 650 DE@DAQ. 700 DE@DAQ. 750 DE@DAQ. 900 W9IAL. 950 W9IAL.

10 Meters: DE@DAQ, N7JXS
15 Meters: N7JXS
20 Meters: SM3OJR, N7JXS, NT@H
80 Meters: SM3OJR

Asia: SM3OJR, I1-21171
No. Amer.: SM3OJR, NT@H
Europe: SM3OJR, I1-21171, NT@H
Oceania: KU@A

Award of Excellence Plaque Holders: I8YRK, W4CRW, SM@AJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA, ON4QX, WA8YTM, YU2DX, OK3EA, I4EAT, OK1MP, N4NO, ZL3GQ, VK9NS, DE@DXM, DK4SY, UR2**, AB9O, FM5WD, I2DMK, W4BQY, I@JX, SM6CST, VE1NG, I1JQJ, WA1JMP, PY2DBU, HI8LC, KA5W, K@JN, W4VQ, KF2O, K3UA, HA8XX, HA8UB, W8CNL, K7LJ, W1JR, F9RM, W5UR, WB8ZRL, SM3EVR, CT1FL, K2SHZ, UP1BZZ, W8RSW, WA4QMQ, EA7OH, K2POF, DJ4XA, IT9TQH, W8ILC, K2POA, N6JV, W2HG, ONL-4003, VE7DP, K9BG, W5AWT, KB@G, HB9CSA, F6BVB, W1BWS, YU7SF, G4BUE, N3ED, DF1SD, K7CU, I1POR, LU3YL/W4, NN4Q, KA3A, VED7WJ, YB@TK, VE7WJ, VE7IG, K9QRF, YU2NA, N2AC, W4UW, NX@I, W9NUF, N4NX, SM@DJZ, DK5AD, WB4RUA, DK5AD, WD9IIC, W3ARK, I6DQE, LA7JO, VK4SS, K6JG, I1EEW, I8RFD, I3CRW, VE3FXR, N4MM.

Award of Excellence Plaque Holders with 160 Meter Endorsement: FM5WD, SM@DJZ, DK5AD, SM6CST, I1JQJ, PY2DBU, W3ARK, HI8LC, KA5W, UR2**, VE3XN, K6XP, LA7JO, W4VQ, K6JG, K3UA, HA8UB, W4CRW, N4MM, K7LJ, SM@AJU, KF2O, SM3EVR, K5UR, UP1BZZ, OK1MP, N5TV, K2POF, W8CNL, DJ4XA, IT9TQH, DL9RK, N6JV, ONL-4003, W1JR, W6OUL, W5AWT, KB@G, F6BVB, W4BQY, YU7SF, W5UR, N4NO, DF1SD, K7CU, I1POR, W8RSW, N4KE, I2UIY, YB@TK, W8ILC, W1BWS, VE7WJ, K9QFR, NN4Q, W4UW, K9QFR, NN4Q, W4UW, NX@I, G4BUE, LU3YL/W4, I4EAT, WB4RUA, VE7WJ, N4NX, DE@DXM, VE7IG, K9BG, I1EEW, AB9O.

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," 880, CR13, Clovis, NM 88101-9511 USA.

The station of the International Amateur Radio Club in Geneva, 4U1ITU, is often operated by visiting amateurs. Here Luc, I1YRL (left), and Mino, I1BAF, check out the equipment.

for Christmas Island operations will begin with VK9X, Cocos (Keeling) operations with VK9C, Mellish Reef with VK9M, Norfolk Island with VK9N, and Willis Island with VK9W. Limited licenses will add the letter Z between the 9 and the first letter of the suffix, Novice licensees will add an N there, and combined licensees will insert a K. Thus, an Australian Novice operating from Willis Island would use a callsign beginning with VK9NW.

Sri Lanka has started to use the **4S6** prefix for their Novices. Sri Lanka Novices can be found on CW in the following frequency ranges: 3500–3600, 21125–21200, and 28000–28500 kHz. *(Thanks, Paddy, 4S7PB.)*

And the Republic of South Africa has begun to issue **ZS3** prefixes to amateurs in Cape Province. Note that these stations count for South Africa, *not* Namibia, which now uses the V5 prefix.

South Sandwich. The team that had to cancel out of their planned Antarctic operation last year is trying again this year. The group is shooting for a December 6th landing on South Thulie Island, in the South Sandwich Group, for a two-week stay. They plan an all-band operation on SSB, CW, and RTTY. The eight operators will not announce their callsign nor planned transmitting frequencies until the operation begins, to discourage pirate operations.

The operators say they will visit some of the SSB DX nets during the last few days of the DXpedition to give some of the lower powered stations an additional chance at a South Sandwich contact.

They promise to QSL all cards received, including those which arrive via the bureau. However, they ask that DXers do not duplicate QSL requests via the bureau that have already been sent direct. Also, they ask that DXers be reasonable about overloading their self-addressed, stamped envelopes. "Twelve QSOs per one envelope, or 10 QSOs on a

The WAZ Program

Single Band WAZ

10 Meter SSB

391 ..... NT5C
392 ..... N4VTN
393 ..... KB4SA
394 ..... WL7E
395 ..... K9IW
396 ..... I8SAT

15 Meter SSB

379 ..... WA8YTM
380 ..... NT5C
381 ..... YC3OSE
382 ..... JH6WMJ
383 ..... WA2VJL
384 ..... I8SAT
385 ..... 4X4JO
386 ..... W@IJN

20 Meter SSB

845 ..... W8AXI
846 ..... K7AZG
847 ..... WO2T
848 ..... WO6R

40 Meter SSB

71 ..... YC5ODQ

10 Meter CW

113 ..... OH3YI
114 ..... JA7FS

15 Meter CW

207 ..... OH3YI
208 ..... K@DEQ
209 ..... AB1U

20 Meter CW

400 ..... OH3YI

40 Meter CW

140 ..... OH3YI
141 ..... DJ7RD
142 ..... K3NW
143 ..... LZ1GC

80 Meter CW

30 ..... OH3YI
31 ..... DJ7RD

12 Meter Mixed

3 ..... VE1YX

17 Meter Mixed

4 ..... VE1YX

RTTY WAZ

64 ..... K2PEQ
65 ..... SP3SUN

20 Meter RTTY

37 ..... K2ENT

WNZ

36—10M SSB KC6EYZ
6—10M Mixed KC6EYZ
7—10M Mixed KA6ING

All Band WAZ

SSB

3758 ..... WA@QIT
3759 ..... OZ1FNX
3760 ..... K@DEQ
3761 ..... WB2JZK
3762 ..... WA9GON
3763 ..... NK3U
3764 ..... 5Z4BH
3765 ..... IT9JPW
3766 ..... KF@LA
3767 ..... JH2BFY
3768 ..... KG5EG
3769 ..... LU8DY
3770 ..... K2ENT
3771 ..... F1LIW
3772 ..... N7KPX
3773 ..... K9YNF
3774 ..... KC8BK

CW/Phone

7019 ..... U1LP
7020 ..... W5QZL
7021 ..... NZ1W
7022 ..... WS6F
7023 ..... N9JR
7024 ..... AA4NG (CW)
7025 ..... W2VT (CW)
7026 ..... NY1F
7027 ..... JH5TBS (CW)
7028 ..... K2ENT
7029 ..... WO2T
7030 ..... SM5ENX (CW)
7031 ..... WB2TPS
7032 ..... T77J
7033 ..... JR1WHI (CW)
7034 ..... JA8BTN

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (75 cents) size 4½ × 9½ to the WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Rd., Sudbury, MA 01776. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point 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. Please make all checks payable to the Awards Manager. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application. Send any questions to K1MEM by mail and include an SASE (please do not telephone).

The Far East Broadcasting Co.'s mini-Field Day from Saipan. From left to right are Clare, VE6CK, Bob, KH0AF, Hugh, KB6QE, Russ, W8BOZ, David, KB4TXM, and Mike, WH0AAP. In the background is one of the 100,000 watt transmitters for KFBS. Now that's QRO!

single card, is too much," they say. They also caution against making too many "insurance contacts" per band. QSL SSB contacts to AA6BB, and CW and RTTY contacts to KA6V.

The organizers have managed to find a ship for half the cost of last year's vessel. However, the new ship will still cost $50,000 to charter. The group seeks contributions from DXers to make the trip a reality. Send your contributions to Jerry Branson, AA6BB, 93787 Dorsey Lane, Junction City, OR 97448.

Saipan Mini-Field Day. Some of the amateurs on Saipan in the Marianas Island gathered at the KFBS shortwave broadcasting station on March 2nd for a mini Field Day. After the Far East Broadcasting Co.'s 100,000 watt station completed its daily broadcast to Russia, China, and Mongolia, the amateurs connected their Kenwood TS-530 to the regular station antenna. This antenna is a curtain array 260 feet high and 150 feet wide! Although their signal was not as strong as KFBS's, they got out very well, working stations around the world. Among the operators and technicians who work for KFBS are chief engineer Bob Springer, KH0AF, Mike Adams, WH0AAP, Hugh Franklin, KB6QE, David Creel, KB4TXM, and Clare Palsky, VE6CK.

Turks and Caicos Amateur Licensees. The Turks and Caicos Amateur Radio Society provides the following requirements for obtaining a VP5 reciprocal operating license: Send a copy of your current license and home address, the dates you will be visiting the islands, your proposed address in the islands, and a certified check or money order for US$21 to the Society at Box 218, Providenciales, Turks and Caicos Islands, BWI. Please allow at least five weeks for your application to be received, processed, and returned to you.

5 Band WAZ

As of May 31, 1991, 320 stations have attained the 200 zone level.

New recipients of 5 Band WAZ Award with all 200 zones confirmed:

K7EG
WS9V
LZ1GC
UQ2MU

The top contenders for 5 Band WAZ are:

N4WW, 199	K9EL, 199
SP9PT, 199	NA0Y, 199
K6YRA, 199	VE7DX, 199
PY7ZZ, 199	W0PGI, 199
DL9WW, 199	W2YY, 199
K0CS, 199	W9WAQ, 199
KB0G, 199	I8IGS, 198
ZS6BCR, 199	VE7AHA, 198
UA4RZ, 199	SM6AHS, 198
AA4KT, 199	K1ST, 198
RT5UY, 199	W1JR, 198
K7UR, 199	

720 Stations have attained the 150 zone level as of May 31, 1991.

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (75 cents) size 4½ × 9½ to the WAZ Manager, Jim Dionne, K1MEM, 31 De Marco Rd., Sudbury, MA 01776. 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. Please make all checks payable to the Awards Manager. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application. Send any questions to K1MEM by mail and include an SASE (please do not telephone).

September Events

DX Gatherings. The Northern Illinois DX Association (NIDXA) holds its annual W9DXCC convention and banquet on Saturday, September 7. The convention includes DXpedition and technical talks during the day and a banquet in the evening. One of the highlights of the convention is the awarding of the DX Hog of the Year award to a Chicago-area DXer. In past years the convention has been held at the Holiday Inn in Glen Ellyn, Illinois. For details about this year's convention contact the NIDXA at Box 519, Elmhurst, IL 60126.

The 1991 SEANET convention will be held in Chiang Mai in northern Thailand on November 8–11. The Radio Society of Thailand will host the event this year. For more information, contact the Society at GPO Box 2008, Bangkok 10501, Thailand, or ask on the SEANET on 14320 kHz at 1200Z.

Saint Pierre & Miquelon. FP5DK and **FP5/ZF2PV** will be operating from this French island near the Canadian province of Newfoundland for one year. QSL both of these operators to Don Simonsen, K7AEJ, P.O. Box 1622, Vancouver, WA 98668. (The 1991 *Callbook* address for K7AEJ is incorrect.) Also during the first week in September, the special callsign **FP9SPM** will be active, operated by members of the St. Pierre and Miquelon radio club and their guests. The group intends a multi-national team to make a big effort with this first use of the FP9 callsign.

Madagascar. Alain, **5R8AL,** plans to return to Madagascar for about two weeks around mid-September. Alain is the only active 5R8 amateur whose QSL cards are acceptable for DXCC. QSL Alain's contacts via F6HUJ.

French Indian Ocean Islands. The islands of Tromelin, Glorioso, Europe, and Juan da Nova are French possessions around Madagascar. All are wildlife refuges, and access to the islands is tightly controlled from Reunion Island. The only reliable amateur operation from these islands is the occasional visit by a DXer from Reunion to service the weather stations on each island. Jacques, FR5ZU, will visit Glorioso this month and be active as **FR5ZU/G**. Next month he'll be on from Tromelin, the rarest of these islands, as **FR5ZU/T**, and then from Juan da Nova as **FR5ZU/J** in November. He prefers list operations. QSL direct to his home call, adding the words "via France" after Reunion Island.

Belgium Liberation Special Event Station. ON4USA/p will be active from the World War II American military cemetery of Henri-Chapelle in east Belgium

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. Deleted countries do not count and are dropped from listing as they occur. Total countries are now 322. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be made at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsement involving the issuance of a sticker is $1.00.

CW

W9DWQ	322	K6LEB	320	N2KW	316	WA2HZR	312	W6DN	308	I4EAT	302	DJ7CX	296	KU0S	290	KA7T	281
K2FL	322	DL8CM	320	W6PT	315	WA4JTI	312	W9RY	307	K9TI	302	K8LJG	296	W1WLW	288	K7ZR	279
K2TQC	322	N6AV	319	K4XO	315	W0HZ	312	W4OEL	307	NY5L	302	WA4DAN	296	W4BV	288	W2LZX	279
N4JF	322	N4MM	319	K9IW	315	W0JLC	312	SM6CTQ	305	K9DDO	302	WD9IIX	295	G2GM	288	KB9XG	279
K4CEB	322	SM3EVR	319	N4PN	314	W9WAQ	311	K4CXY	304	WA8DXA	301	KD8V	295	K8NA	287	W9NUF	279
SM6CST	322	DL3RK	319	KQ9W	314	K6EC	311	W2UE	304	YU2TW	300	W6YQ	295	WB5MTV	287	HB9AFI	278
ON4QX	322	K1MEM	318	DL7AA	314	IT9TQH	311	IT9QDS	304	I3OBO	300	K1VHS	295	G2FFO	286	KA2DIV	278
K9MM	321	W4BQY	318	I5XIM	314	WA4JTI	311	I8WY	304	WA8YTM	300	KB8DB	295	W9SC	286	NC9T	278
DL1PM	321	N6CW	318	W1NG	314	DJ1XP	310	AA5NK	304	DL9QW	299	K2JF	294	G3KMQ	286	KA3R	277
K6JG	321	W0IZ	317	EA2IA	314	W6ID	310	N7RO	304	NN4Q	299	W3BBL	293	K4JLD	286	DL1QT	276
W2FXA	321	K3UA	317	K2OWE	314	K9QVB	310	KZ4V	304	F3TH	299	N5FW	293	K2JLA	285	YV5ANT	276
K9AB	321	W7ULC	317	W1WAI	313	W7CNL	310	WA4IUM	304	DJ2PJ	299	VE7DX	292	KP4P	283	K1HDO	276
YU1HA	321	AA4KT	317	IT9ZGY	313	K8PYD	309	AB4H	303	I2QMU	299	PA0XPQ	292	AG9S	282	K4SE	275
N4KG	320	W0SR	317	K9BWQ	313	WB4RUA	309	N8MC	303	K3FN	297	N5DX	290	JH1VRQ	281		
OK1MP	320	N6AR	316	WD9IIC	313	AA6AA	308	N4AH	303	IT9VDQ	297	KB0G	290	W8URM	281		

SSB

K2FL	322	I8ACB	321	W7FP	318	KA3HXO	315	SM6CST	311	K1VHS	306	WT4T	300	VE5FX	293	WA9BXB	282
W6EUF	322	K9AB	321	KR9O	318	KB2HK	315	AA4AH	311	N4KE	305	K7LAY	300	IT9VDQ	293	YV5IVB	282
VE1YX	322	KZ2P	321	N2KW	318	I8KDB	314	K0HQW	311	K3LUE	305	KB9KD	300	WD9IIC	293	WK3N	282
F9RM	322	CT1FL	321	I2QMU	318	K9LKA	314	K1HDO	311	CX4HS	305	KB2MY	300	K4SE	292	AE2B	281
N4JF	322	OA4OS	321	W4UNP	318	OH5KL	314	W4SSU	310	WA6DTG	305	I2EOW	300	KC8JH	292	AI9R	281
VE3MR	322	KS2I	321	ZL1BIL	318	OZ8BZ	314	K6EC	310	K8YVI	305	WD0DMN	300	AI5I	292	TG9EP	281
DJ9ZB	322	I0AMU	321	K2JLA	318	YV5DFI	314	K8NA	310	KZ8Y	304	VE4AT	299	W9NUF	292	VE3NUP	281
4Z4DX	322	DL6KG	321	KS0Z	318	W9RY	314	NJ0C	310	K8VFV	304	SV8CS	299	KD5ZM	292	N1ALR	281
W4EEE	322	WA4ECA	320	K3UA	318	K8CSG	314	XE1OX	310	EA1QF	304	I2ZGC	299	VE6PW	292	VU2DVP	281
W9DWQ	322	OE3WWB	320	KQ9W	318	KU9Z	314	WE2L	310	K4RIG	304	NW5K	299	TI2LTA	292	PY2DBU	280
W4DPS	322	VE3MRS	320	WA4IUM	318	W6BCQ	314	W6MFC	310	I4WZK	304	WB6GFJ	299	YV1CLM	292	NX0I	280
W0YDB	322	VE7DX	320	YV5AIP	317	PY4OY	314	KA5RNH	310	K4JLD	304	JH1VRQ	299	W3SOH	292	YU1TR	280
EA4DO	322	SV1ADG	320	W8ILC	317	AA5NK	314	K9TI	310	KD5ZM	304	I8IGS	299	WA4LOF	291	G4FAM	279
DL9OH	322	WD8MGQ	320	N6AR	317	IK8CNT	314	KZ4V	310	KB1JU	304	ZL1BOQ	299	AC0A	291	W9VA	279
VE3XN	322	IT9TGO	320	VE7WJ	317	HR1KAS	314	W0ULU	310	KB7VD	304	K5DUT	299	VE3FEA	291	WB8TLI	279
W3AZD	322	W3GG	320	WA4DAN	317	KB3OQ	314	DK2BL	309	IN3ANE	304	WA0TKJ	298	VP9CP	291	W5XO	279
YV1KZ	322	N4KG	320	W9JT	317	I2LLD	313	AA6AA	309	N4KEL/M	304	I6PLN	298	W8LKG	291	K5AOL	279
OK1MP	322	W4UW	320	YV5CWO	317	W1NG	313	AB9O	309	KD8V	303	KA8T	298	SV1JG	291	KB5DN	278
VE3GMT	322	W6DN	320	K4CXY	317	W1LQQ	313	KU9I	309	KC8YM	303	KB2FC	298	KE7UL	291	EA6DE	278
ZL1AGO	322	AA4KT	320	YV1AJ	317	SM4CTT	313	N6AHV	309	KB0SY	303	DJ7CX	298	VE3IPR	290	JH8NYK	278
ZL3NS	322	WB4UBD	320	N4CRU	317	KE4VU	313	KB6OC	309	W7ULC	303	KB9LN	298	W4JFE	290	KX5V	278
K6WR	322	TI2CC	320	I8XTX	317	EA4LH	313	K1MIZ	309	KA9TNZ	303	WD0BNC	298	I4CSP	290	WN5K	278
I4LCK	322	I4EAT	320	WA4WTG	317	WB6OKK	313	IV3YRN	309	WA2FKF	303	K9SM	297	VE3CKP	289	VU2CVP	278
K2TQC	322	N6AHU	320	KA9ABC	317	WB6PSY	313	I5EFO	309	IK1GPG	303	JH4PRU	297	I4UFH	289	K4BYK	277
W2SUA	322	W0SR	320	IK8BQE	317	WB4PUD	313	I1POR	309	XE1KS	302	EA9IE	297	W9TA	288	VE3IUE	277
K8LJG	322	WA4JTI	320	G4ADD	317	KF7SH	313	G4GED	309	W2LZX	302	XE1HI	297	JA5PUL	288	DF6EX	277
W9OKL	322	NY5L	320	DJ1XP	316	KA6V	313	KP4P	309	KB0U	302	KF5DX	297	AI9U	288	KG9N	277
EA2IA	322	YS1GMV	320	KD8VM	316	AA6BB	313	WA9RCQ	309	WD5P	302	NP4CC	297	YV2EJU	288	I8WYD	277
K9MM	322	IT9ZGY	320	N4WF	316	W8PCA	312	XE1MD	309	W4BQY	302	VE2GHZ	297	LU7HJM	288	CE7ZK	277
K4MQG	322	EA1QF	320	K4PQV	316	N2SS	312	WA8YTM	309	XE1XM	302	HP1JC	296	OK1AWZ	287	KA9I	277
OZ5EV	322	NJ2C	320	I8LEL	316	OE2EGL	312	N4PN	308	K7EHI	302	YU7KV	296	EA8TE	287	WA9BDX	277
K4MZU	322	KB8DB	320	KC8EU	316	K0GT	312	WD9IIX	308	TI2JJP	302	XE1OW	296	EA3KW	286	WA5HWB	277
I8AA	322	OZ3SK	319	K9HQM	316	W2FGY	312	K9QVB	308	F6BFI	302	WD9GQV	296	AB9E	286	WB0UFL	277
TI2CC	322	K9IW	319	W6SN	316	G3VOF	312	N3ARK	308	K1MEM	301	NC9T	296	W9SC	286	WN5MBS	277
KM2P	322	IT9TQH	319	AG9S	316	K8CMO	312	W4BQY	308	N5FG	301	WB4TGB	296	PA0XPQ	286	W4PTT	276
YU1HA	322	W7OM	319	K8ZZU	316	KI3L	312	OA4ED	308	I3OBO	301	WB3GPR	295	N8BJQ	285	I8IYW	276
W9SS	321	K1UO	319	K2JF	316	TI2KD	312	K4LR	308	K9UAA	301	KB3KV	295	N9CPW	285	XE1DU	276
I0ZV	321	KB5FU	319	DU9RG	316	K8NWD	312	W5LLU	308	KP4EQF	301	I0SGF	295	K9MNT	285	G4NXG/M	276
I8YRK	321	W2CC	319	OE2EGL	316	F2MO	311	VK4VC	307	N5FW	301	KB0G	295	KB5RF	284	N0AMI	275
VE2WY	321	VK4LC	319	9H4G	316	W0SD	311	N6AV	307	IK8GCS	301	EA4KK	295	KF5AR	284	N7ASL	275
K9BWQ	321	KB4HU	319	VE2PJ	316	K9RF	311	AI8M	307	VE3DLR	301	W0IYR	294	IK8BMW	284	WA4OPW	275
K6JG	321	WB3DNA	319	WD8PUG	316	K9HDZ	311	KC2FC	307	VE6PW	301	KK0C	294	G4SZD	284	KC2RS	275
K6YRA	321	XE1CI	319	K8PYD	315	LA7JO	311	I0MBX	307	IK7DBB	301	G3XTT	294	NZ7D	284	NO4J	275
N7RO	321	K3UA	319	K4XO	315	LU3YL	311	KV2S	306	WA3HUP	300	VE3XO	294	KC7EM	283	KC4MJ	275
ON5KL	321	I8KCI	319	AI8S	315	N6OC	311	VK3JF	306	VE3FJE	300	I7UNX	294	KR9F	283	KA5YCM	275
YU1AB	321	I4ZSQ	318	WB1DQC	315	NA5W	311	VE4SK	306	WB4NDX	300	K3NEE	294	WB3HAZ	282	KI4FW	275
K5OVC	321	W2FXA	318	W6NLG	315	W8ILC/QRPp	311	WA2MID	306	YU2TW	300	W8URM	294	VE3MV	282	NX4Y	275
TI2HP	321	ZS6LW	318	WZ4I	315	I2MQP	311	XE1MDX	306	N4CRU	300	I5BDE	293	ZP5JCY	282	WA4PGM	275
W4NKI	321	W0SFU	318	KE4HX	315	NN4Q	311	WB5TED	306	KZ0C	300	WB3CQN	293	I8DVJ	282	KE5PO	275
N4MM	321	G4CHP	318	XE1AE	315	IK2GNW	311	N6CGB	306	N8BKF	300	KB8O	293	YB3CEV	282		

from September 14–15. The station celebrates the 47th anniversary of the liberation of the eastern part of Belgium by US Army troops, and to commemorate all those who gave their lives in WW II. Look for the special station 40–45 kHz up on CW, and 3670, 7070, 14312, 21385, and 28490 kHz on SSB. QSL direct to the GDV Group at Box 11, B-4800, Verviers 1, Belgium, or via the club call of ON5PL through the Belgium bureau.

Miss America Pageant Special Event Station. The Southern Counties Amateur Radio Association will operate **K2BR** from Atlantic City, New Jersey from September 9–14 in connection with the Miss America Pageant there. Look for the station 65 kHz up on CW, and 25 kHz from the bottom of the General class subbands on SSB. QSL with an SASE to the club at Box 121, Linwood, NJ 08221. Atlantic City is located on Absecon Island, which is Island On The Air island NA-111.

QSL Notes

Bill Crews, WB2CPV, reports that he has returned all logs and cards for **KG4DX** (1982–3) to the operator, who is Garry Murphy, KF4S. Anyone still needing a KG4DX card should QSL direct to Garry.

Duncan Kreamer, W1GAY, says he is **not** QSL manager for **9N1NFO**; try WB4NFO. Duncan does handle cards for **9N38, 9N1AW, VP5VAD,** and **ZF2QA.**

QSL the December 1990 operation of **6Y5/KE2SP** direct to Charles Herbst, KE2SP, Box 7, Palm Bay, FL 32906.

QSL **VU2UR** contacts **after January 1, 1991 only** to Alex Abramov, UA1NDR, Box 225, Petrozavodsk, Karelia 185034, USSR.

W. K. Ginder, **G3NAS,** reports that the *Callbook* still has his address wrong, despite repeated attempts to correct same. His correct address is: The White House,

The operating location of the ZS9Z/1 DXpedition from Seal Island, in the new DXCC country of the Penguin Islands. The abandoned buildings were left over from the previous guano mining operations.

CQ DX Awards Program

SSB

1877	G4NXG/M	1881	OE6CLD
1878	K2VIV	1882	K4HXD
1879	KN4SR	1883	YC3OSE
1880	AB4NS	1884	KW9Q

CW

827	K7JYE	829	K9CC/M
828	KN4SR		

RTTY

6	VE3FXR

SSB Endorsements

320	TI2CC/322	300	WD@DMN/300
320	YU1HA/322	275	VE2GHZ/297
320	KM2P/322	275	WB4TGB/296
320	NJ2C/320	275	W3SOH/292
320	KB8DB/320	275	WN5MBS/277
310	XE1CI/319	275	G4NXG/276
310	I8KCI/319	250	OE6CLD/263
310	K3UA/319	250	YB2OK/252
310	WD8PUG/316	250	WB4UHN/251
310	KB2HK/315	250	N8HUR/250
300	WA8YTM/309	200	K2EEK/242
300	K1VHS/306	200	YC3OSE/235
300	KB7VD/304	Mobile	G4NXG
300	IN3ANE/304	QRPp	K2VIV
300	N4KEL/M/304	28 MHz	YC3OSE
300	TI2JJP/302		

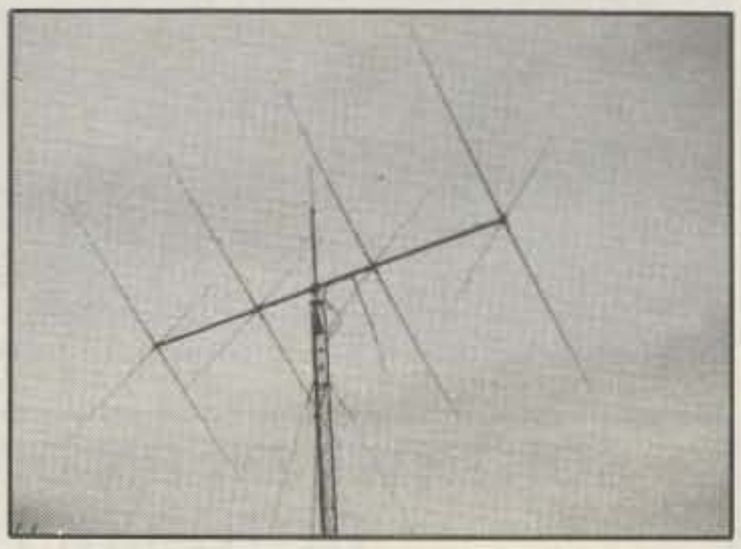
CW Endorsements

310	WD9IIC/313	275	K1VHS/295
310	W@JLC/312	200	I8YRK/240
300	N4AH/303	200	N4KEL/M/228
300	WA8YTM/300	200	WD@DMN/205
275	K2JF/294	Mobile	K9CC

Total number of active countries is 322. A new CQ DX RTTY award is now available. 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 SASE 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.

Watery Lane, Lichfield, Staffs WS13 8ER, England.

GØIAS, QSL manager for **7Q7LA**, reports that the 7Q7LA QSL card is oversized, and he requests a European-sized airmail return envelope. Some sources of these envelopes are: William Plum, 12 Glenn Road, Flemington, NJ 08822; Bob Schenck, N2OO, Box 345, Tuckerton, NJ 08087; and DX QSL Associates, 434 Blair Road NW, Vienna, VA 22180.



Dan McLean, WA4JTI, recently received the first Worked All Zones CW award. Dan used this 15-year-old 4-element Cubex quad to earn this award. He broke down last year and replaced the old feedline and loops.

Tom Gregory's African QSLs

In what has to be a record price for QSLing, Tom Gregory, N4NW, now asks for $10 per station to QSL his **9Q5NW, TN4NW,** and **TL8TG** operations. He explains that his QSL manager, KC4NC, lost his computer and QSL blanks when lightning destroyed his home. Tom maintains backup copies of these logs, but doesn't have enough room on the hard drive of his computer to access them readily. Thus, to QSL one of these stations, he must copy all operating software onto backup disks, load the logs, find the QSO, erase the hard drive, and copy all operating software back. So DXers can get a letter confirming their QSO (all blank QSL cards were lost in the fire) by sending $10 to Tom at 14 Shallow Creek Lane, Stafford, VA 22554. *(Or maybe some DXer with ample hard drive space could offer to handle the few remaining QSL requests for Tom.—ed.)*

Corrections & Amplifications

N4NX is the QSL manager for the **1979** operation of **FR7ZL/T** only. He cannot help with other dates.

NQ9E handles **HA@DU** cards from Steve's **mobile** county-hunting QSOs only. QSL all other HA@DU QSOs direct to Steve at Box 16, Debrecen H4003, Hungary.

QSL the club station **A47RS** direct to ROARS Hq., Box 981, Muscat, Sultanate of Oman, and **not** via KD2OM.

JH1GZV, new QSL manager for BV2A/BV2B, says he can handle only Japanese QSOs with the following stations: **AD1S/KH5, VK@HI, VK@CW, VU4APR, VU4NRO, VU7APR, and VU7NRO.** Hiro

QSL Managers

3C1EA to EA4CJA
3D2XV to VK2BCH
3X1SG to ON6BV
4A2FN to XE2JNE
4K1A to UZ1PWA
4K1B to UV6AAP
4K1BDU to UA9MA
4K1FS to OH2BU
4K2BCA to RA3YA
4K2OIL to UA9MA
4M5A to YV5KWS
5B4AAJ to G0HTK
5N0ETP to N6QLQ
5V7RF to NC6A
5Z4BI to W4FRU
5Z4FO to KB4EKY
6C1RJ to YK1AO
6W1QB to DK3NP
7J1AGE to N2BA
7P8EG to K0JZM
7Z1IB to OE6EEG
8E7ITU to YB7BC
8Q7CQ to DL2GAC
9H3VJ to DL1VJ
9J2FR to I2ZZU
9K2KS to ON7LX
9K2SH to OE6EEG
9L3BM to VE3VON
9M8FH to N4FTR
9U5BZP to G4BZP
9V1YQ to K2QBV
9X5HG to DJ6EA
9X5SW to DL1HH
A22GH to G3KMQ
A61AD to WB2DND
AG9A/KH2 to AG9A
AX2ITU to VK2PS
BV2DA to DL7FT
BV2FB to AA6BB
C21NI to K0HGW
C30EUA to HB9MM
C53GB to F1MXH
CE8ABF to LU8DPM
CM2VS to I0WDX
CM3RK to I0WDX
CN8NS to I0WDX
CQ7CNT to CT1CNT
CS5CWT to CT1DNP
CT3/HB9CHY to HB9CHY
CU2DX to KB5RA
D2ACA to LZ2DF
D68JM to WV4F
EG8CAC to EA8ZX
EJ0A to W2ORA
EK100RW to UZ9OA
EL2/KC4WCV to N4TBB
EL2FO to N4TBB
EM7BRN to UB4RWW
EO4AES to UZ4AXQ
ET2A to F6HIZ
EX1FAL to UF6FAL
EX1FEI to UF6FEI
EX2FP to UF6DZ
EZ9AX to UA9XC
FG5FC to F6DZU
FH5EJ to F6EBA
FM5WN to WA4JYK
FO0IGS to F6EEM
FO0KAW to JG1DUN
FO0LIJ to JF1WQC
FO4NR to F6ELE
FO4NS to FD1PLR
FO5VO to KK6FK
FV60ST to F9IE
FY5RA to F6GNG
FY5YE to W5JLU
G0KKZ to WB2MMD
GB0FX to G3FXB
H44KA to KC9V
H44SX to G3SXW
H44VG to GW3WVZ
H44XF to G3TXF
HG0D to HA0HG
HG0X to HA0NNN
HG1S to HA1KSA
HG3CW/0 to HA8LKE
HI500UD to HI3UD
HK0OEP to HK0NZY
HK3CAA/HR1 to HK3CAA
HV3SJ to I0DUD
HY0P to F6PFH
HY2X to F2VX
HZ1AB to K8PYD
IS0/DL6RAI to DL6RAI
IT9ITU to IT9TQH
J37R to N4ZDB
J73R to N4ZDB
J79MD to N4CRU
J88AQ to W2MIG
KC4USV to KG5GH
KC6XW to AG9A
KC6XX to WO0G
LT5F to LU5FCI
LW1DQK to LU7DID
LX/FF5KD to FD1OZK
N7ET/DU7 to N7ET
N7LGI/FJ to N7LGI
OG0M to OH2BDA
OG5AD to OH5AD
OH3AC/OH0 to OH3AC
OK3CLA/5N0 to OK3LZ
OK6CW to OK1RR
OL8A to OK3LZ
OX3JF to OZ1JFC
P29DK to KE4EW
P29PL to VK9NS
P29SC to WB1GWB
P40T to W3BTX
PA0GAM/ST2 to PA0GIN
PJ1A to W1AF
PJ2/PA0VDV to PA0VDV
PS5C to PY5CC
PW0QN to PY1AJK
PY0SK to PS7KM
PY0SR to PP5JD
R1AP to UR2RZ
R4AU to UA4UBC
RF6FO to UF6FFF
S79KMB to KN2N
SI3SM to SM3CER
SI4SM to SM6BUR
SI5SM to SM5DYC
SN0JP to SP4KM
SN5JP to SP5PBE
SO6R to HA9PP
ST0DX to WA2NHA
SV0DV/9 to WB4TDB
SV0HS to DJ8MT
SV0HV to KA5EJX
SV0HW/SV9 to KA5EJX
T30JH to VK2GJH
TA/N1GNF to N1GNF
TA7/RF6FO to UF6FFF
TI9JJP to TI2AOC
TJ1GG to I2EOW
TJ1MR to F6FNU
TL8MB to F6FNU
TM8A to F6IMS
TO5ITU to FB1MUX
TR8/F6AXX to F6AXX
TR8JWH to G4TWT
TU2VH to SM7ERJ
TU2XB to G4BZP
TV9RAI to FF6KED
TW3M to FE1JCG
UA2FEK to I0WDX
UF6FBI to UA3TT
UF6VAI to UF6FFF
UF6VBZ to WF2S
UH8EA to W5BWA
UI8A/G3SWH to G3SWH
UI9BWF to UA3TT
UM3M to UW3AA
UO0Z to UO5PU
UR0UCH to UB5UCH
UV3DDC/UA0I to UW6HS
V29A to W4FRU
V31BM to KE4BM
V31KF to W5ASP
V51JM to NK2T
V51QM to NK2T
V63BN to JG1NBD
V63ST to KB6CC
V73AX to KX6BU
VE4ANM/4U to VE6LU
VI3AHY to VK3 Buro
VI5KL to VK5 Buro
VI75CUB to VK2 Buro
VI91AG to VK1 Buro
VK0KC to VK4BB
VP2MDH to KJ4VH
VP2VDX to KT6V
VP5VEB to AA4NG
VP8CDJ to GM4KLO
VP8CFM to GM4KLO
VP8GAV to GM4LVI
VP8SGB to VK4OH
VQ9AY to G4RFV
VQ9JH to KA1CRP
VS6CT to KA6V
VS6WV to K0TLM
WS4E/C6A to WS4E
XQ0X to CE3ESS
XV2A to JA1AH
XX3JP to CT3BX
YC4GDZ to YB4FNN
YJ0AFU to NA5U
YJ0RN to N9DRU
YN/SM0OIG to SM0KCR
YS1DRF to W2PD
YU400/5B4 to K2VHW
YZ0ITU to YU2MM
ZC4BS to G4KIV
ZC4MK to G0JHC
ZD8DX to WB2K
ZD8WD to G4RWD
ZD8XX to W4FRU
ZD8Z to W6CF
ZD9BV to W4FRU
ZP9/PY5BI to PY5BI
ZS1BJUN to ZS6TJ

3B8GA to Faizal Baccus, Modern Square, Vacoas, Mauritius
4K4/UA0KBZ to P.O. Box 485, Cape Schmidt 686830 USSR
4S7WP to P.O. Box 80, Colombo, Sri Lanka
5N0RJM to Rabi, Box 28, Apaca, Lagos, Nigeria
7B8EB to Rick, Box 1668, Maseru, Lesotho
7P8DF to P.O. Box 1668, Maseru 100, Lesotho
BV5OC to Paul, P.O. Box 575, Changhua 50099, Taiwan
C53FJ to P.O. Box 165, Banjul, Gambia
C91TDM to P.O. Box 25, Maputo, Mozambique
CE0LJI to c/o Hospital, Easter Island, Chile
CE9GEW to P.O. Box 74D, Punta Pirenas, Chile
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LU8HCE to P.O. Box 65, 5000 Cordiva, Argentina
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P29PA to P.O. Box 11, Tari, Papua-New Guinea
PJ8AD to P.O. Box 518, Saba, Netherland Antilles, Leeward Islands
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TA8C to P.O. Box 13, Gazantiep, Turkey
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Kusano, Box 43, Oji, Kita-ku, Tokyo 114, Japan, or via JP1LAB for bureau QSLs.

USSR QSL Notes

QSL the contest call **RZ1A** to Box 417, Leningrad 191011, USSR, with SASE, please.

QSL **R1ATM** to Alex Zuev, UA1TGA, Popova-20-25, Novgorod 173025, USSR.

Cards for Chuvash stations (Oblast 097: UA4Y) can be sent to the Oblast QSL bureau: Box 145, Cheboksary 17, Chuvash Rep., 428017, USSR.

W5MUA says he has had very good luck sending cards and US$1 to Vlad, UW9OW, for USSR QSLs. (See February 1991 *The DX Magazine*.) W5MUA is now QSL manager for the University of Simferopol club station, **UB4JWO**. And Igor Kovalyov, UW6HWP, offers help with USSR cards. Write to him at Box 123, Stavropol 355042, USSR. "Guarantee of confirmation is 80%," he says.

73, Chod, VP2ML

PROPAGATION

BY GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Sunspot Cycle Stalled

For five months in a row the smoothed sunspot count has held practically steady at 142.

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 121 for May 1991. A high reading of 163 was recorded on May 27th, with a low reading of 86 reported for May 2nd. This results in a 12-month running smoothed sunspot number, upon which the cycle is based, of 142, centered on November 1990. This is the same level recorded (within a count of 1) since July 1990.

A smoothed sunspot number in the upper 120s is forecast for September 1991.

The Algonquin Radio Observatory, Ottawa, Canada, reports a 10.7 cm solar flux level of 190 for May 1991. The smoothed value for November 1991 remains unchanged near the 200 level.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for September 1991

	Expected Signal Quality			
Propagation Index	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 4,6, 16, 20-21	**A**	**A**	**B**	**C**
High Normal: 5, 7, 10, 17-19, 27	**A**	**B**	**C**	**C-D**
Low Normal: 1, 8-9, 12-13, 15, 25-26, 28	**B**	**C**	**D**	**D-E**
Below Normal: 3, 11, 14, 22, 24, 30	**C**	**C-D**	**D-E**	**E**
Disturbed: 2, 23, 29	**C-D**	**D**	**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 S0 and S3, and with considerable fading and noise.

E—No opening expected.
3 dB per S-Unit.

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 good-to-fair (B-C) on September 1st; poor (D) on the 2nd; fair-to-poor (C-D) on the 3rd; excellent (A) on the 4th; good (B) on the 5th, etc.**

Bulletin

This past June was one of the worst months for shortwave propagation in the history of radio! Violent solar flares, originating on the sun's surface, spewed high levels of electromagnetic energy into the earth's atmosphere almost on a daily basis. Intense solar flares of relatively long duration, which saturated measuring devices in terrestrial laboratories and aboard scientific satellites, took place on June 5, 9, 10, and 11. These caused widespread auroral displays, and an almost complete blackout of long-distance shortwave propagation.

Propagation conditions were rated *very* poor on June 1, 2, 3, 8, 9, 10, 11, 12, 13, and 24. Poor conditions were observed on June 7, 14, 17, 18, 21, 23, 25, and 26. This didn't leave many days during June for the usually expected good summertime openings.

I'll have more to say about this in a future column.

CQ DX Contest Special 1991

The 1991 contest weekends will mark the 40th consecutive CQ DX Contest for which this column has contained special propagation forecasts. This year's contest weekends are:

October 26–27—Phone Section
November 23–24—CW Section

In the tradition of the past 40 years there will appear in next month's Propagation column a special, comprehensive forecast which will focus on both sections of the contest. Besides the latest updated propagation predictions to all areas of the world, the column will also contain pointers for scoring as many points as possible. Don't fail to read next month's column if you are planning to participate in the 1991 CQ DX World-Wide Contest.

A Hearty Thank You!

I want to personally thank the many readers of this column who took the time to drop me a note on the occasion of my 40th anniversary with *CQ*. It was very heart warming to learn what good use has been made of this column over the years. I was especially gratified to hear of several "second-generation" readers to this column—that is, parents who have read the column almost from the beginning, and their children, who began reading it when their interest in amateur radio developed.

Two letters in particular had very special interest for me since they reunited me with friends I have been out of touch with for nearly 50 years!

11307 Clara Street, Silver Spring, MD 20902

September Conditions

September is generally a month of change for HF radio propagation conditions. On some days conditions may seem much the same as during the summer months; on other days the first signs of wintertime conditions should be noticeable. For this reason this month's column contains both Short-Skip and DX Propagation Charts. The DX Charts are valid for the period from mid-September through mid-October; the Short-Skip Charts are valid for the entire months of September and October.

During September expect a considerable increase in the number of DX openings during the daylight hours on *10, 12, 15, 17,* and *20* meters. Of the five bands, conditions on *15* meters should be best most of the time, with *12, 17,* and *20* meters not far behind. Improved nighttime DX propagation conditions are forecast for *30, 40, 80,* and *160* meters as a result of the increasing hours of darkness and a seasonal decline in static levels. Nighttime conditions on *30* and *40* meters should be optimum with conditions on *80* meters somewhat weaker and noisier. While improved DX conditions are expected on *160* meters, signals will continue to be relatively weak and noisy.

With decreasing hours of daylight, September should see a decline in post-

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IC-W2A

IC-H16/U16

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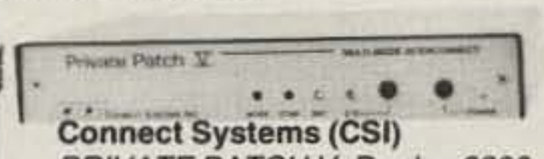

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HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distances column of a particular Meter band (10 through 160 Meters) as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 40 Meters) for a particular geographical region of the continental USA as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

(4) Opening should occurr on more than 22 days
(3) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. etc. On the Short-Skip Chart appropriate *daylight time* is used at the *path midpoint*. For example, on a circuit between Maine and Florida, the time shown would be EDT; on a circuit between N.Y. and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are HST. To convert to daylight time in other USA time zones, *add* 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in the CDT zone, and 6 hours in the EDT zone. *Add* 10 hours to covert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 P.M. in Los Angeles; 18 or 6 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA *subtract* 7 hours in the PDT zone; 6 hours in the MDT zone, 5 hours in the CDT zone and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave length above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level for each 10dB loss, it will lower by one level.

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

CQ Short-Skip Propagation Chart
September & October 1991
Local Daylight Time
At Path Mid-Point (24-Hour Time)

Band Meters	Distance Between Stations (Miles)			
	50-250	250-750	750-1300	1300-2300
10	NIL	10-19 (0-1)	08-10 (1) 10-12 (1-2) 12-14 (1-3) 14-15 (1-4) 15-17 (1-3) 17-19 (1-2) 19-22 (0-1)	08-09 (1-2) 09-10 (1-3) 10-12 (2-4) 12-14 (3-4) 14-15 (4) 15-17 (3) 17-19 (2) 19-20 (1-2) 20-22 (1)
15	NIL	08-10 (0-1) 10-14 (0-2) 14-15 (0-3) 15-17 (0-2) 17-21 (0-1)	08-10 (1-2) 10-14 (2-4) 14-15 (3-4) 15-17 (2-4) 17-20 (1-3) 20-22 (1-2) 22-08 (0-1)	08-09 (2) 09-10 (2-3) 10-17 (4) 17-20 (3) 20-22 (2-3) 22-23 (1-2) 23-01 (1) 01-08 (1-0)
20	12-14 (0-1) 14-17 (0-2) 17-22 (0-1)	08-10 (0-3) 10-12 (0-4) 12-14 (1-4) 14-17 (2-4) 17-18 (1-4) 18-22 (1-3) 22-03 (0-2) 03-08 (0-1)	06-08 (1-2) 08-10 (3-4) 10-18 (4) 18-22 (3-4) 22-01 (2-3) 01-03 (2) 03-06 (1)	06-08 (2) 08-10 (4) 10-14 (4-2) 14-16 (4-3) 16-22 (4) 22-00 (3-4) 00-01 (3) 01-03 (2) 03-06 (1-2)
40	08-10 (2-3) 10-12 (3-4) 12-18 (4) 18-20 (3-4) 20-23 (1-2) 23-06 (0-1) 06-08 (1-2)	08-10 (3-4) 10-12 (4-3) 12-16 (4-2) 16-18 (4-3) 18-20 (4) 20-23 (2-4) 23-01 (1-4) 01-06 (1-3) 06-08 (2-3)	08-10 (4-2) 10-12 (3-1) 12-16 (2-1) 16-18 (3-2) 18-20 (4-3) 20-01 (4) 01-04 (3-4) 04-06 (3) 06-08 (3-4)	08-10 (2-1) 10-16 (1-0) 16-18 (2-1) 18-20 (3-2) 20-04 (4) 04-06 (3-4) 06-08 (4-3)
80	07-09 (3-4) 09-11 (4) 11-19 (4-3) 19-00 (4) 00-05 (3-4) 05-07 (2-4)	07-09 (4-2) 09-11 (4-1) 11-17 (3-1) 17-19 (3-2) 19-21 (4-3) 21-07 (4)	07-09 (2-1) 09-17 (1-0) 17-19 (2-1) 19-21 (3-2) 21-22 (4-3) 22-06 (4) 06-07 (4-3)	07-09 (1-0) 09-17 (0) 17-19 (1) 19-21 (2) 21-22 (3-2) 22-04 (4-3) 04-06 (4-2) 06-07 (3-1)
160	17-19 (1-0) 19-21 (2-1) 21-06 (4) 06-08 (3-2) 08-10 (2-1) 10-12 (1-0)	18-20 (1-0) 20-21 (1) 21-03 (4-3) 03-06 (3-2) 06-08 (2-1) 08-10 (1-0)	20-21 (1-0) 21-23 (3-1) 23-03 (3) 03-06 (2-1) 06-08 (1)	21-23 (1-0) 23-03 (3-2) 03-06 (1) 06-08 (1-0)

HAWAII
September & October 1991
Openings Given In
Hawaiian Standard Time

To:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	06-08 (1) 08-12 (2) 12-14 (3) 14-16 (2) 16-17 (1)	05-06 (1) 06-08 (2) 08-12 (1) 12-16 (2) 16-18 (3) 18-20 (2) 20-22 (1)	11-14 (1) 14-16 (2) 16-18 (3) 18-21 (4) 21-00 (3) 00-04 (2) 04-06 (3) 06-07 (2) 07-08 (1)	18-20 (1) 20-23 (2) 23-00 (3) 00-01 (2) 01-02 (1) 20-22 (1)* 22-00 (2)* 00-01 (1)*
Central USA	06-08 (1) 08-11 (2) 11-14 (4) 14-16 (2) 16-17 (1)	05-06 (1) 06-08 (2) 08-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-18 (3) 18-20 (2) 20-22 (1)	09-14 (1) 14-16 (2) 16-18 (3) 18-22 (4) 22-00 (3) 00-04 (2) 04-06 (3) 06-09 (2)	18-20 (1) 20-22 (2) 22-01 (3) 01-03 (2) 03-04 (1) 21-22 (1)* 22-00 (2)* 00-02 (1)*
Western USA	07-09 (1) 09-11 (2) 11-14 (4) 14-16 (3) 16-18 (2) 18-19 (1)	06-07 (1) 07-09 (2) 09-14 (3) 14-17 (4) 17-19 (3) 19-22 (2) 22-00 (1)	10-15 (2) 15-17 (3) 17-19 (4) 19-00 (3) 00-02 (2) 02-04 (1) 04-06 (2) 06-08 (4) 08-10 (3)	18-19 (1) 19-20 (2) 20-02 (4) 02-04 (3) 04-05 (2) 05-06 (1) 21-22 (1)* 22-23 (2)* 23-02 (3)* 02-03 (2)* 03-04 (1)*

ALASKA
September & October 1991
Openings Given In GMT

To:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	18-20 (1) 20-23 (2) 23-00 (1)	16-18 (1) 18-22 (2) 22-01 (3) 01-02 (2) 02-03 (1)	14-16 (1) 21-23 (1) 23-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	08-12 (1)
Central USA	19-21 (1) 21-00 (2) 00-02 (1)	17-19 (1) 19-22 (2) 22-00 (3) 00-02 (4) 02-03 (2) 03-04 (1)	15-17 (1) 21-23 (1) 23-00 (2) 00-04 (3) 04-05 (2) 05-07 (1)	08-11 (1) 11-13 (2) 13-14 (1) 11-13 (1)*
Western USA	20-22 (1) 22-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	18-21 (1) 21-23 (2) 23-02 (4) 02-03 (3) 03-05 (2) 05-06 (1)	16-18 (1) 18-20 (3) 20-00 (2) 00-02 (3) 02-04 (4) 04-05 (3) 05-06 (2) 06-10 (1)	08-11 (1) 11-14 (2) 14-16 (1) 11-14 (1)*

#See explanation in "How To Use Short-Skip Charts" at the beginning of this column.
Note: The Alaska and Hawaii Propagation Charts are intended for distances greater than 1300 miles. For shorter distances use the preceding Short-Skip Propagation Chart.
*Indicates best time 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.
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.

HOW TO USE THE DX PROPAGATION CHARTS

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

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

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. wetc. Appropriate *daylight* time is used, *not* GMT. T 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 transmitted power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level for each 10dB loss, it will lower by one level.

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

September–October 15, 1991
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	08-10 (1) 10-11 (2) 11-13 (3) 13-15 (2) 15-16 (1) 09-11 (1)**	08-09 (1) 09-11 (2) 11-14 (4) 14-15 (3) 15-17 (2) 17-19 (1)	02-04 (1) 04-06 (2) 06-10 (3) 10-12 (2) 12-15 (3) 15-17 (4) 17-21 (3) 21-02 (2)	18-19 (1) 19-21 (2) 21-23 (3) 23-02 (4) 02-03 (3) 03-04 (2) 04-05 (1) 20-22 (1)* 22-01 (2)* 01-04 (1)*
Northern Europe & European USSR	09-10 (1) 10-13 (2) 13-14 (1)	08-09 (1) 09-10 (2) 10-13 (3) 13-14 (2) 14-16 (1)	03-06 (1) 06-08 (2) 08-11 (3) 11-13 (2) 13-17 (3) 17-19 (2) 19-21 (1)	18-20 (1) 20-04 (2) 04-06 (1) 21-04 (1)*
Eastern Mediter-ranean & Middle East	09-10 (1) 10-12 (2) 12-14 (1)	08-09 (1) 09-12 (2) 12-14 (3) 14-16 (2) 16-18 (1)	07-09 (2) 09-15 (1) 15-17 (2) 17-21 (3) 21-23 (2) 23-01 (3) 01-03 (2) 03-07 (1)	19-21 (1) 21-00 (2) 00-01 (1) 22-00 (1)*
Western Africa	09-12 (1) 12-14 (2) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1) 09-12 (1)**	07-09 (1) 09-13 (2) 13-15 (3) 15-17 (4) 17-19 (3) 19-20 (2) 20-22 (1)	05-08 (2) 08-15 (1) 15-17 (2) 17-21 (4) 21-00 (3) 00-03 (2) 03-05 (1)	20-23 (1) 23-02 (2) 02-04 (1) 00-03 (1)*
Eastern & Central Africa	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1) 09-11 (1)**	08-10 (1) 10-13 (2) 13-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	12-14 (1) 14-17 (2) 17-22 (3) 22-02 (2) 02-03 (1)	20-02 (1) 00-01 (1)*
Southern Africa	09-11 (1) 11-12 (2) 12-13 (3) 13-14 (2) 14-15 (1) 10-12 (1)**	08-11 (1) 11-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-08 (2) 08-15 (1) 15-16 (2) 16-19 (3) 19-00 (2) 00-03 (3) 03-04 (2) 04-06 (1)	19-22 (1) 22-00 (2) 00-02 (1) 23-01 (1)*
Central & South Asia	09-11 (1) 19-22 (1)	08-09 (1) 09-12 (2) 12-13 (1) 20-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-22 (2) 22-01 (1)	05-07 (1) 20-23 (1)

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

Time Zones: CDT & MDT (24-Hour Time) CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	09-11 (1) 11-13 (2) 13-14 (1) 10-11 (1)**	08-10 (1) 10-12 (2) 12-14 (3) 14-16 (2) 16-17 (1)	06-07 (1) 07-10 (2) 10-13 (1) 13-14 (2) 14-16 (4) 16-18 (3) 18-23 (2) 23-03 (1)	18-20 (1) 20-23 (2) 23-01 (3) 01-02 (2) 02-03 (1) 21-23 (1)* 23-01 (2)* 01-02 (1)*
Northern & Central Europe & European USSR	09-13 (1)	08-09 (1) 09-11 (2) 11-12 (3) 12-13 (2) 13-15 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-13 (2) 13-17 (3) 17-19 (2) 19-21 (1) 23-04 (1)	20-23 (1) 23-01 (2) 01-02 (1) 22-01 (1)
Eastern Mediter-ranean & Middle East	10-13 (1)	08-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-16 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (2) 16-20 (3) 20-22 (2) 22-00 (3) 00-01 (2) 01-02 (1)	20-23 (1) 21-23 (1)*
Western Africa	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1) 09-11 (1)**	07-10 (1) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-20 (2) 20-21 (1)	05-08 (2) 08-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-02 (2) 02-05 (1)	20-23 (1) 23-01 (2) 01-02 (1) 23-01 (1)*
Eastern & Central Africa	11-13 (1) 13-16 (2) 16-17 (1) 09-11 (1)**	09-10 (1) 10-13 (2) 13-17 (3) 17-18 (2) 18-19 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-23 (2) 23-00 (1) 07-09 (1)	21-00 (1)
Southern Africa	09-11 (1) 11-12 (2) 12-13 (3) 13-14 (2) 13-15 (1) 10-13 (1)**	07-09 (1) 09-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-08 (2) 08-14 (1) 14-16 (2) 16-19 (3) 19-22 (2) 22-01 (3) 01-05 (1)	20-21 (1) 21-23 (2) 23-01 (1) 21-23 (1)*

Central & South Asia	09-11 (1) 19-21 (1)	09-11 (1) 18-19 (1) 19-21 (2) 21-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-22 (2) 22-01 (1)	06-08 (1) 19-21 (1)
Southeast Asia	10-12 (1) 12-13 (2) 13-15 (1) 17-18 (1) 18-19 (2) 19-20 (1)	09-11 (1) 11-13 (2) 13-15 (1) 18-19 (1) 19-20 (2) 20-22 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-11 (2) 11-13 (1) 16-20 (1) 20-23 (2) 23-02 (1)	05-09 (1)
Far East	15-17 (1) 17-19 (2) 19-20 (1)	10-16 (1) 16-18 (2) 18-21 (3) 21-22 (2) 22-23 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-16 (1) 16-19 (2) 19-21 (1) 21-23 (2) 23-00 (3) 00-01 (2) 01-03 (1)	03-05 (1) 05-08 (2) 08-09 (1) 06-08 (1)
South Pacific & New Zealand	11-13 (1) 13-14 (2) 14-15 (3) 15-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 11-14 (1)** 16-18 (1)**	08-09 (1) 09-15 (2) 15-17 (3) 17-20 (4) 20-21 (3) 21-22 (2) 22-00 (1)	04-08 (2) 08-11 (3) 11-13 (2) 13-18 (1) 18-20 (2) 20-22 (3) 22-02 (4) 02-04 (3)	00-01 (1) 01-06 (3) 06-08 (4) 08-09 (2) 09-10 (1) 02-04 (1)* 04-07 (2)* 07-08 (1)*
Australasia	09-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 16-18 (1)**	08-09 (1) 09-11 (2) 11-15 (1) 15-16 (2) 16-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-23 (1)	06-08 (2) 08-11 (3) 11-13 (2) 13-16 (1) 16-18 (2) 18-20 (2) 20-22 (2) 22-00 (3) 00-02 (4) 02-04 (3)	02-03 (1) 03-05 (2) 05-07 (3) 07-08 (2) 08-09 (1) 05-06 (1)* 06-07 (2)* 07-08 (1)*
Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-10 (2) 10-12 (3) 12-16 (4) 16-17 (3) 17-18 (2) 18-19 (1) 09-12 (1)**	07-08 (1) 08-09 (2) 09-11 (4) 11-14 (3) 14-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	07-10 (4) 10-12 (3) 12-14 (2) 14-16 (3) 16-23 (4) 23-03 (3) 03-05 (2) 05-07 (3)	19-20 (1) 20-21 (2) 21-22 (3) 22-05 (4) 05-06 (3) 06-07 (2) 07-08 (1) 20-23 (1)* 23-05 (2)* 05-07 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Urguay	08-09 (1) 09-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1) 09-15 (1)**	06-07 (1) 07-08 (2) 08-11 (3) 11-15 (2) 15-16 (3) 16-19 (4) 19-21 (3) 21-22 (2) 22-23 (1)	10-16 (1) 16-17 (2) 17-18 (3) 18-00 (4) 00-03 (3) 03-05 (2) 05-07 (3) 07-10 (2)	21-00 (1) 00-04 (2) 04-06 (1) 01-05 (1)*
McMurdo Sound, Antarctica	15-19 (1)	11-15 (1) 15-17 (2) 17-21 (3) 21-22 (2) 22-23 (1)	16-17 (1) 17-20 (2) 20-03 (3) 03-05 (2) 05-07 (1) 07-09 (2) 09-10 (1)	23-01 (1) 01-05 (2) 05-07 (1) 04-06 (1)*

Time Zone: PDT (24-Hour Time) WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	09-12 (1)	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-15 (1) 22-00 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-21 (1) 23-01 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Central & Northern Europe & European USSR	09-11 (1)	08-09 (1) 09-11 (2) 11-13 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-17 (2) 17-18 (1) 21-23 (1)	20-21 (1) 21-22 (2) 22-23 (1)* 21-22 (1)*
Eastern Mediter-ranean & Middle East	09-11 (1)	08-09 (1) 09-10 (2) 10-11 (3) 11-12 (2) 12-13 (1) 20-22 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (3) 16-20 (1) 20-23 (2) 23-01 (1)	20-23 (1)
Western & Central Africa	09-11 (1) 11-12 (2) 12-14 (3) 14-15 (2) 15-17 (1)	08-10 (1) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	01-07 (1) 07-09 (2) 09-14 (1) 14-15 (2) 15-16 (3) 16-20 (4) 20-23 (3) 23-01 (2)	21-00 (1)
Eastern Africa	11-13 (1) 13-15 (2) 15-16 (1)	09-13 (1) 13-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	07-09 (1) 12-15 (1) 15-17 (2) 17-19 (3) 19-21 (2) 21-23 (1)	20-23 (1)

sunset openings on *15*, *17*, and *20* meters. Fairly good conditions, however, should continue, with *15* and *17* meters remaining open through the early evening hours on many days, and *20* meters available for DX through midnight, and on many days throughout the entire period of darkness.

The fall, or *autumnal, equinox* will occur on September 22 as the sun crosses the plane of the equator on its apparent travel from northern to southern skies. On this day the hours of daylight and darkness are equal in length throughout the world. The effects of the equinox are felt on HF propagation conditions from about mid-September through October. During this period, the characteristics of the ionosphere are similar over large areas of the world, and this is usually the best season for DX openings between the temperate regions of both the northern and southern hemispheres. A similar period occurs during the spring equinox, which is centered on March 21. Look for an improvement in conditions between the U.S.A. and South America, to the South Pacific area and Australasia, to southern Asia, and to southern Africa and Antarctica. This improvement should be noticeable on all bands *10* through *160* meters. The best times to look for equinoctial-type openings should be the twilight periods around local sunrise and sunset, but they will occur at other times as well. Many of these inter-hemispheric openings may follow either the *long* or the *short* great circle path, so be sure to check both directions. The expected improvement in equinoctial propagation is reflected in the DX Propagation Charts appearing in this month's column.

VHF Ionospheric Openings

Solar activity remains high enough to support some F-2 layer DX openings from the U.S. to many areas of the world on the *6* meter band. During September and early October it may be possible to take advantage of equinoctial propagation for *6* meter DX openings between the U.S. and the temperate areas of the southern hemisphere. The best times for such openings are during the daylight hours, and they are shown with a ** in the DX Propagation Charts.

Conditions are expected to improve during September for trans-equatorial (TE) type openings on *6* meters. The best time to look for such openings is between 8 and 11 PM local standard time. TE openings favor locations in the southern tier states, and they generally extend across the magnetic equator into the temperate areas of South America. While F-2 layer openings on *6* meters are often steady and strong, TE openings are usually characterized by very weak signals and strong flutter fading.

Although summertime sporadic-E ionization should fall off considerably during September, an occasional *6* meter short-skip opening may still be possible over distances ranging between approximately 1000 and 1300 miles. Best time to check for these short-skip conditions is before noon and again during the early evening.

While no major meteor showers are expected during September, some minor activity may be possible on September 1, 21, and 29. Check for meteor-type ionospheric openings on both *6* and *2* meters on these days.

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

*Indicates best times 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.

**Indicates best times to listen for F-2 layer openings on 6 meters.

For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.

Auroral activity tends to increase during the equinoctial period, so some auroral-type ionospheric openings are likely on both *6* and *2* meters during September. The best possibilities for such openings should coincide with periods of expected radio storminess. Check the Last Minute Forecast at the beginning of this column for those days during September that are expected to be Below Normal or Disturbed. 73, George W3ASK

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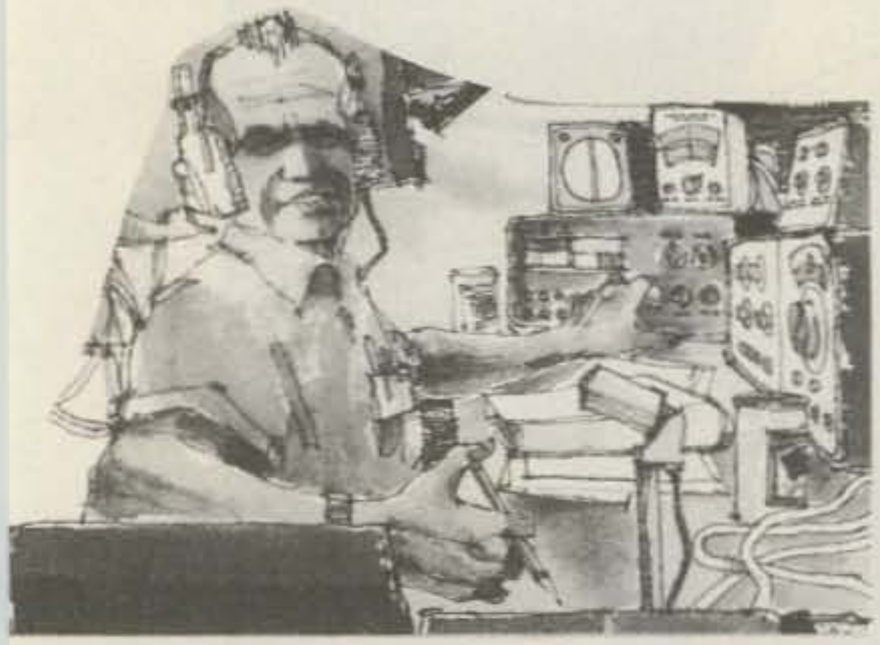

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WM1K	6,103,482
KA5W	4,379,388
KO7N	4,369,940
WO0G	4,007,301
KK9V	3,350,904
KC7V	3,169,956
W5KFT	2,448,258
WE5I	2,417,877
W0CG	2,416,553
WB2UEY	2,321,228
K5TSQ	2,263,476
NG8D	1,830,334
KF2O	1,735,020
KA1HGY	1,620,960
K2PS	1,526,094
KJ6DL	1,491,104
N0ZA	1,485,036
AA5OR	1,473,792
K6HNZ	1,420,800
KF0GV	1,362,072
WA4CPQ	1,323,297
KD9ST	1,224,488
WY2W	1,193,808
WB5ASP	1,131,030
KB1WH	1,127,280
WB2EAR	1,055,884
WW6O	1,033,728
KA4RRU	1,000,269

28 MHz

NX1H	3,032,393
KS3F	2,767,580
WE3C	2,144,956
N4ZZ	2,068,320
AA5BL	1,799,148
K7QQ	1,180,470
AG8W	997,832
K1VUT	992,358
KI6CG	901,890
WB8TLI	660,265
N8AA	649,979
WB4KRH	616,275

21 MHz

WN4KKN/6	4,285,122
K1ZM	3,726,492
W7CB	1,300,023
WM4Z	1,251,828
NE8T	1,242,700
N4MO	1,149,148
N3GB	1,011,840
K6OY	901,950
WB1DXD	667,584

14 MHz

K2VV	2,270,690
KC2X	1,549,561
KC8FT	1,212,610
AB4WD	487,500
W1LQQ	183,498
KS2M	162,193

7 MHz

KV0Q	1,082,250
N7AVK	1,051,512
KA1DWX	164,352
KE6ZE	153,900
KE4BM	92,518

3.7 MHz

KQ3V	303,780

1.8 MHz

AA4MM	17,236

QRP/p

AA2U	A	854,217
N1AFC	A	781,664
K5RX	A	642,350
K5IID	A	508,644
WA2UUK	A	476,307
KZ5Q	A	233,448
W9UP	A	139,755
K6SVL	28	280,476
WO1X	28	122,140
K9OSH	14	88,506
AA6XX	7	28,500

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WG5J	5,436,571
AA5B	5,403,960
WF5E	5,348,070
W1FEA	5,086,128
WU7Q	4,783,535
NM9H	4,078,800
NJ1F	3,886,632
KR0U	3,453,582
W8FN	3,187,541
WV9T	2,787,029
W4PRO	2,034,473
K3ZLK	1,884,575
KM0L	1,628,926
WT2F	1,595,232
W3BGN	1,438,722
N5NMX	1,202,448
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WZ6Z	17,509,914
W3FV	519,108

DX SINGLE OPERATOR ALL BAND

ZW5B	12,366,592
PJ9X	12,254,060
HC1OT	11,881,755
6Y0I	8,292,956
WR6R/KH6	7,473,564
HI500A	7,447,654
VO7XX	7,175,955
OK1RI	7,124,166
CT8N	7,037,116
GW4BLE	6,318,305
ZF2NE/ZF8	6,184,290
WM1K	6,103,482
L33F	5,446,700
A92FN	4,817,704
KA5W	4,379,388
KO7N	4,369,940
OA4ZV	4,361,030
4D9RG	4,252,700
VA3XN	4,038,975
SM5GMG	4,026,724
WO0G	4,007,301
FX0U	3,683,680
JA8YBY	3,634,685
ZP5XHM	3,597,798
D44BC	3,550,872
WL7E	3,464,175
KK9V	3,350,904
VP5F	3,311,304
OY9JD	3,234,530
KC7V	3,169,956
ED8URL	3,118,227
JF1SEK	3,025,746

28 MHz

ZP50Y	10,787,337
FR5DX	7,543,818
ZS6WPX	5,694,876
KG6DX	4,442,405
K6GSS/NH6	4,440,015
HG0NAR	4,167,680
4N2V	4,006,926
VA8A	3,811,893
EI8GS	3,573,060
IO9BLB	3,194,220
NX1H	3,032,393
DL8FBD	3,026,787
5N0ETP	3,000,470

21 MHz

ZX5C	8,178,356
ZY5NW	6,316,440
TM1K	4,497,243
YW3A	4,332,768
EA8AM	4,322,366
WN4KKN/6	4,285,122
4X5U	4,084,437
K1ZM	3,726,492
I2PJA	3,139,500
4T4ANR	2,858,220
OH6NIO	2,567,299
YT3EW	2,532,599
OH5BM	2,520,608

14 MHz

GB8FX	4,025,478
PT5T	3,744,417
CE6EZ	3,231,118
CT3BD	3,000,390
OH1MA	2,956,816
EA3KU	2,867,538
YY5A	2,632,464
DL8PC	2,622,375
YT7A	2,354,280
K2VV	2,270,690

7 MHz

YV5A	3,465,140
HA9RT	2,502,408
VA7SV	2,112,834
I4AVG	1,800,198
LU1IV	1,592,692
KV0Q	1,082,250
N7AVK	1,051,512
OK1DXS	1,051,380

3.5 MHz

VA3EJ	1,950,592
YV3A	1,667,372
FP5DX	1,168,224
YU3NA	356,952
LY2BHM	345,720
IG8R	326,522
KQ3V	303,780
LZ1RN	223,520
UO4OF	221,178
EA1CON	145,200

1.8 MHz

UL7ACI	331,008
LZ1KWZ	43,956
OH3VV	39,738
OZ3SK	29,088
AA4MM	17,236

QRP/p

VP2E	A	4,453,398
AA2U	A	854,217
N1AFC	A	781,664
K5RX	A	642,350
K5IID	A	508,644
WA2UUK	A	476,307
HA7YS	A	316,128
K6SVL	28	280,476
JR3RWB	28	260,764
ED1EPB	28	181,250
K9OSH	14	88,506
AA6XX	7	28,500

MULTI-OPERATOR SINGLE TRANSMITTER

P40V	27,178,710
TA5/N0FYR	16,524,144
TW1C	14,024,961
TK7A	13,640,670
CT3M	13,025,727
GB6BT	11,624,448
TO7C	11,572,820
CK7C	11,360,512
WC4E	10,637,352
9H0DX	9,680,028
ZW0JR	9,656,130
ED3MM	9,088,057
UT4UXW	9,034,480
VP5E	8,812,755
FL0P	8,747,725
PA6WPX	8,672,994
RZ1A	8,502,327
TV6M	8,216,087
UB6Q	7,591,152
F1B	7,562,532
KL7RA	7,508,970
TH8X	7,448,960
UL8LYA	7,258,621

MULTI-OPERATOR MULTI-TRANSMITTER

ED8ACH	47,636,676
HG73DX	31,045,980
YT2E	28,285,668
WZ6Z	17,509,914
OH1AA	16,746,312
JE2YRD	13,218,840
ZV4B	12,172,875
W3FV	519,108

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Model	Sq. Ft.	Roto TQ.	Brake TQ.	Note
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747SRX	21.8	50	502	H.S.
1105MSX	27.3	57	717	
1105MSAX	27.3	57	717	P.S.
1200FXX	27.3	143	1290	H.S.
1300MSAX	32.7	215	1792	P.S.
1800FSX	38.2	287	2150	P.S.

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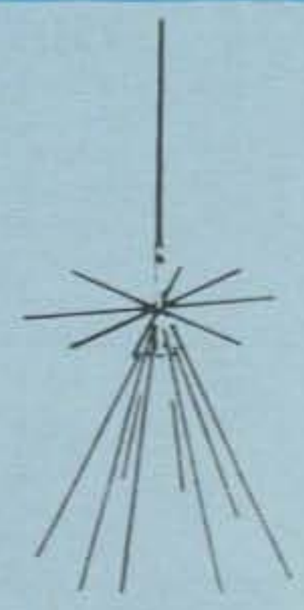
WB 1300
Frequency:
Receive 25-1300 MHz
Transmit 50,144,430,900 & 1200MHz

Max.Pwr.: 200W
Length: 5'6"
Connector: "N" Type
Mast Dia: 98"-2"
Weight: 2.2lbs.



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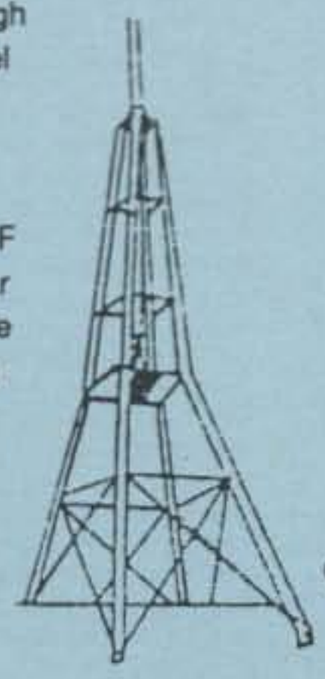
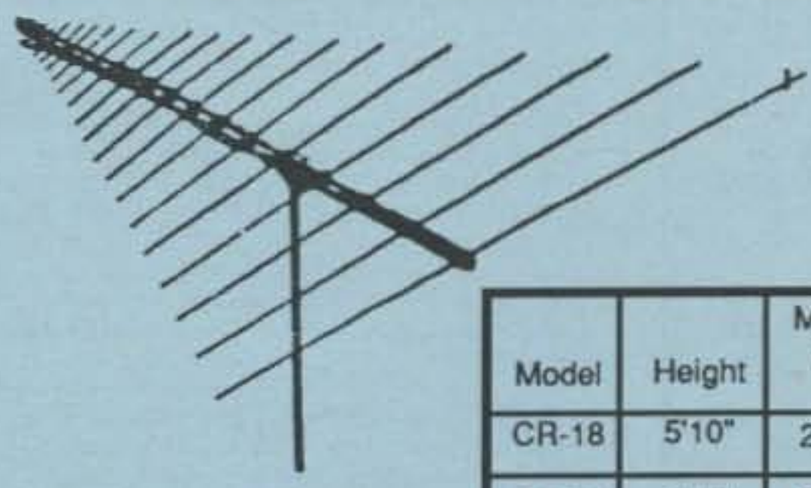
* Subject to availability
* For safety's sake all towers should be guyed
* U.P.S. Not Included



CR-30



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Model	Height	Max. Antenna Wind Load in FT.2	Base Width	Max. Vert. load lbs.	Tower Weight in lbs.
CR-18	5'10"	21 @ 90mph	31 1/3"	440	18
CR-30	9'10"	27 @ 90mph	39"	1322	33
CR-45	14'9"	23 @ 90mph	39"	881	57
CK-46	Thrust Bearing for Cr-18, CR-30, and CR-45 Maximum Acceptable Mast Diameter 2 1/2"				

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SSM-2 stainless ball mt.
SSM-3 spring
QD2 quick disconnect
FX2 2mt. 5/8 mag. mt.
HOT trunk mt. w/swivel ball
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RM12 12m standard
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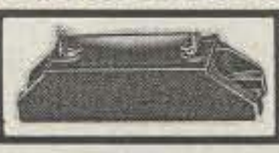

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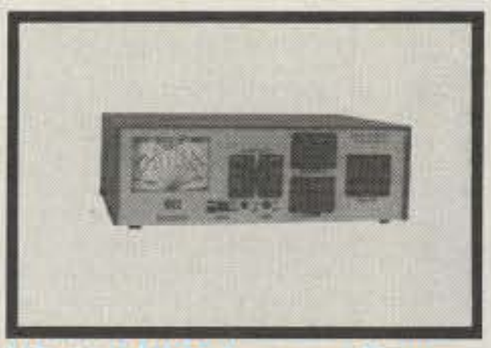
(714) 985-6250

HF-600-QSK Linear Amplifier:

1.8 - 29.7 MHz; with **Eimac** 3-500Z tube; QSK vacuum relays; 1.2 kW input; cross - needle metering; pressurized cooling **$1299.95**

PS - 30VM DC Power Supply:

30 Amps; OVP; short circuit protection; thermal controlled fan cooling. Other models include 8A, 12A and 50A; cross - needle metering for V and A.....**$199.95**



VC-300 DLP Antenna Tuner:

1.8 - 30 MHz; **built-in dummy load**; **illuminated** cross-needle SWR and power meter; 30 or 300W range; **peak or average** **$159.95**

PM - 30 Power / SWR Meter:

true shielded directional coupler; illuminated cross-needle meter; peak or average; 300 or 3000 W range **$89.95**

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- **1500 W DIGITAL peak - reading antenna tuner,1.8 - 30 MHz**
- **1.2 kW 6 meter amplifier**
- **500 W 1.8 - 21 MHz Economy compact HF amplifier**
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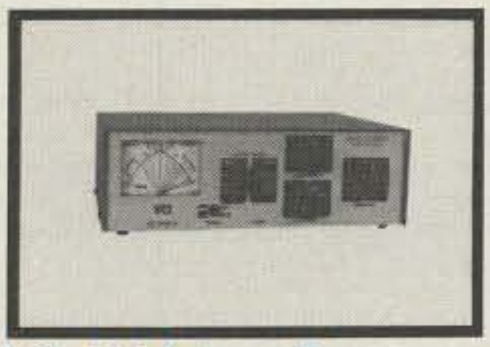

VC - 300 Antenna Tuner:

1.8 - 30 MHz; 30 or 300 W; cross -needle SWR and power meter **$129.95**

DL - 650M Dry Dummy Load:

1500 W (10 sec); 100 W continuous; DC to 650 MHz; VSWR < 1.3 : 1 .....**$59.95**

LP - 30 Low Pass Filter:

suppresses TVI at the source; **-60 dB** or better, depending on frequency; 50 ohms; insertion loss < 0.5 dB in passband **$49.95**

HPF-1 Braid Breaking High Pass Filter: suppresses TVI; attenuates signals below 30 MHz; **-40 dB** or better; 75 and 300 ohm; (baluns included) **$18.95**

CIRCLE 31 ON READER SERVICE CARD

MORSE CODE COMPUTER INTERFACES with Software for IBM or COCO $49.95. Ham License Study Programs $14.95. Free Public Domain and Ham catalog for IBM or COCO. Dynamic Electronics, Box 896, Hartselle, AL 35640 (205-773-2758 or 205-772-0618).

WANTED: Contact with anyone who worked for, was associated with in any way, or knows of someone associated with **E.H. Scott Radio Laboratories,** 4450 Ravenswood Ave., Chicago, Illinois. I am attempting to preserve the history of the company. Forward to: John Meredith, 1792 Nemoke Trail, Haslett, MI 48840 (517-349-4348).

AMIGA, MACINTOSH, ATARI XL/XE/ST Amateur Radio PD software $4.00 disk. Two-stamp SASE brings catalog. Specify computer! Kinetic Designs Hamware, Box 1646, Orange Park, FL 32067-1646.

MACINTOSH ham software. DX Helper(TM) for locating and identifying DX. Propagation, gray lines, great circle maps, code practice, more. $49.95. Satellite Pro(TM) for tracking satellites. Maps, data, view from space, more. $79.95. For free info call or write MacTrak Software, P.O. Box 1590, Port Orchard, WA 98366 (206-871-1700).

RADIO TRANSCRIPTION DISCS WANTED: W7FIZ, Box 724, Redmond, WA 98073-0724.

WANTED: ART 13 transmitter complete condition and any accessories. Write giving price and condition. Don Unwin, Box 263, Cranbrook, B.C. V1C 4H8 Canada.

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Decodes all 16 touchtones. Works with terminal modem programs.
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***Mount All modules including C64,** Predrilled & painted incl. mounts & cable clamps **ALBX .....$ 159.95**

Digital Voice Recorder 32 or 64 sec. voice Mailbox & ID tail, Inc. 1 Meg Ram, control with CS8 or PK8, Incl. cable for REV8 Ultra board, 5 or 12VDC **DVM.....$ 179.95**

12V Power for C64 & 1541 with this crystal controlled Switching supply, runs cool & efficient draws <1 amp, Plugs into C64, fused, protected, heavy duty Model **DCPS.....$ 129.95**

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Add 2 Voice Meters + 2 Alarm Inputs + 8 Relay On/Off Switches **PK8 $159.95**

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WANTED: Yaesu FT-23R-HT and pre 1980 micro computers for museum. KK4WW, 703-231-6478/763-3311.

ROSS'$$$$ NEW September (ONLY) SPECIALS: LOOKING FOR THAT HARD TO FIND ITEM?? KENWOOD TS-450S $1139.90, TR-8400 $349.99, TS-811A $1260.00, TM-241A $349.90, HMC-1 $46.50, PB-2 $39.90, TS-940SAT $2019.90, TS-950SAT $3270.00. MFJ 815B $45.90, 948B $104.90, 941E $99.90, 422B $119.90. HEATHKIT HW-2P $279.99, HD-1234 $27.90, HD-1416 $22.90. NYE VIKING MB-V-A $654.90, MBI-02 $179.90. KLM KT-34A $394.90, 134-138-16C $94.90. TELEX/HY-GAIN 395S $429.90, 188S $237.50, 376S $269.90. YAESU FT-26/25 $269.90, FT-26/27 $286.90, FT-650 $1309.90, FT-2400H $340.00, FT-747GX $679.90, FT-470 $390.00. ICOM 229H $355.00, 24AT $389.90, 228A $300.00, 3200A $459.99, 471H $899.90, W2A $514.90, 725A $759.90. SEND SASE FOR USED AND CLOSE-OUT LIST. ALL L.T.O. (Limited Time Offer). LOOKING FOR SOMETHING NOT LISTED?? CALL OR WRITE. Over 9039 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. Preston. Hours Tuesday to Friday 9:00 to 6:00, 9:00 to 2:00 PM Mondays. Closed Saturday & Sunday. ROSS DISTRIBUTING COMPANY, 78 South State, Preston, Idaho 83263 (208-852-0830).

WANTED: Recent copy of Japanese CQ magazine. Happy to cover costs. Dave, WE6L, 28927 Eagleton, Agoura, CA 91301 (818-889-3470).

PICTURE QSL CARDS of your shack, etc., from your photo or black ink artwork. 500 $26.00, 1000 $40.50. Also non-picture cards. Custom printed cards, send specifications for estimate. Send 2 stamps for illustrated literature. Generous sample kit $2.00, half pound of samples $3.00. Raum's, RD 2, Orchard Road, Coopersburg, PA 18036. Phone 1-215-679-7238. Closed July 15 to August 15.

AFRAID OF FCC TESTS? Let your C64/128 drill you. All questions on 5¼ inch disk. With instructions. Full screen diagrams if used. Your call on screen and optional printed summary. PPD. Novice, Tech or General $19.95. Advanced or Extra $24.95. New NOCODE (2 disks) $34.95. Ralph Parlette, WB6JOY, 27 Morning Sun, Mill Valley, CA 94941 (415-383-0507).

"HAMLOG" COMPUTER PROGRAM: Full features. 18 modules. Auto-logs, 7-band WAS/DXCC. Apple, IBM, CP/M, Kaypro, C128, $24.95. CQ-KA1AWH, PB 2015, Peabody, MA 01960.

DIGITAL SWR and **POWER METER,** assembled, kit or plans, with Alarm and Set Points. **FREE** information. Rupp Electronics, 5403 Westbreeze, Fort Wayne, IN 46804 (219-432-3049.

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TUBES $3.00 EACH. Thousands of surplus receiving and TV tubes, many values in small quantity. Orders over $20.00 shipped free. Send $1.00 for list or letter with wants to: C. Campbell, P.O. Box 108, Cohoes, NY 12047-0108.

COMPUTER: Radio Shack Model 100 Laptop, Model CCR-81 computer tape recorder, software, cables, $300. Call 601-684-1647 evenings. John Conn, 330 Kentucky Ave., McComb, MS 39648, KA5FFX.

SAVE THIS AD! Send with your order for QSL cards and deduct 10% from price of cards. **Quality! Samuel Morse,** Satellite, ARRL, Cartoon, Patriotic, Mike and Key, Keys, USA and State Outlines. **Economy** (Plain and State Outline) **Plastic Cardholders.** Display 20 cards. Three—$4.75. Four or more—$1.40 each. **Samples?** Business SASE 52¢ postage. **Rusprint,** Rt 3, Box 192CQ, Springhill, Kansas 66083.

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VHF-UHF-SHF: Try the VHFer in its 11th year. Large SASE: VHFer, Box 685, Holbrook, AZ 86025.

DON C. WALLACE, W6AM, Amateur Radio's Pioneer. By Jan D. Perkins, N6AW. This book describes the history of amateur radio, as experienced by Don. Hardbound, 320 pages and 200 photographs, 24 in color. $29.95 plus S&H ($3 US, $5 overseas). CA residents add 7%. Wallace & Wallace, 11823 E. Slauson Ave. Suite 38, Santa Fe Springs, CA 90670.

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The *World Ham Net Directory* lists special interest ham nets for DXers, missionaries, weather watchers, retired persons, and many other interests. $9.95 plus $2 shipping ($3 foreign) US funds from Tiare Publications, P.O. Box 493, Lake Geneva, WI 53147. Catalog $1.00, free with order.

Ready to explore VHF/UHF operating? Get Ed Noll's *Basic Guide to VHF/UHF Ham Radio*. Covers equipment, antennas, propagation, repeaters, contesting, band plans, and more. All the basics you need! Just $6.95 plus $2 shipping ($3 foreign) US funds from Tiare Publications, P.O. Box 493, Lake Geneva, WI 53147. Catalog $1.00, free with order.

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RTTY JOURNAL: Published ten times per year. Covering the digital modes of RTTY, AMTOR, FAX, PACKET, plus technical and other interesting articles about this fascinating phase of Ham radio. $15.00 per year USA, foreign slightly higher. RTTY JOURNAL, 9085 La Casita Ave., Fountain Valley, CA 92708.

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THE DX MAGAZINE is your monthly DX reference: DXpedition reports, equipment and software reviews, six meters, awards, QSL information, and more. Sample only $1.00. Box 50-C, Fulton, CA 95439 (707-523-1001).

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WANTED: Old tube audio components, especially early integrated amps and tuners. Jack Smith, 288 Winter St., N. Andover, MA 01845 (508-686-7250).

CRYSTALS: SASE for my list. K8LJQ, 2023 Lannen Rd., Howell, MI 48843.

DRAKE WV-4 VHF SWR/wattmeter wanted. K8TBW, 419-435-4127.

SELL: Amateur radio equipment (and bought). List/$1 and SASE. Joe Bedlovies, P.O. Box 139, Stratford, CT 06497.

WANTED: Electro Cap for Drake AC/4 supply, 40/40 uFd at 150 volt, Part Number 3180360. Ron Golini, W4NDV, Rt. 5, Box 500, Orangeburg, SC 29115-9355 (803-534-8865).

SALE: Challenger DX-VI Gap vertical no trap antenna. Uniden Bearcat BC 100XLT 100 channel handheld scanner. Both new. W3CJI, 215-433-4485.

TET 3el 20m Yagi, new, boxed $169; other TET parts, SASE list. G. Rattmann, 14250 Calle De Vista, Valley Center, CA 92082.

SALE: Heath Battery Eliminator BL4; Batt Elim. Filter BF-1; Signal Tracer IT-12; Transistor Checker IT-18 Signal Tracer Mod T2. Make offer one or all. Write or call W2FXA, 716-655-4162.

KENWOOD TS-530S with 270, 500 Hz filters and digital VFO 230, $700. W1WAI, 508-443-9867.

SPECIAL BOOK FOR COLLECTORS: *Wireless Telegraphy and Telephony* edition 1923 by E. Redpath. In excellent condition. Please make offer. SV1RP, George Vlahopoulos, EMM. Xanthou 6, Dasos-Haidari, Athens, GR-12462, Greece.

WANTED: 2 KW Antenna Tuner with Wattmeter in good condition. K7BD, 103 E. Bartlett Ave., Selah, WA 98942.

PHELPS DODGE 6 cavity isolation reject duplexers 450-470, 470-512 meg. Good, $75. Easterly, 511 Larson, Grand Saline, TX 75140 (903-962-4393).

FOR SALE: EICO VTVM, Model 232 in mint condition. With probe and book. $25.00 plus UPS. B. Nastoff, 320 W. 56th Place, Merrillville, IN 46410.

IBM XT COMPATIBLE: 512K, Mono monitor, 2 FDD, RS232, Para, like new, 6 mo warranty, FOB $495. Call (408) 739-1833. Mike Bae, Box 4808, Santa Clara, CA 95054.

WANTED: Screw-base flashbulbs #2, 22, 50 clear or blue. Remote for Kenwood TM201B. Colbert, General Delivery, Burton, OH 44021.

WANTED: EBY "PCK" CW transmitter, 6C4/5763, produced in late 50s, any condition. Sever, 1701 Harcourt Drive, Leesburg, FL 34748.

HEATHKIT HW16 CW Xcvr and HG10B VFO for sale. Both work perfectly, manuals included. $90 for both, I ship UPS to lower 48. N4WWW 205-887-3069.

SALE: Heathkit 614 station monitor. Tandy TRD-80 Model 100 portable computer. TRS-80 printer. W3CJI, 215-433-4485.

WANTED: Old AM Broadcast Receivers. Especially Cathedrals and Bakelites. G. Skloot, 2923 Mandalay Beach Road, Wantagh, NY 11793.

WANTED: Heathkit Morse Keyboard, HW7, HW8, or HW9 QRP rig. WØKKQ, 1-719-561-9620.

WANTED: A tone encoder microphone or tone encoder for KDK model # 2015R transceiver. Kevin, KC4YMH, P.O. Box 5032, Springfield, VA 22150.

NEW IN BOX. Antennas Hy-Gain 5BDQ 10 thru 80 meter trap dipole, $60. Hustler G7 144 MHz, $100. Hustler MO1 and MO2 break-over mobile mast, $16. You pay shipping. Call 216-484-5302.

KENWOOD TS-830S with Fox Tango 2.1 SB filters, mint, $725. Kenwood VFO-230 external VFO digital model, mint, $325. Kenwood SP-230 external speaker with audio filters, $75. Tony Musero, K3UKW. Callbook or 215-271-8898.

FOR SALE: Ten-Tec Corsair Model 560 solid-state transceiver with matching 260 power supply. This is a one-owner, mint condition unit that covers the complete HF bands. Excellent in every way, $650. Charlie, KD4AJ, 404-396-0276.

TEKTRONIX 88 MHz bandwidth oscilloscope, Model 585 with dual channel P-82 plug-in, X1 and X10 probes, and instruction manuals, $500. 48-foot aluminum tower consisting of 8 six-foot tapered sections with insulated stainless-steel guys, $200. W1WI 508-475-1214.

QTH GAINESVILLE, Florida: 3 BR, 2 BA Ranch home on 1 acre. Tower, Antennas, Satellite Dish. $60,000. W4OMG, 904-495-2169.

HEATHKIT HW16 CW XCVR and HG10B VFO for sale. Both work perfectly, manuals included. $90 for both. I ship UPS to lower 48. N4WWW, 205-887-3069.

WANTED: Tempo 6N2 amplifier, Millen Solid-State Dip-Meter, Kenwood TS-830S, Sony ICF-2010, Yaesu YO-301. Kauppi, 4912 Vermillion, Gilbert, MN 55741.

WANTED: 12 volt solar charger, E.M. Sargent Co. super het receiver (was employed there in 1937). SALE: B/W closed-circuit TV camera with 25mm, 1 and 3 inch lenses. B/O. W6RKJ, 415-357-9888.

WANTED: Modifications and improvements for Kenwood R-1000, Ten-Tec Century 22. Also, Ten-Tec #679 keyer kit for C-22. Glenn, KB5AYO, Rt. 1 Box 580-B, Reserve, LA 70084.

WANTED: Schematic diagrams for Heath HWS-2 HT, Heath HD-1481 remote coax switch. Also Heath HWA-180 speaker/mike. Glenn, KB5AYO, Rt. 1 Box 580-B, Reserve, LA 70084.

R/S MODEL HX-100 10 meter mobile rig for $150.00 or trade for HT or mobile 2 meter rig. More info send SASE to P.O. Box 518, Whitehouse, FL 32220.

WANTED: ICOM IC-SP2 Speaker and RYCOM R-2174A/URR Voltmeter. Charles T. Huth, 229 Melmore St., Tiffin, OH 44883 (419-448-0007).

CRYSTALS: SASE for my list. K8LJQ, 2023 Lannen Rd., Howell, MI 48843.

TS-950SD OWNERS: Information nine Power On Functions not mentioned in Instruction Manual. Please send SASE and quarter. Ralph Cabanillas, Jr., W6IL, 2359 Creston Dr., Hollywood, CA 90068.

FOR SALE: MFJ-1224 Terminal $60.00, Realistic wireless Intercoms (4) $40.00, Microsoft-Write V1.0 for Macintosh (unopened) B.O., Curtis Electronic Fist EK-39 $69.00. K8SCA, 313-373-5873.

TEN-TEC Model 705 Desk Microphone, new in box, $65. G. Skloot, 2923 Mandalay Beach Road, Wantagh, NY 11793 (516-221-3535).

WANTED: Manual for RCA AR88 communication receiver. H. Newby, 619-463-5422.

WANTED: Kantronics KT-120, AEA 10 meter DX HANDY, MIZUHO QRP MX-20 monobanders. FOR SALE: Complete set of CCITT RED BOOKs 1985, $95. CCI ATV4 902 MHz Amateur TV converter, $50. KE2SP, P.O. Box 7, Palm Bay, FL 32906.

7/8 HARDLINE CONNECTORS, old and new style, M/F. Walter Obenhofer, 716-392-4231, after 6 PM. 159 Lighthouse Road, Hilton, NY 14468.

WANTED: YAESU TC-2 2-meter and TC-6 6-meter converters and transfer relays/switches w/"N" type connectors. Charles T. Huth, 229 Melmore St., Tiffin, OH 44883 (419-448-0007).

SELL OR TRADE: 51 years QST, 1931-81, $500 or HF xcvr or gear. K8SJ, Box 266, Girard, OH 44420.

CIRCLE 42 ON READER SERVICE CARD

CIRCLE 46 ON READER SERVICE CARD

CIRCLE 39 ON READER SERVICE CARD

MINT (97%) STANDARD 2 Meter FM handheld touch pad $120. Mint (95%) TCS Navy transmitter and receiver $275 for set. Dan, W7HBF, 206-387-3558.

NEED MANUAL or copy for Yaesu FT-227-R two meter rig. University Amateur Radio Club, Attention Bob May, P.O. Box 19060A, East Tenn. State University, Johnson City, TN 37614.

CLIPART, PCX format, of old radios and telegraph equipment wanted. Dick Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550-1851.

WANTED: PEN PALS. Hams who are into Bluegrass Music to swap ideas on music, ham radio. Jim Queen, KB3Y, Box 274, Oxon Hill, MD 20750.

WANTED: AC POWER CORD for 75S-1; power cable for 32S-1; schematic for 516F-2, for club youth program. San Benito ARC, POB 1382, San Benito, TX 78586.

WANTED: Transceivers IC-402. Piller J.P. c/o Borghini PH., 330 Kennedy Dr., Spring Valley, NY 10977.

DRAKE WV-4 WANTED. K8TBW, 419-435-4127.

FOR SALE or TRADE. CQ/HR/QST/73 Magazines. SASE or call 508-947-4444. KA1VY, E. Guimares, 401 Bedford St., Lakeville, MA 02347.

IBM XT COMPATIBLE: 512K, Mono monitor, 2 FDD, RS232, Para, like new, 6 mo warranty, FOB $495. Call (408) 739-1833. Mike Bae, Box 4808, Santa Clara, CA 95054.

SELL: Santec ST-144 2-meter, mobile and wall charger, leather case, speaker mike, needs new batteries, $130. Greg, KA3DBG, 301-946-6460.

TET SURPLUS ANTENNA PARTS, SASE list. G. Rattmann, P.O. Box 1625, Valley Center, CA 92082.

WANTED: Urgently need manual for Hammarlund HQ-110 receiver. Please call (916) 487-7118 *collect* for $ details.

ATV AND SSTV buffs: Have Ampex Studio Camera, built-in 4 × 5 monitor, tripod, zoom lens, and manual. W3CJI, 215-433-4485.

COLLINS PARTS: Type 70K-2 PTO assy for 312-B5, KWM-2 or S-line. Includes turns-counting dial (not Collins). Use to build 312-B5. $85/trades? Also COLLINS 516-E1 12 volt mobile pwr supply for KWM-2, KWM-1 or S-line. Never used, very clean w/schematic. $135 or trade for Murch Tuner. KD3RF, 215-348-2363.

WANTED: Accurate Antenna Rotor. Also 2 meter base station linear amplifier. Richard Mollentino, 7139 Hardy, Overland Park, KS 66204.

7Q7RM Ron in need of an amplifier donation. He needs a 6 meter amp. He has 10 watts of 6 meter power for drive. Anyone who can help out with a donation? Please mark package "gift" when shipping it to 7Q7RM. Thank You. N8ZM.

WANT: Flashbulbs #50, #22, 4 × 5 lensboard for Toyo-Omega, 4 × 5 metal field camera. T.N. Colbert, Burton, OH 44021.

AMP SUPPLY LK-500ZB with Jennings vacuum relay for QSK. Less than 2 hrs on tubes, $700.00 U SHIP. EVEREX 2400 Baud Internal Modem, NEW with warranty card, $100. WANT: DRAKE WV-4. K8TBW, 419-435-4127.

WANTED: Personal anecdotes relating to Lindbergh's Transatlantic flight or subsequent US tour, to be displayed in a museum housed in the Spirit of St. Louis shipping crate. Larry Ross, Easy Street, RFD 2, Box 5130, Canaan, ME 04924.

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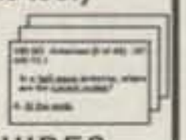

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UG-21D/9913	N Male for RG-8 with 9913 Pin	3.95
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CIRCLE 41 ON READER SERVICE CARD

Announcing *(from p. 82)*

Sept. 21–22, **Walla Walla Valley ARC Hamfest,** Ferndale School Gymnasium, near Milton-Freewater, Oregon. Contact Ralph P. Taylor, N7DWD, P.O. Box 321, Walla Walla, WA 99362 (509-525-3002). (Exams Sunday afternoon.)

Sept. 21–22, **York, Pennsylvania Hamfest & Computer Show,** York, PA. Contact York Hamfest, P.O. Box 351, Dover, PA 17315. (Exams.)

Sept. 22, **CARA Fleamarket,** Elk's Club, Danbury, CT. Contact Candlewood ARA, 203-790-7987.

Sept. 22, **Champaign/Logan ARC Hamfest & Computer Show,** Fairgrounds, Urbana, OH. Contact KC8NM, 513-355-5352.

Sept. 22, **LIMARC Hamfest,** New York Institute of Technology, Old Westbury, Long Island, NY. Contact Neil Hartman, WE2V, 516-462-5549.

Sept. 27–29, **ARRL Amateur Radio 10th Computer Networking Conference,** Radisson Airport Hotel, San Jose, CA. Contact Glenn Tenny, AA6ER, Fantasia Systems, 2111 Ensenada Way, San Mateo, CA 94403 (415-574-3420).

Sept. 28, **SCRA Ham Radio Fleamarket & Auction,** Holy Ghost Hall, Sebastopol, CA. Contact Sonoma County Radio Amateurs, P.O. Box 116, Santa Rosa, CA 95402 (707-523-1001 days, 707-526-2198 evenings).

Sept. 28, **American Red Cross II Hamfest,** National Guard Armory, 2 miles north of Warsaw, IN. Contact John Sparks after 3 PM at 219-269-5187.

Sept. 28, **Northern Michigan Chain of Clubs Swap,** Vanderbilt School, Vanderbilt, MI. Call 517-732-9539. (Exams.)

Sept. 28, **Elmira International Hamfest,** Chemung County Fairgrounds, Elmira, NY. Contact Dave Lewis, RD 1 Box 191, Van Etten, NY 14889. (Exams 0900.)

Sept. 28–29, **Greater Louisville Hamfest,** Commonwealth Convention Center, Louisville, KY. Contact Greater Louisville Hamfest Assn., P.O. Box 34444-C, Louisville, KY 40232-4444. (Exams.)

Sept. 29, **Adrian, Michigan ARC Hamfest & Computer Show,** Lenawee County Fairgrounds, Adrian, MI. Contact Dennis Boydston, WE8Z, 2383 E. Clearview Dr., Adrian, MI 49221 (517-265-8054 after 4 PM. (Exams.)

Sept. 29, **Metro 70cm Network Hamfest,** Lincoln High School, Yonkers, NY. Contact Otto Supliski, WB2SLQ, 53 Hayward St., Yonkers, NY 10704 (914-969-1053). (Exams.)

Sept. 29, **Pasco County, Florida Hamfest,** New Port Richey Recreation Center, FL. Contact Suncoast ARC, P.O. Box 7373, Hudson, FL 34676, or call Ralph, N4QIK, 813-847-4043. (Exams.)

Sept. 29, **Cleveland Hamfest & Computer Show,** Cuyahoga County Fairgrounds, Berea, OH. Contact Ed Stevens, WB8ROK, 18607 Fairville Ave., Cleveland, OH 44135-3915 (216-267-5473). (VE exams 2 PM walk-ins.)

Sept. 29, **BARCfest '91,** Boulder County Fairgrounds, Longmont. CO. Contact Kim Elmore, N5OP, 1103 South Gay Drive, Longmont, CO 80501 (303-530-2903, leave message). (Exams.)

Sept. 29, **St. Peters ARC Swapfest,** Warrenton, MO. Contact SPARC, c/o Mike Trail, NØLBM, 607 Booneslick, P.O. Box 311, Warrenton, MO 63383.

Sept. 29, **JARSFEST 91,** American Legion Complex, Benson, NC. Contact Jim Creswell, KJ4SW, Rt. 1 Box "JARS," Benson, NC 27504 (919-894-5479).

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393S	TH5MK2S Thunderbird, 5 elements	827.00
395S	Explorer 14 Broad Band	655.00
221S-1	TH3JRS Thunderbird, 750W PEP	415.00
390S	TH2MKS Thunderbird, 2 elements	388.00
396S	30/40 Meter Kit for Exp. 14	167.00

MODEL	MONOBAND BEAMS	AMATEUR NET
239S-1	103BAS 3 element 10 meter	$148.00
236S	153BAS 3 element 15 meter	205.00
226S	203BAS 3 element 20 meter	333.00
375S	105BAS Long John 5 element 10 meter	283.00
376S	155CAS Long John 5 element 15 meter	430.00
377S	205CAS Long John 5 element 20 meter	762.00
394S	204BAS 4 element 20 meter	555.00
371S	Discoverer 7-1 Rotary dipole 30/40 meter	303.00
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373S	Discoverer 7-3 Director Kit for 7-2	428.00

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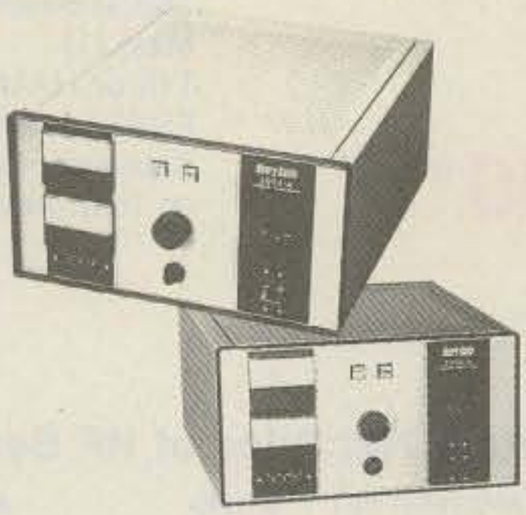

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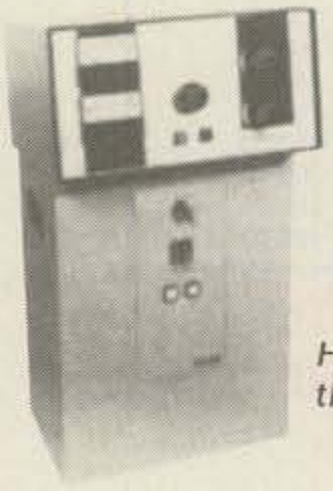

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CIRCLE 8 ON READER SERVICE CARD

Advertiser's Index

(continued on page 145)

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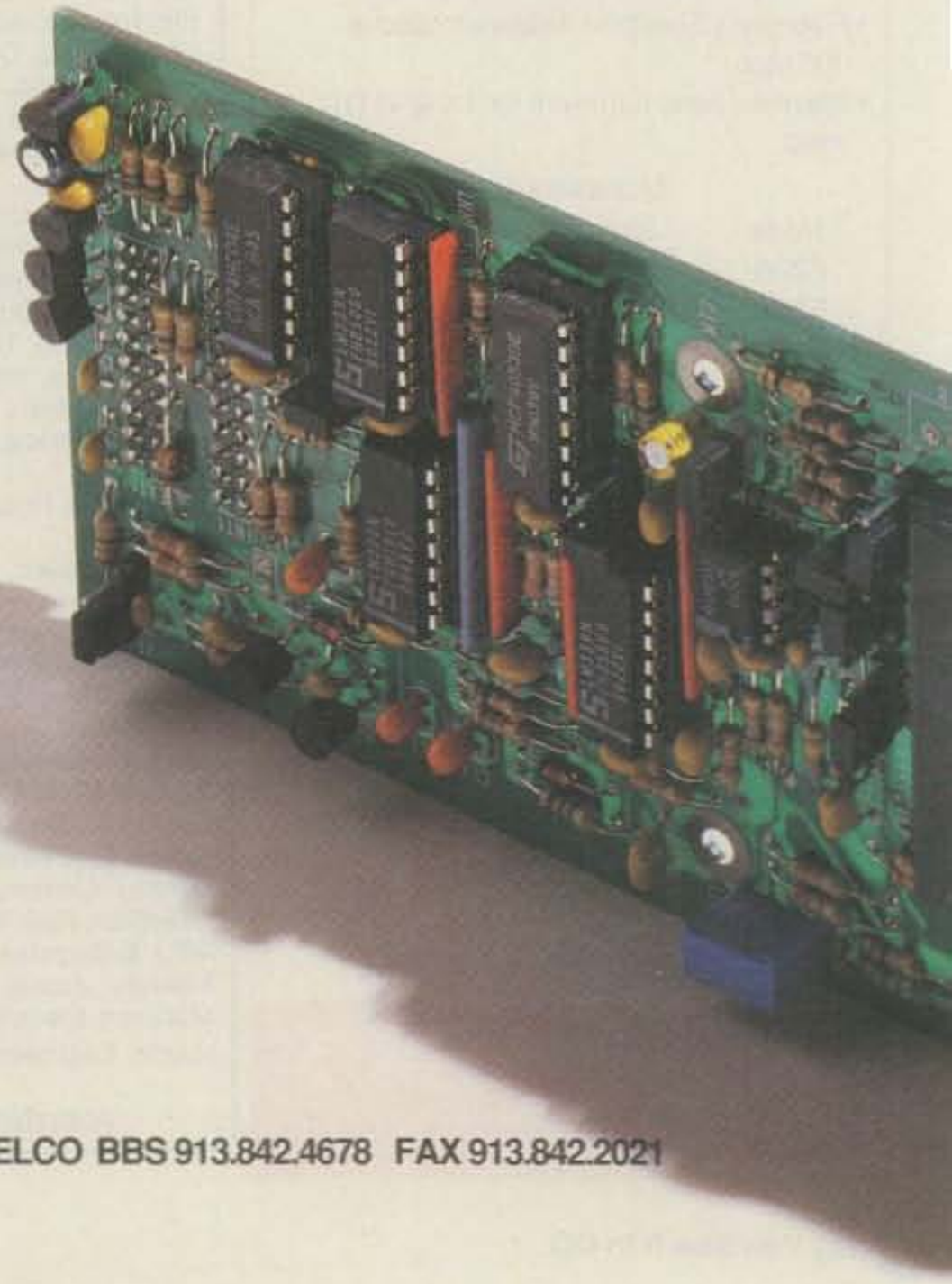

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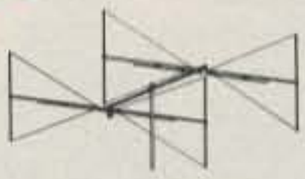

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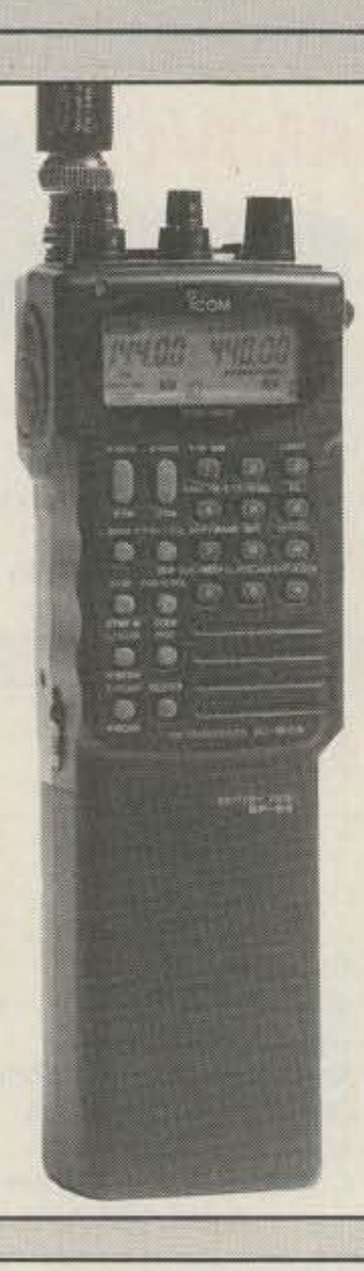

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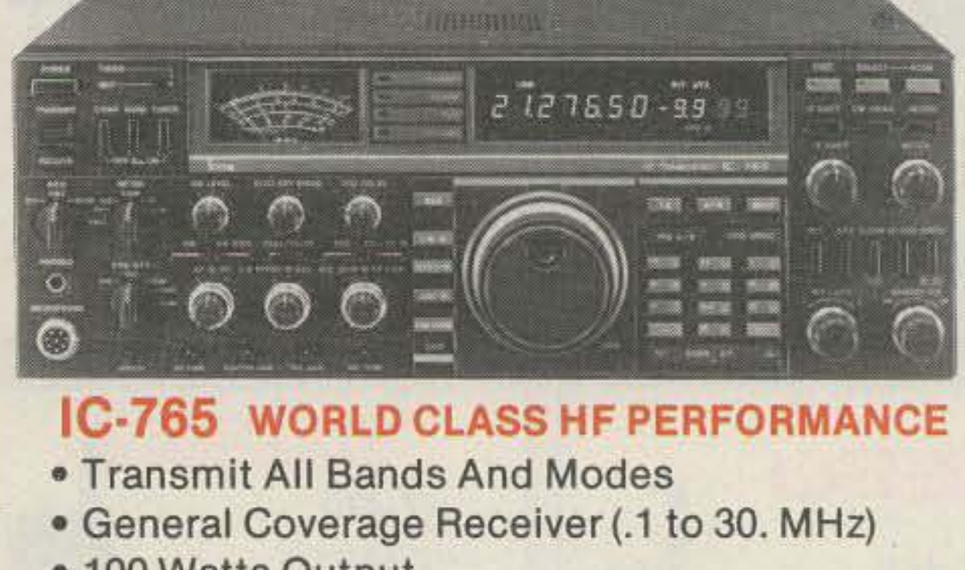

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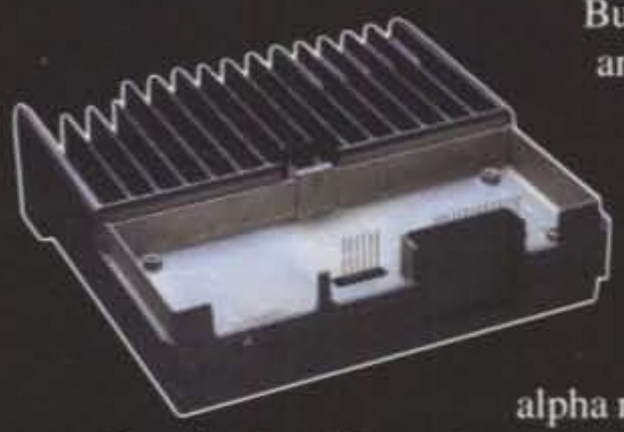

Built to take the abuse of highway and off-road use, the FT-2400 is packed with exceptional features including 26 full-function memory channels. The FT-2400 also allows you to identify channels with your choice of frequencies or alpha numeric readout. A new DTMF microphone with easy to see backlit keypad and a modular plug is included. And for effortless reading day or night a huge LCD display features big numbers and an automatic level dimmer control.

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Features:

• VHF Hi-power mobile three selectable power levels 50w high, 25w mid, 5w low • Wide band receiver coverage 140–174 Rx, 140–150 Tx • CTCSS encode built-in selectable from front panel • 5 scanning functions: Band scan, Memory scan, Memory channel lock-out with selectable scan stops and priority scan • Channel steps: 5, 10, 12.5, 15, 20, 25 and 50 • One piece die-cast flame construction body and heat sink • Automatic repeater offset • Programmable call channel

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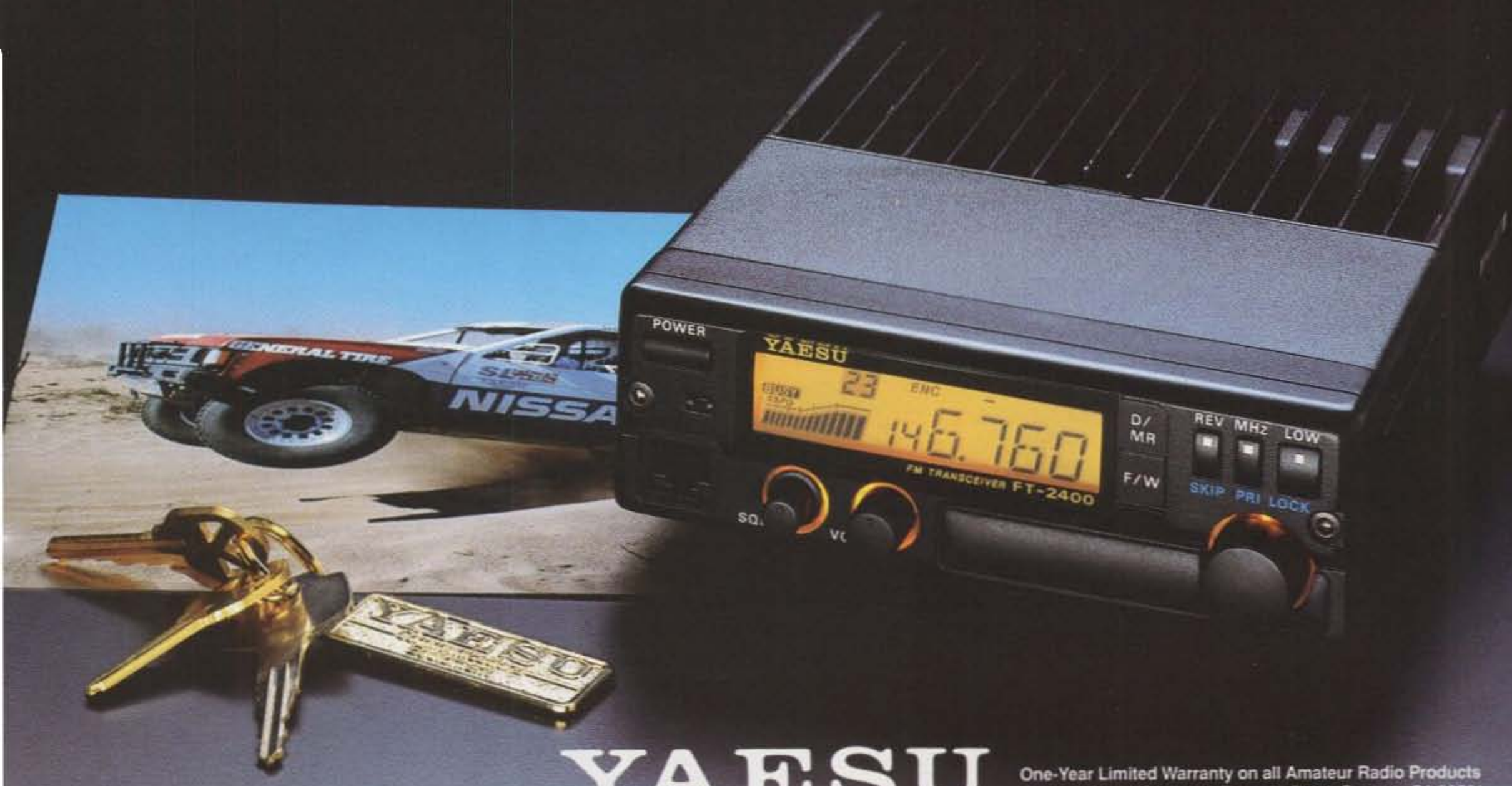

*Passed MIL STD 810 Shock and Vibration Test.

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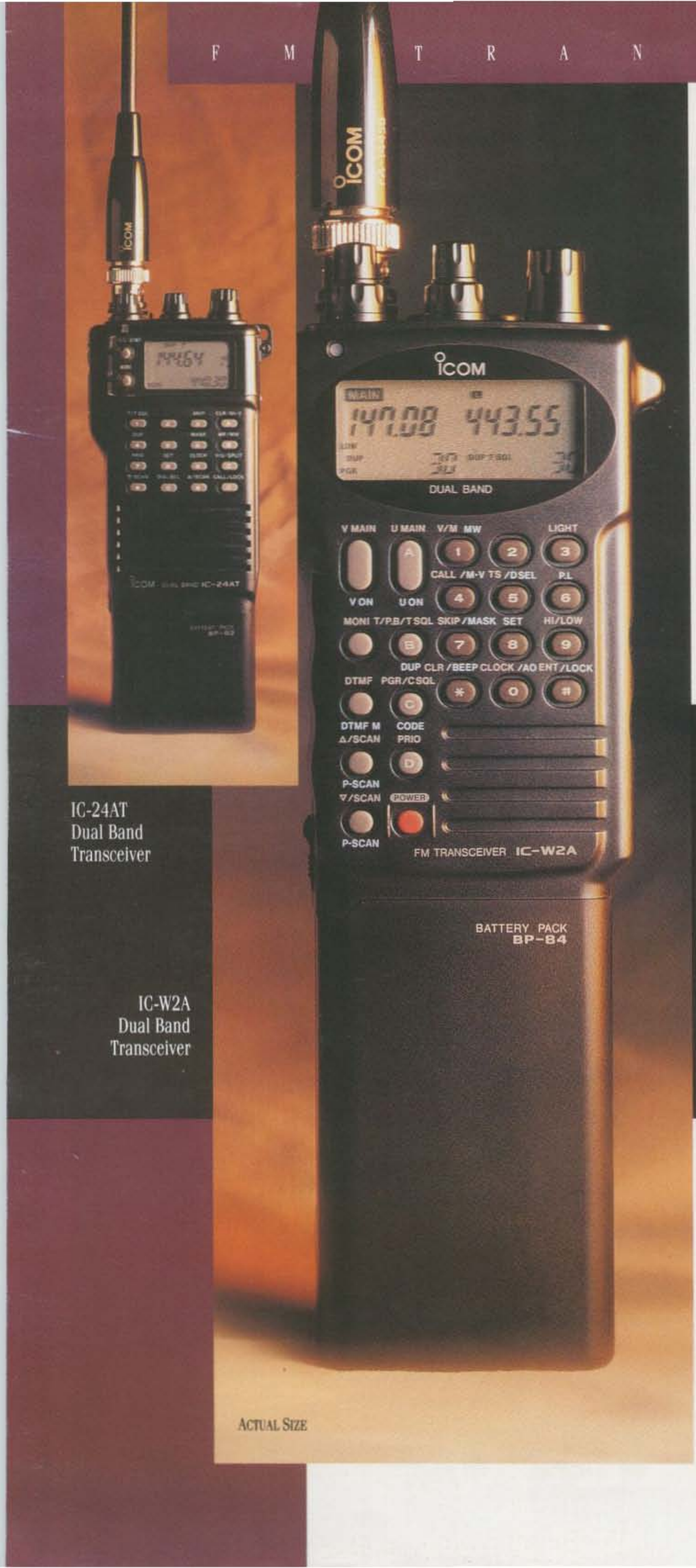

IC-24AT
Dual Band
Transceiver

IC-W2A
Dual Band
Transceiver

ACTUAL SIZE

Icom continues to dominate the industry with exceptional product design and innovation. The IC-24AT firmly established Icom as the leader in dual band technology. Now the IC-W2A gives you the advantage of choosing the dual bander best suited for your needs.

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