

# Amateur Radio

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**CQ**



*Season's Greetings*



THE RADIO AMATEUR'S JOURNAL

# KENWOOD

...pacesetter in Amateur Radio

DX-celligence!

## #1 Rated HF!



### TS-940S Competition class HF transceiver

TS-940S—the standard of performance by which all other transceivers are judged. Pushing the state-of-the-art in HF transceiver design and construction, no one has been able to match the TS-940S in performance, value and reliability. The product reviews glow with superlatives, and the field-proven performance shows that the TS-940S is "The Number One Rated HF Transceiver!"

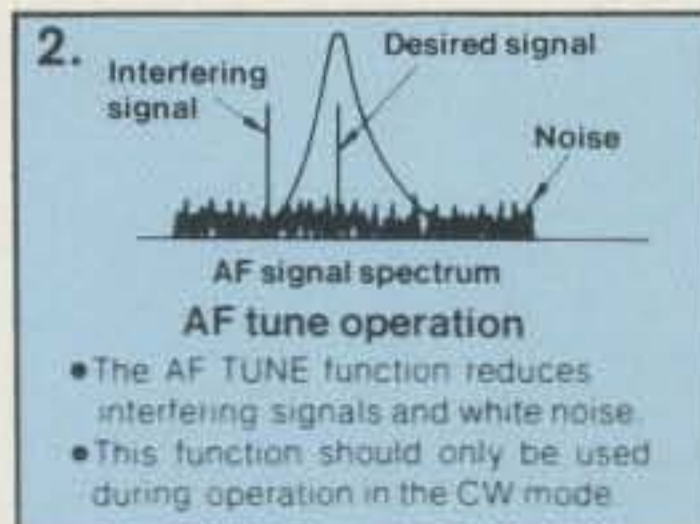
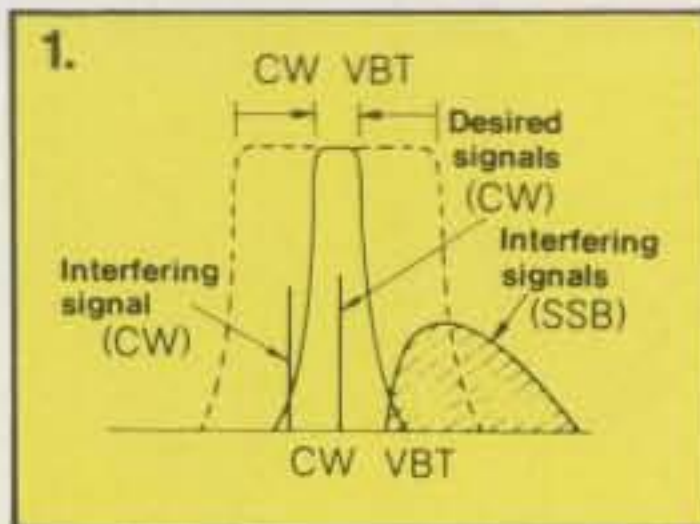
- **100% duty cycle transmitter.** Kenwood specifies transmit duty cycle **time**. The TS-940S is guaranteed to operate at full power output for periods **exceeding one hour**. (14.250 MHz, CW, 110 watts.) Perfect for RTTY, SSTV, and other long-duration modes.
- **First with a full one-year limited warranty.**
- **Extremely stable phase locked loop (PLL) VFO.** Reference frequency accuracy is measured in **parts per million!**

#### Optional accessories:

- AT-940 full range (160-10m) automatic antenna tuner
- SP-940 external speaker with audio filtering
- YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter
- VS-1 voice synthesizer
- SO-1 temperature compensated

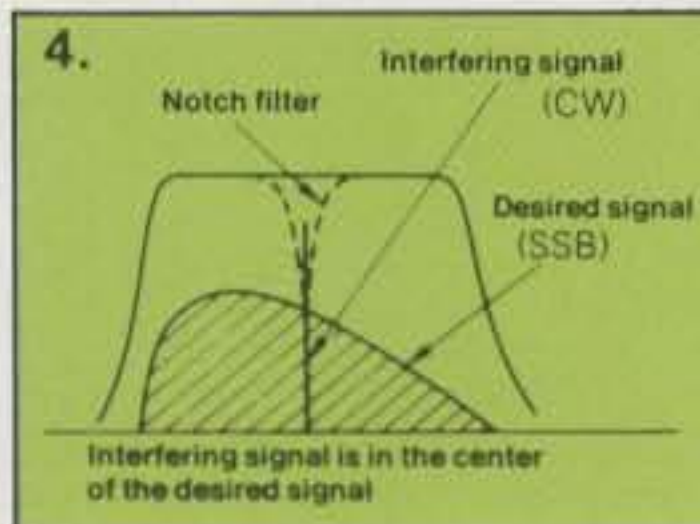
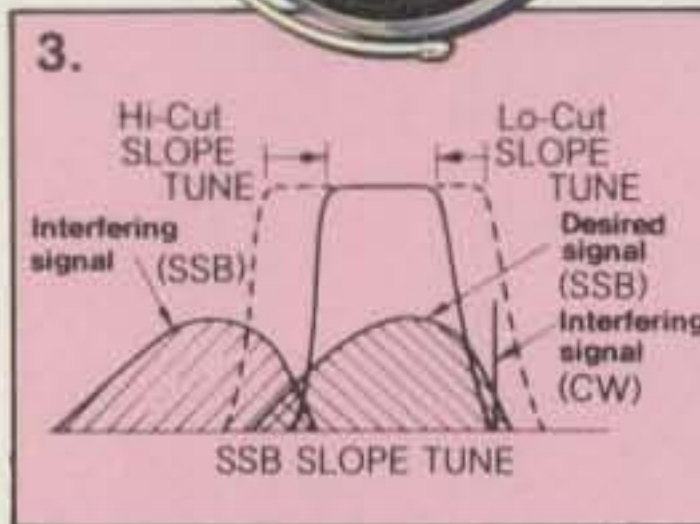
Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features, and prices are subject to change without notice or obligation.

- crystal oscillator
- MC-43S UP/DOWN hand mic.
- MC-60A, MC-80, MC-85 deluxe base station mics.
- PC-1A phone patch
- TL-922A linear amplifier
- SM-220 station monitor
- BS-8 pan display
- SW-200A and SW-2000 SWR and power meters
- IF-232C/IF-10B computer interface.



**1) CW Variable Bandwidth Tuning.** Vary the passband width continuously in the CW, FSK, and AM modes, without affecting the center frequency. This effectively minimizes QRM from nearby SSB and CW signals.

**2) AF Tune.** Enabled with the push of a button, this CW interference fighter inserts a tunable, three pole active filter between the SSB/CW demodulator and the audio amplifier. During CW QSOs, this control can be used to reduce interfering signals and noise, and peaks audio frequency response for optimum CW performance.



**3) SSB Slope Tuning.** Operating in the LSB and USB modes, this front panel control allows independent, continuously variable adjustment of the high or low frequency slopes of the IF passband. The LCD sub display illustrates the filtering position.

**4) IF Notch Filter.** The tunable notch filter sharply attenuates interfering signals by as much as 40 dB. As shown here, the interfering signal is reduced, while the desired signal remains unaffected. The notch filter works in all modes except FM.

- **Complete all band, all mode transceiver with general coverage receiver.** Receiver covers 150 kHz-30 MHz. All modes built-in: AM, FM, CW, FSK, LSB, USB.
- **Superb, human engineered front panel layout for the DX-minded or contesting ham.** Large fluorescent tube main display with dimmer; direct keyboard input of frequency; flywheel type main tuning knob with optical encoder mechanism all combine to make the TS-940S a joy to operate.
- **One-touch frequency check (T-F SET) during split operations.**
- **Unique LCD sub display indicates VFO, graphic indication of VBT and SSB Slope tuning, and time.**
- **Simple one step mode changing with CW announcement.**
- **Other vital operating functions.** Selectable semi or full break-in CW (QSK), RIT/XIT, all mode squelch, RF attenuator, filter select switch, selectable AGC, CW variable pitch control, speech processor, and RF power output control, programmable band scan or 40 channel memory scan.

# KENWOOD

KENWOOD U.S.A. CORPORATION  
2201 E. Dominguez St., Long Beach, CA 90810  
P.O. Box 22745, Long Beach, CA 90801-5745

# KENWOOD

...pacesetter in Amateur Radio

NEW!

## Affordable DX-ing!

### TS-140S

HF transceiver with general coverage receiver.

Compact, easy-to-use, full of operating enhancements, and feature packed. These words describe the new TS-140S HF transceiver. Setting the pace once again, Kenwood introduces new innovations in the world of "look-alike" transceivers!

- **Covers all HF Amateur bands with 100 W output.** General coverage receiver tunes from 50 kHz to 35 MHz. (Receiver specifications guaranteed from 500 kHz to 30 MHz.) Modifiable for HF MARS operation. (Permit required).
- **All modes built-in.** LSB, USB, CW, FM and AM.
- **Superior receiver dynamic range** Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range.



- **New Feature! Programmable band marker.** Useful for staying within the limits of your ham license. For contesters, program in the suggested frequencies to prevent QRM to non-participants.
- **Famous Kenwood interference reducing circuits.** IF shift, dual noise blankers, RIT, RF attenuator, selectable AGC, and FM squelch.

- **M. CH/VFO CH sub-dial.** 10 kHz step tuning for quick QSX at VFO mode, and UP/DOWN memory channel for easy operation.
- **Selectable full (QSK) or semi break-in CW.**
- **31 memory channels.** Store frequency, mode and CW wide/narrow selection. Split frequencies may be stored in 10 channels for repeater operation.
- **RF power output control.**
- **AMTOR/PACKET compatible!**
- **Built-in VOX circuit.**
- **MC-43S UP/DOWN mic. included.**

#### Optional Accessories:

- **AT-130** compact antenna tuner • **AT-250** automatic antenna tuner • **HS-5/HS-6/HS-7** headphones • **IF-232C/IF-10C** computer interface
- **MA-5/VP-1** HF mobile antenna (5 bands)
- **MB-430** mobile bracket • **MC-43S** extra UP/DOWN hand mic. • **MC-55** (8-pin) goose neck mobile mic. • **MC-60A/MC-80/MC-85** disk mics.
- **PG-2S** extra DC cable • **PS-430** power supply
- **SP-40/SP-50B** mobile speakers • **SP-430** external speaker • **SW-100A/SW-200A/SW-2000** SWR/power meters • **TL-922A** 2 kW PEP linear amplifier (not for CW QSK) • **TU-8** CTCSS tone unit
- **YG-455C-1** 500 Hz deluxe CW filter, **YK-455C-1** New 500 Hz CW filter.



### TS-680S

All-mode multi-bander

- 6m (50-54 MHz) 10 W output plus all HF Amateur bands (100 W output).
- Extended 6m receiver frequency range 45 MHz to 60 MHz. Specs. guaranteed from 50 to 54 MHz.
- Same functions of the TS-140S except optional VOX (VOX-4 required for VOX operation).
- Preamp for 6 and 10 meter band.



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NEW!

## Compact Breakthrough!



### TH-25AT/45AT

#### New Pocket Portable Transceivers

The all-new TH-25 Series of pocket transceivers is here! Wide-band frequency coverage, LCD display, 5 watts plus...

- Frequency coverage: **TH-25AT:** 141-163 MHz (Rx); 144-148 MHz (Tx). (Modifiable for MARS/CAP. Permits required.)  
**TH-45AT:** 438-450 MHz.
- Automatic Power Control (APC) circuit for reliable RF output and final protection.
- 14 memories; two for "odd split."
- Automatic offset selection (TH-25AT).
- 5 Watts from 12 VDC or PB-8 battery pack.
- Large multi-function LCD display.
- Rotary dial selects memory, frequency, CTCSS and scan direction.
- T-ALERT for quiet monitoring. Tone Alert beeps when squelch is opened.
- Band scan and memory scan.
- Automatic "power off" circuit.
- Water resistant.
- CTCSS encoder built-in (TSU-6 decoder optional).
- **Supplied accessories:** StubbyDuk, battery pack, wall charger, belt hook, wrist strap, water resistant dust caps.



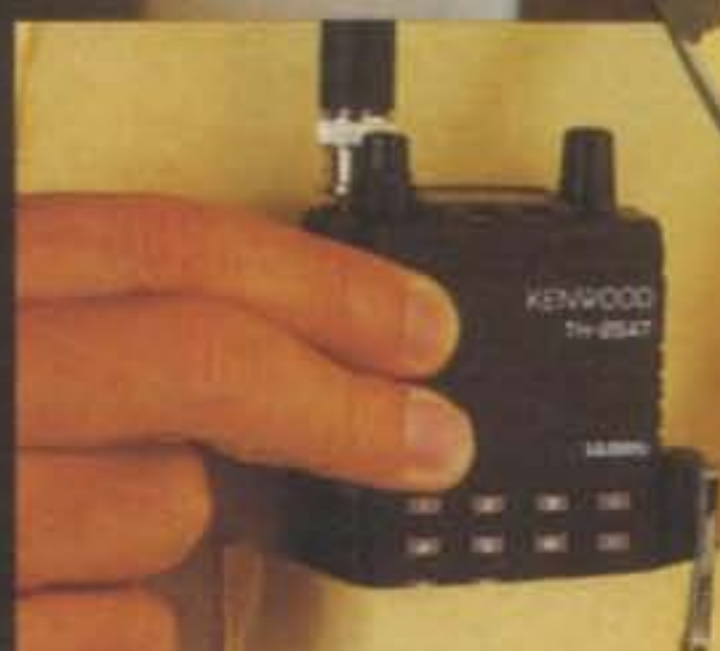
#### Optional accessories:

- PB-5 7.2 V, 200 mAh NiCd pack for 2.5 W output • PB-6 7.2 V, 600 mAh NiCd pack • PB-7 7.2 V, 1100 mAh NiCd pack
- PB-8 12 V, 600 mAh NiCd for 5 W output • PB-9 7.2 V, 600 mAh NiCd with built-in charger • BC-10 Compact charger
- BC-11 Rapid charger • BT-6 AAA battery case • DC-1/PG-2V DC adapter • HMC-2 Headset with VOX and PTT • SC-14, 15, 16 Soft cases • SMC-30/31 Speaker mics. • TSU-6 CTCSS decode unit • WR-1 Water resistant bag

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# The Radio Amateur's Journal



**ON THE COVER:** Bob Kajawski, WA2VDX, of New Hamton, NY looks surprised as he catches Santa using his rig to call for Christmas lists. Photo by Larry Mulvehill, WB2ZPI.

**DECEMBER 1987**

**VOL. 43, NO. 12**

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### EDITORIAL STAFF

Alan M. Dorhoffer, K2EEK  
**Editor**  
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 Dave Ingram, K4TWJ  
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 Hal Keith  
**Illustrator**  
 Larry Mulvehill, WB2ZPI  
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**A**s you'll probably get this towards the end of November, there's still time to check out the ads and suggestions for this year's holiday wish list. I know that some will view this as mercenary and materialistic, but let's face it—toys are what it's all about. I also know that there are quite a few things in this issue that would bring a very broad smile to my face if I were to find them under my tree this year. No, *need* has nothing to do with it. It's more like *want*.

Just recently, when Arnie and I were leaving the grounds of Radio Expo on the way to the airport, we passed an amateur with four HTs on his belt. I find it hard to believe that he actually *needed* four, but he surely *wanted* four. So I'll start off right away dismissing the Ebenezer Scrooges of our hobby when they say that it's all a money-grubbing scheme of manufacturers and publishers to pick the pockets of the lowly amateur. Even Scrooge had a change of heart. The holiday season is a season of joy and fun. Amateur radio can be a part of that fun, that is if you are of a mind to have fun.

Throughout 1987 I've met a lot of you at hamfests who admit that you are having fun. We both know who you are, so don't try to deny it. I've even seen a few attempts at smiling by some of the more serious types of amateurs, and there's the hope of a full-fledged grin in 1988. The Ebenezer Scrooges by and large don't go to hamfests unless someone else buys their ticket, and even then they complain about everything.

I assume that the rest of us are in there trying to have fun in whatever particular niche we enjoy within amateur radio. So within that context I hope your wish list is as long as possible. You certainly don't have to get everything on the list, but it's nice to know that it's all there for the wishing. Of course, you have to remember that if you casually want to leave around your wish list for others to see, it might help to list a couple of sources for the King Kong "Super Mega Blaster."

If 1987 marks your first year in amateur radio, the best is yet to come. With the advent of Novice Enhancement and a definite upward turn in the sunspot cycle, there's a tremendous amount of fun for all in the near future. The doom and gloom that the Scrooges predicted just isn't there. In fact, since the adoption of Novice Enhancement, the first items to sell out at our hamfest booths have been licensing material—of all grades. Now with a stable exam question pool people can be less frantic about what to study, and VECs and examiners can concentrate on examining.

The whole gang here at *CQ* joins in wishing you a very happy holiday season and a really terrific 1988. May we all find that King Kong "Super Mega Blaster" under our trees except for the Scrooges who only deserve a few new batteries for their T-17 mikes.

## Travels With CQ

During the last couple of weeks the intrepid *CQ* crew traversed the country. The last weekend of September found Arnie and I at Radio Expo in Mundelein, Illinois. The weather for this event is usually like a bad Dayton—rainy and cold. Lo and behold, it was a perfect weekend of sun and very mild temperatures. It brought out the folks in droves, and I have to admit that the gang who puts on this one had more of their act together than last year. Dorothy Johnson, WB9RCY, our Awards Editor and custodian of our USA-CA Award, was there lending support to the *CQ* booth. This hamfest features a giant fleamarket with a lot of good stuff to bring home. George Loudon, N9CCI, caught me out in the fleamarket where he was selling some "good stuff" and renewed his subscription on the spot. He also presented me with one of his items, an aerosol pump for insecticide like the old Flit pumpers. George had marked these "Software Debuggers."

The following weekend Dick drove down and manned the *CQ* booth at Virginia Beach. Although the weather left a lot to be desired, the turnout was good, and their usually terrific fleamarket was still good but a bit smaller this year. I didn't get to see any of the goodies he brought back for himself, but I heard that he did bring back a few things that had to be shipped out for some of the other exhibitors who couldn't take the items with them.

The second weekend of October found Arnie and Peter covering the Houston Hamfest and me out in Scottsdale, Arizona for the ARRL Southwestern Division event. Arnie and Peter reported that the activity in Houston was down from last year and that the fleamarket was also a bit thin. Lew McCoy, W1ICP, joined me in Scottsdale and even made sure that I took in some of the local sites such as the Heard Indian Museum. We almost never get to see anything on these trips, so it was a treat to actually act like a tourist. We also managed to walk through the Arizona Biltmore Hotel out in Paradise Valley, a landmark hotel designed by Frank Lloyd Wright. With McCoy, of course, you have to sample a few 807s along the way.

We still have one more event before

the end of the year, one in our own backyard. There's a new one this year called Hamexpo 87 scheduled as a one-day event in early November. It's going to be held at Suffolk Community College in Selden, Long Island. We'll be there, and I'll report on this one next month.

The hamfest food situation, I'm afraid, is not getting better. It went from a poor "double yechhh" to none at Scottsdale. If you wanted something to eat or drink at this one, you had to leave the convention area and go across to the hotel complex to the main dining room—certainly not convenient. For the most part it seems to be a steady diet of hot dogs, corn dogs, and Polish sausages. After each trip I always manage to have some of each on my ties. I think I'll start a competition for 1988. How about some sort of award or recognition for the hamfest group that has the best food?

## CQ Editor To Receive Award

Yes, after all of these years of being on the other side of awards, presenting that is, I'm about to receive one at the end of November. The Board of Directors of The Radio Club of America has voted to elect me to the status of Fellow within that organization. The presentation will be made on November 20 at their annual meeting and banquet. Needless to say, I'm quite pleased and very proud to be so elected. I'll have a picture of the event in a later issue.

## New Years Resolutions

I know that most of us are full of good intentions and well meaning when we make up that mythical list of New Years Resolutions. There are the ones that are ideal and the ones where you can score a few points by giving up something you can't stand anyway like lima beans or brussels sprouts. The ideal resolutions are the ones where you have to do something, usually positive, for you, your family, or mankind. Those are the really hard ones to keep, and sometimes we simply don't keep them for more than a few days. Well, why not add one for 1988 that says that you'll try to help a few new Novices get a better foothold in amateur radio, or even that you'll introduce a few new people to amateur radio this year. Even if you can only do it for a week or two, we'll all be better off for your input. Who knows, you might even grow to like it and keep doing it for the whole year. But whatever you decide to do in amateur radio for 1988, try to put some fun in it.

73, Alan, K2EEK

## New PK-232 Breakthrough

# Six Digital Modes - Including Weather FAX

1900 25FE87 38A-4 01052 17831 SC24N112W-2



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

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



**\$319<sup>95</sup>** AMATEUR NET  
\$379.95 AEA RETAIL

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

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

Operation of the PK-232 is a breeze, with twenty-one front panel indicators for constant

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

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

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



## Brings you the Breakthrough

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

# Announcing

• **Bethlehem, Connecticut** - W1FHP, the Hen House Gang, will operate from Christmastown (Bethlehem, Connecticut) the entire month of December on 10-80 meters plus Novice CW. Contacts count towards the Bethlehem special award from Santa's helpers. Send one first-class stamp only, no envelope. Callbook address and Hen House Gang, Hard Hill Road, Bethlehem, CT 06751.

• **New Castle, Delaware** - The First State ARC will operate Special-Event station K200QBD from The Old State Capitol in New Castle, Delaware on December 5th and 6th in celebration of the 200th anniversary of Delaware's signing of the Declaration of Independence. Look on the 80-15 meter bands 25 kHz ± QRM up from the lower end of General phone bands and the 10 meter Novice phone band. For certificate

send QSL and large SASE to FSARC, P.O. Box 1050, Newark, DE 19711.

• **Faribault, Minnesota** - The annual Courage Center Handi-Ham Winter Hamfest will be held Saturday, December 5 at the Eagles Club in Faribault, Minnesota starting with registration at 9 a.m. There will be a Handi-Ham equipment auction, dinner at noon, and program. Talk-in on 19/79. Amateur radio license exams will also be given. For more information, contact Don Franz, W0FIT, 1114 Frank Avenue, Albert Lea, MN 56007.

• **Hazel Park, Michigan** - The Hazel Park Amateur Radio Club will hold its 22nd Annual Swap & Shop on December 6 at the Hazel Park High School, 23400 Hughes, north of 9-mile, west of Dequinder, Michigan. General admission is \$2.00 in advance, \$3.00 at the door. Children under 11 years free. Tables \$1.00 per foot. Plenty of free parking. Talk-in from the 9-Mile and I-75 area on 146.52 simplex. For tickets and table

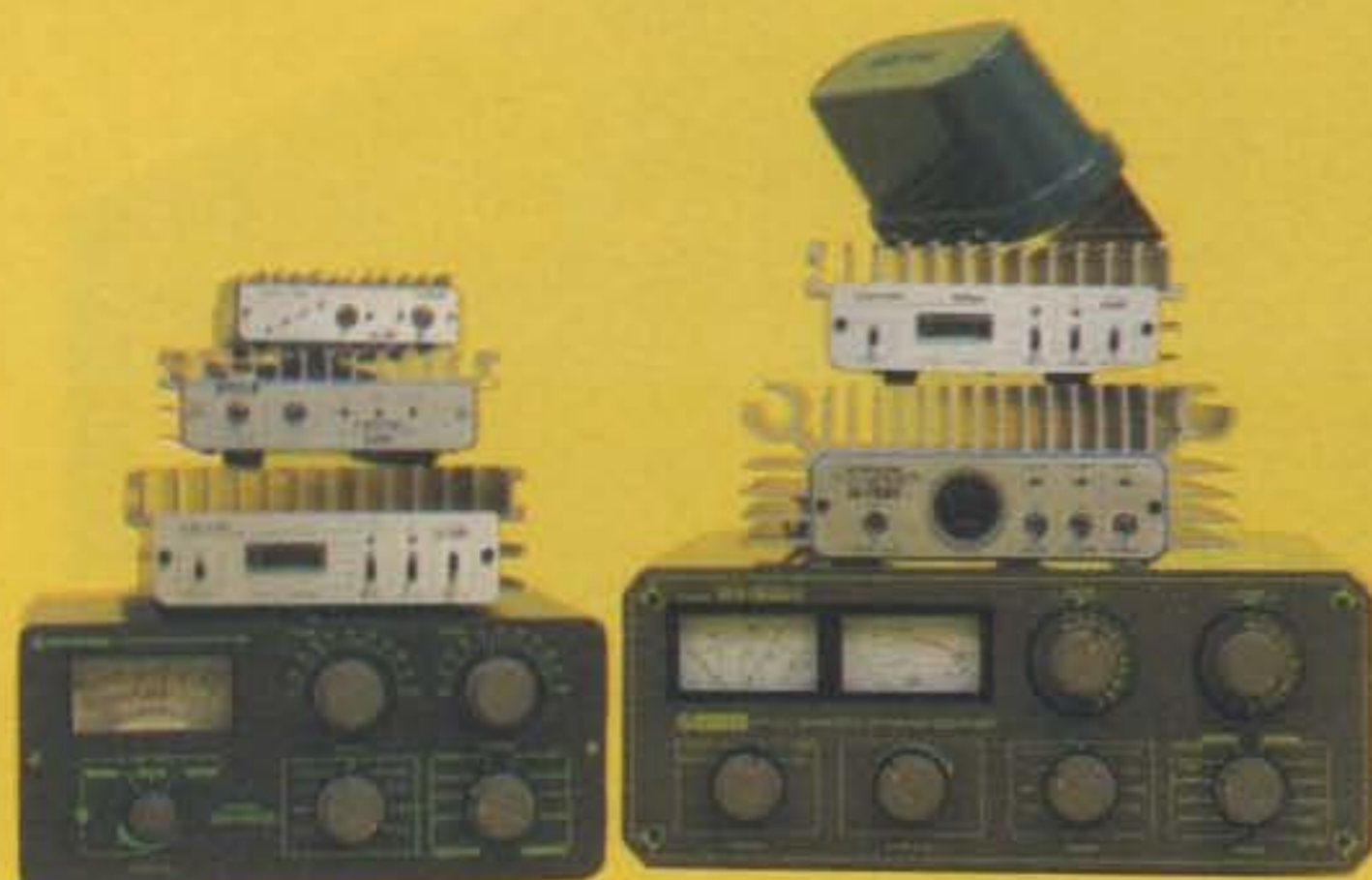
reservations send SASE to HPARC, P.O. Box 368, Hazel Park, MI 48030.

• **Athens, Ohio** - The Athens County Amateur Radio Association will operate Special-Event station WD80XK on December 12th and 13th to celebrate the 200th anniversary of the Northwest Ordinance from the home of Ohio University, first public university in the territory. Operation from 1500-2300Z each day. Suggested frequencies: lower portions of the General 80, 40, 20, 15, and 6 meter bands. Novice phone ± 28.400. For certificate, send QSL and large SASE to Jeffrey White, WD80XK, P.O. Box 73, Athens, OH 45701-0073.

• **QSOs Wanted** - Attention WWII members of the 835th Signal Service Battalion, and signal teams who served as radio operators at Karachi and New Delhi, Indian (JGTA and JGTZ). Write to George Bane, 124 Autumn Drive, Vicksburg, MS 39180. Would like to contact old friends for QSOs.



AMPLIFIERS • COUPLERS



THL THE INDUSTRY LEADER IN DESIGN AND PERFORMANCE add-on accessory VHF/UHF amplifiers, antenna couplers and now HF LINEARS too. When power out is your problem, stop in for the THL brand solution.



NOW! MOBILES AND PORTABLES FROM THE FEATURE-PRICE LEADER



The right features and the right stuff formulate the features everyone asks to have. Add quality, parts and construction, stir up a great price and you've got SANTEC's formula for customer satisfaction. See one at your dealer TODAY!

SANTEC  
SANTEC  
SANTEC

FM-240  
ST-20T  
KT-220M

2-Meter Mobiles  
2-Meter Portable  
Marine Band Portable

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Rivendell Electronics	NH	603-434-5371	Hooper Electronics	MS	601-432-0584	Douglas Electronics	TX	512-883-5103
EGE, Inc	NH	603-898-3750	Universal Amateur Radio	OH	614-866-4267	Stephens Electronics	TX	512-991-6789
Rogus Electronics, Inc	CT	203-621-2252	A.E.S. Ohio	OH	216-585-7388	Austin Amateur Radio	TX	512-454-2994
KJI Electronics	NJ	201-239-4389	Kenmar Industries	OH	216-499-7388	CW Electronics	CO	303-832-1111
Barry Electronics	NY	212-925-7000	R & L Electronics	OH	513-868-6399	Colorado Radio Center	CO	303-288-7373
Hamtronics	PA	215-357-1400	Electrocom Industries	IN	219-232-2743	Miley's Radio	CO	303-784-3040
Ham Buerger, Inc	PA	215-659-5900	The Ham Station	IN	812-422-0231	Ross Distributing Co	ID	208-852-0830
Delaware Amateur Supply	DE	302-328-7728	Ferris Radio	MI	313-398-6645	Ham Radio Outlet	AZ	602-242-3515
Amateur Radio Center	MD	301-889-5214	Michigan Radio	MI	313-469-4656	Pace Engineering	AZ	602-888-3333
Electronic Equipment Bank	VA	703-938-3350	Purchase Radio Supply	MI	313-668-8696	Roberts Electronics, Inc	AZ	602-367-2346
EGE, Inc	VA	703-643-1063	H.R. Electronics	MI	616-722-2246	A.E.S. Las Vegas	NV	702-647-3114
Williams Radio Sales	NC	919-993-5881	A.E.S. Milwaukee	WI	414-442-4200	Reno Radio	NV	702-331-7373
Ham Radio Outlet	GA	404-263-0700	TNT Radio	MN	612-535-5050	Henry Radio, Inc	CA	213-820-1234
Quad Electronics	FL	904-438-3319	R.F. Enterprises North	MN	218-765-3254	Jun's Electronics	CA	213-390-8003
A.E.S. Orlando	FL	305-894-3238	Burghardt Amateur Cntr	SD	605-886-7314	Ham Radio Outlet	CA	213-988-2212
N & G Dist. Corp	FL	305-592-9685	H.C. Van Valzah, Co	IL	312-852-0472	Ham Radio Outlet	CA	714-560-4900
Miami Radio Center	FL	305-264-8406	Erickson Communications	IL	312-631-5181	Ham Radio Outlet	CA	714-761-3033
International Radio Sys	FL	305-594-4313	Floyd Electronics	IL	618-345-6448	Ham Radio Outlet	CA	415-342-5757
Mike's Electronic Dist. Co	FL	305-491-7110	Missouri Radio Center	MO	816-741-8118	Base Station	CA	415-685-7388
Eli's Amateur Radio	FL	305-525-0103	Dandy's	KS	316-326-6314	Ham Radio Outlet	CA	415-534-5757
A.E.S. Clearwater	FL	813-461-4267	Moory Electronics	AR	501-946-2820	Shaver Radio, Inc	CA	408-370-6665
ACK Radio Supply Co	AL	205-322-0588	Electronic Center, Inc	TX	214-526-2023	Quement Electronics	CA	408-998-5900
Music City Hamshack	TN	615-865-2189	Madison Electronics	TX	713-520-7300	The Radio Place	CA	916-441-7388
			Mission Comm & Conslt Expt	TX	713-879-7764	Honolulu Electronics	HI	808-949-5564
			Texas Comm Center	TX	713-957-8011	C-Comm, Inc	WA	206-784-7337
			Appliance & Equipment	TX	512-734-7793	Amateur Radio Supply Co	WA	206-767-3222
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**PG-4C** As above, but 8-pin, as supplied with MC-60A.

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**RA-10B** As above, for 440 MHz.

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## Our Readers Say

### Company in the Fox Hole

Editor, CQ:

I just read Lew Decker's "Scoot over, Mitzi!" and had to write to let you know what a wonderful refreshing experience it was to read. While reading it my mind started to play some pleasant tricks on me. Suddenly I remembered the exciting feeling of firing-up my first transmitter, a Heath AT-1, with my only crystal (3.733 MHz). I remembered the pounding of my fist with my first "CQ" with a louder and less steady pounding of my heart when I heard my call (KN2MMT) coming from the speaker of my little National SW-54. It all came back during my reading of "Scoot over, Mitzi!"

Although more than 30 years have past, and I too have been in and out of ham radio many times. The excitement of the first Novice QSOs on CW, my very first AM QSO on 2 meters (I actually talked to someone!), and even those rare treats of DXing as a Novice was like no other experiences of my life. I have flown airplanes, dove to the bottom of the seas, flown to weird places around the world . . . but those early Novice days when I was a teenager in the Bronx were the real treats.

I want to thank Lew for bringing back the memories and for filling a "gap" by lighting the "spark" once again.

Now at 46, with teenagers of my own, I feel 13 again and can't wait to feel that excitement of those early days. Will it be when that "JA" answers my QRP call (with my recently built HW-9)? Will the old feeling be rekindled when I lug my battery pack and Argonaut to the beach and hang my new mobile-whip-dipole out of the window at my summer beach apartment? Whatever it is I'm feeling that excitement again. Lew is going to have lots of company in the fox hole, and we will have to get Mitzi to help with erecting the antennas so we can try for some DX while we are down there.

Peter A. Brandenburg, K2MMT  
San Diego, CA

### Thank you, NA Stations

Editor, CQ:

May I through the media of your magazine say a big thank you to all the North American stations who made it possible for me to win the Bermuda Contest this year.

The response and good operating standards from everyone on your side of the Atlantic made the contest a most enjoyable weekend, even after a disastrous start when I miss-set the alarm clock and slept through the first 2½ hours of the contest!

May I also take this opportunity to praise the very high standard of QSLing from North American for my recent DXpedition to the Seychelles (S79LJ). Almost everyone sent a self-addressed envelope plus postage, which made my task of getting some 6000 cards out a relatively straightforward matter. I wish I could say the same about Indonesia, India, and South Africa!

Best wishes to all for the coming Festive Season.

Ian Shepherd, G4LJF  
Wokingham, Berkshire, England

# Yaesu's FT-736R. Because you never know who's listening.

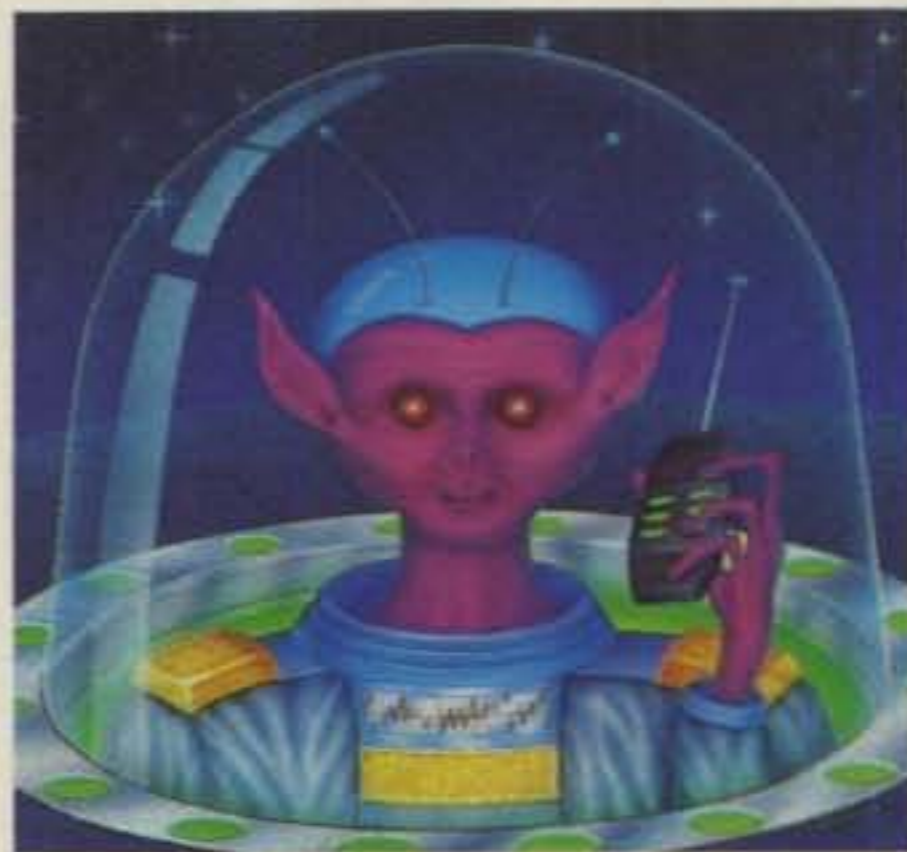
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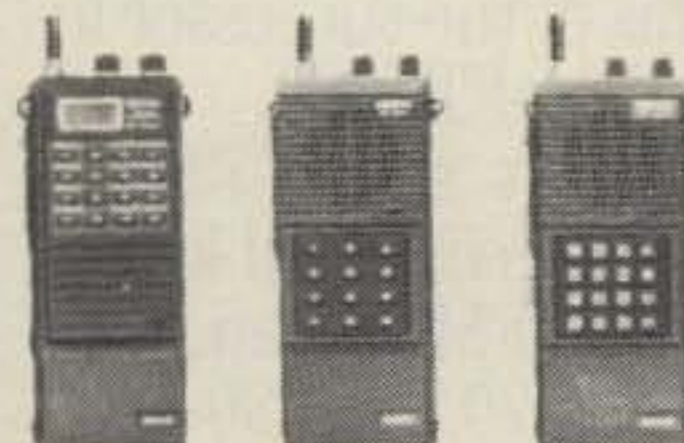
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# Results of the 1987 CQ 160 Meter CW and Phone DX Contests

BY DONALD McCLENON\*, N4IN

**W**e had good conditions, noisy in some areas, for both CW and phone, for the first time in several years. Activity was down on phone because of a schedule glitch with ARRL CW DX, which is regrettable and won't happen again. There was no way to predict the 3Y1EE diversion on CW, but it did hurt participation. There were 3786 valid CW participants and 5257 on phone. Both are down from last year, but the highest scores topped last year's best in both modes.

The total of valid QSOs in all logs submitted works out to about 220,000! About 5% of all submitted entries contain some kind of error (one letter wrong in a call, wrong state, dupe, dud, or not in the other station's log). Contesters have asked, "Do you actually run every single log entry through the computer?" If only it were that simple! Somehow, each log must be corrected *before* it goes into the computer, so the data will not be contaminated with errors. The following are required: (1) An alphabetic master list of everyone who made at least one contact in the contest, (2) a list of all participants in each of at least 40 states and provinces, (3) the latest call issued by the FCC in each "call block" for each call area, and (4) the latest callbook for all world stations.

It's a lot of work to make an accurate master list. It can be started with an alphabetic list of the biggest log available. It doesn't matter if this log contains errors; they will be cleared up later. Any other log can then be checked call-by-call against the first one. If the call is there, it is checked off as valid. If not, it is checked against the callbook and FCC list to see if it exists and is in the state claimed. If so, it is put in the "limbo" file with a notation of whose log it came from, and marked "unique" in the log. Later when someone else claims it, the call goes in the "good" list, and the unique designation is removed from the first log. If the call is not valid, different prefixes or letter similarities are checked (for example the claimed W2SLK is not licensed, but W2FLK is on the good list from the same state). This is confirmed if we have his log. If nothing fits, the call is declared a dud. After a few big logs from various parts of the country are run, the work decreases dramatically; most logs don't add any new calls, and only require correcting call reading and writing errors. DX works similarly for the same and neighboring countries. Eventually the unchecked calls on the original list are checked for legitimacy or similarity to valid calls. We realize uniques in your own area can be valid, and most are accepted.

\*3075 Florida Ave., Melbourne, FL 32904



Top CW multi-op station W2GD.

Every entry is cross-checked with logs on hand from fairly rare or unique multipliers to ensure they were actually worked. Even the big guns sometimes lose multipliers on the "not in log" test. After the log is corrected, it is run on a computer programmed to keep a running multiplier and score total and flag each dupe as calls are entered.

Here are a few interesting examples of CW errors found in the logs. See if you can figure how they occurred: YV1OB logged as Y31OB, VE3PN logged as VE3ANN, VK3BEE logged as VK3BI, YV3AGT logged as Y43AG, K3RN logged as K3RTE, and OK1JDX logged as OK1WDX. On phone, we have "sound alike" problems with Q/U, I/Y, A/K/J, BCDEGPTZ. We have letter reversal problems in both modes where: WA2UUH logs WA2UHH, N4PN logs NP4N, KG6ME logs K6GME, W8IEU logs W8EIU, VE5XU logs VE5UX, and G3HGD logs G3HDG. We have handwriting problems in both modes, where: H looks like M, O looks like D, and W looks like N, and you can't tell U from V. Please, fellows, it's a big enough job processing the logs if written correctly, so don't burden me with this extra detective work.

## CW Contest—January

All states were active, but no PEI, VE8, or VY activity was reported. 108 countries tied last year's record. USA stations were happy to work any of the 18 Russian prefixes and some of the following active ones: 3A, 5B4, 7J1, 8Q7,

9H1, 9M2, C6A, CT3, CX, EA6, FO, GD, GJ, HC, HL, KH9, KX6, LA, LU, OA, OY, P29, PZ, SV5, TG, TK, VK9, VS6, VU, XX, YB0, YN, YS.

The following number of active stations were reported from each country having over ten:

Country	Stations	Country	Stations
W	1612	ON	23
OK	279	PA	23
UA	260	UP	21
G	211	F	20
UB	209	GM	19
DL	166	LZ	16
JA	160	UR	16
VE	85	OE	15
YU	44	UC	13
HB	40	EA	12
I	40	OZ	12
UQ	37	UL	11
OH	30	HK	10
Y	30	Others	372
		Total	3786

Of course there are always a few phonies either created by reading errors (like YV1OB = Y31OB), or someone doing it on purpose. We had a JY like that and a low-powered "G" station who was only able to reach people in Illinois.

It seemed as if no one could beat the high score from CT3 established last year by operator OH2BH. Jeffrey Briggs, K1ZM, did it this

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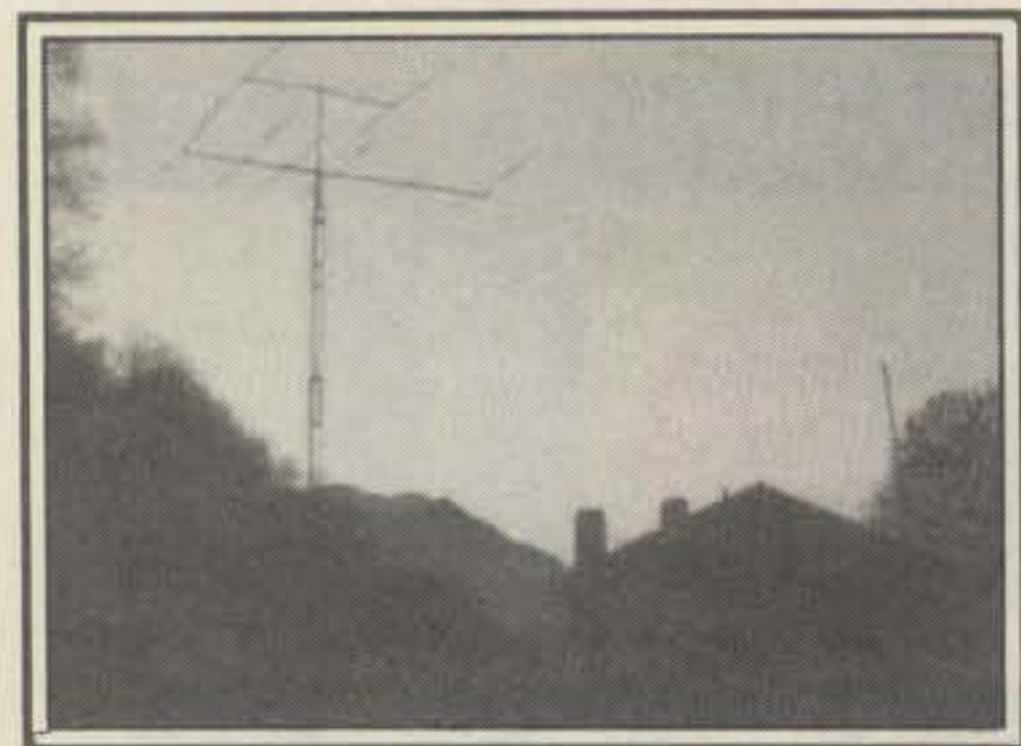
To make 5th highest world phone score Raj, 8R1RPN had to contend with his South American summer static.

year, operating NP4A for a world-high 860,377 score. His own words provide interesting background and show what a terrific operator he is. "Almost didn't make it to NP4A, due to a snowstorm that closed JFK airport in New York. Tried to sleep on the airport floor Thursday night, and got to NP4A 10 minutes before the contest started. I was a zombie throughout, and lucky to participate at all. Pedro kept me awake constantly with cokes, coffee, and moral support. Very happy with the score, considering almost zero sleep for over 4 days straight."

Second world high was AA1K at 388,630, followed by K2EK 387,550, KM1H 358,419, K5NA 346,395, HK1AMW 328,419, VE1ASJ 308,210, VE6OU/3 290,105, ON4UN 277,324, W3BGN 263,538, DJ6RX 260,736. All these scores are by single operator stations. Top 10 scores in the WVE Single Operator, DX Single Operator, and World-Wide Multi-Operator categories are shown in the score boxes.

QSO leaders were NP4A 985, AA1K 913, K2EK, K5NA 847, N5RZ 802, W2GD 792, W9AZ 773, KM1H 757, KS8S 749, W0ZV 739, W0AIH 723. Outside WVE, QSO leaders were NP4A 985, UP1BZZ 606, UR1RWX 556, I2UBI 546, SP6PAZ 525, DJ6RX 517, YT2R 512. High contact totals outside N.A./EU were HK1AMW 369, UG6GAW 342, KH6CC 338, PJ9J, 299, YV3AGT 266, 4X4NJ 253, YV1OB 218, UV9FM 203, UA9CBO 197.

Last year's multiplier high was 120. This year NP4A made 133. He was followed by K2EK 115, KM1H 111, AA1K 110, K5NA 105, N4IN 103, KS8S 102, W2GD, W3BGN, VE1ZZ 99, VE1ASJ, W3GM 98. DX multiplier leaders not shown above were HK1AMW 91, DJ6RX



Multi-op phone HB9CXZ shunt-fed this top-loaded tower; a very popular way to put out a good 160 meter signal from a small lot.

84, YV1OB, YV3AGT 83, CT1AOZ 80, ON4UN 76, EA3VY 75, GM3IGW, UP1BZZ 73, DK6AS 72, PJ9J 71.

Countries worked leaders were NP4A 78, K2EK 60, KM1H 56, DJ6RX 56, AA1K 55, UP1BZZ 54, ON4UN 52, YT2R 52, DK6AS, SP6PAZ, UZ6LWZ 51, N4IN, K5NA, UG6GAW, I2UBI 50.

World, USA, and continental winners for both modes will receive plaques as shown in the special plaques box. Sponsors for each are also indicated. Single and multi-op winners in each state, province, and country will receive CQ certificates.

### Phone Contest—February

The unfortunate conflict with the ARRL all-band CW DX contest caused mutual interference, and serious contesters had to forego one of the contests. Many of us put in a partial effort in both. This situation will be avoided in the future.

Conditions were much better than the last two years. All states and provinces were on except VO, VE8, VY, but NB, KH6, and KL7 were rather scarce for most WVEs. Of the 100 countries reported active, WVE would probably be pleased to work any of the 17 Russian prefixes and 5B4, 8Q7, 9H1, 9M2, C31, CT3, EA6, FM, FS, GU, HC, HP, IS, IT, KH3, KX6, LA, LX, OA, OD, OH0, P29, P40, SV5, TG, TK, VK9, VS6, VU, YN, YS, ZS4.

The following number of active stations were reported from each country having 10 or more participants:

Country	Stations	Country	Stations
W	1986	YU	22
UB	1015	UF	21
UA	927	UP	21
UA9	226	UQ	19
VE	188	F	17
G	172	GW	17
I	87	GM	16
OE	47	OH	16
UL	44	ON	16
VK	38	UI	14
UC	37	UO	12
OK	29	PA	11
DL	27	SP	10
HB	25	UM	10
EA	23	Others	164
		Total	5257

In spite of all the problems, Jerry Rosalius, WB9HAD posted the world high score of 290,030, which topped last year's best. He was followed by LZ2CJ 268,112, UL7ACI 246,410, UG6GAW 239,071, 8R1RPN 183,750, LZ1KOZ 137,385, K0HA 125,936, K1NG\* 125,652, KB4I\* 124,740, KR9S\* 119,420, WA4JXI\* 114,638, W0CEM\* 107,136, HK4DUM 106,600, WB4GNT\* 104,991, VE1BPY 101,982. Asterisks denote multi-op stations. It is interesting that the top 7 scores are all single operators, and the next 5 are all multi-ops. Top 10 scores in the WVE Single Operator, DX Single Operator, and world-wide Multi-Operator categories are shown in the score boxes.

WB9HAD was the world QSO leader with 1216, ahead of his last year record. The next 10 were as follows, with asterisks denoting multi-ops: LZ2CJ 970, K0HA 788, KR9S\* 732, W0CEM 726, K1NG\* 718, UL7ACI 626, LZ1KOZ 599, KA8POW\* 592, KB4I\* 558, NF9R\* 551. Outside N.A./EU, high contact totals were UL7ACI 626, UG6GAW 508,

UA9AXO 422, 8R1RPN 249, HK4DUM 172, YV2IF 162, 4X4NJ 150.

The highest multiplier of 97 was made by WB9HAD. Others with high multipliers were WA4JXI 86, KB4I 84, N4NX 81, AA4MM 80, WB4GNT 79, N4RJ 78, WB4ZNH 77, WA4VDE, 8R1RPN 75, K1NG 74, N4IN, KA7AUH, KR9S 70. DX multiplier leaders were 8R1RPN 75, HK4DUM 65, YV2IF 62, EA3CCN 60, TI2CC 60, YU3EF 56, I8CZW 55.

Country totals were down this year as LZ2CJ again led the pack with 51. Next in order were EA3CCN 50, UG6GAW 48, YU3EF 45, IV3PRK 44, LZ1KOZ 43, WB9HAD, I6FLD, OK1DFP 42, UA6HRZ, UL7ACI, 4X4NJ 41. WVE country leaders were WB9HAD 42, WA4JXI 35, KB4I 32, AA4MM 31, N4NX 30, N4RJ 28.

Sponsors and trophy winners for various categories are shown in the special plaques box. Single and multi-op winners in each state, province, and country will receive CQ certificates.

### Advice for Contestants

If you want to get me down on you, so all doubtful QSOs are deleted rather than allowed, DO:

1. Write sloppy so I can't read the calls.
2. Use sheets with 80 or 100 QSOs per page instead of the desired 40, so there's no place to mark corrections.
3. Write on both sides of each sheet. It saves postage, so to heck with the nuisance it is to me.
4. Staple one side or corner of a fan-folded log, without separating or numbering the sheets. It gives me something to do, and is especially interesting if log entries are written right on the folds.
5. Make me pay at least one ounce of postage due. Even if everyone does this, I am only out about \$100.
6. DX especially: Omit showing any state abbreviations when the QSO is not a new multiplier. If you make an error, you lose that one for sure, and you're crazy if you think I'm going through all your contacts with a callbook to see if you worked someone else in that state.

### DON'T:

1. Serially number your multipliers. One or two might not get entered, but you didn't need them all, did you?
2. Bother to find and mark your dupes. The computer will get them all anyhow, and maybe there are so few you won't get disqualified.
3. Provide a summary sheet. Let me guess



Jeffrey Briggs, K1ZM set new all-time CW score and country records operating NP4A, after a snowstorm almost kept him from getting there.





*On the Twelfth Day of Christmas  
My True Love Gave to Me...*

*Twelve Folks Conversing  
Eleven Geezers Griping  
Ten Novices Keying  
Nine Raggers Chewing  
Eight Amateurs Arguing  
Seven Turkeys Babbling  
Six Extras Explaining  
Five Garrulous Hams  
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## 2 Meters



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## Aggregate CW and Phone Club Scores

Total Score	Club Name	Top CW	Top Phone	Total Score	Club Name	Total Score	Club Name
2,162,287	Frankford Radio Club	AA1K	—	77,420	Latvian Radio Club	UQ2GM	—
1,826,600	Yankee Clipper Contest Club	NP4A	K1IK	58,764	Petaluma DX Society	WB6EGE	WB6EGE
1,391,997	Southeastern DX Club	N4PN	KB4I	57,728	DARC Rendsburg	DL0FJ	—
836,004	Potomac Valley Radio Club	W3LPL	—	56,463	Lakeway A.R.C.	—	N4FNB
770,048	Society of Midwest Contesters	W9AZ	WB9HAD	53,196	Questa College Radio Club	W6JU	—
405,497	LZ Contest Group	—	LZ2CJ	49,646	Western Washington DX Club	W7BYK	W7MGU
394,084	Radio Club Venezolano	YV3AGT	—	46,063	Northern Illinois DX Assn.	W9YYG	W9YYG
334,446	Mile High DX Club	W0ZV	—	38,592	Radioklub Zapotockeho	OK2KHF	—
284,185	Grand Mesa Contesters	W0KEA	K0GAS	37,225	Northern Ohio Amateur Radio Assn.	K8SVT	—
281,775	Mad River Radio Club	WB8JBM	KA8POW	31,995	Radioklub Kralove	OK1KHK	—
267,023	Klub PZK Obole	SP6PAZ	SP6PST	30,659	Utica A.R.C.	NA2Q	NA2Q
265,505	Radio Club RTV Zagreb	YT2R	YT2R	28,980	Radioklub Teplice	—	OK1KPU
255,236	Central Arizona DX Assn.	K7OX	K7SPF	28,386	Kettle Moraine Radio Amateurs	N9KS	N9KS
199,714	Kuanas Polytech Inst Radio Club	UP3BO	RP2BIH	27,820	Carolinas DX Assn.	—	AA4V
197,440	Viimsi Radio Club	UR1RWX	—	25,738	Radioklub Sedlcany	OK1KQH	—
163,666	Radioklub der DDR	Y33VL	Y28AL	22,230	Mississippi Valley DX Club	W0HBH	—
157,000	Central Arkansas DX Club	KB5DN	KB5DN	20,217	Rubber Circle Contest Club	K7LXC	—
152,145	Central Lancs A.R.C.	G4OBK	—	17,664	Hoosier Contest Club	W9RE	—
149,910	Southwest Ohio DX Assn.	W8IMZ	W8IMZ	17,328	North Texas Contest Club	K5WXZ	—
147,060	Michigan DX Assn.	W0CD	—	15,158	Nagoya University Radio Club	JA2YKA	—
144,904	SP DX Club	SP9GDB	SP6CZ	14,580	Radioklub Postupicka	OK1KYP	—
134,568	Murphy's Marauders	K1TO	—	13,133	University of Tokyo A.R.C.	JA1YWX	—
133,952	Dixie DXers	K4JPD	—	10,455	Northern California DX Club	K6LRN	—
133,532	Williamette Valley DX Club	K5MM/7	—	10,197	Gower Gulch Gang	—	N6LL
133,088	Radio Club Senta	YZ7A	YZ7A	9,130	Radioklub MEZ Vaitin	OK2KJT	—
110,954	Radioklub Partizanske	OK3KAP	—	8,760	Ganz Electric Radio Club	—	HA5KFZ
109,065	Radio Klub Belisce	YT2B	—	5,032	Central Virginia Contest Club	WU4G	—
96,506	Providence Radio Assn.	W1OP	—	4,256	Radio Club Nova Paka	OK1KMP	—
92,256	Southern California Contest Club	N6VR	—	2,850	Radioklub Liptal	OK2KPS	—
87,050	Radioklub Omega	OK3KFF	—	2,600	Radioklub Tatry	OK3KTY	—
84,420	Fraser Valley DX Club	—	KA7AUH	826	Long Island DX Assn.	W2TE	—
83,980	Davenport Radio Amateur Club	W0BXR	—	100	Radioklub P-8 Praha	OK1KCF	—
79,488	San Diego DX Club	N6ND	—	12	Kanazawa University A.R.C.	JA9YBA	—
78,642	South Manchester Radio Club	G3FVA	—				

your name, state, address, claimed score, etc. 4. Staple all log sheets together. I can do it for you, and staples are cheap. If not done, some sheets will surely get lost with so many in the same envelope.

In a more serious view, if you leave out any dupes in a recopied log, the other guy may delete the other one, and my cross-check will show "not in log," so you lose it, and maybe even a multiplier. There is no penalty for marked dupes.

### Club Competition

Frankford Radio Club was again in first

place, with a score only a little below last year. Yankee Clipper upped their last year's score to retain the runner-up spot. With a big surge in club activity, Southeastern DX Club moved up to third place, approaching double last year's score. Their members sponsor most of the plaques for this contest, and we all owe them a lot. There were 67 clubs reporting.

### Next Time

The CW contest will be held the last full weekend of January 1988 (Jan. 29-31), and the Phone contest will be held the last full weekend of February (Feb. 26-28). Times for both are 2200Z Friday to 1600Z Sunday. The 1825-1830 kHz "DX Window" has not been seriously observed for several years, and will no longer re-

ceive any special restrictions for this contest. We still encourage Pacific DX to transmit 1907-1912 kHz and specify a listening frequency. WVE transmission there is counter-productive.

Send your business-size SASE to CQ, 76 North Broadway, Hicksville, NY 11801 with enough postage for the log and summary sheets. You can photocopy as many copies of the log sheets as you need. You can make up your own logs, 40 QSOs per page, with Universal Time (Z), station, info sent and received, sequentially numbered multipliers as each is first worked, and claimed points. Indicate all no-point dupes before sending in the log, but leave in, for cross-checking. There is no penalty for marked dupes. Include a summary sheet, showing scoring and other essential info, and a declaration that all rules and country regulations were observed.

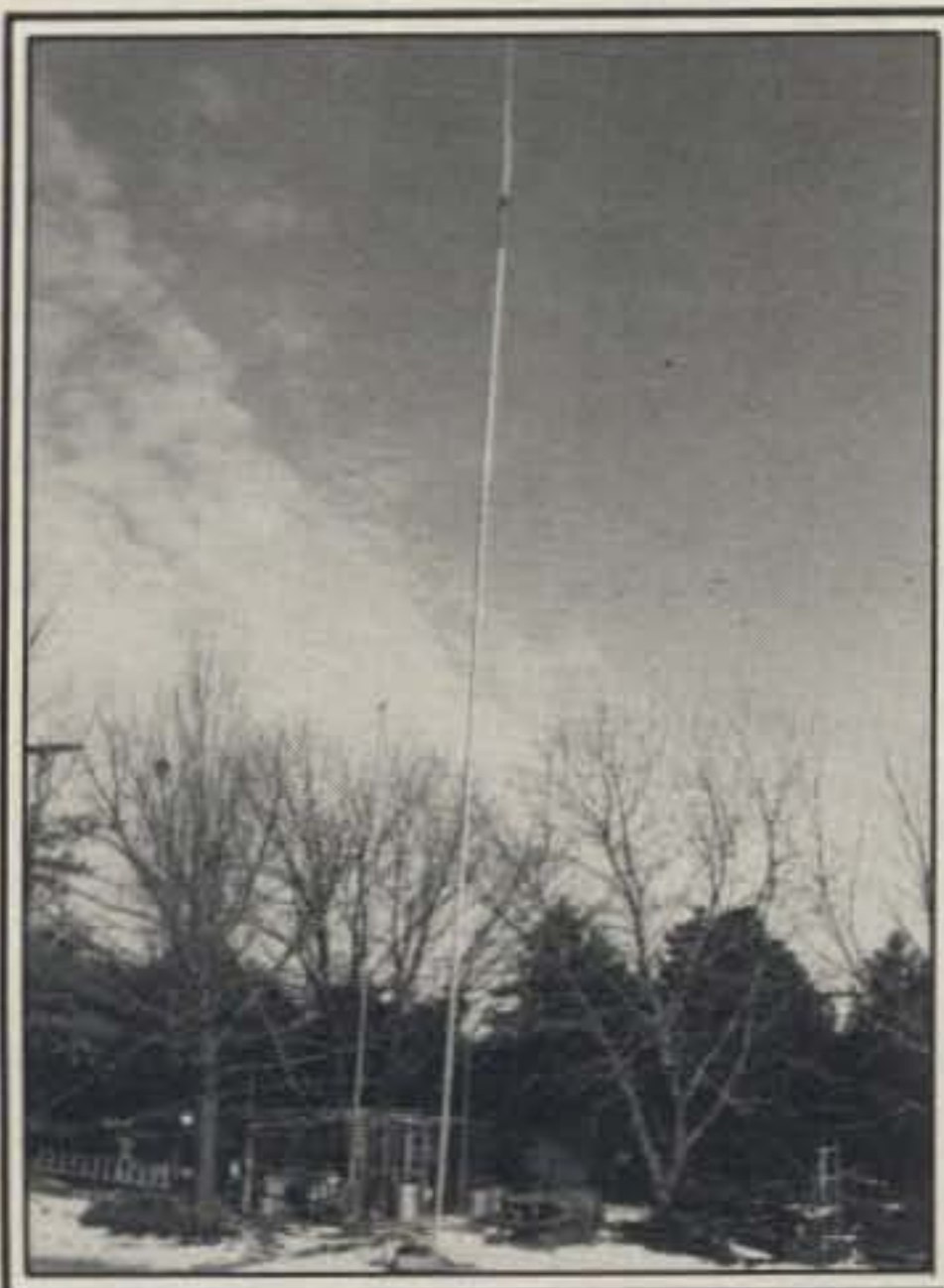
CW mailing deadline is Feb. 28, and March 31 for Phone. Send logs to 160 Meter Contest Director Don McClenon, N4IN, 3075 Florida Ave., Melbourne, FL 32904 USA. They may also be sent to the CQ office. Please indicate CW or Phone on the envelope. Share good photos of yourself and setup. Photos may be sent well after the log deadlines.

Join us in the 1988 contests.

73, Don, N4IN

### Soapbox W/VE CW

Baby born Friday night, after which wife shoes me out of hospital to go home and contest a bit. All this and taking care of the 2 year old didn't produce much more . . . N1ACH. There are a lot of good ops out there who could copy my 2 watt signal . . . KN1H. Since many people seem to "own" frequencies, I would like to rent one for the next contest. What is a



W0CEM CW multi-op crew. Left to right: W0CEM, K0WA, AB0S, WB0DOX, and their 80 foot irrigation pipe vertical made a six-figure score from Kansas. With the same setup, and the first 3 operators, they made 5th world-high multi-op phone score.

**Plaques  
Single Operator  
CW**

**World by K5AAD.** Winner NP4A operated by Jeffrey Briggs, K1ZM.  
**U.S.A. by N4PN.** Winner Jon P. Zaines, AA1K (The W0AW memorial).  
**Europe by K4SB.** Winner John Devoldere, ON4UN.  
**Asia by WD4RCO.** Winner Robert Grigorian, UG6GAW.

**Phone**

**World by K5AAD.** Winner Jerry W. Rosalius, WB9HAD.  
**U.S.A. by K4JRB.** Winner William C. Hohnstein Jr., K0HA.  
**Europe by N4IN.** Winner Wally Stefanoff, LZ2CJ.  
**Oceania by Dixie Dxers.** Winner H. McQuillan, ZL2SQ.

**Multi-Operator  
CW**

**World by N4RJ.** Winner John M. Crovelli, W2GD.

**Phone**

**World by S.E. DX Club.** Winner John R. Olsen, K1NG.

fair per-hour rate? . . . W1PL. Called CQ Sat. night, and heard a roar of DX stations. Thought there must be a rare one on freq, then realized they were calling ME! Spent next 2 hours sorting them out . . . AA1K. This really is a CQ contest. Someone was calling CQ every 500 Hz . . . W4BAA. Never again barefoot . . . WB6JMS. Contest interrupted by my dog having pups Sat night . . . KD0QA. Contesting and chasing Peter Island don't mix . . . VE6OU/3.

**Soapbox DX CW**

Nice to see such activity; much different than when I was in the contest as exotic

EP2BQ . . . ZL2SQ. We would all score more points if some ops used their receivers as much as their CQ machines . . . CT1AOZ. Worked more Europe than USA . . . KL7Y. At least a dozen stations missed a multiplier when I couldn't break their memory keyers . . . N4RP/C6A. Someone closed the west gate this year . . . EA3VY. Not ready at home on 160, but this water tower is perfect . . . PA3DQW. This contest is so much fun, and stimulates activity so much, it's a pity it is only once a year . . . PA3AAV.

**Soapbox W/VE Phone**

Ten years ago I never would have believed 160 could be this much fun . . . N4RJ. Things got so slow Sunday, was even glad to get dupe calls, so I knew the rig was still working . . . W4TMR. I need a louder alarm clock . . . KF4HK. Courtesy of many stations was outstanding to help a low power guy like me . . . W4HVU. Already have plans for better antennas next year. Wife doesn't know about that yet . . . WA0LRJ. Thought we had a good one, till we thought more about SL1M . . . KA8POW. New amplifier arrived 4 days after contest . . . K9HWU. Pleased to get my vertical up and working with 5 helium balloons . . . KC0FJ. Just finished new radio room 4 days before contest . . . VE1BPY.

**Soapbox DX Phone**

My first 160 contest and hope to put in more time next year . . . EA5CXL. USA heard at 0030 but not workable until 0450 . . . GW4IOI. So much fun making QSOs, almost forgot about the QRN. I look forward to next year . . . 8R1RPN. Thanks for the Top Asian trophy from last year. Very proud to display it . . . 4X4NJ.

**CW Multi-Op Station Crews**

KY1H & NT2X, AK4L. K1RQ & KB1W, KB1KE, WA1ZAM, WB1EYL. W10P: N1AK0, N1BBM, KA1KWE, W1GS, WA1JHV, WA1TAQ. W2GD & K2TW, KU2C. W2XL & NJ2L. K3WW & Net. K3UA & W3FSB. K4UEE & Net. WB4GNT & Net. N4NX & Net.

WD4RCO & Net. N4XM & KD4U, N4NCN. KB5DN & AF5M, KB5RF, W9BN/5. K6XV & K6PJY. N6RZ & AA6T. N6VR & AC6T, N6ADI, NS6X. W6JU & K6FI, N6WP, W6HDO, W6JTA, W6WYQ. WB6EGE: KA60PN, N6MQ, WB6WPO. K7QQ: Not given. W0CD & K8GG, W8UVZ. K8LX: K8GM, WA8ZDT. KS8S & AD8P, N8ET, K3LR, W8ZD. W9AZ: AK9F, K9NR, WB9HAD, WB9JKI. W0AIH/9 & K0FVF, KM00, W0UC. KY0A & KV0Q. W0KEA & K10G. KJ0G & K0CL, K0GAS, K0UK, NN0M. W0BXR: N2AWE, K9AYK, N9OK, W9TW, KA0OVA, N0EL, NU0G, W0OJD. W0CEM & AB0S, K0WA, WB0DOX. K0DD & WA0PEV, WB0ADO. 8P9DX: VE3ICR & VE3CPU. VS6DO & VS6UP. JA2YKA: JE2VYM, JF2DQJ, JF2UTL, JG2MTC, JG2VTD. JA1YWX: JI1GUT, JI1QQI, JM1MCF, JO1BMV, JR4NIV. JA9YBA: JA9VDA, JA9-10148. OK3KAP: OK3CGI, OK3TPV, OL8COS. OK3KFF: OK3CIW, OK3CSW, OK3LL, OL8CPS, OL8CQF, OL9CPG. OK2KHF: Not given. OK1KHK: Not given. OK1KQH: OK1HL et al. OK1KYP: Not given. OK2KJT: Not given. OK1KMP: OK1MZO et al. OK2KPS: Not given. G3FVA: G3PFZ, G3SVW, G3ZDM, G4HON, G4TFU. DL0FJ: DF7LF, DG7LX, DF9LX, DJ2EA, DK4VP, DK8LN, DL4LV. HG5A: HA5FM, HA5UA. HG9R: HA9OA, HA9PP, HA9RP, HA9RU, HA9RX, HA9SU. PA3CLH & PA3AFF, PA3AUC, PA3BAS, PA3CVI, PA3DSB, PA3ZNH, PA0PAZ. PA3DQW & PA3ENJ, PA0ERA, PA0KHS. SP6PAZ: SP6BIB, SP6CYX, SP6DVP, SP6FJG, SP6HEK. GM3IGW: G3IGW, G3BBB. EA3VY: EA3AIR, EA3AVV, EA3DXD, EA3LL. UR1RWX: UR2RDJ, UR2RJ, UR2RRR. UR1RYY: UR2RDO, UR2RE. UZ6LWZ: UA6-150-1103, UA6-150-1104, UA6-150-1336. UZ3AYR: UA3-170-481, UA3-170-

**Top 10 Scores**

Top 10 W/VE Single Op CW		Top 10 W/VE Single Op Phone	
AA1K	388,630	WB9HAD	290,030
K2EK	387,550	K0HA	125,936
KM1H	358,419	VE1BPY	101,982
K5NA	346,395	AA4MM	87,760
VE1ASJ	308,210	VE3XN	82,128
VE6OU/3	290,105	K6HNZ	81,673
W3BGN	263,538	VE3PN	80,024
W3GM	248,332	WA4VDE	79,575
N5RZ	242,976	W4TMR	77,931
N2MM	207,765	KC0FJ	68,880

Top 10 DX Single Op CW		Top 10 DX Single Op Phone	
NP4A	860,377	LZ2CJ	268,112
	(K1ZM Op.)	UL7ACI	246,410
HK1AMW	328,419	UG6GAW	239,071
ON4UN	277,324	8R1RPN	183,750
DJ6RX	260,736	LZ1KOZ	137,385
I2UBI	220,640	HK4DUM	106,600
YV3AGT	216,547	YV2IF	96,968
PJ9J	208,740	YU3EF	86,464
KH6CC	208,152	EA3CCN	83,340
CT1AOZ	207,760	4X4NJ	64,108
DK6AS	206,424		

Top 10 Multi-Op CW		Top 10 Multi-Op Phone	
W2GD	259,182	K1NG	125,652
UP1BZZ	251,996	KB4I	124,740
KS8S	236,130	KR9S	119,420
EA3VY	226,350	WA4JXI	114,638
W9AZ	205,390	W0CEM	107,136
SP6PAZ	204,068	WB4GNT	104,991
YT2R	202,510	WB4ZNH	96,789
UR1RWX	197,440	N4NX	92,583
PA3CLH	179,193	KA8POW	89,310
W0AIH/9	170,010	KA7AUH	84,420



World-high phone scorer Jerry Rosalius, WB9HAD, topped last year's best. He also had one of the most accurate logs submitted.





Check logs are gratefully acknowledged from the following: W4DGJ, W4DHZ, W8RA, N9BJP, GW3JI, OE1TKW, OH5OZ, OK1DQT, OK1DVK, OK1DWJ, OK2BWM, OK2KJU, OZ1BUR, OZ1FGS, OZ1IPP, PA3AAV, RA3AUU, RA3DJA, RB5EX, UA3ATV, UA3DMY, UA3GTN, UA3PDW, UA3QBD, UA4WES, UA6ADH, UA6HOF, UA6PCH, UB5JLJ, UB5VAA, UV6AGF, UW3PN, VE3DCM, Y27KL, Y56-15-F.

Disqualified for excessive dupes: OK1KJA. Disqualified for excessive duds: W0JLC, LZ1KDP, YU3EF.

Disqualified for excessive dupes and duds: K7RO, OK1JDX, OK2PLR, OL1BMX, UA3XDM.

## PHONE SCORES SINGLE OPERATOR NORTH AMERICA

### United States

Connecticut				
ND1X	36,450	305	50	9
W1WY	10,260	90	45	7
Maine				
N1CTD	65,720	431	62	14
Massachusetts				
W1YK	24,210	232	45	5
		(KA10DA Op.)		
New Hampshire				
AF1T	9,485	100	35	6
Vermont				
K1IK	54,912	356	64	15
New Jersey				
K8XR	57,960	375	63	15
W2FCR	19,760	151	52	10
W2CVW	3,780	60	28	2

New York				
NA2M	22,176	178	48	11
WB2TKD	4,992	66	32	4
NA2O	2,484	48	23	2
NA2A	2,205	45	21	2
Pennsylvania				
W3TS	54,656	421	56	10
W3UHP	10,736	104	44	4
N3CWP	8,064	86	42	4
KA3AVB	7,656	117	29	2
Alabama				
N4JF	6,364	80	37	3
Florida				
AA4MM	87,760	375	80	31
N4IN	41,020	196	70	23
Georgia				
WA4VDE	79,575	419	75	24
K4DLI	23,912	219	49	8
K4TEA	21,528	165	52	9
K4JRB	22,562	155	58	15
K4EZ	10,920	110	42	6
N4HOH	6,055	69	35	7
K4RPK	5,177	76	31	4
W4UYC	3,750	72	25	3
W4NT	3,456	50	27	5
WN4KKN	3,288	52	24	6
W4DMB	3,186	56	27	2
KB4IT	1,960	49	20	1
KC4BX	1,720	40	20	2
K4UEE	1,376	40	16	2
North Carolina				
W4TMR	77,931	530	63	15
KF4HK	41,470	336	55	9
K8CFU	14,750	81	50	18
W4HVV	3,248	43	29	5
South Carolina				
AA4V	27,820	225	52	8
W4TWW	10,320	96	43	9
Virginia				
W1LUG/4	2,976	56	24	2
Arkansas				
WA5NFC	35,351	302	53	6

Louisiana				
N05H	1,817	35	23	4
Mississippi				
W05L	13,616	136	46	4
K50BG	9,424	108	38	7
New Mexico				
K5TVC	35,510	299	53	5
WD5T	10,906	121	41	4
KN5S	5,610	76	33	4
Texas				
KF5UN	6,004	73	38	3
California				
K6HNZ	81,673	446	67	17
N4ARO/6	5,771	90	29	5
W8AKS/6	1,620	38	18	4
W6PFE	1,577	37	19	4
W6EIG	1,316	44	14	3
Arizona				
NF7E	6,048	83	32	6
K7SP	5,790	85	30	5
Nevada				
W7ABX	1,692	41	18	3
Oregon				
KA7EQS	4,450	74	25	4
Washington				
K7SS	10,693	120	37	5
W7MCU	2,470	35	26	6
Wyoming				
W8LRJ	61,183	455	59	8
KB7M	520	20	13	1
Michigan				
N08H	44,492	406	49	3
K8CV	4,698	75	29	2
NK8Q	2,376	45	24	2
Ohio				
K8YGL	35,600	315	50	6
K8KEM	7,560	96	36	2

West Virginia				
W8VEN	8,526	91	42	3
Illinois				
WB9HAD	290,030	1216	97	42
KR9G	37,637	255	61	11
K9IFO	22,101	172	53	8
W9LNO	17,325	172	45	3
K9NR	16,544	148	47	5
W9HOT	9,040	101	40	3
KD9QK	6,860	92	35	2
W9YYG	456	15	12	2
Wisconsin				
WA1UJU	58,300	499	53	3
W9MQZ	29,376	247	51	7
N9KS	3,429	62	27	2
Colorado				
K0GAS	32,812	284	52	4
K9MWM	1,680	35	24	1
KA0WMZ	1,292	31	19	2
Minnesota				
WB1H	616	22	14	1
Missouri				
KC0FJ	68,880	502	60	8
AA0A	13,899	159	41	2
Nebraska				
KBHA	125,936	788	68	14
North Dakota				
NT0V	37,020	258	60	11
Canada				
Prince Edward Is.				
VE1BPY	101,982	279	69	27
Ontario				
VE3XN	82,128	283	59	14
VE3PN	80,024	303	56	12
British Columbia				
VE7ERY	18,354	91	42	5
VE7GDM	7,656	56	29	4

Bermuda				
K8WW/VP9	600	11	10	4
Costa Rica				
TI2CC	51,120	141	60	27
Cuba				
CO2CB	43,440	180	48	6
Dominican Republic				
H1BLC	1,380	20	12	7
Mexico				
XE2NNZ	6,840	72	19	2
ASIA				
Israel				
4X4NJ	64,108	150	44	41
U.S.S.R. Asia				
Armenia				
UG6GAW	239,071	508	49	48
Asiatic S.S.R.				
UA9AKO	52,554	422	19	19
Kazakh				
UL7ACI	246,410	626	41	41
EUROPE				
Aland Is.				
OH8NA	14,010	90	30	30
Austria				
OE1DH	32,688	182	36	36
OE1TKW	2,086	37	14	14
Bulgaria				
LZ2CJ	268,112	970	52	51
LZ1KOZ	137,385	599	43	43
		(Ivanoff Op.)		
Czechoslovakia				
OK1AJN	60,624	330	36	36
OK1DFP	54,524	245	43	42
OK1KPU	28,980	157	36	36
		(OK1JDX Op.)		

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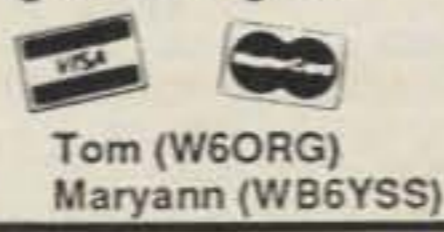
- See live action color & sound like broadcast TV
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- Some repeaters also have weather radar, Space Shuttle video, BBS, & computer video

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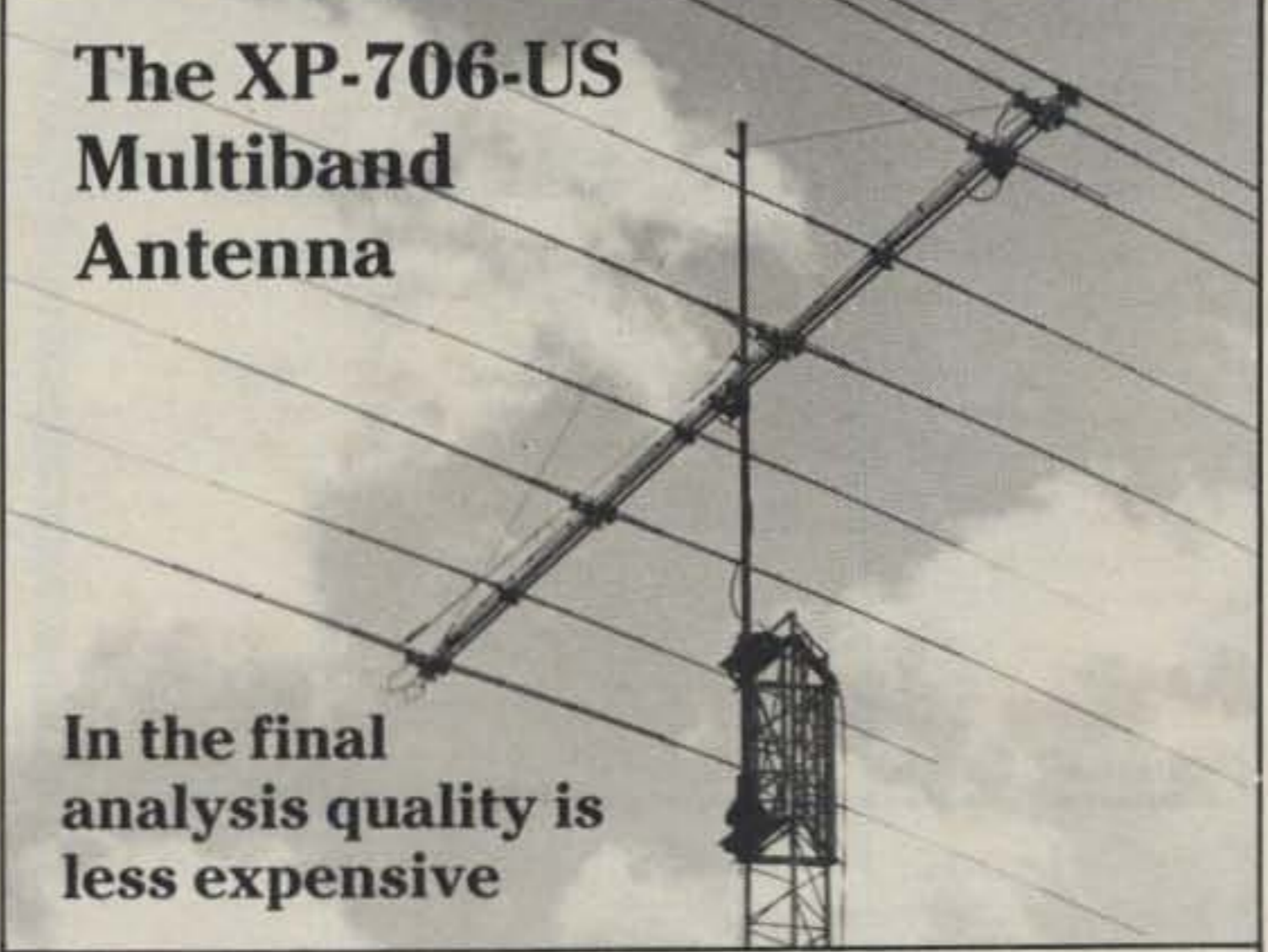
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## CONTINUOUS COVERAGE ANTENNAS FOR COMMERCIAL & AMATEUR SERVICE

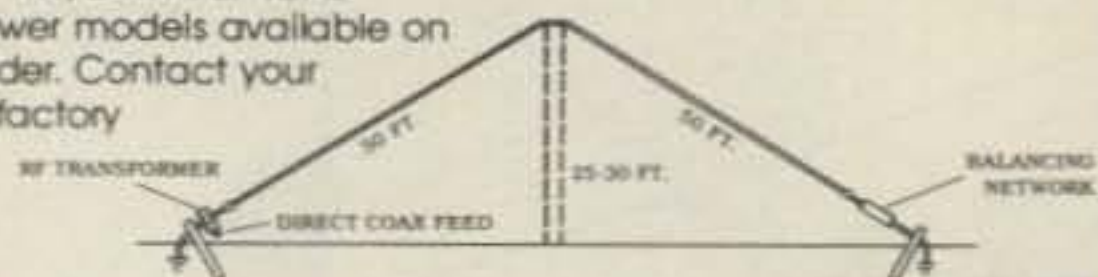
### Model AC 1.8-30

1.8 to 30 MHz

- SWR Max 2:1, 1.4:1 average from 1.8 to 30 MHz
- Can be installed in approximately 80 ft. space
- Ideal for commercial services for multi frequency operation without the need for antenna tuners or additional antennas
- Handles 1 KW, 2 KW PEP ICAS
- Higher power models available on special order. Contact your dealer or factory

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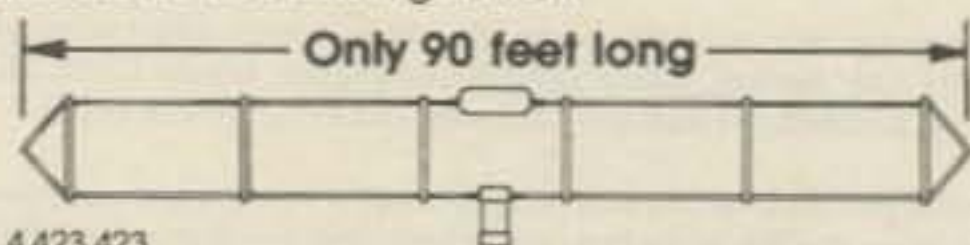
### Model AC 3.5-30

3.5 to 30 MHz

- SWR less than 2:1 from 3.5 to 30 MHz
- Complete assembled. Balun terminated with standard SO-239 connector
- Power capability 1 KW - 2 KW PEP ICAS. Higher power model is available on special order.
- Designed for 50 ohm feedline
- Weather proof balun and balancing network

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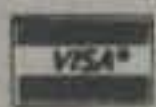
U.S. Patent No. 4,423,423

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OK1HCH	9,558	71	27	27
OK1DKS	2,793	32	19	19
OK1DVK	2,352	21	21	21
OK3CRT	1,755	22	15	15
OK2BHQ	1,128	20	12	12

Finland				
OH3GD	185	7	5	5
OH6GZ/3	14	2	2	2

France				
F6A0J	26,368	153	32	31

Germany (GDR)				
Y28AL	7,383	65	23	23
Y21YO	3,800	38	19	19
Y24MB	259	8	7	7

Italy				
IV3PRK	52,992	207	48	44
I6FLD	19,482	111	34	32
I4CSP	8,721	66	27	27
I8KHP	2,414	27	17	17

Poland				
SP6CZ	17,205	110	31	31
SP9AKD	2,250	33	15	15

Portugal				
CT1A0Z	29,479	103	41	28

Spain				
EA3CCN	83,340	245	60	50
EA5AEN	5,320	51	19	18
EA5JC	3,655	38	17	16
EA1AW	1,694	23	14	14
EA5CXL	902	17	11	11
EA5EFV	130	7	5	5

### U.S.S.R. European

Estonia				
UR2RMM	648	14	9	9

European S.S.R.				
UA6HRZ	52,152	274	41	41
RA3AUU	16,480	303	16	16
RA3DX	12,354	81	29	29
UA6RB	4,284	45	18	18

Kaliningrad				
UA2EC	7,360	61	23	23

Latvia				
UQ2GNL	22,950	154	27	27

Lithuania				
RP28IH	18,100	180	20	20

Moldavia				
U050NQ	61,560	305	38	38
U050V	10,368	75	27	27

Ukraine				
RB5DX	39,039	284	33	33
RB5IOV	9,048	72	24	24
UB5YFZ	7,575	62	25	25
RB4IGN	2,925	41	15	15
UY5TE	1,518	30	11	11

White Russia				
UC2WAZ	400	10	8	8

Wales				
GW4IOI	45,193	194	43	37

Yugoslavia				
YU3EF	86,464	282	56	45

### OCEANIA

Australia				
VK3BEE	1,629	47	9	5

New Zealand				
ZL2SQ	2,646	26	14	7

### SOUTH AMERICA

Brazil				
PT7CB	17,244	51	36	18

Colombia				
HK4DUM	106,600	172	65	31

Guyana				
8R1RPN	183,750	249	75	29

Neth. Antilles				
P48GD	3,186	20	18	10

Venezuela				
YV2IF	96,968	162	62	25

## MULTI-OPERATORS NORTH AMERICA

United States			
Rhode Island			
K1NG	125,652	718	74 22

Florida			
WA4JXI	114,638	467	86 35

Georgia			
KB4I	124,740	558	84 32
WB4GNT	104,991	532	79 27
WB4ZNH	96,789	515	77 27
N4NX	92,583	434	81 30
N4RJ	59,046	246	78 28
K4PI	24,610	241	46 6

Tennessee			
N4FNB	56,463	410	59 11

Arkansas			
KB5DN	67,776	461	64 13

Louisiana			
KA5DLM	37,180	299	55 9

California			
N6LL	10,197	131	33 4
WB6EGE	9,870	111	35 8

Washington			
KA7AUH	84,420	439	70 18

Michigan			
KA8POW	89,310	592	65 15

Ohio			
W8IMZ	60,312	473	56 6

Illinois			
K9HWU	41,287	348	53 4

Indiana			
KB8AC	6,790	88	35 4

Wisconsin			
KR9S	119,420	732	70 16
NF9R	81,216	551	64 13

Colorado			
N8BSA	17,480	175	46 4

Kansas			
WBCEM	107,136	726	64 11

Mexico			
XE2PQ	39,900	160	50 8

### EUROPE

Austria			
OE3WQB	28,743	157	39 39

Czechoslovakia			
OK5MVT	246	10	6 6

Hungary			
H5KXZ	8,760	70	24 24

Italy			
I8CZW	60,280	204	55 46

Poland			
SP6PST	62,955	258	45 43
SP6PAZ	40	2	2 2

Switzerland			
HB9CXZ	48,160	211	43 42

### U.S.S.R. European

European S.S.R.			
UZ3AYR	1,482	22	13 13

Lithuania			
UP1BZO	15,840	146	22 22

Ukraine			
UB4QWW	34,298	452	22 22
UB4IYU	9,177	77	23 23

Yugoslavia			
YT2R	62,995	275	43 41
Y27A	40,736	208	38 38

Check logs are gratefully acknowledged from the following: WBRA, PA3AAV, VE3INQ, VE3DCM, UA4-156-871.

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# CQ REVIEWS:

## The Kenwood TS-440S Transceiver – Part I

BY JOHN J. SCHULTZ\*, W4FA/SV0DX

This month W4FA presents the first part of his review of the Kenwood TS-440s HF transceiver. Part I focuses on the technical specifications of this moderately priced rig.

Every now and then I have to sit back in awe to consider the tremendous development of HF transceivers over the past decade. That reflective mood certainly set in when I initially studied the Kenwood TS-440 S.

The front panel of the unit measures only about 10½ by 4 inches, and, yet, it is a full fledged 100-watt-output class transceiver with all band coverage, dual VFO's, 100 memory channels, general coverage receive, etc. There is even space in the unit for an optional automatic antenna tuner! I thought some of the advanced (and extremely expensive) military HF transceivers that I've seen over the years had sophisticated features that amateur radio would never see, but that is no longer the case.

### General

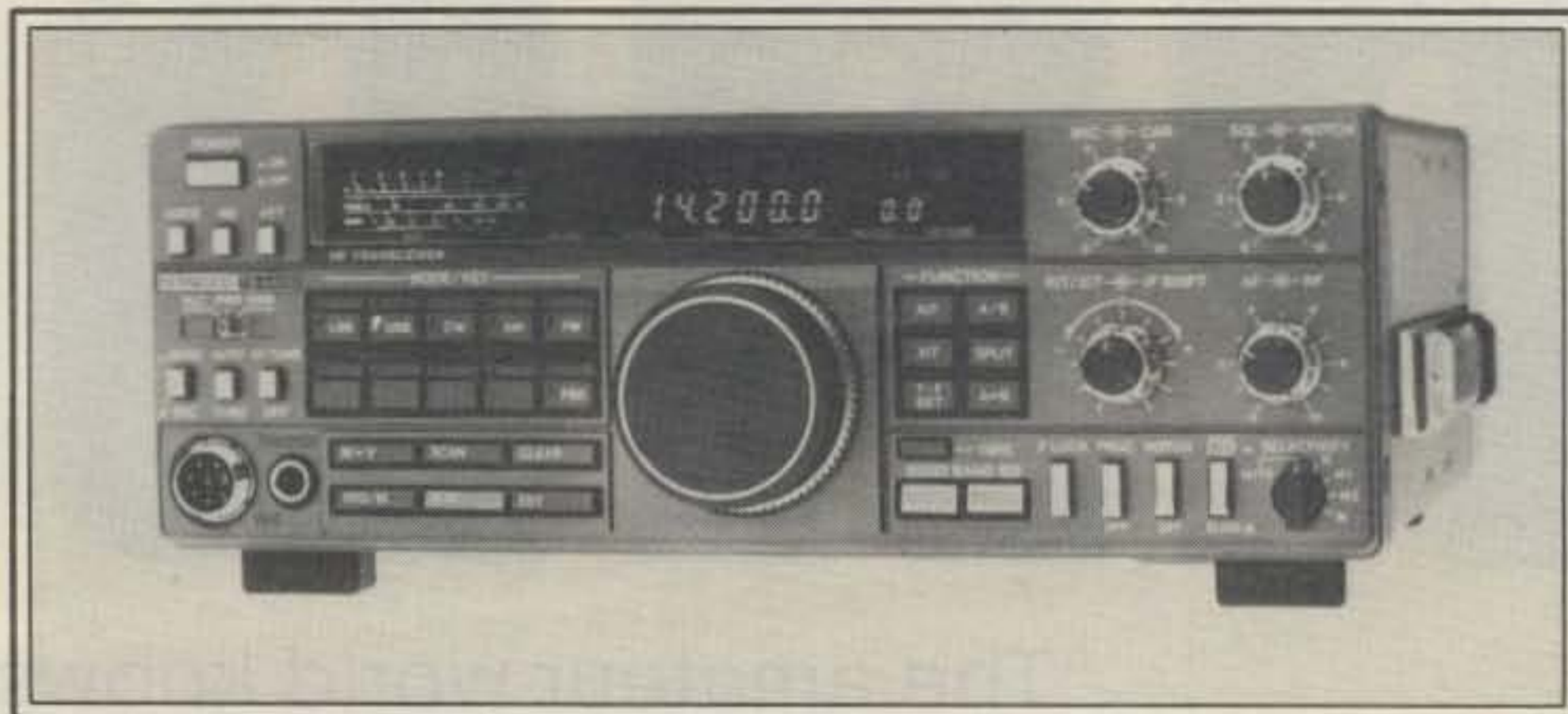
Table 1 presents the technical specifications for the TS-440 in rather exhaustive detail. I realize that some readers tend to regard specification presentations as superfluous. But for those of us who are more interested in the technical side of things, they do make interesting reading. Also, it's the type of presentation most manufacturers do not include in their advertisements for reasons ranging from space availability to the lack of its attention capturing potential.

I would say that the TS-440S presents itself as a compact, light-weight transceiver with technical specifications in some areas just a shade below what one would expect in a twice-as-expensive top-of-the-line transceiver.

### Circuitry

Fig. 1 shows a block diagram for the

\*c/o CQ magazine



The TS-440S is a sharp-looking transceiver in a very small package.

TS-440S. Although it is a sophisticated and complex transceiver as far as its circuitry is concerned, it isn't too difficult to get at least a basic idea of what happens inside of it. In the receive mode (note the antenna switch position in the upper left corner of fig. 1) the incoming signal is routed through a switchable attenuator and low-pass filter to any one of ten diodes switched high-pass filters. Then it goes to the first RX mixer (not to a preamplifier) and is translated to the first IF frequency of 45.05 Mhz. Only then does the signal encounter an amplifier stage, Q5.

The signal is then further translated in the second RX mixer to the second IF of 8.83 MHz and filtered. A third RX mixer translates the signal to the final IF of 455 kHz, where it is again filtered. Depending upon whether the AM, SSB/CW or FM mode of reception has been chosen, the 455-kHz signal is further amplified and routed to various detectors. The output of each detector passes through a variable AF type notch filter, and the squelch circuitry is active in all modes. Also, in all modes, some elaborate AGC loops are active going back to the various IF amplifiers.

One thing to note is that the only point at which optional filters can be installed is in the 8.83 MHz IF chain. A 2.2-kHz SSB/CW filter is standard, and, as an option, one can add either a 1.8- (narrow) or

2.4- (wide) kHz SSB filter and either a 270- (narrow) or 500- (wide) Hz CW filter. That is, one can add one optional SSB filter and/or one optional CW filter.

On the transmit side, things start out in the lower right hand corner of fig. 1 with the microphone input signal. The signal is routed through an AF type compressor circuit and then to a balanced mixer (IC5) operating at the 455-kHz IF. By looping the DSB signal back to the 455-kHz receive chain filters, the TS-440 forms a SSB signal.

Following the signal through the first, second and third TX mixers, we note that the signal is translated to the output frequency and brought up to the 100-watt output level in the Final Unit. The signal from there is routed through any one of six relay-switched low-pass filters before going to the optional antenna tuner unit.

The other major circuits in the TS-440S are concerned with frequency generation, displays, timing for RX/TX switching and, of course, the all-important microprocessor based control unit. There are two points that might be of interest in all that complex circuitry. All functions are referenced back to a single 36-MHz master crystal oscillator. Second, there is a back-up battery for the microprocessor so it retains memory. The battery is a lithium type which Kenwood says should last five years. Kenwood recommends that

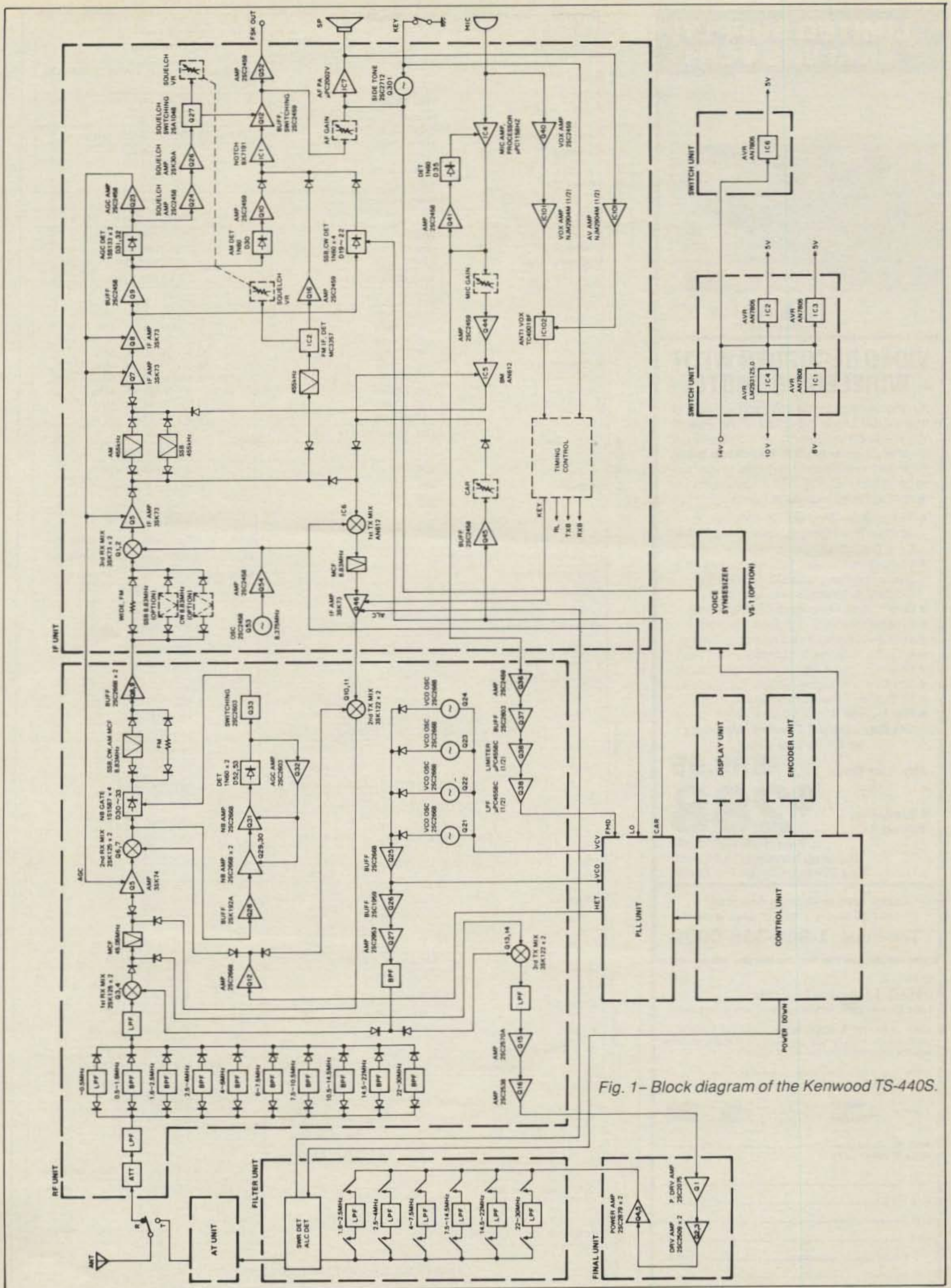


Fig. 1-Block diagram of the Kenwood TS-440S.

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Specifications		Model	TS-440S		
General	Mode		LSB (A3J), USB (A3J), CW (A1), AM (A3), FM (F3), FSK (F1)		
	Antenna impedance	With AT unit	20 to 150 ohms (Transmit only)		
		Without AT unit	50 ohms		
	Power requirement		12 to 16 VDC (13.8 VDC reference)		
	Grounding		Negative		
	Current drain	Receive mode with no input signal		1.9 A	
		Transmit mode		20 A	
	Operating temperature		-10 to +50°C (+14 to +122°F)		
	Dimensions ( ) includes projection.	Wide		270 (279) mm	
		High		96 (108) mm	
	Deep		313 (335) mm		
Weight	With AT unit		7.3 kg (16.1 lbs)		
	Without AT unit		6.3 kg (13.9 lbs)		
Transmitter	Frequency range	160 m band	1.8 to 2.0 MHz		
		80 m band	3.5 to 4.0 MHz		
		40 m band	7.0 to 7.3 MHz		
		30 m band	10.1 to 10.15 MHz		
		20 m band	14.0 to 14.35 MHz		
		17 m band	18.068 to 18.168 MHz		
		15 m band	21.0 to 21.45 MHz		
	12 m band	24.89 to 24.99 MHz			
	10 m band	28.0 to 29.7 MHz			
	Input power	LSB, USB, CW, FM, FSK		200 W PEP	
AM			110 W PEP		
Modulation	LSB, USB		Balanced modulation		
	FM		Reactance modulation		
	AM		Low level modulation		
Spurious radiation (CW)			Less than -40 dB		
Carrier suppression			More than 40 dB (with 1.5 kHz reference)		
Unwanted sideband suppression			More than 50 dB (with 1.5 kHz reference)		
Third order distortion			More than 26 dB below one of two tones		
Maximum frequency deviation (FM)			±5 kHz		
Frequency response (-6 dB)			400 to 2600 Hz		
Microphone impedance			500 ohms to 50 kΩ		
Receiver	Circuitry		Triple conversion superheterodyne		
	Frequency range		100 kHz to 30 MHz		
	Intermediate frequency		1st: 45.05 MHz, 2nd: 8.83 MHz, 3rd: 455 kHz		
	Sensitivity	LSB, USB, CW, FSK (at 10 dB S/N)	100 to 150 kHz	Less than 2.5 μV	
			150 to 500 kHz	Less than 1 μV	
			500 kHz to 1.6 MHz	Less than 4 μV	
			1.6 to 30 MHz	Less than 0.25 μV	
			AM (at 10 dB S/N)	100 to 150 kHz	Less than 25 μV
				150 to 500 kHz	Less than 13 μV
		500 kHz to 1.6 MHz		Less than 40 μV	
1.6 to 30 MHz		Less than 2.5 μV			
FM (at 12 dB SINAD)		1.6 to 30 MHz		Less than 0.7 μV	
Selectivity		LSB, USB, CW, FSK	-6 dB	2.2 kHz	
			-60 dB	4.4 kHz	
	AM	-6 dB	6 kHz		
		-50 dB	18 kHz		
FM	-6 dB	12 kHz			
	-50 dB	25 kHz			
Image ratio	100 kHz to 1.6 MHz		More than 50 dB		
	1.6 to 30 MHz		More than 70 dB		
IF rejection	100 kHz to 1.6 MHz		More than 50 dB		
	1.6 to 30 MHz		More than 70 dB		
IF SHIFT variable range			More than ±0.9 kHz		
RIT/XIT variable range			More than ±1 kHz		
NOTCH filter attenuation			More than 20 dB (at 1.5 kHz)		
Squelch sensitivity	LSB, USB, CW, AM, FSK	100 to 150 kHz	Less than 20 μV		
		150 to 500 kHz	Less than 10 μV		
		500 kHz to 1.6 MHz	Less than 20 μV		
		1.6 to 30 MHz	Less than 2 μV		
	FM	1.6 to 30 MHz	Less than 0.32 μV		
Output			1.5 W across 8 ohms load (10% distortion)		
Output load impedance			4 to 16 ohms (both ext. speaker and phones)		
Frequency control	Frequency accuracy (at RIT/XIT off)		Less than ±1 × 10 <sup>-5</sup>		
	Frequency stability (at RIT/XIT off)		Less than ±1 × 10 <sup>-5</sup> (-10 to +50°C)		

Table I- Kenwood TS-440S specifications.



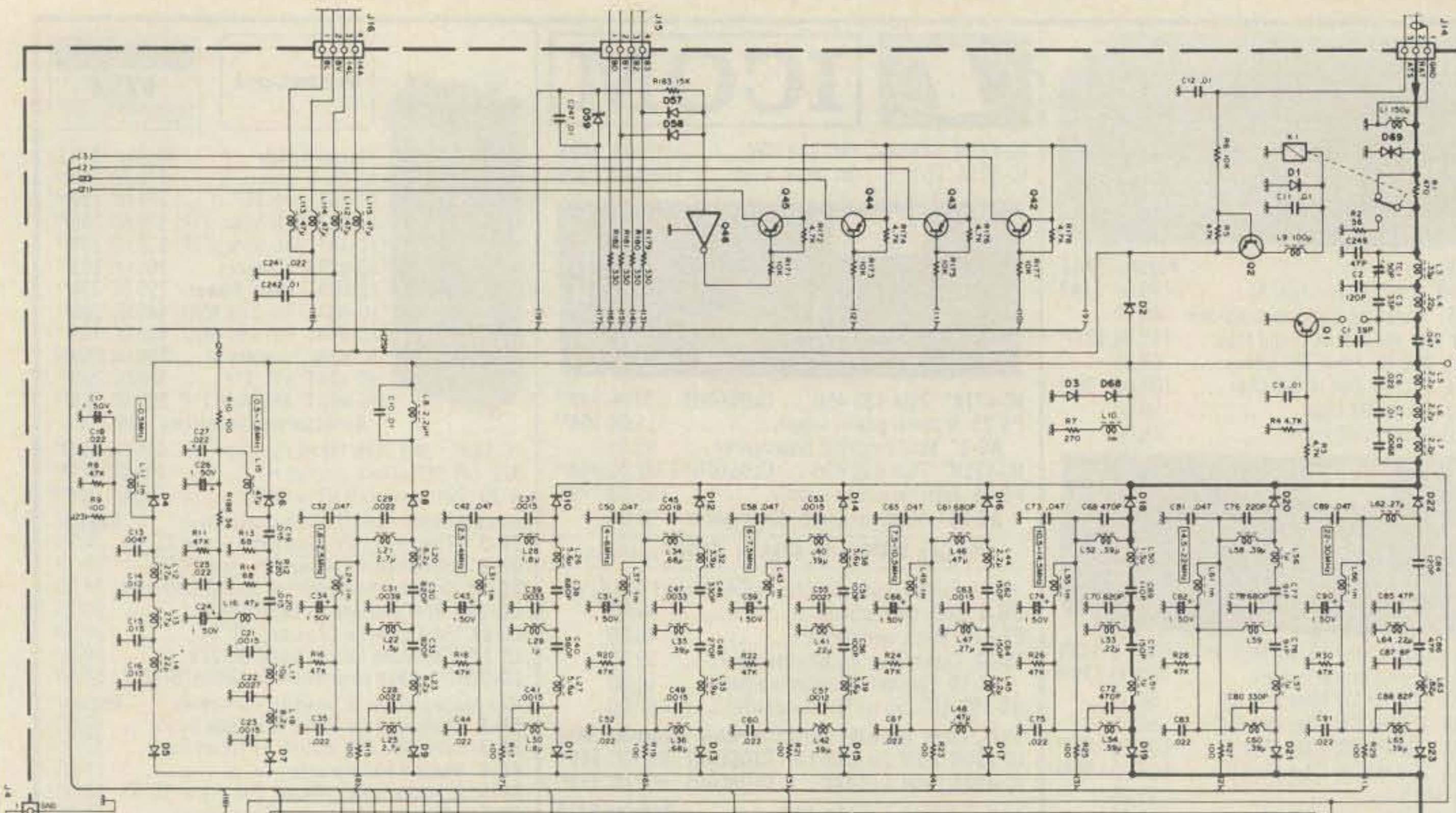


Fig. 2—Part of the "front end" of the TS-440S. Antenna input is at J14 (upper left). Note the extensive use of input filtering, the use of balanced mixers and the lack of an RF amplifier stage.

they or a dealer replace the battery. Once it is replaced, however, reset of the microprocessor is extremely simple using only front panel switches. One then only has to enter whatever frequencies into memory again one wants to store.

### A Few Circuits of Interest

Fig. 2 shows part of the RF Unit block and the "front-end" of the TS-440S. It's quite an interesting "front-end" with extensive fixed low-pass filtering, switchable high-pass filters and the use of double-balanced mixers. Follow the heavy line signal input starting at J14. Fig. 3 shows the Final Unit or RF power amplifier.

Fig. 4 shows the optional antenna tuner unit. Again, this is a new design as compared to the automatic tuner in the TS-940S (probably made necessary by space restraints in the TS-440S). The circuitry is still that of a "T" network tuner, although the actual tuner RF components (lower left) are almost lost in the detail of the control circuitry. M1 and M2 (upper right) actually turn VC1 and VC2.

### A Look Inside

The photographs give an interior glimpse of the transceiver. If I was awed looking at the exterior of the unit, I was doubly impressed when looking inside it. It's a small gem of fine construction. There is plenty of shielding, and the basic frame looks like it can take the rugged type of usage associated with mobile op-

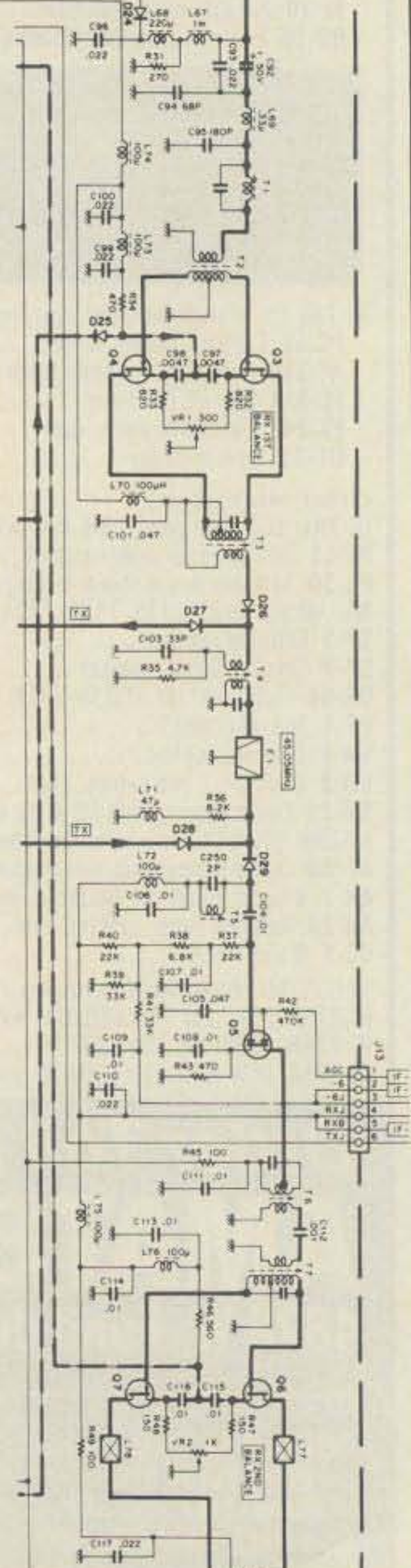
eration. Plenty of connectors are used throughout. There shouldn't be any problem in getting at any PC board, although it's hardly a playground for inexperienced technicians.

The size of the heatsink is impressive. Also, the location of the internal fan is unique in that it is located fairly well inside the transceiver. Externally, the finish is excellent. All of the various knobs and switches are well proportioned. The VOX controls are screwdriver adjustable and located on the rear panel. Only one switch is located on the top cover area, and it controls the selection for VOX on/off in the phone modes and the selection for semi- or full break-in in the CW mode.

### Measurements

The TS-440S is conservatively specified. The power output, using a PS-50 power supply, was *at least* 100 watts on all bands. Using the PS-50 supply the transceiver was tested key-down for over an hour without any decrease in power output! The power output can be varied continuously by a "carrier control" on all modes except SSB.

The latter may present a small problem when using a linear amplifier which does not have an ALC feedback connection to the TS-440S. It's true that one can reduce the microphone gain on the TS-440S to reduce the PEP output drive to a linear, but then one also loses the compression



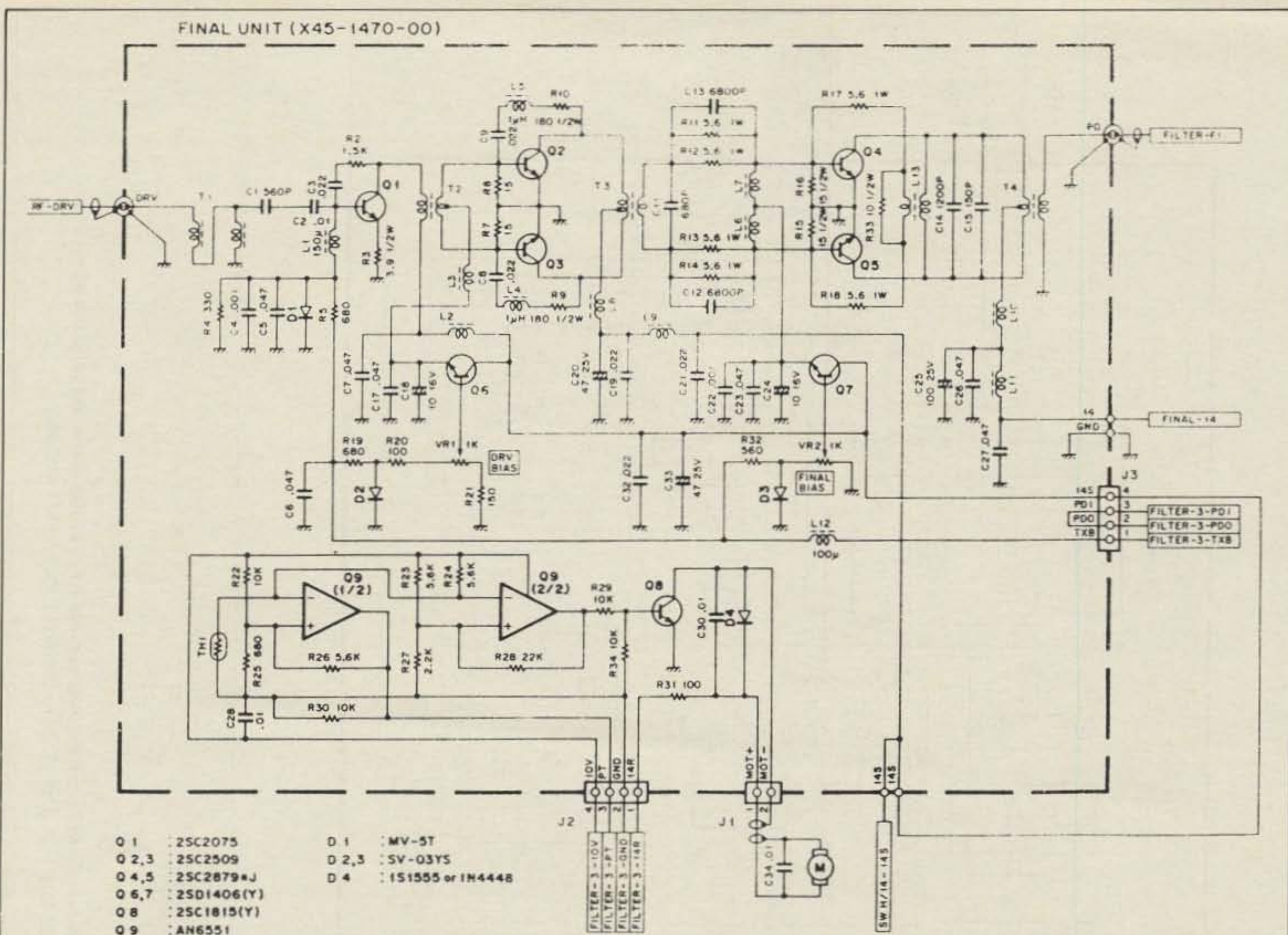


Fig. 3- TS-440S final amplifier stage. The fan is thermally controlled by the heat sink temperature. Various external circuits provide protection for the final amplifier in case of high SWR.

effect of the ALC loop within the transceiver. Third order IMD products were about -30 dB which is a bit better than specified and perfectly acceptable.

The AT-440 automatic antenna tuner was tested with simulated resistive loads representing SWR's of up to 1:4 and it performed perfectly on all bands (80-10 meters). Tune-up time was rarely more than 10 seconds. Although the TS-440S covers 160 meters, the AT-440S only extends down to 80 meters. An external tuner may be needed on 160 meters. On the other hand, if the TS-440S is modified for HF MARS coverage, the AT-440 operates anywhere in the 3.5-29.9 MHz range. Harmonic and spurious outputs were at least -50 to -70 dB down referenced to full carrier output level.

The TS-440S provides exceptional "receive" performance. It has a clean, quiet background noise aspect to it. This direct mixing system does produce results. Minimum discernable sensitivity was a hair over 0.03 uV (-137 dBm), and that combined with a blocking sensitivity of -33 dBm made the blocking dynamic range come out to -104 dBm (500 Hz bandwidth,

QSLs BY

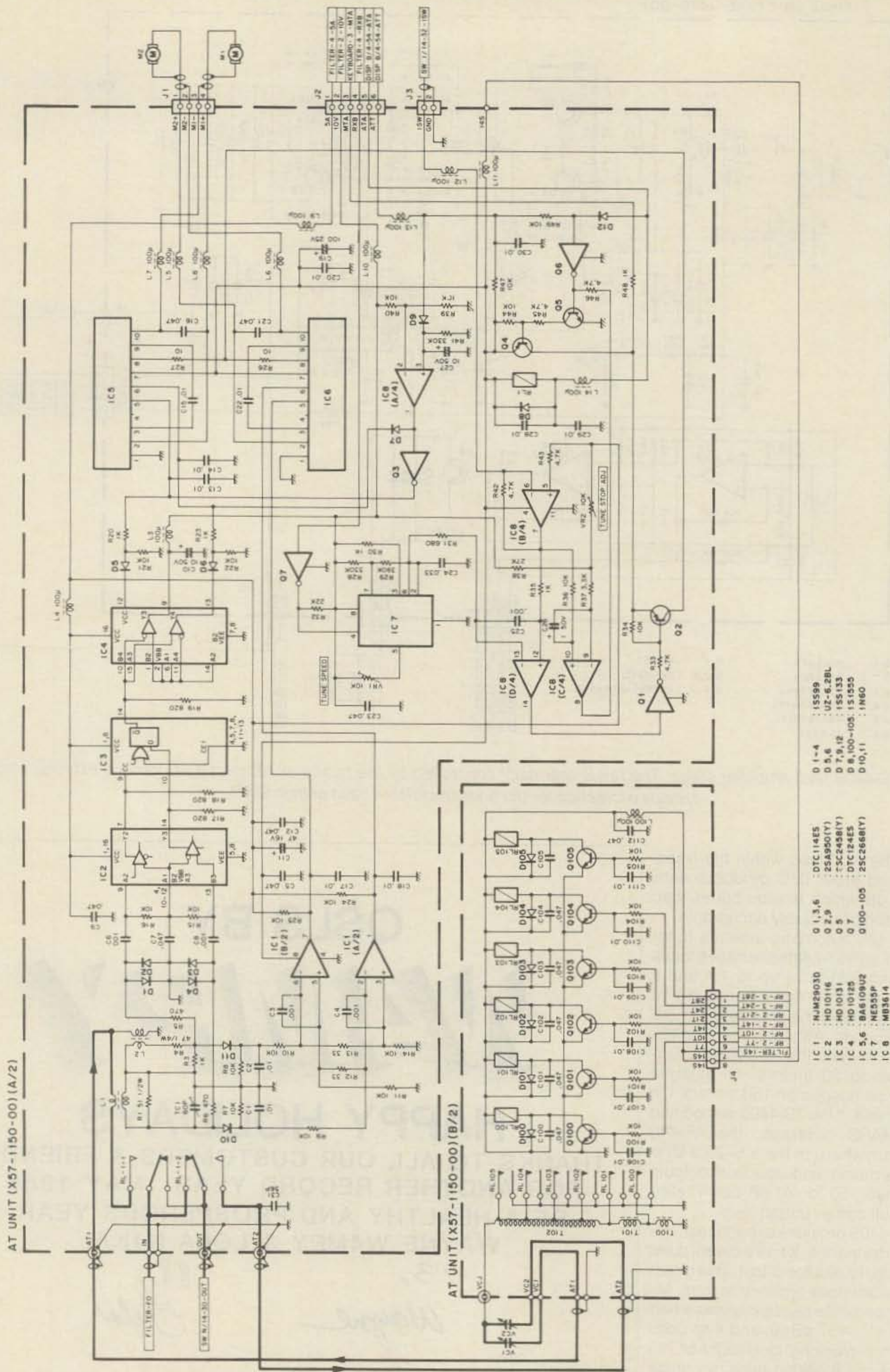
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- |         |            |           |              |              |            |
|---------|------------|-----------|--------------|--------------|------------|
| IC 1    | : NJM2903D | Q 1, 3, 6 | : DTC114E5   | D 1-4        | : 1S599    |
| IC 2    | : HD10116  | Q 2, 9    | : 2SA950(Y)  | D 5, 6       | : UZ-6.2BL |
| IC 3    | : HD10131  | Q 5       | : 2SC245B(Y) | D 7, 9, 12   | : 1S5133   |
| IC 4    | : HD10125  | Q 7       | : DTC124E5   | D 8, 100-105 | : 1S1555   |
| IC 5, 6 | : BA6109U2 | Q 100-105 | : 2SC2668(Y) | D 10, 11     | : 1N60     |
| IC 7    | : NE555P   |           |              |              |            |
| IC 8    | : MB3614   |           |              |              |            |

Fig. 4—Optional antenna tuner diagram. This unit fits inside the TS-440S. SWR sensing circuitry is at the upper left, and the actual RF components are at the lower left. Capacitors VC1 and VC2 are turned by motors M1 and M2.



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Bands: 30-50, 88-108, 118-136, 144-174, 440-512 MHz.

The Regency Z60 covers all the public service bands plus aircraft and FM music for a total of eight bands. The Z60 also features an alarm clock and priority control as well as AC/DC operation. Order today.

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Bands: 30-50, 118-136, 144-174, 440-512 MHz.

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**Sidelit liquid crystal display • EAROM Memory**

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Bands: 29-54, 118-136, 144-174, 406-420, 440-512 MHz.

The new handheld Regency HX1500 scanner is fully keyboard programmable for the ultimate in versatility. You can scan up to 55 channels at the same time including the AM aircraft band. The LCD display is even sidelit for night use. Includes belt clip, flexible antenna and earphone. Operates on 8 1.2 Volt rechargeable Ni-cad batteries (not included). Be sure to order batteries and battery charger from the accessory list in this ad.

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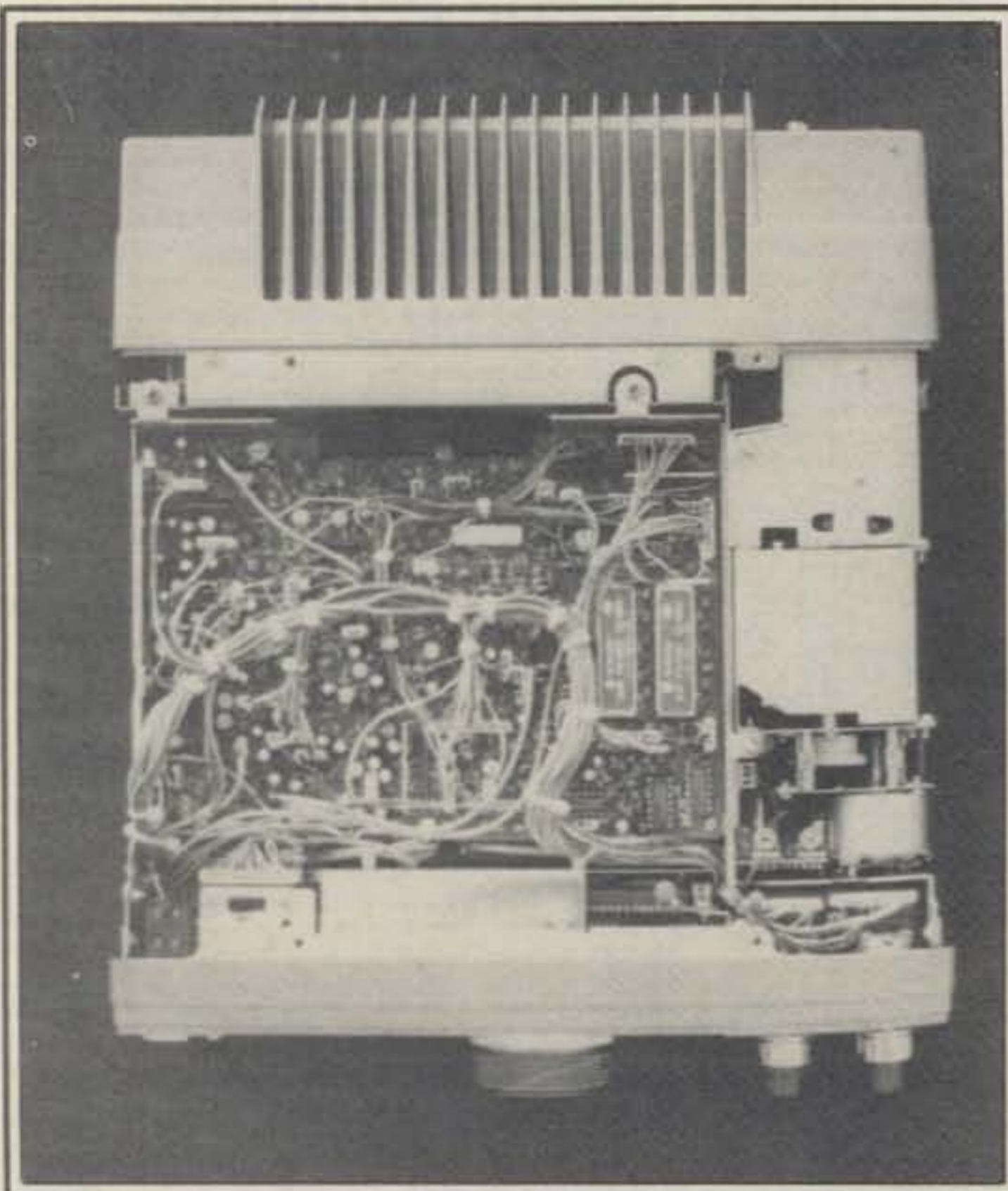
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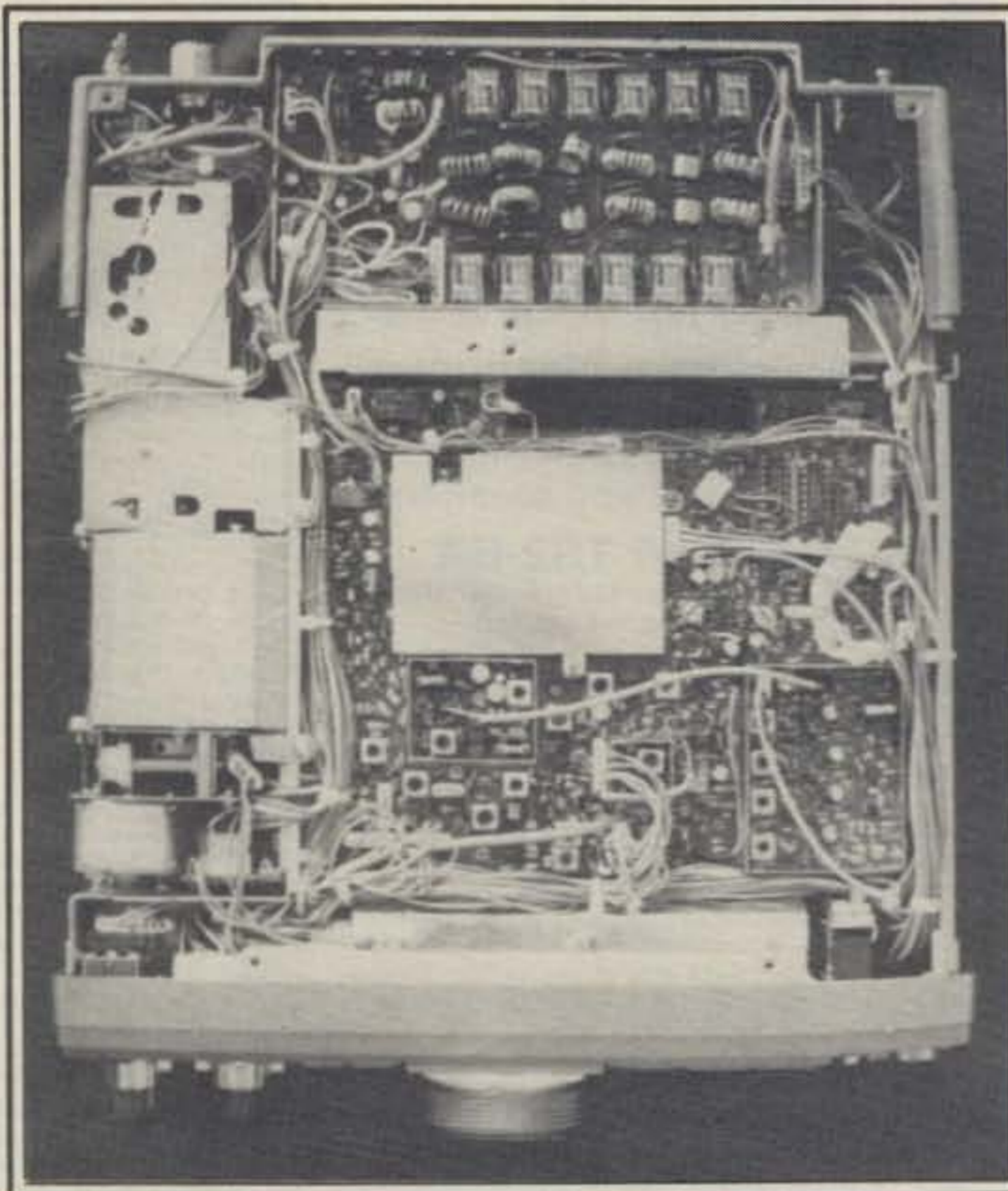
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Looking inside the top of the transceiver one can see two optional filters installed on the right side of the large PC board. One motor for the very compact automatic antenna tuner is in the lower right. The main cooling fan is located inside just before the power amplifier compartment and the massive heat sink.



Looking at the bottom inside of the TS-440S one can see another motor (lower left) for the antenna tuner and most of the tuner's housing. Another large PC board in the middle contains various RF, AF, and frequency generation functions. The relays and coils in the upper portion of the photograph are associated with the low-pass filtering assembly following the power amplifier. The construction is first-rate in every sense.

20 kHz signal spacing on 20 meters).

The third order intercept point is an excellent +14 - 15 dB. Not all of the sensitivity/frequency range specifications were checked but spot checks indicate that most are as claimed. Tuning rate is 10 kHz per revolution in the SSB, CW and FSK modes and increases to 50 kHz/revolution in the AM and FM modes. Frequency readout is to 100 Hz, but a simple

internal modification (cutting a wire) will extend the readout another digit to 10 Hz. The RIT and XIT offsets, when used, are displayed separately.

Filter specifications measured as claimed. Table I lists the specifications for the standard filters, while Table II lists the specifications for the available optional filters. A final pleasant surprise, when I had the TS-440S on a test bench,

was to discover that the "S" meter provides realistic readings! S9 is just a shade under 50 uV and S1 represents 0.6 uV (measurements on 20 meters).

Next month W4FA finishes his review of the TS-440S with his impressions of how well it measures up to its promises. He also looks at the matching PS-50 heavy duty power supply.



■ **YK-88C CW FILTER**

Center frequency : 8,830.7 kHz  
 Passband width : 500 Hz (-6 dB)  
 Attenuation bandwidth : 1.5 kHz (-60 dB)  
 Guaranteed attenuation : More than 80 dB

■ **YK-88CN CW NARROW FILTER**

Center frequency : 8,830.7 kHz  
 Passband width : 270 Hz (-6 dB)  
 Attenuation bandwidth : 1.1 kHz (-60 dB)  
 Guaranteed attenuation : More than 80 dB

■ **YK-88SN SSB NARROW FILTER**

Center frequency : 8,830.0 kHz  
 Passband width : 1.8 kHz (-6 dB)  
 Attenuation bandwidth : 3.3 kHz (-60 dB)  
 Guaranteed attenuation : More than 80 dB

■ **YK-88S SSB FILTER**

Center frequency : 8,830.0 kHz  
 Passband width : 2.4 kHz (-6 dB)  
 Attenuation bandwidth : 4.2 kHz (-60 dB)  
 Guaranteed attenuation : More than 80 dB

Table II- Specifications for the optional filters.

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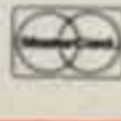
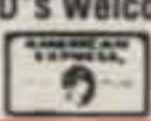
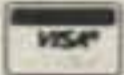
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**Here's another of N5RMs monster antennas that's guaranteed to activate your imagination.**

# The Forty Meter Flame Thrower

BY ROBERT H. MITCHELL\*, N5RM

**D**on't let the title excite you too much. The beam described here does not spit out fire—well, at least, not that the neighbors can see. The name was given to the beam a few years ago by one of the 7-MHz operators at super contest station N5AU. He described it in club meetings as the "Flame Thrower" because it was the only antenna in the Southwest that beat them out in pileups consistently. Gordon, N5AU, himself, came by to inspect the beam while it was on the ground and pronounced it one of the strongest 7-MHz beams he had ever seen.

Well, the beautiful aspect of this beam is its construction. The construction is simple. The major machined parts are the plugs that join the tips of the elements to the centers of the elements. The boom-to-mast coupling plates were cut and drilled at a machine shop, as were the element-to-boom coupling plates. That was because I can't seem to drill well-aligned holes, even with the use of a drill press. In addition, the shims for the coupling between the boom sections were rolled at the same shop.

The rest of the work was done with portable electric drills, a hacksaw, and a large hammer. As for material cost, I believe that today it would be in the neighborhood of \$1,000.00.

The result? A sturdy and long-lasting beam that doesn't appear to be plagued by the "delicate conditions" that affected Victorian ladies and seem to affect most 7-MHz beams. This beam, and its immediate antecedent, have been up for 14 years.

## Honorable Ancestor

The original beam was a combination 2-element 7-MHz and 5-element 14-MHz beam on a common 40-foot boom sold by Wilson Electronics in Henderson, Nevada, as the DB-52. I put that up in Indiana in 1973, when I was W9DD. A Wilson DB-65 (6-element 21-MHz and 5-element 28-MHz beams on a common boom) was



*Fig. 1—View from the top of the 40-meter tower, looking east. Foreground-looking down at 145-foot rotating tower for TH28DX, 200 feet away. Right-A4 on 48-foot tower, 400 feet away. Element sag is quite noticeable from the top of the tower.*

mounted about 8 feet above the larger beam on a steel mast 2-inches in diameter, with a wall 0.400 inches thick.

We lived on top of a steep hill overlooking the Wabash River Valley and frequently received extremely high winds because of the Venturi effect. One wind bent the mast at a 90-degree angle, just below the mounting point for the DB-52, but left the antennas intact. Then I became more confident of the mechanical makeup of the Wilson beams.

We moved back to Dallas in 1977. The same stack was erected on a 165-foot tower and seemed to work well. Then, in 1979, a really severe ice storm hit North Texas. In the morning's first light, I saw that the 7-MHz elements looked like archery bows drawn overly tight. A consultation with my wife followed immediately. She urged me to let things sit. I decided to rotate the beams to the stops to see if I could knock some of the ice off. Unfortunately, the 7-MHz elements were bent

down so far that they became entangled with the top guy wires on the tower.

That resulted in major damage—a broken DB-52 boom, a broken 7-MHz element, and some damage to the DB-65 mounted above the mess. It also resulted in some rather harsh and well-deserved words. We got the damaged beams down, repaired them, and put them back up again. But the damage resulted from my hasty action and could not have been blamed on the antenna construction.

## Birth Of A Giant

Sometime in there I decided to take down the stack and to build a 3-element 7-MHz Yagi. The first area of consideration was the boom. Wilson had supplied a boom made of two 20-foot sections of 0.065 inch aluminum tubing, three-inches OD. Inside the middle of the boom, a 12-foot length of heavy-wall tubing was inserted to form a joint and reinforcement. The result was a boom with walls almost

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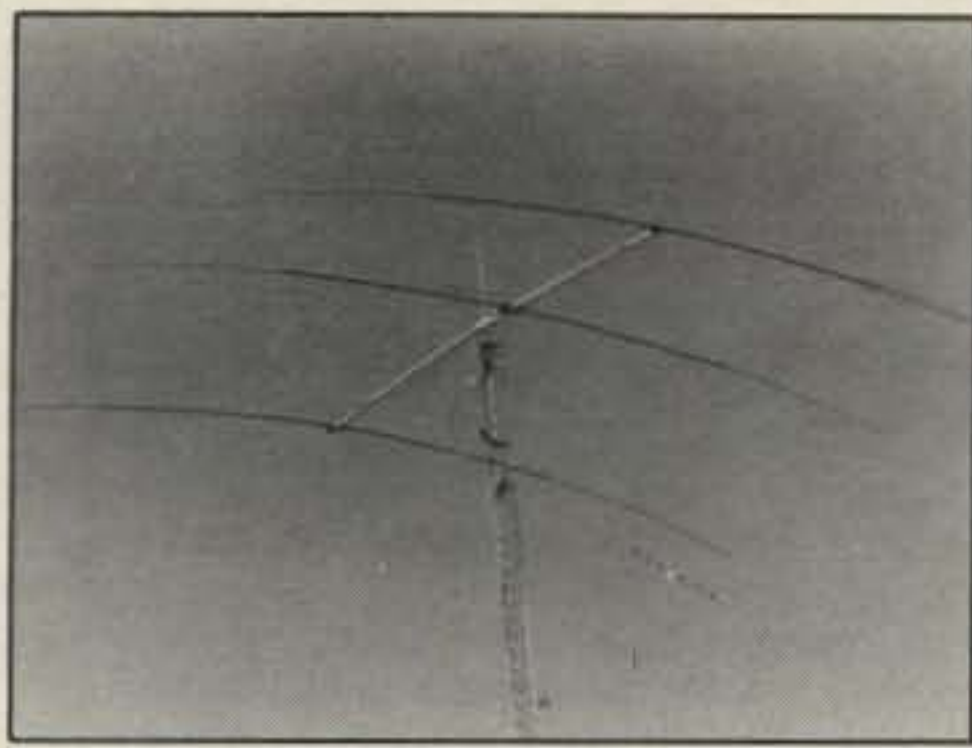


Fig. 2—The Forty Meter Flame Thrower at 160 feet.

0.25 inches thick in the center. It did a fine job on the DB-52, but it did not appear to offer a sufficient margin of safety for a 3-element 7-MHz beam, where elements would be placed at the outer ends of the booms.

While thumbing through a metals handbook, I noticed that standard 3-inch aluminum pipe is 3.5 inches OD, and that "Schedule 40" pipe had an ID of 3.068 inches. That appeared to be a good bet for the center section of the boom, as the pipe comes in 21-foot lengths. Next, the boom had to have end sections.

Three-inch tubing comes in 12-foot lengths. Two of those, each inserted 18 inches into a 21-foot pipe, would result in a 42-foot boom, which was what I wanted. The next question was whether to use 0.25-inch or 0.125-inch wall tubing. A fast call to my favorite consulting engineer (he doesn't charge me), K5IU, resulted in a reasonably fast analysis considering the price.

Dick stated that I could use either, provided I used 6061-T6, but that he would recommend using 0.25-inch wall tubing, if I used 6063. However, he did suggest using what he called a "boom spacer", but which I called a "round shim" or "sleeve", and he was nice enough to

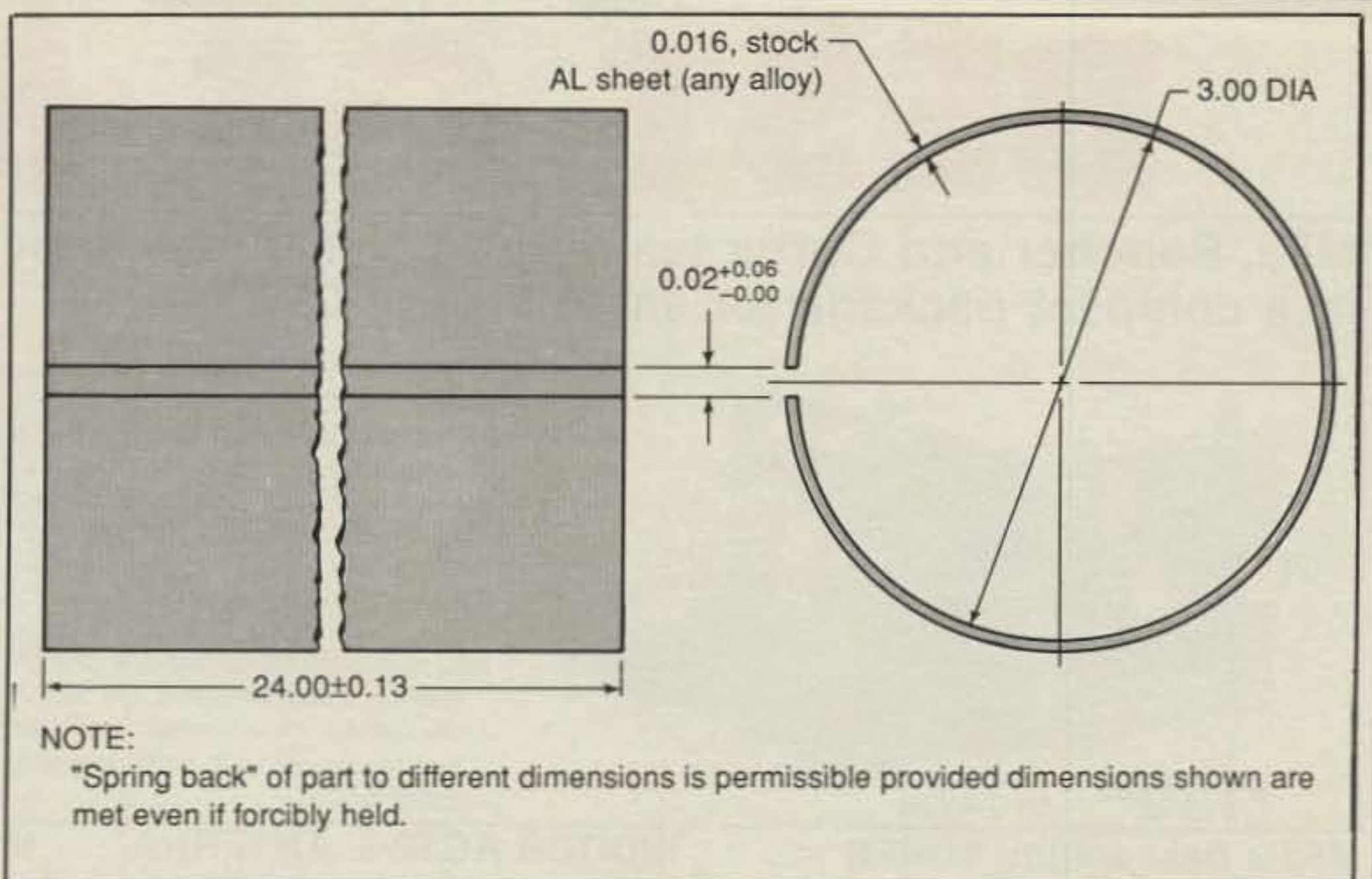


Fig. 4—Drawing: Sleeve for 3" tubing to 3.5" pipe in boom.

make a drawing of the proposed part (fig. 4).

This piece was to prevent wobble in the boom, because of the differences in ID and OD of the pipe and tubing, respectively. It has. I joined the boom sections with a half-inch bolt through the ends of the pipe and through the tubing inserted in each end of the pipe.

With the shims in place, the boom is sturdy and rigid. Initially I used sway braces and droop braces, but took them off after we moved to Greenville, and they do not seem necessary. In fact, Dick scoffed when I proposed putting them on when we first built the beam, but I still like them.

The elements came next. I decided to use the Wilson construction design for the elements, as the elements had held up so well. In brief, two twenty-foot lengths of tubing are joined together to

form the center piece of each element. This tubing is 2-inch OD, with 0.050-inch walls. It is of 6063-T6 tubing and is known as "heavy-duty construction tube." This is considerably cheaper than aircraft-type tubing and seems to do as well. Another tubing in this range is two-inch "irrigation tubing." It has walls only 0.043 inches thick. It may do, but the 0.050-inch tubing is stronger.

A center "stiffener" is used to join the two two-inch OD pieces. It is a 12-foot length of 1.875-inch OD aluminum tubing, with 0.058 inch walls, and is of 6063-T6 material. (fig. 5) The Wilson beam had used 1.875-inch tubing with a wall I measured at  $\frac{1}{16}$  inch. However, when I ordered  $\frac{1}{16}$ -inch tubing from my vendor, he sent 0.058-inch wall material.

My consultant insists that the 0.058-inch wall tubing is not husky enough nor long enough. It has held up for five years, but, in view of his intransigence on this subject, I will use a heavier-wall tubing for the stiffener when the current elements break.<sup>1</sup>

The tips of each element taper down abruptly from the two-inch tubing. Two "element plugs" are mounted at the element tips. These element plugs are machined from aluminum stock. The plugs are machined to 1.875-inch OD, and 0.877-inch ID, are 0.75 inches thick, and have four holes tapped 90 degrees apart on the faces and through the plug (fig. 6).

Allen-head set screws are used in these to hold the ends of the 0.875-inch tubing used in the first "step-down" from the two-inch tubing. One plug is mounted at the end of the 0.875 inch tubing, and the second is mounted eight inches in from the end. The two plugs, with the 0.875 inch tubing, are mounted inside the outer ends of the two-inch tubing. A two-



Fig. 3—The TH28DX and Flame Thrower side-by-side for comparison of relative sizes.

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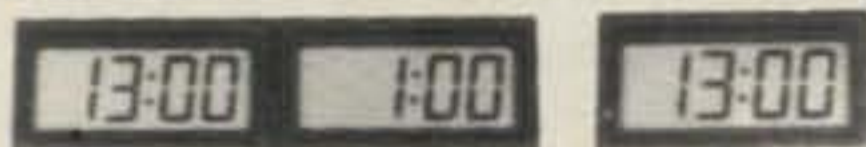
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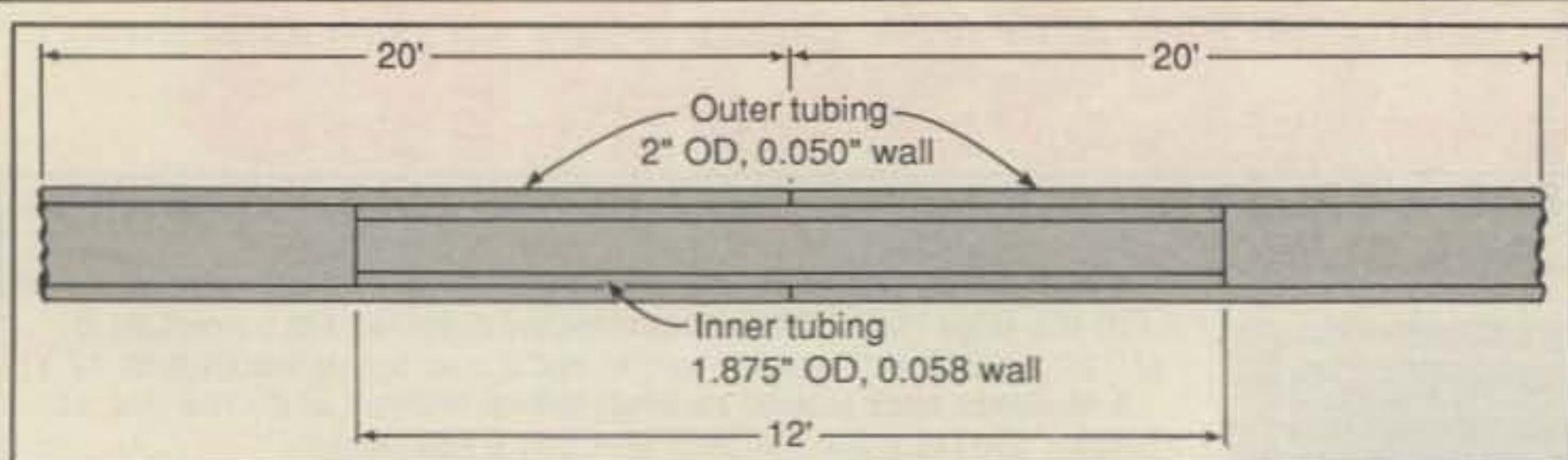


Fig. 5- Drawing: Center Sections of elements.

inch muffler clamp is used at the outer end of the two inch tubing to hold the inserts in place (fig. 7).

The tapered outer tips are made of our pieces of tubing. I bought one 12-foot piece each of 0.875, 0.750, 0.625, and 0.5-inch tubing for each of the three elements. The first three had walls of 0.058-inch tubing (0.049 will do), while the fourth section had a 0.035-inch wall.

All of the material was either 6063-T6, or 6061-T6, depending upon what the dealer had in stock. Normally the 6063 is cheaper, but if the dealer has only 6061 in stock and the price is reasonable, take it. Each of the 12-foot sections was cut in half, and the resultant pairs of four sections were placed together to form tips of the correct length (fig. 8).

### Tapering Tips Tribulation

Before discussing the rest of the construction materials, it would be well to discuss the element lengths. Because of the severe element taper, the lengths are not what one would expect from standard formulae. The first time we put the beam up, we were disappointed, to put it mildly. The beam had been cut for 7050 kHz, using the formulae:

$$\text{Reflector} = 500/f$$

$$\text{Radiator} = 472/f$$

$$\text{Director} = 450/f$$

These resulted in estimated lengths of 70.47, 66.95, and 63.83 feet, respectively.

With the beam at 165 feet, SWR was lowest at about 7450 kHz. At 7 MHz, the

radiation off the back was better than off the front. I remembered—vaguely—an old article on forty-meter beam lengths and managed to find it.<sup>2</sup> From that article, it appeared that my elements were too short by five per cent or more. Then I found a fancy curve by Bill Orr that indicated my elements needed to be lengthened by 5.8 per cent, with my element taper of four-to-one.<sup>3</sup>

The elements were lengthened according to W6SAI's curve. New element lengths were 74.56, 70.83, and 67.53 feet respectively. The beam was erected once again.

This time, the beam tuned to resonance at 7050 kHz and the SWR curve was beautiful, running from 1.1-to-1 at 7000, 1.0-to-1 at 7050, slightly under 2-to-1 at 7200, and 2.4-to-1 at 7300 kHz. The beam had good front-to-back ratio across the whole band. The actual f/b ratio varies with angle-of-arrival, time of day, etc., but down on the low end of the band where I spend most of my time, it runs 20-to-30 dB.

### Anybody Got A Match

The original Wilson beam used a gamma match. The rod was about ten feet long and it would not support my weight. So it was necessary to swing the element to the vertical position, go down the tower ten feet, adjust the length of the gamma, then go back up to the top of the tower to adjust the gamma capacitor, after releveling the element.

After about ten adjustments, my already thin patience wore thinner. So, I decided upon an omega match.<sup>4</sup> Wilson had supplied a gamma capacitor in a box. The variable capacitor appears to be about 300 pf, at about 3,000-volts rating. That was used again, this time for the series capacitor in the omega. The omega rod was set to four feet long, was of 0.875-inch tubing, and was eight inches, wall-to-wall, from the radiating element. A 15-inch length of 12-gauge wire was run from the omega rod to the tuning box (fig. 9). The shunt capacitor tuning was set with a 200-pf receiving-type variable.

After finding the lowest SWR (at about 135 pf on the shunt capacitor, and full scale on the series capacitor), the small shunt capacitor was replaced with a capacitor made of about five feet of RG8A/U cable (one three-foot piece paralleled with another, which was cut for best SWR). The shunt capacitor may require a higher voltage rating than the series capacitor. The RG8A/U probably will handle several times the 1500-watts maximum output at this station.

### Boom-To-Mast Clamp

The boom-to-mast clamp plate was made of half-inch aluminum plate, 10 inches high, and 24 inches long. A half-inch hole was drilled through the clamp and boom, about one inch from each end of the plate. Half-inch bolts, six inches long, run through the plate and boom at each end.

With this arrangement, either bolt can be withdrawn, and the boom tipped to vertical after the clamps are withdrawn from the plate. (**Don't do this in a high wind.**) Because I wanted to be able to tip the boom, the radiating element was placed 24 inches off center, toward the director.

The clamps for the boom are 3.5-inch and 3.0-inch muffler clamps, and those for the rotating pipe are two-inch muffler clamps. Four of the two-inch clamps are used above the boom, and two are used below the boom, to hold the boom plate to the rotating mast. Three of the 3.5-inch clamps are used on either side of the rotating mast to hold the boom to the plate.

My consultant advised me that I had made a mistake using a two-inch-OD, 0.25-inch-wall steel tube for the rotating pipe. He said that I should have used three-inch-OD tube of the same wall thickness, and then I could have mounted a BIG antenna above the Flame Thrower. Fortunately, Dick told me that after I had bought all the materials, and I *couldn't* succumb to another of his devilish schemes.

The element-to-boom plates are made of half-inch aluminum, and are 6 inches by 24 inches. Two-inch muffler clamps are used to fasten the elements to the plates, and three inch clamps are used to fasten the end plates to the boom, while 3.5 inch clamps are used to fasten the off-center plate to the boom.

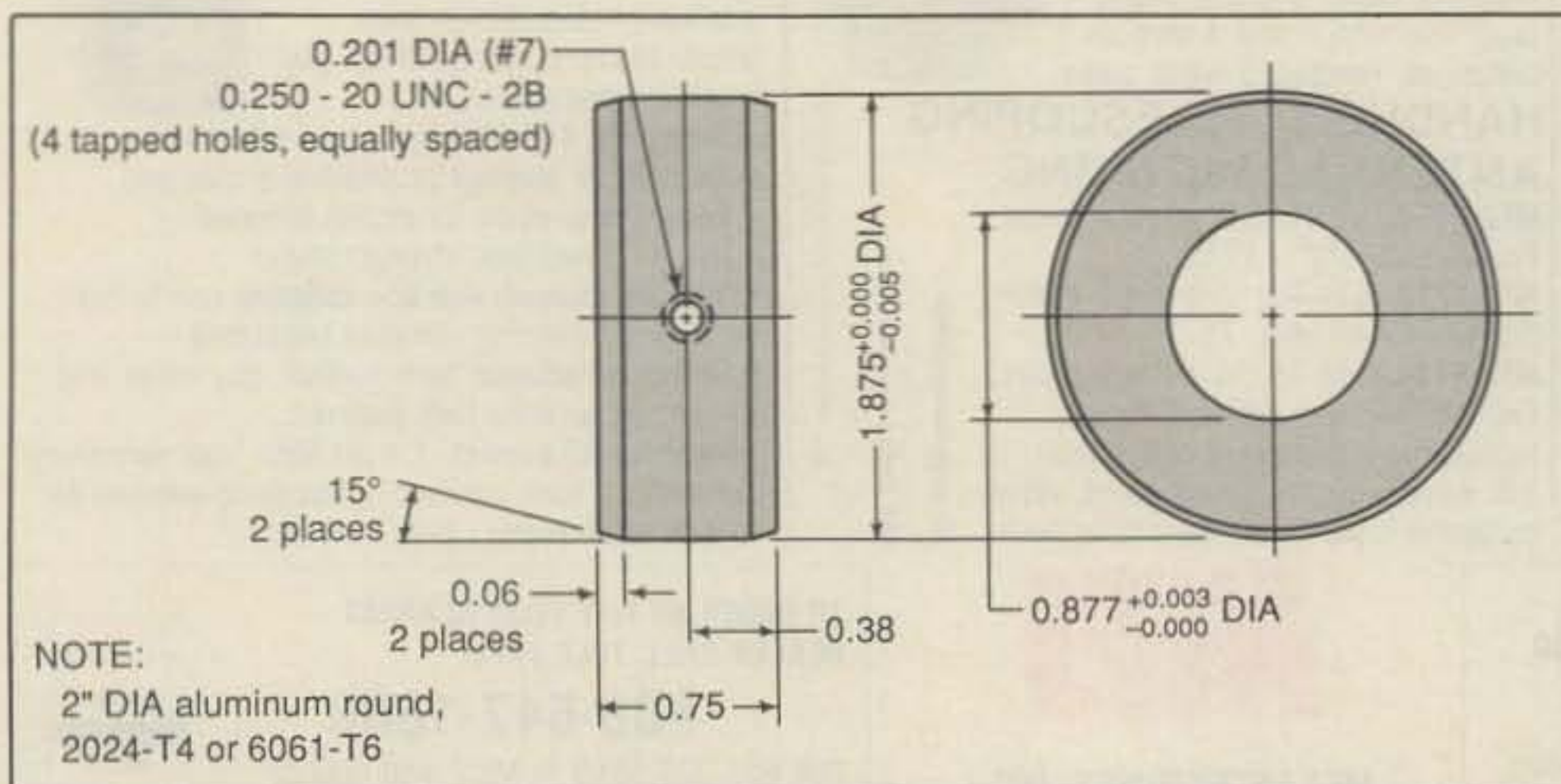


Fig. 6- Drawing: Element Plugs/Reducers.



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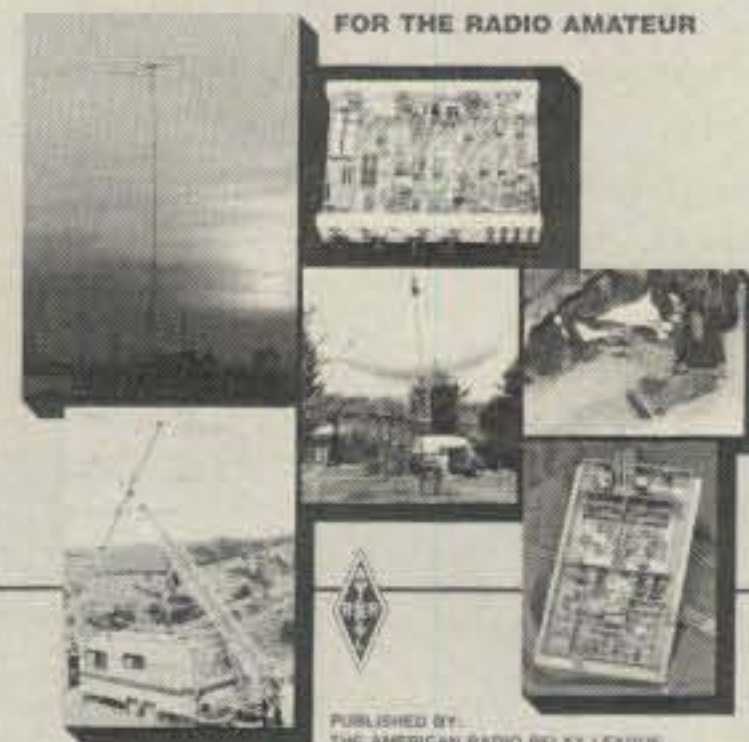
SuperSCAF is available as an easy to assemble kit. No adjustments, calibration, or test equipment are required. The kit can be completed by most builders in one or two evenings. SuperSCAF is available for \$129.95 plus \$7.00 shipping and handling. Order from AFtronics, Inc., PO Box 785, Longwood, FL 32752-0785. Florida residents should include state sales tax.

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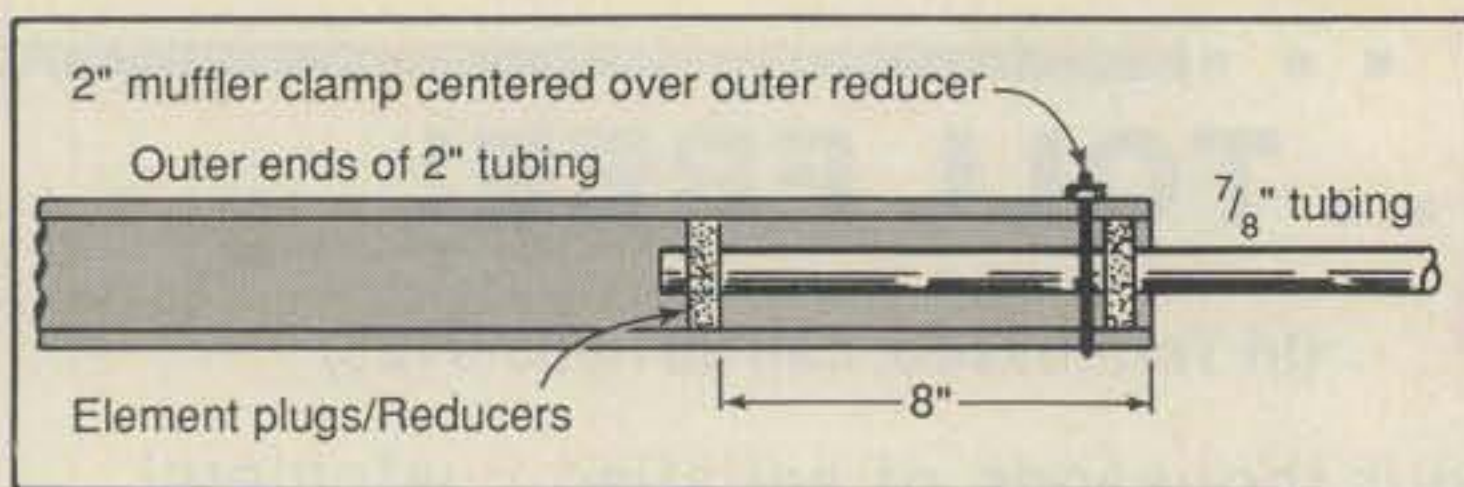




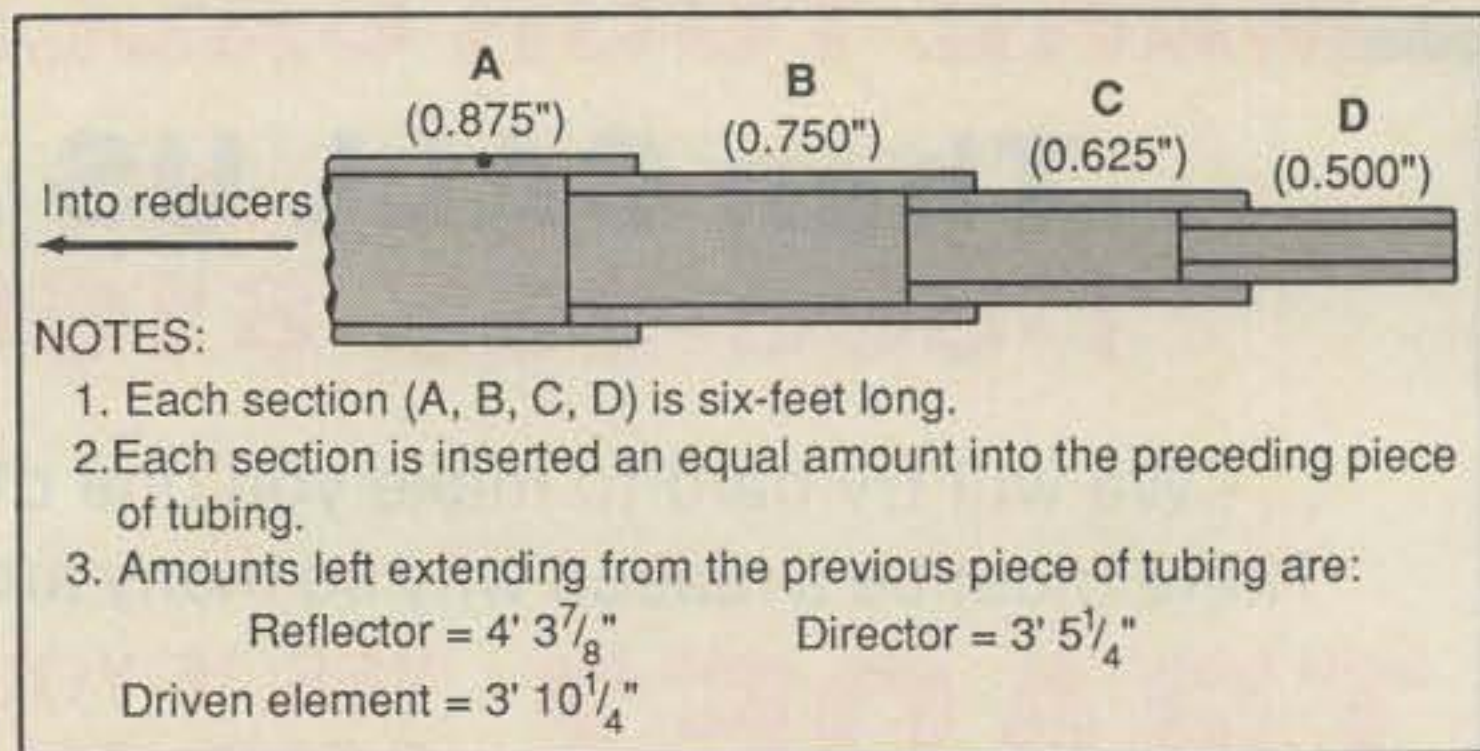
Fig. 7- Drawing: Outer tips of 2" sections of elements. 

Fig. 8- Drawing: Tapered tips of elements. 



Not-so-incidentally, all of the muffler clamps were taken to the local plater's shop and were given a heavy coating of cadmium. That caused them to bind, when nuts were attached, but a good application of WD-40® from a spray can freed things up. Alas, environmental concerns being what they are, our local plater was served with a new requirement to clean up his act to the tune of \$250,000 in new equipment. He only did \$30,000 in sales per year, so he closed down. I hope I can find a new plater, as I may want to build another antenna, someday.

### 30 lbs. Per dB

The completed beam weighs a bit over 200 pounds, I believe (about 30 pounds per decibel). When I could hold it over my head, a few years ago, the element tips hit the ground, so I estimate a seven-or-eight foot sag. From the ground, that isn't particularly apparent. In fact, the size of the beam is not very apparent.

One amateur braved the 50-mile drive from Dallas just to see the Flame Thrower he had heard about. He was most disappointed, as the beam seemed so small. However, after he had listened to the performance, he went away counting his pennies.

The astute reader may have noticed that the formulae are for broad-band design, rather than for peak gain. Scaling the beam to 144 MHz and checking on my "antenna range" showed gain of slightly under 7 dB at the low end of the band, decreasing to about 6 dB at the high end. (Note: Scaling a one-half inch element tip by 20:1 is difficult. Constant diameter elements were used, with appropriate revisions for L/D ratios. My antenna range has an accuracy approaching that of the antenna formulae.)

The beam does work well. Most stations are raised on the first call. Stuff like long-path JA at 3 PM CST, or Central Europeans in mid-afternoon is not unusual. At noon, stations on the east coast or the west coast are worked with S9 signal reports both ways. The antenna really is too high for outstanding results in the U.S. during hours of darkness. In the sweepstakes, for example, stations with 2-element short Yagis at 80 feet often beat me. I need another Flame Thrower at 80 feet for that arena. Unfortunately, the guying for the tower will not accommodate a full-sized 3-element Yagi at 80 feet.

Gerald, K5GW, of Texas Towers, is now erecting a 200-foot guyed Rohn 55 tower that will rotate. (He is using the rotating rings and bearings, etc., from Rota-

ting Tower Systems, Inc.). Currently he is planning to put two copies of the Flame Thrower at 200-and-80-foot levels, with a TH-28DX<sup>5</sup> in and around the big beams. Watch out for the Forty-Meter Flame Thrower, Mark II.

### References

<sup>1</sup> A considerable amount of discussion and correspondence have resulted between K5IU and me on the subject of the strength of the elements. My (initially) firmly held position was that one of the elements had been up for 14 years in all sorts of winds, icing, etc.; that the second had been damaged by my trying to run it through a guy wire; that the third (last element added) had been up for five years; and that that should prove the strength of the beam. Dick's response was to work out a computer program showing that my elements should not be strong enough to hold up under even a 70 MPH wind, if it had the additional "gust factor" that should be considered. I do know that normal mechanical construction standards include a 30 per cent factor for gust loading. The EIA standard contains a similar gust factor, so a 70 MPH rating would include the ability to handle gusts to 91 MPH.) Dick also worked out a program to improve the construction of the existing elements using the material currently employed, and then worked out yet another program showing a considerably improved method of element construction, using materials only moderately different from those I had used. The proposed material changes reduce stresses by about 25 per cent compared with those of the original design. Dick is working on some articles about stress on antenna elements, and will show some practical, optimized, designs. Gerald, K5GW, is converting Dick's program to a BASIC program and intends to join him in writing the first article on the subject. The proposed work should result in an invaluable addition to practical knowledge of element design for radio amateurs.

<sup>2</sup> Berger, J.C., W3MWC, "Forty-Meter Beam Hints," *QST*, February, 1968, p. 54.

<sup>3</sup> *Radio Handbook*, 22nd Edition, p. 29.7.

<sup>4</sup> *Ibid.*, p. 26.13.

<sup>5</sup> Mitchell, R.H., N5RM, "The TH-28DX," *CQ*, August 1986, p. 11.

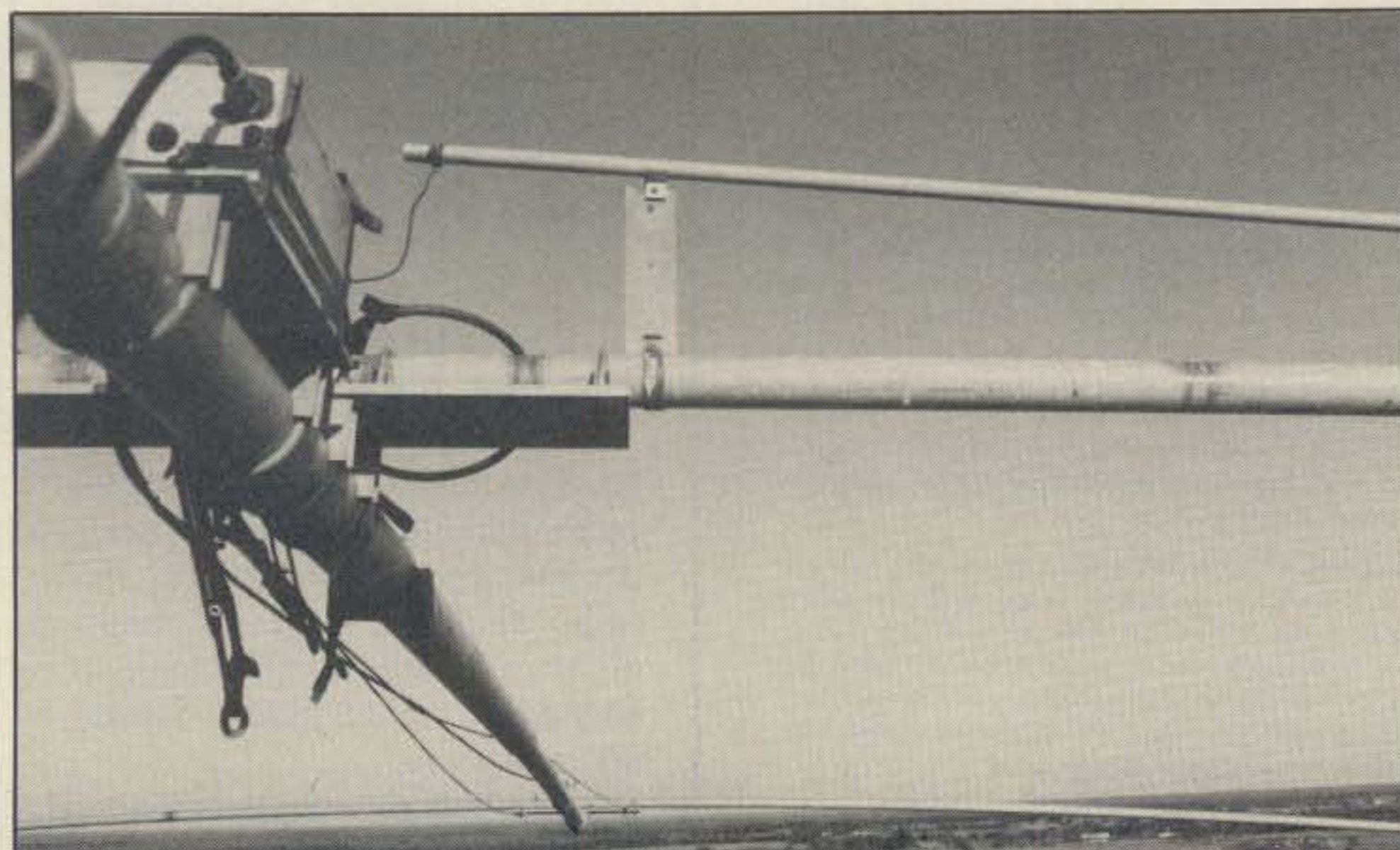


Fig. 9- Omega match with tuning box.

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# Novice Enhancement

## The New World of 10 Meters

### Part I

BY LEW McCOY\*, W1ICP

**W**ith the FCC changing the rules permitting new modes and adding frequencies for Novice operation (and some Technician privileges), a whole new world of amateur radio exists for Novices. This article will treat the features of 10 meters and what the newcomer can expect.

For myself, 10 meters has always been one of my favorites, if not my main choice. When I came on the air after World War II, I had what was then known as a Class B license, and the only low-band phone available for such a license was 10 meters. I started out chasing DX (foreign countries) and ended up being the first amateur in the world to work DXCC, 100 different countries all on 10 meters (all DXers like to brag and I am no exception). However, my point is a simple one: I have literally a world of experience with 10 meters, so I feel qualified to talk about the band.

In addition, I was Novice Editor for many years for *QST*. It is all history now, but I supported phone operation for Novices from the very inception of the license class simply because I felt that Novices should be exposed to the major forms of emissions used by amateurs so they could acquire experience. Novice Enhancement provides this opportunity. One more little item of "preaching" and then I'll get into the meat of the subject.

Good radio amateurs, those with acceptable operating techniques, exist primarily because they learn from experience. Whether we like it or not, we, the hams with experience, are the teachers. If you encounter Novices with bad operating procedures it is your job and my job



*How simple can a station be? Here is the ICOM 735 set up with a mike and a key. The coax lead goes to a simple dipole as shown in Fig. 1.*

to try to correct any bad habits. If we are gracious in doing so, we cannot help but improve amateur radio.

### Equipment: Receivers and Transmitters, or Transceivers

In the earlier days of amateur radio all hams built their own equipment—that included both transmitters and receivers! One would search long and hard to find an amateur who builds his own these days. In fact, I don't know of a single one. For many years there was a slightly less than complimentary term applied to those who bought ready-built gear. They were called "Appliance Operators." We all fit into that category today. Very, very few amateurs build their own receivers or transmitters these days. So aside from making antennas and small station ac-

cessories, what is available for the Novice today?

### Used Equipment—Good or Bad?

In the used market, I did much looking at the Dayton Hamvention this year and saw many tube-type transmitters and receivers. But I would be reluctant to recommend most of such equipment to newcomers unless they had an opportunity to test the gear before buying.

I did see many Collins S-line transceivers and also the Drake TR line of used equipment. This was good stuff in its day (and can still be), but they are tube types and tubes are becoming scarce (and expensive). One problem is that this type of equipment tends to get marginal in performance on 10 meters. However, it is possible to add solid-state preamplifiers

\*Technical Editor, *CQ*, 200 Idaho St., Silver City, New Mexico 88061

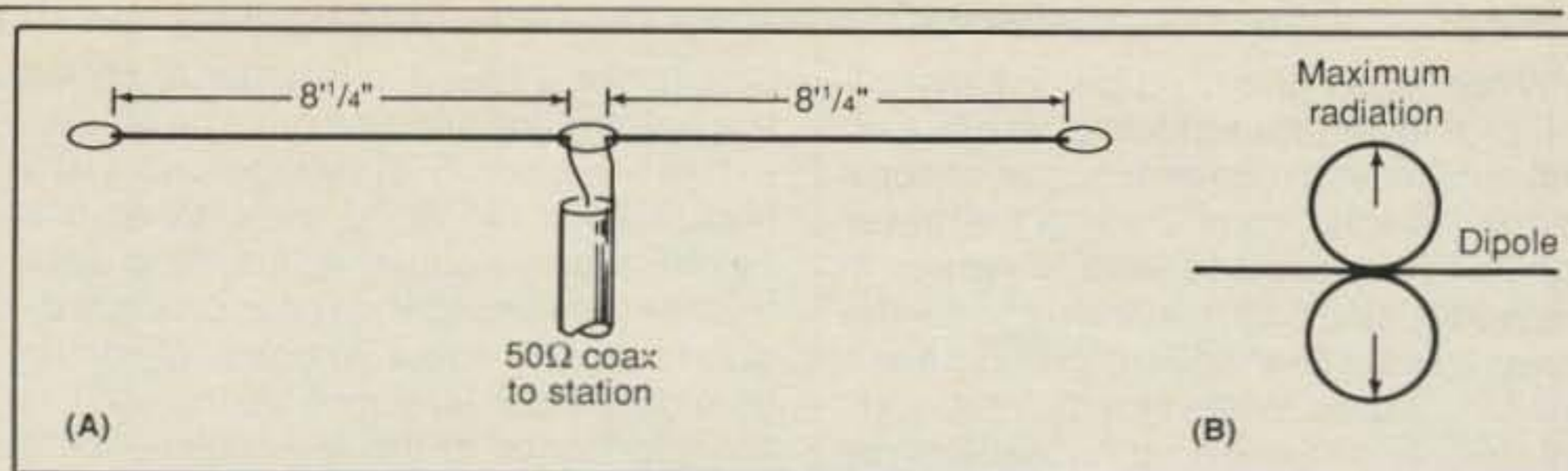


Fig. 1—The dipole consists of two equal lengths of wire fed at the center. The center separation should be about 1/2 inch. At B is the pattern of radiation from a dipole, two major lobes on each side of the plane of the wire.

(simple to build) to the receivers that will soup up reception.

My advice about buying this type of gear is to find an amateur who has been through the tube era and get his recommendations before buying. Also, I would certainly want to be able to try the equipment before investing. And this is certainly true of the early solid-state gear.

There are good buys to be had in these solid-state rigs of 10 or so years ago, but be sure to insist on a working test. At the Dayton Hamvention this year a story made the rounds of a ham who wanted to buy a used transceiver in the flea market (from a regular dealer) and insisted on trying it on AC. The dealer agreed, and when the unit was plugged in, you guessed it, clouds of smoke. As if this wasn't bad enough, the dealer insisted that he had made a mistake and so they tried another rig. True story—smoke came billowing out!

Since writing the above paragraphs I took in the Flagstaff, Arizona hamfest, an annual affair that draws about 3000 amateurs and flea marketeers. With this article in mind, I looked through the flea market for suitable Novice equipment that was available. There was much gear to be had that was excellent. Many solid-state transceivers were there for sale at relatively reasonable prices. In nearly every case, the seller actually offered a money-back deal if the equipment didn't work. And, in all cases, the offer was made to plug the equipment into nearby AC outlets to prove it would work.

Regardless of what I have just said, my recommendation is to have the advice of an experienced amateur when you buy. I would never say that the amateur radio seller would misrepresent his piece of gear (!), but treat buying used equipment like buying a used car.

### What To Buy—New, That is

If I were really pinned down, I would have to give equal praise to the three major Japanese manufacturers of transceivers—ICOM, Yaesu, and Kenwood—and likewise for our only American firm, Ten-Tec. As far as I can see from my own tests and observations, the sensitivities (the ability to detect signals) of these trans-

ceivers on 10 meters are all within a gnat's eyebrow of each other, regardless of the model.

Selectivity will depend on which model and which filters one orders. When 10 meters gets crowded with phone operation, and it will, you'll need what is known as a sideband filter in your transceiver. The filter acts like a window, permitting signals within the window to pass through but stopping any signals on the sides of the window. The most useful portion of a voice sideband signal is between 500 and 2500 cycles so you need to be sure you have this selectivity available. Usually the filter is specified anywhere from 2.1 to 2.7 kHz.

I recently did a product review of an audio filter called SuperSCAF which is an excellent filter for adding selectivity to any receiver whether old or new. This is a completely adjustable filter (panel controls) that will provide maximum selectivity for either phone or CW signals. The unit is a kit that is easy to put together and is available from AFTronics (see ads in CQ).

In most cases, the average Novice operating on 10 meters must end up buying a piece of equipment that covers many other bands besides 10 meters. This may appear to be a waste of money but it is not. Any Novice should always want to think of upgrading to have access to other bands. Even if you don't upgrade, sooner or later you will want a new rig. Having more than one band will increase the resale value of your rig. In addition, you already have CW privileges on many of these bands so don't be afraid to get your feet wet on CW.

I think I would also recommend a transceiver that includes a general-coverage receiver simply because it is such a useful adjunct. These are especially useful for checking WWV and the solar flux conditions—more on that in a moment.

Shown in the station photograph is the ICOM 735 transceiver, which is *one of many* that I have used and *one of many* I would recommend highly. This transceiver has a general-coverage receiver covering from below the broadcast band up through and including 30 MHz. The unit comes with a 2.3-kHz filter, which is plenty of selectivity, and even more selective



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filters are available. The sensitivity (ability to hear signals) rates right at the top, as good as any other transceiver on the market.

Transmitter power of the 735 is 200 watts input. What is probably more important than anything else is that all modern transmitters, the 735 included, do not require any tuning adjustments. In other words, when you go to "Transmit," and assuming your antenna load impedance is in the vicinity of 50 ohms, tune-up is automatic.

You can run any level of power up to 200 watts input by merely adjusting the output control. (Output power on CW will be about 100 watts with SSB peaks in the same range, but that is another article.) Included in the unit is a standing wave bridge (SWR) for measuring the SWR. In other words, the ICOM 735 has everything but the kitchen sink built in. All one needs to add is an antenna to start making contacts.

## How Much Power?

The Novice power limit is 200 watts PEP (peak envelope power). However, practically all of the transceivers available today are rated around 100 watts PEP so running too much power is not a problem. The important point here is that high power is *not* required or even needed on 10 meters.

When 10 is "open," either via sporadic-E or F-layer propagation (and more on that subject in a moment), signal absorption is minimal compared to the lower bands. It is possible to work anywhere in the world using only a relatively few watts (sometimes a few milliwatts) and have a booming signal. When I mentioned working 100 or more countries earlier, my power *input* was about 50 watts! So you don't need expensive power amplifiers to get the job done.

## Antennas

As a newcomer will soon find out, the most important part of your station will be your antenna system. And, the antenna system can be thought of as the transmission line, its fittings, the antenna itself, and a Transmatch or antenna tuner. Let's discuss feed lines first.

My guess is that 95 percent of all amateurs use coaxial type feeders. And of that number, a large percent use the RG58/U, a 50-ohm impedance type. Let me say a word or two about impedance. The impedance of an antenna consists of three items. These are Ohmic resistance, radiation resistance, and when the antenna is not in resonance, reactance.

Ohmic resistance is the actual DC resistance of the metal conductors in the antenna and is usually a very small number or part of the impedance. Any of your power fed to the antenna that is used up by Ohmic resistance is simply dissipated as heat. It is a part of your signal that is lost.

Radiation resistance is the useful part of the impedance and it is the feed part of the antenna that accepts the RF energy and permits the antenna to couple this energy into space (and makes you all those nice contacts!).

Reactance exists in the impedance when the antenna is not resonant. Reactance is not a "real" resistance in that it doesn't dissipate power. However, it hinders the flow of power into the antenna and we must make compensation for the reactance in order to put power into the antenna.

A simple antenna for 10 meters is a common one-half wavelength long dipole. The dipole can be made from wire or tubing. A drawing of such an antenna is shown in fig. 1, and the dimensions given are for the Novice portion of 10 meters. The dimensions for a dipole are determined by dividing 468 by the desired frequency, in MHz, and the answer will be in feet. For 28.4 MHz, using the formula, the answer is 16.48, or 16½ feet over all.

$$\frac{468}{28.4} = 16.48, \text{ or } 8'3'' \text{ per leg}$$

The dipole has a very pronounced pattern of radiation. There are two lobes, one on each side of the plane of the wire more

or less like a figure 8. In order to obtain this pattern, the antenna must be at least a half-wavelength above ground (16.5 feet in the case of 10 meters). At this height, the newcomer will quickly learn that the feed impedance of an ordinary dipole is usually about 70 ohms. (And, the impedance we have been talking about is the impedance at the feed point, where the feed line is attached.)


I have found that Novices show considerable concern about the mismatch using a feed line that has 50 ohm impedance to feed a 70 ohm antenna. Feeding a 70 ohm dipole with 50 ohm line would result in a mismatch or standing wave ratio of 1.4 to 1. (The mismatch of SWR is determined by dividing the impedance of the feed line into the impedance of the antenna. In this case, 50 into 70, or 1.4 to 1.) Believe me, don't concern yourself with such a small mismatch—it isn't worth the worry! Modern transceivers will work very nicely with this load. The commonly available coaxial lines are 50 ohms, and that is what we use.

## However—But . . . .

Many newcomers, and old timers for that matter, do not take into consideration the amount of losses when using RG-58/U on 10 meters—and they can be appreciable. RG-58/U has a loss of 2.5 decibels per 100 feet on 10 meters. How much is 2.5 dB? The loss is just slightly less than 50 percent of your power! In other words, if you were running 100 watts output and had 100 feet of RG-58/U, only about 55 watts or so would reach the antenna. The rest would be dissipated as heat in the line! This much loss you *know* you will have. Poorly made coaxial fitting connections can add much more losses. So what is the answer to avoid these losses? By the way, these losses increase with the operating frequency. You don't even want to know how much power you'd lose in 100 feet of RG-58/U on 220.

RG-58/U is the least expensive of the coaxial cables but I have always believed that it is a false economy to use the line, particularly for runs of over 25 feet. A much lower loss line, 0.9 dB per 100 feet, is RG-213/U. It sells for about 30 cents per foot, and it is what I would recommend. RG-8/X is fair, with a loss factor of 1.2 dB per 100 feet at 10 meters. It costs about 20 cents a foot. In any case, it is false economy to try to save a few dollars when buying your feed line.

As I just said, a mismatch of 1.4 to 1 is not worth considering. You'll find that a 10-meter antenna that covers the Novice portion of 10 meters will provide at least this good a match or better. A 10 meter antenna for the Novice will have a wide enough bandwidth so that any mismatch is no problem. More on the subject of antennas in Part II.



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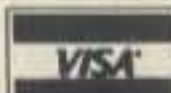

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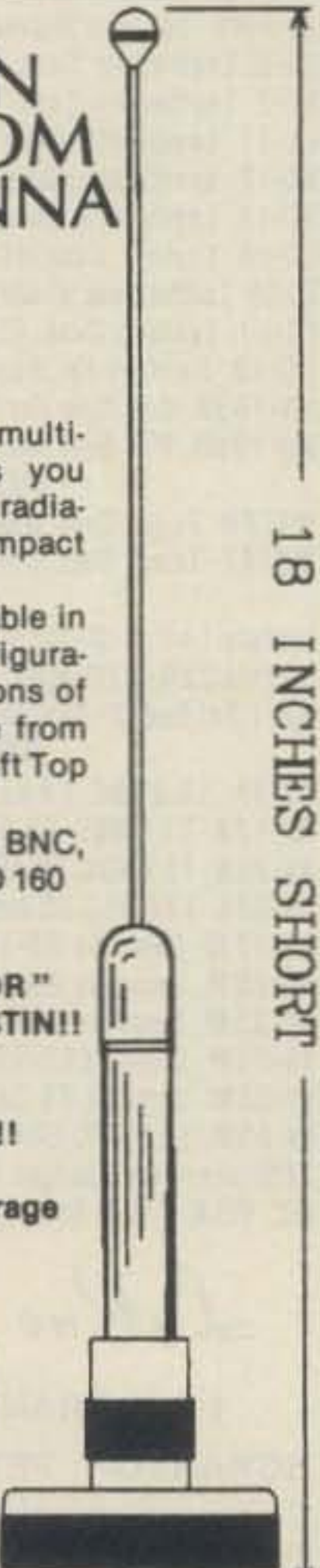
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# CQ REVIEWS:

## The F9FT Tonna 50/5, 5 Element Six Meter Beam Antenna

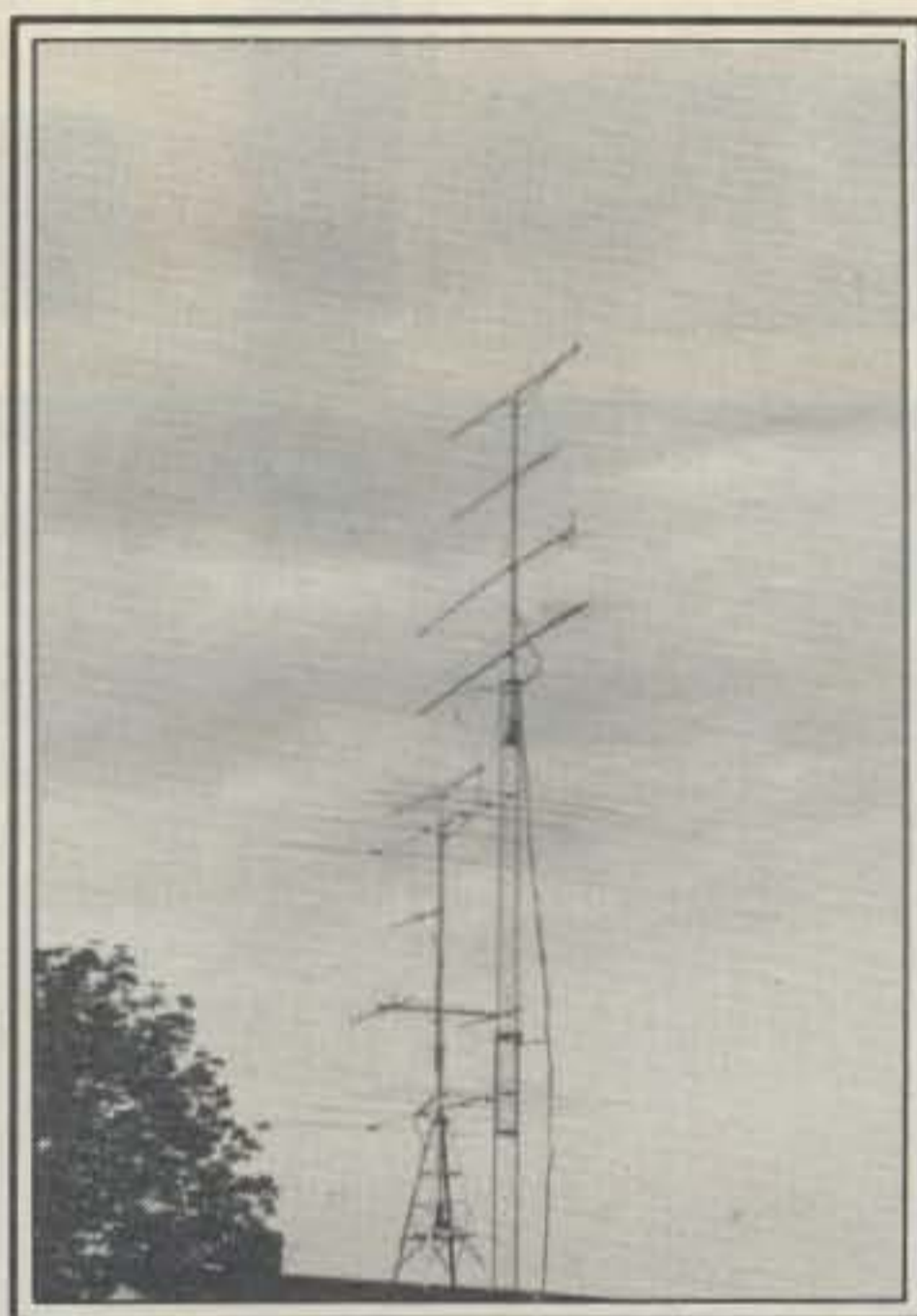
BY STEVE KATZ\*, WB2WIK

I picked up two Tonna 50/5 six meter beams from their importer, The PX Shack, months ago in hopes of erecting them before the big summer E-skip season (May-August) this year. As usual, Murphy stepped in the way of my plans and I didn't get to erect these fine antennas until early September: too late for the big E-skip season, but just in time for the VHF QSO Party!

Upon inspecting the Tonna 50/5 published specifications, I was just a bit disappointed that the manufacturer chose such a short (.57 wavelength) boom for their new six meter beam. It couldn't have much gain with this boom length, nor would its main lobe be very sharp. Indeed, Tonna rates the antenna forward gain to be 10.0 dBi, with a 45-degree-wide main lobe (E plane, -3 dB points).

I decided to stack a pair of these antennas, rather than use one longer Yagi which would have about equal gain. This was an attempt to reduce the vertical radiation angle while causing my rotator almost no start and stop resistance (and zero weight load, because I intended to use a thrust bearing). Besides, the wide horizontal lobe might be useful for general operating. Lack of critical beam steering might give me more time to concentrate on really listening for weak signals.

As is typical of their products, these Tonna antennas came well packed and totally complete, with precisely the amount of hardware indicated by the accompanying parts list (this includes a couple of spare nuts, which are on the list). All hardware is metric and stainless steel. The U-bolts, which mount the antennas to their support mast, will accept up to  $2\frac{1}{16}$ " (54 mm) mast diameter. This is a real plus, because I seldom use support masts less than 2" outside diameter.



*The pair of 50/5 Tonna Yagis are installed above an Alinco 6'6" tall roof tower on 16" of 2" diameter pipe. In the background is the WB2WIK main crank-up tower, supporting Yagis for 144, 220, 432 and 1296 MHz. More towers are in the works (shhh—don't tell the neighbors!)*

Many other commercially made antennas must be modified to accommodate such large material.

As with other F9FT products, assembly is simplified by the use of prefabricated element brackets held captive to the square boom material by wing nuts. With the six-meter beams, each element is supplied in two equal-length sections of aluminum tubing that are inserted into molded element mounting brackets, which at first appear to be insulators. I could understand using an insulator for the driven element, but why insulate the

parasitic elements? And why insulate the half elements from their mates?

Closer inspection reveals the answers. The molded mounting brackets are designed and fabricated in two very different ways: one way for the driven element, and another way for the parasitic elements. The parasitic element mounting brackets have an aluminum insert molded into each assembly. This insert electrically shorts the two element halves together, and also connects them to the mounting screw which affixes the bracket to the boom. Thus, the antenna is designed as a conventional Yagi with a conductive boom to which the parasitic elements are electrically bonded.

The driven-element mounting bracket is truly an insulator, serving to isolate the two element halves from each other as well as the boom. A small, rectangular molded plastic box snaps open to allow access to the feedpoints and shuts to form a weatherproof enclosure. This is all well detailed in the printed instructions, which use graphics more than words to describe antenna assembly.

Final assembly of the 50/5 is pretty foolproof. Even the boom sections cannot be misjoined, and Tonna provides little hints like a red-colored boom end-cap on the "front" end of the antenna and a black-colored boom end-cap on the "rear" end. The short boom appears strong enough to support itself in any kind of weather. But Tonna uses a second, parallel boom above (or below) the main boom, for additional support, with both booms clamping to the support mast. I cannot envision any circumstance under which this antenna would be overstressed by environmental conditions.

I did not care much for the design of the feedpoint connections. A pair of metal clamping mechanisms pinch the outer conductor (braid) of the coaxial feedline. Tonna provides a solder point for the center conductor.

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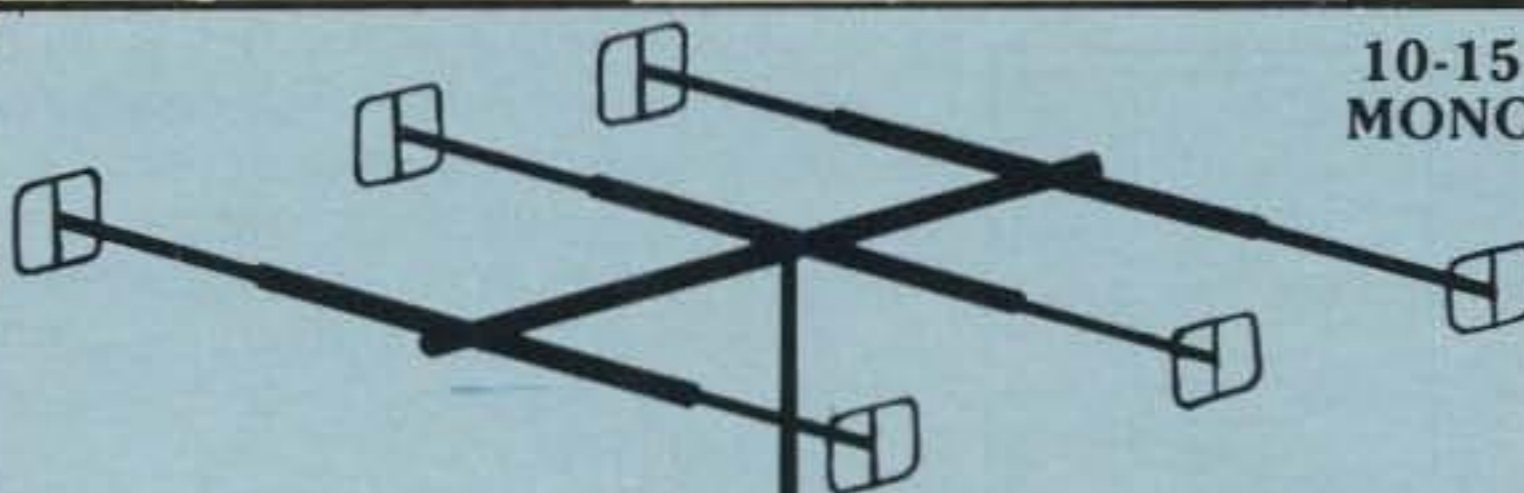
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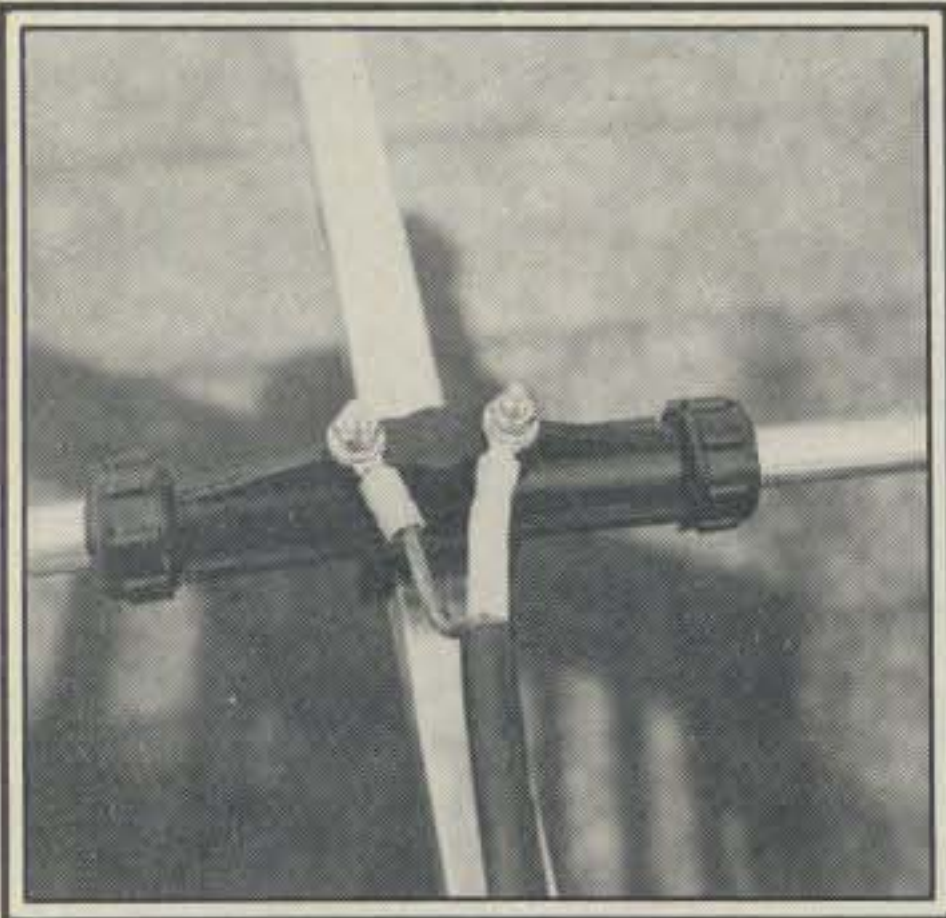
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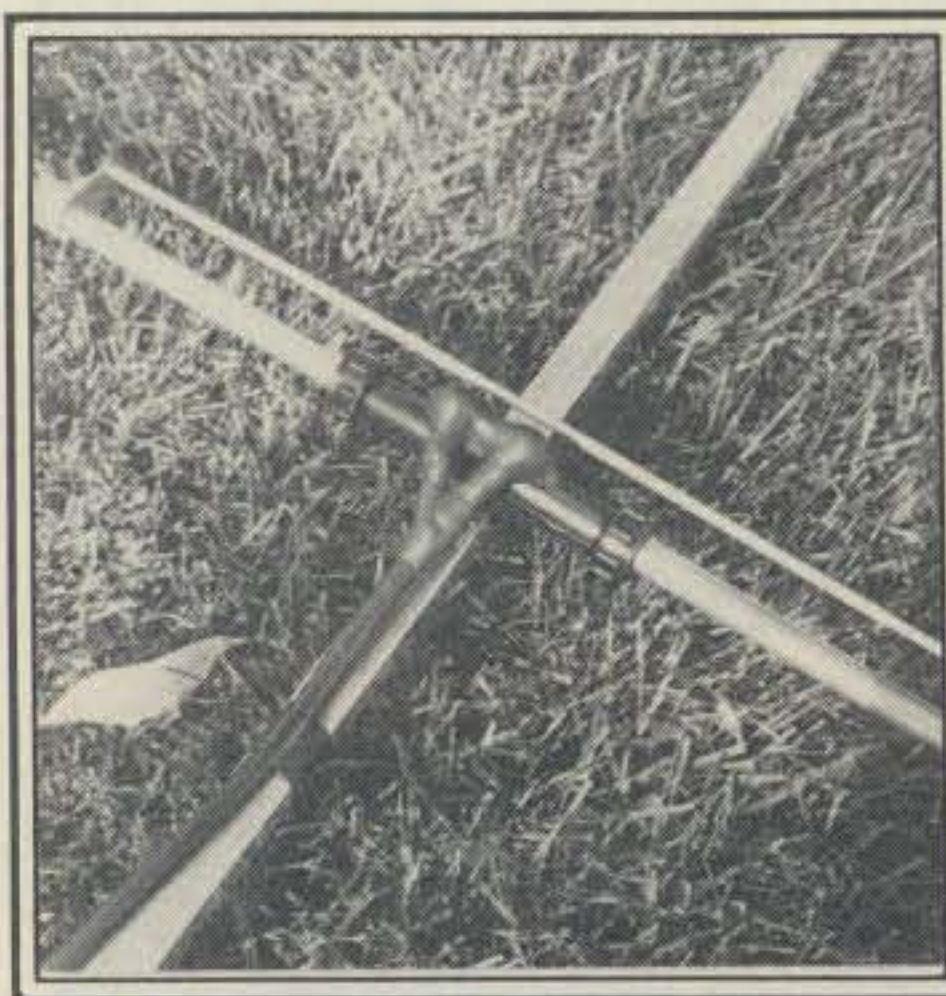


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Detail of WB2WIK modification of 50/5 Tonna Yagi feedpoint, showing feedline connections directly to metric studs as described in the text.



Detail of the 50/5 Tonna Yagi feedpoint, showing feedline and stud attachment points covered by "Coax Seal" weatherproof putty. The "beta match" rod is now installed and properly centered.

I removed the little molded enclosure, the metal clamps and so forth, leaving a pair of hefty metric threaded studs protruding from the molded element insulator bracket. I connected the center and outer conductors of my feedlines to the studs. Using the original metric nuts, I attached the conductor with "good old fashioned" closed-loop solder lugs and flat washers. A close-up view of this assembly is shown in the accompanying photograph.

To weatherproof the feedpoint, I applied a lot of "Coax-Seal" waterproof putty, formed to the shape of the conductors, the studs and the insulator bracket. I feel quite certain this is a weathertight installation, and I'm very sure about the integrity of the coaxial cable connections (now).

The driven element feed system is rather unique; Tonna refers to the matching device as a "beta match," but it is unlike the "beta match" used with Hy-Gain antennas. What it appears to be is a modi-

fied version of the "L"-match used on some two meter beams years ago. No coaxial (or other) balun is supplied or employed. Yet, for its magical appearance, the feed system works well. It achieves a nearly perfect VSWR with no field adjustment if the assembly instructions are carefully followed.

Although the instructions are not specific about the location of the shorting bars (called "beta match contact clamps") on the beta rod, it seems the optimum location for them is right at the very ends of the rod. By locating these clamps as stated and precisely centering the "beta rod" per the instructions, my antennas each achieved a very low VSWR without further adjustment.

I fabricated a two-way coaxial power divider of  $\frac{1}{4}$ -wave sections of RG11/U 75-Ohm cable, adjoining  $\frac{1}{2}$ -wave sections of RG8A/U 50-Ohm cable which connected to the driven elements. It would have been easier to use  $\frac{3}{4}$ -wavelength sections of RG11/U and eliminate the RG8A/U extensions completely, but I didn't have enough of the 75-Ohm cable handy. In any case, Antennes Tonna, who offers 2- and 4-way power dividers for all bands above 144 MHz, does not offer one for 50 MHz (nor does anyone else I know of). If you choose to stack antennas for six meters you'll probably have to fabricate your own, too. My divider, which was carefully measured then grid-dipped to confirm resonance at 50 MHz, worked flawlessly.

The completed installation of two 50/5 antennas stacked with 12' ( $\frac{5}{8}$  wavelength) spacing offers better than expected performance. The VSWR is astonishingly low. With 750-W forward power, the reflected power reads "zero" with my 1000 W Bird element, and barely above zero with a 25 W element. I'll call this 1.1:1 for lack of better resolution; it's a great match by any standard.

I installed (with considerable help from Pete, KT2B) the pair of 50/5 yagis on a 16' length of 2" diameter  $\frac{1}{4}$ " wall aluminum tubing (6061T6 "Hollowbar"). Just atop the upper 5 element beam is a 23-element F9FT Yagi for 33 cm. Between the two six-meter antennas are a 4-element KLM Yagi for 146 MHz (vertically polarized) and a pair of 7-element Cushcraft Yagis for 223 MHz (vertically polarized) mounted on a one-wavelength crossarm.

The mast is secured with a thrust bearing mounted in the top of an Alinco 6'6" tall four-legged roof tower, and a Ham-M rotator turns the whole affair. In my installation, the lower 5 element beam is 35 feet above ground and the upper beam is at 47 feet. Despite their proximity to both ground and the higher frequency antennas, the stacked 5-element beams work well.

During the September VHF QSO Party, I made numerous contacts on six meters via meteor scatter with little difficulty. On

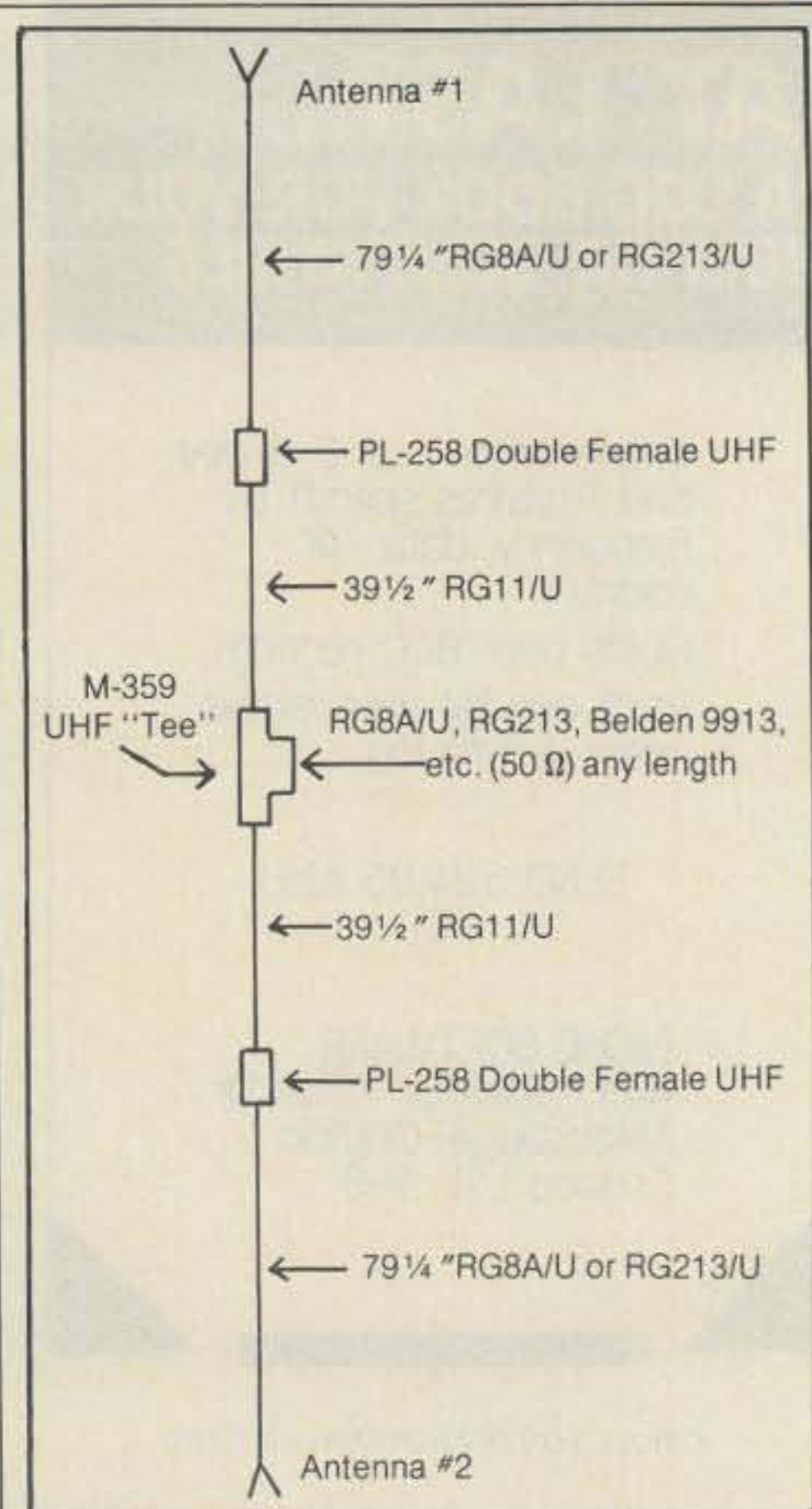


Fig. 1— Suitable power divider for stacking two 50-MHz antennas (see text). Note: antenna phase (polarity of feedpoint) must be observed.

several occasions, the station worked took time to remark about my unusually strong signal. After working WB2OTK/4 in SC, Rich called me on the telephone to say "Boy, are you loud! What are you running?" I was only running 750-W PEP output, about 3 dB shy of the legal limit, with my 4-1000A barely driven by my Microwave Modules MMT50/28 transverter. Other operators contacted on six meters during and after the contest appear in agreement that the stacked system is working up to par. I often hear that my signal is competitive with anyone in NJ. This, frankly, is pretty amazing for a pair of little 0.57 wavelength Yagis. I wonder what a four-bay would do?

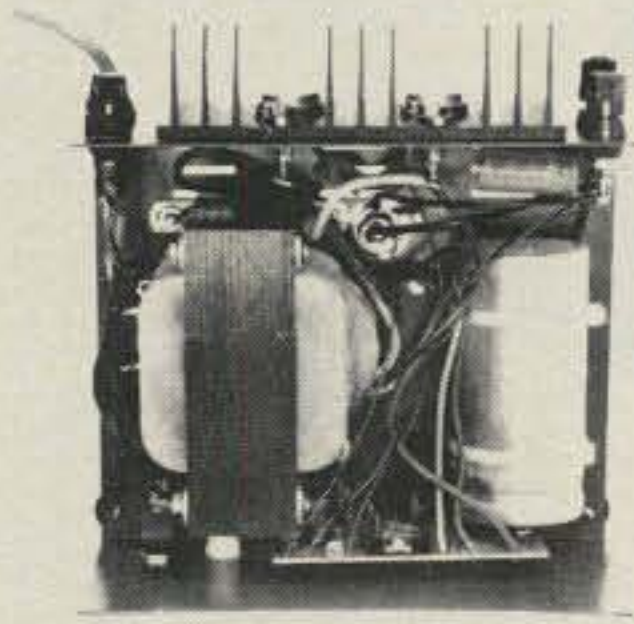
As you can tell, I'm well pleased with the 50/5 antennas. To round out the discussion: Each 50/5 weighs 14 lbs. and has an approximate wind load of 36 lbs. at 100 mph wind speed, when installed for horizontal polarization. The manufacturer rates the antenna's front-to-back ratio as 23.8 dB "average diffuse radiation," or 30 dB E-plane only. The 50/5 is rated for 1000 Watts maximum acceptable RF power.

The Tonna 50/5 six-meter antennas are imported by The PX Shack, 52 Stonewyck Drive, Belle Mead, NJ 08502 and are available directly from the importer or from franchised distributors.



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- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD
- ONE YEAR WARRANTY • MADE IN U.S.A.

### PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- Also available with 220 VAC input voltage



MODEL RS-50A

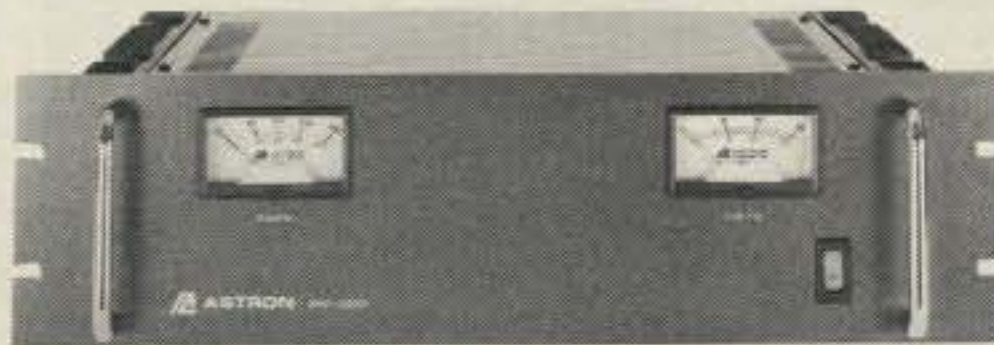


MODEL RS-50M



MODEL VS-50M

### RM SERIES



MODEL RM-35M

### 19" × 5 1/4" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5 1/4 × 19 × 8 1/4	16
RM-35A	25	35	5 1/4 × 19 × 12 1/2	38
RM-50A	37	50	5 1/4 × 19 × 12 1/2	50
• Separate Volt and Amp Meters				
RM-12M	9	12	5 1/4 × 19 × 8 1/4	16
RM-35M	25	35	5 1/4 × 19 × 12 1/2	38
RM-50M	37	50	5 1/4 × 19 × 12 1/2	50

### RS-A SERIES



MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A	2.5	3	3 × 4 3/4 × 5 3/4	4
RS-4A	3	4	3 3/4 × 6 1/2 × 9	5
RS-5A	4	5	3 1/2 × 6 1/8 × 7 1/4	7
RS-7A	5	7	3 3/4 × 6 1/2 × 9	9
RS-7B	5	7	4 × 7 1/2 × 10 3/4	10
RS-10A	7.5	10	4 × 7 1/2 × 10 3/4	11
RS-12A	9	12	4 1/2 × 8 × 9	13
RS-12B	9	12	4 × 7 1/2 × 10 3/4	13
RS-20A	16	20	5 × 9 × 10 1/2	18
RS-35A	25	35	5 × 11 × 11	27
RS-50A	37	50	6 × 13 3/4 × 11	46

### RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4 1/2 × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10 1/2	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13 3/4 × 11	46

### VS-M AND VRM-M SERIES



MODEL VS-35M

- Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps)			ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
	@13.8VDC	@10VDC	@5VDC			
VS-12M	9	5	2	12	4 1/2 × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10 1/2	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13 3/4 × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5 1/4 × 19 × 12 1/2	38
VRM-50M	37	22	10	50	5 1/4 × 19 × 12 1/2	50

### RS-S SERIES



MODEL RS-12S

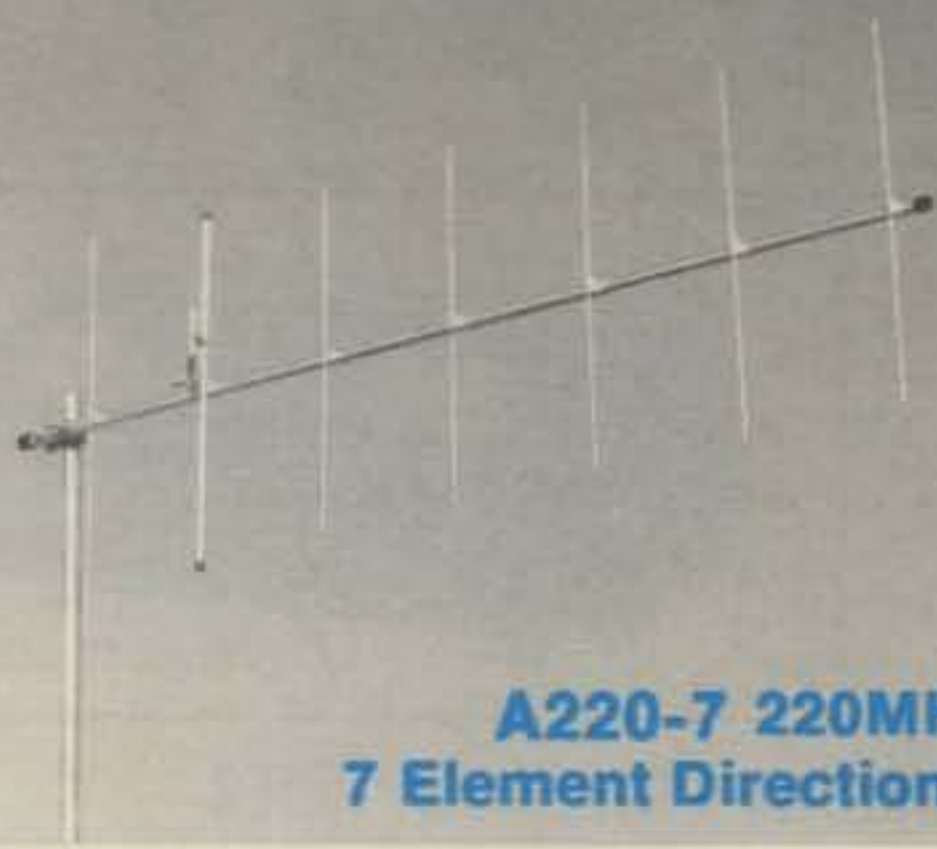
- Built in speaker

MODEL	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	5	7	4 × 7 1/2 × 10 3/4	10
RS-10S	7.5	10	4 × 7 1/2 × 10 3/4	12
RS-12S	9	12	4 1/2 × 8 × 9	13
RS-20S	16	20	5 × 9 × 10 1/2	18



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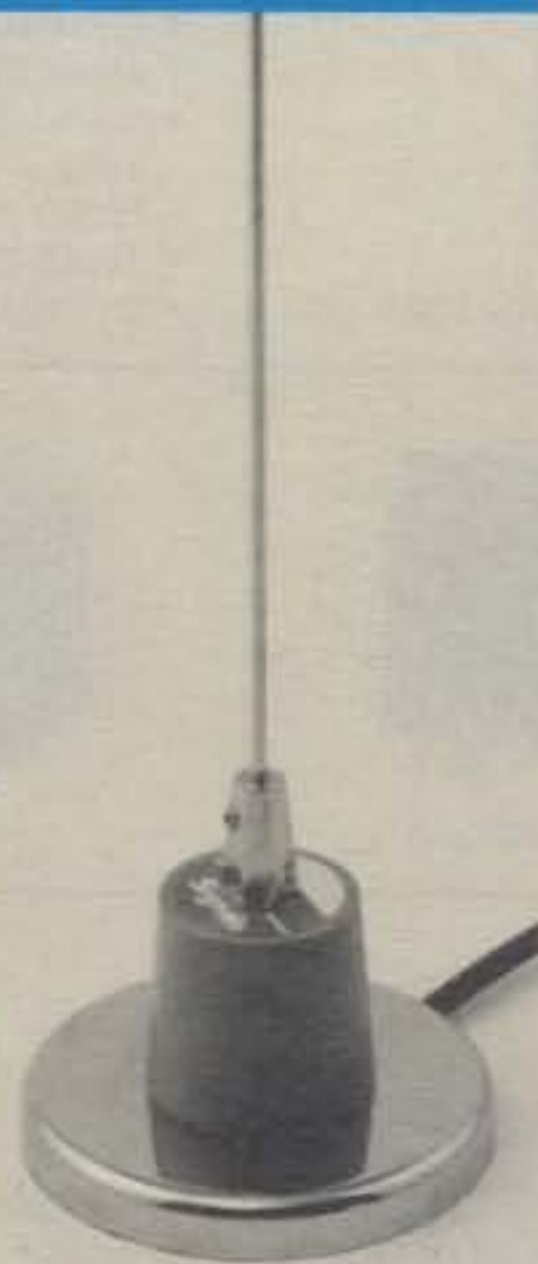


**A220-7 220MHz  
7 Element Directional**

**ARX-220B**



**220MHz  
Omni-Base**



**CS-220  
220MHz Mobile**



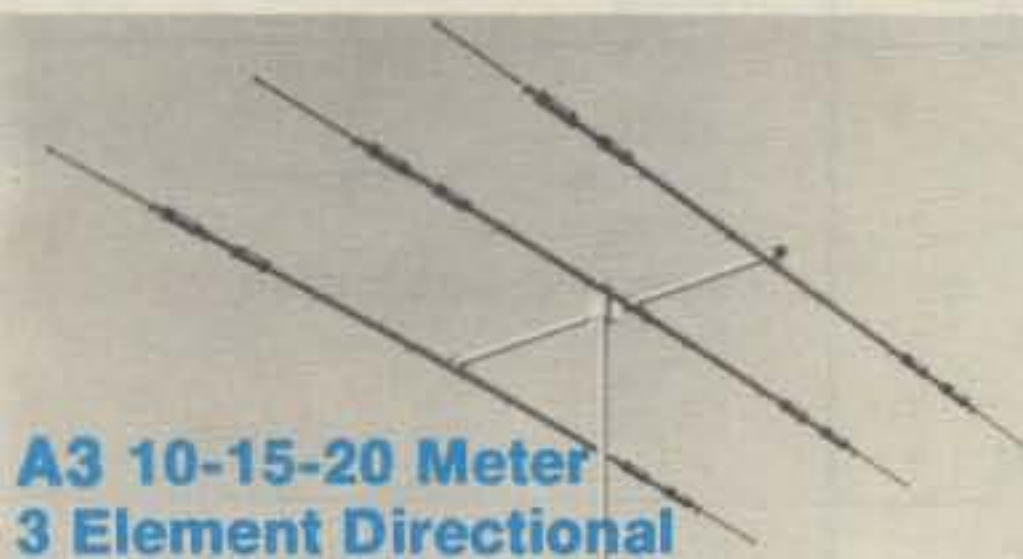
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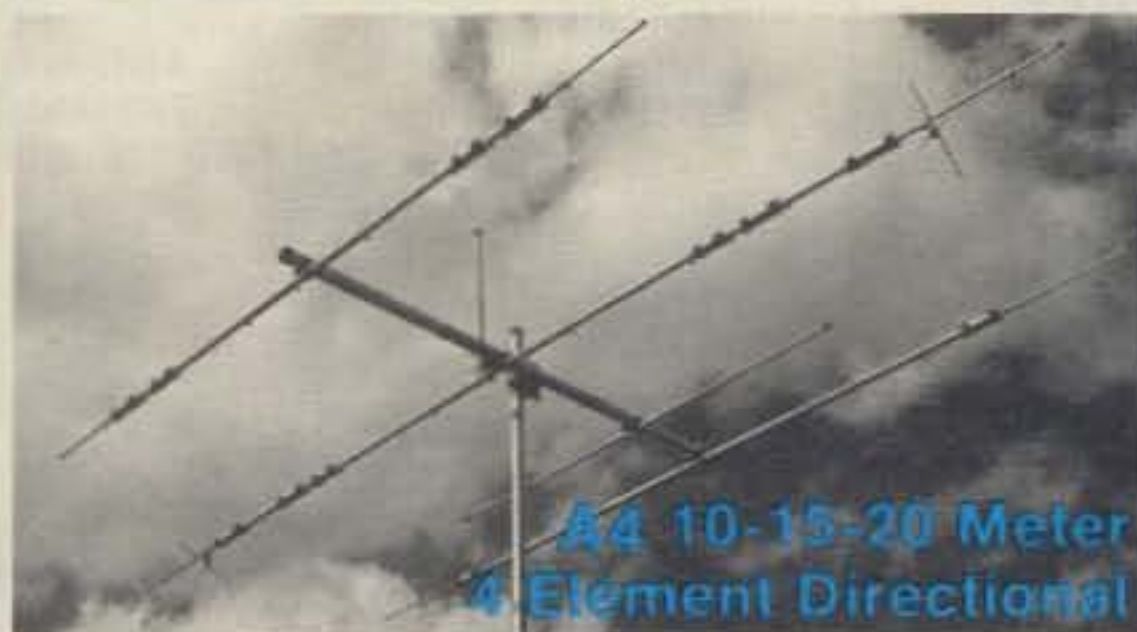
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- Turning Radius 15.5ft

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*Works absolutely great! . . . Bob N1EKP*

*Thanks for a fantastic antenna . . . Jeff KA8TKC*

*The antenna went together quickly without missing or left over parts. Nice job of packing! . . . Ray KE7RO*

*A fine antenna! . . . Joe KA3MMJ*

*The beam performed very well under rugged conditions. Over 13,000 contacts were made and 142 countries . . . Navassa Expedition 6Y5NR*



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***It's a circuitous route (pardon the pun) that gets us where we are in amateur radio. KA2VXM relates his odyssey below.***

## **From Hot Dogs To Ham Radio**

BY ALAN GLASSER\*, NY2G

I always fooled around with "electronics" when I was a kid. The first electronic project I ever built was an electronic hot-dog cooker consisting of two nails attached to the end of an old electrical cord. The idea was to wrap each of the bare ends of the wire around a nail and then insert one nail into one end of a hot dog and the other nail into the other end. Plug the whole affair into an electrical outlet, and in about three minutes the hot dog would be sizzling.

Those were the best hot dogs I ever tasted, and my mouth still waters whenever I think of them. I also know now how foolish I was to be playing with 110 VAC in such a precarious way, and I do not suggest anyone try it. There are much more simple ways to get "involved" with electronics.

The amateur radio bug bit me when I was 12 years old and going to summer sleep-away camp in Monroe, New York back in the late 1960s. There was a special program which included a full-time amateur radio operator/counselor. His ham shack was right next to my bunk house. The first time I went into his shack I knew that amateur radio was for me! There sat a 6 foot high, 19 inch rack with all sorts of electronic stuff bolted to it. Tubes glowed a warm golden yellow and sometimes a bright cherry red. Strange noises came billowing out of a speaker with a torn cone. And there were wires leading every which way. One of those wires led to a big pole which swayed precariously in the wind above the shack's roof. I know now that the pole was a trapped vertical.

I don't remember the amateur's name (and if he's reading this article maybe he'll contact me), but I do remember that he always wore worn-out patched jeans. Upon questioning his dress code, I received my first lesson in amateur radio. His comment was: "Hams spend money on equipment first, jeans last." To this day I usually operate in my oldest, most comfortable, worn-out blue jeans, with my knees and pockets exposed. I guess I learned my first lesson well.

My second lesson in amateur radio was how to receive and send Morse code. I purchased a code practice key that used a "D" cell battery and had a

buzzer built in. I still have that key today. Within three days I discovered how to "get on the air." By attaching a length of wire to one side of the buzzer contact and another wire to a ground, I invented my first "buzzer" transmitter, which was transmitting across the entire AM broadcast band on portable radios up to 100 feet away. Some of the other campers and I would conduct regular QSOs by sending to each other after we wrote out the message in dots and dashes on a piece of paper. Copying was another story. Fortunately, those old buzzer code-practice keys are not available anymore. "Spark Gap" transmission is illegal, and the tone was definitely harsh for learning Morse code.

Sadly, my amateur days ended when camp ended. But not forever.

I continued with my electronic experimentation. Warren Street, Green Street, Cortland Street, Canal Street, and most of "Radio Row" in downtown New York City were often frequented by me. For most of you younger readers "Radio Row" was gobbled up by the World Trade Center. What a loss.

Hot-dog cookers were small-time stuff compared to some of the more advanced Teslor Coils, Jacob's Ladders, and super-regenerative receivers built over the years from parts gathered on Radio Row.

In the fall of 1984 I noticed a strange-looking license plate on a friend's car: "Are you a ham?" I asked. "Yes" was his reply. "Ooh, I always wanted to be a ham. Would you give me the Novice test?" The next day I went out and bought a copy of *Tune In The World With Ham Radio*. Within six weeks I picked up the code again and passed both the code and written tests, sent in the forms, and anxiously awaited my ticket from the FCC.

It came! I was a ham! Only 25 years after I was first bitten by the bug. KA2VXM. Let's see, dah-di-dah di-dah di-di-dah-dah-dah di-di-di-dah dah-di-di-dah dah-dah. That wasn't so hard. I practiced it over and over.

My station consisted of an old Knight Kit R100 receiver and a T150A CW/AM transmitter that I had had since I was a kid. The antenna was a hastily installed 40 meter dipole between the TV antenna mast and the telephone pole in the backyard. A knife switch transferred the antenna between the receiver and the

transmitter. In front of the equipment I neatly organized paper, four sharpened pencils, que sheets, frequency chart, "Q" codes, and just about everything else needed to make my first contact. After a couple of weeks experimenting with the transmitter (if dummy loads could only talk) and listening around, I decided to call CQ. No answer. I returned a couple of CQs. No answer. Humph! Something must be wrong. Better check out everything.

Now you might be thinking that the first contact I made was on this setup. Wrong! As in many instances in life, the best comes unexpectedly. It just so happened that I had purchased a used Heathkit HW-8 in "mint condition" through the Ham-Ads in *QST*. When it arrived I found out that the word "mint" can also mean "any various aromatic plants whose leaves are used..." This particular HW-8 was not aromatic. It stunk! The tuning capacitor was broken, there were some bad solder joints, and the case was well weathered. *Caveat Emptor*. Some careful work on the service bench and some replacement parts from Heath and I had it up to par. (That HW-8 now performs like a charm and is my favorite vacation rig. Just wish I had built it from scratch.) "Okay, Alan," I said to myself, "before you put the cover back on tune through the bands and see how it sounds." Forty meters, fine; 20 meters, fine; 15 meters... Holy cow! A CQ and it sounds like it's coming from down the block! Better hit the key. See if the OM can copy me. KA5GCB KA5GCB DE KA2VXM KA2VXM KA2VXM. He came back. Now what? Everything I had prepared was in the other room. The HW-8 was attached to my head by the earphones and I couldn't hear without them. I picked up a pencil from the workbench and began to copy. At least I thought I was copying (today I can hardly read a word of what I wrote down).

Now it was my turn. What was I supposed to say? Damn it! All that preparation was in the other room! I didn't want to sound like a Novice. After all, I'm 36 years old. Well let's give it a try anyway....

By the time my first QSO was over I suffered all of the symptoms of "Hamafirst-yeest." Sweaty palms, confusion, disorientation, euphoria, and a big grin from ear to ear which could only be rivaled by

\*2133 66th St., Brooklyn, NY 11204

Cheshire Cat. When I recovered, I quickly ran up the basement steps to tell my family what had happened.

My wife greeted me with "Oh, that's nice. Are you ready for lunch yet?" My six-year old daughter asked, "How come he didn't call you on the phone?" Call me on the phone? Lunch? The world was at my fingertips! Have to get back down to the basement! CQ CQ CQ DE . . . .

By the spring of 1985 I passed the Advanced class test under the new VEC program and received my Advanced ticket shortly thereafter.

I had only had time to make about one contact a week since I received my license and didn't have time to participate in the Novice Round-up. But I did join a

couple of local clubs to gain some much-needed experience. In the beginning of June the members all started talking about Field Day and passed around pictures of past Field Days.

Then it hit—"contest fever!"

Having missed the Novice Roundup, I was not about to miss Field Day. I donated a portable generator and a Saturday morning to the Kings County Repeater Association in Brooklyn, New York. They used the Field Day call of K2GJ. I helped them get set up that morning, but my heart was set on working my own home station since I had just bought a Kenwood TS-430S and had never had it on the air using a mic.

When I returned home, I fired up my

second portable generator and generated a little audible QRM and QRN for my neighbors.

When Field Day was over, I wondered if I would ever get bored with amateur radio. Not at all. I realized that the end is not in sight. I passed my Extra class test on September 9, 1986, and CW and phone are just the beginning. RTTY, SSTV, ATV, satellites, AMTOR, Packet, microwaves, computers, contests, DX, nets—there are all kinds of things for a "kid" my age to do!

Seems like all this writing has made me hungry. Guess I'll pop a hot dog into my 28 MHz cavity hot-dog cooker and fire up my 2 kilowatt linear. Boy, do those hot dogs taste great! Di-dah di-dah-dit.



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**IC-761**

HF Equipment	List	Juns
IC-761 New Top Of Line	\$2499	Call \$
IC-735 Gen. Cvg Xcvr	999.00	Call \$
IC-745 Gen. Cvg Xcvr	1049.00	Call \$
IC-751A Gen. Cvg. Xcvr	1649.00	Call \$
IC-575A 10m/6m Xcvr	TBA	Call \$
<b>Receivers</b>		
IC-R7000 25-1300 + MHz Rcvr	1099.00	Call \$
IC-R71A 100 kHz-30 MHz Rcvr	949.00	Call \$
<b>VHF</b>		
IC-275A All Mode Base w/PS	1199.00	Call \$
IC-275H All Mode Base 100w	1389.00	Call \$
IC-27A FM Mobile 25w	429.00	Call \$
IC-27H FM Mobile 45w	459.00	Call \$
IC-28A FM Mobile 25w	429.00	Call \$
IC-28H FM Mobile 45w	459.00	Call \$
IC-2AT FM HT	299.00	Call \$
IC-02AT FM HT	399.00	Call \$
IC-μ2AT Micro HT	329.00	Call \$
IC-900 Six Band Mobile	TBA	Call \$
<b>UHF</b>		
IC-475A All Mode 25w	1399.00	Call \$
IC-47A FM Mobile 25w	549.00	Call \$
IC-48A FM Mobile 25w	459.00	Call \$
IC-4AT FM HT	339.00	Call \$
IC-04AT FM HT	449.00	Call \$
IC-μ4AT 440 FM HT	369.00	Call \$
IC-3200A FM 2m/70cm 25w	599.00	Call \$
<b>220 MHz</b>		
IC-375A All-Mode, 25w, Base Sta.	TBA	Call \$
IC-38A 25w FM Xcvr	459.00	Call \$
IC-37A FM Mobile 25w	499.00	Call \$
IC-3AT FM HT	339.00	Call \$
IC-03AT Deluxe HT	449.00	Call \$
<b>1.2 GHz</b>		
IC-1271A All Mode 10w	1229.00	Call \$
IC-120 1w, FM, Xcvr	579.00	Call \$
IC-12AT Deluxe 1w HT	459.00	Call \$



**TS-440S/AT**

HF Equipment	List	Juns
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TS-940S Gen. Cvg Xcvr	2119.95	Call \$
TS-930S/AT Gen. Cvg Xcvr	1999.95	Call \$
TS-830S Xcvr	1199.95	Call \$
TS-430S Gen. Cvg Xcvr	899.95	Call \$
TS-440S/AT Gen. Cvg Xcvr	1299.95	Call \$
TS-440S Gen. Cvg Xcvr	1099.95	Call \$
TS-140S Compact, Gen. Cvg Xcvr	New	Call \$
TS-680S HF Plus 6m Xcvr	NEW	Call \$
TL-922A HF Amp	1599.95	Call \$
<b>Receivers</b>		
R-5000 100 kHz-30 MHz	949.95	Call \$
R-2000 150 kHz-30 MHz	699.95	Call \$
<b>VHF</b>		
TS-711A All Mode Base 25w	999.95	Call \$
TR-751A All Mode Mobile 25w	629.95	Call \$
TM-221A Compact FM 45w	419.95	Call \$
TM-2530A FM Mobile 25w	459.95	Call \$
TM-2550A FM Mobile 45w	489.95	Call \$
TM-2570A FM Mobile 70w	589.95	Call \$
TH21-BT FM, HT	279.95	Call \$
TH-205 AT, NEW 2m HT	279.95	Call \$
TH-215A, 2m HT Has It All	359.95	Call \$
<b>UHF</b>		
TS-811A All Mode Base 25w	1,199.95	Call \$
TR-851A 25w SSB/FM	729.95	Call \$
TM-421A Compact FM 35w	439.95	Call \$
TH-415A 2.5w 440 HT	379.95	Call \$
TH-41BT FM, HT	299.95	Call \$
TW-4100A, 2m/70cm FM	669.95	Call \$
TR-50 1w 1.2GHz FM	599.95	Call \$
<b>220 MHz</b>		
TM-3530A FM 220 MHz 25w	479.95	Call \$
TH-31BT FM, 220 MHz HT	299.95	Call \$
TM-321A Compact 25w Mobile	439.95	Call \$
TH-315A Full Featured 2.5w HT	379.95	Call \$



**FT 757GX**

HF Equipment	List	Juns
FT-ONE Gen. Cvg Xcvr	\$2859.00	Call \$
FT-980 9 Band Xcvr	1795.00	Call \$
FT-757 GX II Gen. Cvg Xcvr	1079.95	Call \$
FT-767 4 Band New	1895.00	Call \$
FL-7000 15m-160m Solid State Amp	1895.00	Call \$
<b>Receivers</b>		
FRG-8800 150 kHz - 30 MHz	699.95	Call \$
FRG-9600 60-905 MHz	679.95	Call \$
<b>VHF</b>		
FT-211RH FM Mobile 45w	459.95	Call \$
FT-290R All Mode Portable	579.95	Call \$
FT-23 R/TT Mini HT	299.95	Call \$
FT-209RH FM Handheld 5w	359.95	Call \$
<b>UHF</b>		
FT-711RH FM Mobile 35w	479.00	Call \$
FT-770RH FM Mobile 25w	479.95	Call \$
FT-73 R/TT Mini HT	314.95	Call \$
FT-709RH FM HT 4w	359.95	Call \$
<b>VHF/UHF Full Duplex</b>		
FT-736R, New All Mode, 2m/70cm	TBA	Call \$
FT-726R All Mode Xcvr	1095.95	Call \$
HF/726 Module for 10,12,15M	289.95	Call \$
430/726 430-440 MHz	329.95	Call \$
440/726 440-450 MHz	329.95	Call \$
SU-726 Sate Duplex	129.95	Call \$
FT-690R MKII, 6m, All Mode, port.	569.95	Call \$
<b>Dual Bander</b>		
FT-2700RH FM 2m/70 cm 25w	599.95	Call \$
FT-727R 2m/70 cm HT	479.95	Call \$
<b>220 MHz</b>		
FT-109 RH New HT	379.95	Call \$
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**WF6P looks at old ways to learn and polish code skills. It worked for him. Why not give it a try?**

# So You Want To Increase Your Code Speed

BY ARTHUR R. LEE\*, WF6P

**W**ith the advent of the new Volunteer Examiner program and published question pools free for the asking, it is now quite a simple matter to upgrade your license.

Gone are the days when long and frustrating trips to FCC Field offices in distant cities were the norm. From my QTH to San Francisco required a round trip of nearly 180 miles. Heavy traffic, an \$8.00 parking fee (if parking could be found at all), and usually an expensive lunch or dinner rounded out the day.

Once in the testing room, not everyone could hear the code tapes well. Traffic sounds and poor room acoustics reduced sound clarity. Worse, many of us were only marginally ready for the code test and depended a lot on hope. The resultant failure rate was always high. Probably less than half passed on the first try. It was on my third trip to the city that I fi-

nally passed the 13 word per minute requirements for my General class license. Persistence, as everyone knows, is the key to attaining any goal. Hard work helps, too!

If we approach the problem with the assumption that less than half of the applicants pass the code test on the first try, then some serious thought should be given to proper preparation for the code test.

Morse code isn't an easy language to master; additionally, learning can be slowed by mental blocks, hearing losses, nervous reactions, and, sad to say, fear of failure.

FCC statistics show that many Novice ticket holders are not upgrading. Some amateurs upgrade to Technician class, then avoid the use of the code, hoping and waiting for the "no-code" license. That is not to be, at least in the foreseeable future.

So what is left? Three local amateurs had gotten their Technician licenses

years ago. One had been a Technician for over 33 years; the other two for nearly as long. Although all were very active amateurs and on the air daily, the allure of 2 and 6 meters had captured them. Mastery of the code was something they had not needed nor pursued.

When our local VEs set up a testing date for our city, I thought it would be a handy way for me to upgrade. After all, one of the major reasons for having the incremental licensing program was to encourage continuous and further study in the field of amateur radio. How many of us would have stopped learning if we had been given our Extra class privileges when we received our Novice licenses? The old adage, "A goal, once achieved, ceases to motivate," still holds true.

I have always had some illusions of upgrading from Advanced to Extra class. Not so much from the standpoint that I had gained a lot of knowledge, but rather with the thought that I had worked moderately hard and learned something more than

\*106 Western Ct., Santa Cruz, CA 95060



*Copying code from a mobile location. Many times CW will get through to distant stations when conditions are marginal for voice communications.*



*Copying on-the-air code. Finding and working a schedule with a good CW operator is vital to any code improvement program.*



when I had initially been licensed. A fruitless trip to San Francisco was not to my liking, but a test in my own backyard, so to speak, was inviting. What had I to lose? I had been working CW mostly, shunning voice except for some Maritime Mobile net work and our local 2 meter nets.

My "natural" code speed had been hovering at about the 15 to 16 wpm plateau for the past year or so. On occasion I could copy short bursts at 18 wpm with about 75% of copy. Perhaps, just perhaps, I could bring my speed up to the required standards by test time, then about four weeks away. It would be worth a try, but how could I do it?

Not everybody likes to work code, and few operators I know ragchew at 20 wpm or above. Commercial tapes are available, of course, but it seems that most students complain either of poor tape quality or that they memorize the material almost immediately. Knowing that, I decided to avoid the use of pretaped QSOs and concentrate on making my own.

One of the best sources for varied material is the W1AW training schedule, as published in *QST*. I can receive the code sessions on 20 meters here in California. I had taped W1AW in the past, so all I had to do was to retape my slower tapes at 20-25 wpm.

As soon as I decided to try for the Extra class license, Bob, NW6Q, overheard my discussion on 2 meters and volunteered to help me with my code. Great! We agreed to meet on an unused portion of the 10 meter band after the evening news programs were over. So, every night at 1930 we tuned up and he sent code.

Fortunately, Bob's code was nearly perfect. What a rare and pleasant surprise that was for me. Bob had worked a lot of CW and had an excellent fist.

After a week or two of listening to Bob's code, he asked if I wanted him to use his computer. He had a program for Morse code. Yes, that would be fine with me. To my utter amazement, and to Bob's credit, I could not detect his shift from the paddle to the computer! He did complain that my requests for him to QRQ exceeded his ability to type numbers and letters above 20 wpm!

Ah yes, the numbers and letters mix. They can slow your copy speed down; this is especially true with call signs. Nightly, Bob included as a finale, both at 25 then slowing to 20 wpm, numbers and call signs taken from the pages of contest winners in *QST* and *CQ*.

My copying ability was slow at first, then gradually increased. I tried not to stop if I fell behind. I just kept going. I taped our nightly sessions for playback during the day. My aural responses began to take over and pay dividends. I was beginning not to think code, but to think content. Words came to me instead of a string of letters. Call signs remained difficult but manageable.

Once a day I tried to tape and copy W1AW, usually with fairly good success. Signal fading was something to contend with, yet even that had a benefit. When the signal faded in and out I copied what I could hear, ignoring the sounds which were lost. There was no going back to add to or correct what had been missed, a common fault among beginners when learning code.

With the luxury of having my own personal tutor, plus at least one hour of listening to tapes during the day, I passed into a state of understanding code messages. We all learn the code characters easily enough; hearing them as words is the hard part.

One night, on a final session or two just before the day of the code test, I was copying in a very relaxed manner. I was beginning to feel more comfortable with the code. My careful printing had evolved into a hasty, scrawling writing style, but words were recognizable. The numbers were harder. At 20 wpm I asked Bob if he would go to 25 wpm and give me some call signs. Instead, he started sending the groups at 20. Vexed at his misunderstanding of my request, I began to copy, wondering to myself why he was using voice to send the simple data. Voice? What an incredible thought! What voice? He was sending clear code with letter-number combinations at 20 wpm and I was copying easily, even waiting for the next group!

How did it happen? I would like to say it happened easily, and perhaps it did, but I could only attribute it to a positive code program I had initiated and stuck with.

## The Program

First, most of my contacts are on CW. In my opinion, there is no better way to get familiar with the code. At least that is the place to start. "You have to hear the music," my old friend Rod, KA5NIM, so often says.

Second, to really get going toward the goal I had set, I made use of my taped QSOs at every available moment. That meant listening to the tapes at times such as when working in my workshop, while reading the morning paper, and while driving to school or work.

Third, I set up an old AEA keyer trainer that I had and ran that device at the desired speed at times other than when listening to tapes. I also kept my general-coverage receiver tuned to a fast (but easy to copy) CW operator whenever I was in the shack for any reason.

Fourth, best of all, and undoubtedly the most effective learning tool, was my nightly CW exercises with NW6Q.

Can anyone advance their code speed to 20 wpm? I would say yes, and one easy way would be to follow the procedures I have outlined above.

Many amateurs are ready to help others advance their knowledge of ama-

teur radio and to increase their code speed. A slow-speed net can be started in your area by anyone. It doesn't have to be a net in the sense that it has to be formal. In fact, the informality of a friendly group inspires each member to experiment with various speeds. Keeping a rotating order is all that is necessary to avoid confusion. One of the amateurs mentioned earlier in this article had been a Technician for 25 years and joined a slow-speed net and passed her 13 wpm code test easily after about a month. Now a General, she prefers to keep her old familiar call sign.

How did I do on my Extra code test? I passed, missing only one question, a number in a temperature report. I got the call signs without difficulty. The plain text was easy. The VE test tapes were clear and readable—with no QSB!

The preparations I had undertaken ensured that I was truly ready to take the test. All of the VEs were well-known amateurs in the community, two of whom I had worked on the air. They were pulling hard for all of us to pass our examinations. They cared. Gone were the tensions of past testings at FCC sites.

Will I stay with code and become a CW operator? Probably. At least it is something I can call an accomplishment. It is a language that once learned doesn't fade away. Besides, CW is fun if you take the time to learn to be comfortable with it.

The other day a friend came over to pick up some study guides for his General class license. He had been a radioman in the U.S. Navy during the Korean War. He had not heard or used his code since his discharge nearly 30 years earlier. He took his code test and passed it, but had not kept up with the theory and rule changes. While I searched for a few books I had, we listened to some 20 wpm CW on 20 meters. My friend copied the QSO in his head. To him, it was just so much "talking" between two operators. When he left the shack, he said that hearing the code again gave him a greater inspiration to get his General. He has no rig, not even a receiver. One note: As he was leaving, he looked around the shack and asked where I kept my earphones. When I produced them, he seemed satisfied. It seems that all ex-military radio operators were trained using earphones. It has to do with complete concentration, I guess.

To me CW is a great sport and well worth the time and effort put into learning it. When my daughter got her Novice last year, we encouraged her to work for her General so we could go on voice. She thought about that for a moment, then asked, "But can I still work code after I get my new license?"

Give CW a try. If it has been awhile, dust off the old key and pound away. The code will come back to you easily enough. There are a lot of good CW operators out there just waiting to CU on the air. Me too!

□

## Coaxial Dynamics, Inc. Model 81000-A Directional Wattmeter

BY PETER R. O'DELL\*, KB1N

**S**o you think that all wattmeters and SWR meters are alike, particularly at HF. Who needs an "expensive" directional coupler when you can get by with a \$9.95 CB special from Wattmeters-R-Us? If you believe that all wattmeters are created equal, then I have some news for you.

Four years ago, I worked for another magazine. I was reviewing the HyGain TH-7 broadband triband beam. Almost everything seemed fine. The antenna performed beautifully. I had no problem loading into it. But the SWR curve didn't come close to matching the projected one that HyGain supplied.

Roger Cox at HyGain was perplexed, and everyday, it seemed, he would send me something else to replace on the beam. I was getting tired of climbing my tower to switch "new" for "old."

Nothing changed the SWR readings that I got.

One day it occurred to me that my moderately priced SWR Bridge/wattmeter might not be accurate. I borrowed a professional wattmeter from the laboratory. Once I had translated the forward and reflected readings of the wattmeter into SWR and plotted the points, I found that my SWR curve was almost identical to the one that HyGain said I should have.

SWR Bridges and RF wattmeters have a characteristic known as "directivity." Connect any of these meters to a 50-ohm transmission line terminated with a 50-ohm resistor, and you should get a 1:1 match. But replace the resistor with some complex impedance that also measures 50 ohms, and you may find the meter indicating something other than a 1:1 match. If the meter has high directivity, it



*Coaxial Dynamics 81000-A wattmeter with optional plug-in elements and Quick Match Connectors.*

will show the true ratio. If it doesn't, it may or may not show the true relationship, depending on the frequency and the length of the coaxial cable linking the meter to the load.

That gives us a simple test for how accurate our wattmeters are. Simply check the SWR or forward and reflected power of your beam. Add a few different lengths of coax to the line connecting your meter to your antenna. Do the meter readings change as you vary the length of the connecting cable? If so, your meter is not ac-

curate. If the readings do not change, your meter is accurate.

This is a rather complex way of getting into a product review, but I believe it is a point that is often overlooked and should not be. I am happy to report that the Coaxial Dynamics Model 81000-A passes this test with flying colors. After four years of service, the TH-7 SWR curves are still a close match for the ones supplied by HyGain—when measured with the 81000-A. My old wattmeter still gives erroneous indications. You really do get what you pay for.

The 81000-A uses plug-in elements designed for specific power and frequency ranges. A wide variety of elements are available ranging from 100 mW to 5 kW and 2 to 1350 MHz. (The company has just announced a new line of elements for the 950- to 1350-MHz range with power ratings of 5 to 250 W.) For this review, Coaxial Dynamics supplied 2-to-30-MHz elements with 250- and 1000-W power ratings and 100-to-250-MHz elements with 5- and 50-W power ratings. This provides reasonable power/frequency ranges for my equipment and operating style.

Another feature that adds versatility to the 81000-A is the Quick Match Connectors available in everything from UHF to SMA styles. Type N connectors are standard equipment on the 81000-A. For the review, Coaxial Dynamics supplied sets of UHF and BNC connectors. Like most amateurs, I use UHF-type connectors for HF equipment and BNCs for VHF.

Changing the Quick Match Connectors is simple. Remove the four screws that anchor the connector to the 81000-A, pull the connector away from the case, and insert the new connector. Put the screws back in, and you have made the switch. It should take less than a minute. What a

\*Associate Editor, CQ

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big improvement over having two or three adapters hanging off each side of the wattmeter!

The 30-u ammeter, mounted in a shock-proof housing, features a 4½-inch mirrored scale calibrated in three ranges. I found it easy to read the meter in the most adverse lighting conditions. With the mirrored effect, parallax problems were nonexistent. More importantly, the meter is the taut-band type. This insures smooth, reliable operation with small shifts in power level. Not once during the review did I find it necessary to "thump" the case to get the meter needle to move.

A small feature that indicates Coaxial Dynamics attention to detail is the labeling of the elements. To switch from reading forward to reflected power, you must rotate the element 180 degrees in the socket. Assuming you were reading forward power with the element arrow pointed to the right, it now points to the left. This also has the effect of turning the label upside down, making it quite difficult to read. Coaxial Dynamics has printed the power and frequency information upside down on the bottom of the label, as well as right side up on the top. Thus, as long as the element is positioned for either forward or reflected reading, the element information will be right-side up making identification quick and easy. It is a small point, but it shows that the company has paid attention to the needs of the customer.

Should it be more convenient, you can remove the line section and install it at a remote spot up to 200 feet from the meter. This would require an optional connecting cable.

The case, which measures 7.3 x 5 x 4 inches, is made of a durable heavy-gauge steel. A leather carrying handle and a carrier that holds two elements make the unit very practical for use away from the test bench.

Accurate, solid, durable, dependable — these are the words that come to mind as I use the 81000-A. In the next few weeks, I will be setting up the station at our new home. It is a comforting thought to know that I will be able to optimize the antenna farm with the Coaxial Dynamics Model 81000-A. After all, why risk connecting a solid-state rig to an improperly tuned antenna? If you can't trust your Wattmeter, what can you trust?

List price for the 81000-A is \$159. HF elements are \$56 each, while standard 25- to 1000-MHz elements are \$48 each. Lower power and higher frequency elements are available at slightly higher costs. Female UHF Quick Match connectors are \$7.00 each, and BNC females are \$12. Other connectors are available at various prices. For more information, contact Coaxial Dynamics, Inc., 15210 Industrial Parkway, Cleveland, OH 44135 or phone 1-800-COAXIAL.

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## THE ART OF VERY LOW POWER OPERATING

### *The QRP Scene: Don't Wait for the '90's!*

I'd like to say a few things to those of you who have thought about QRP but haven't tried it yet. QRP is for those of you who are interested in a kind of amateur radio that challenges you as an operator. It forces you to develop new skills and learn new ways of looking at the mystery of communicating through radio. That seems to be the one thing that high power removes—the mystery of it all, the unpredictability.

With QRP, you are never quite sure that the guy you call is going to hear you. He may be S9 + 20dB and that may seem to guarantee excellent propagation between you, but even so, he may not respond to your call. And that leaves you wondering "what went wrong", or better yet, "what wasn't right?" Aye, mates, there's the mystery in QRP'ing.

With high power and a decent antenna, you don't really have to pay much attention to the WWV solar flux reports at 18 minutes past the hour. You just flip on the big switch, scan around the band and take your pickin's.

Not so with QRP. If you're a savvy QRP operator, you take it the way Mother Nature doles it out in order to avoid disappointment and frustration. The QRP signal can't win out against poor propagation or high ionospheric loss. It needs a "greased rail" to slide along to the guy on the other end. If Old Sol isn't pumping out an adequate amount of the radiation that ionizes the path between you and the other end, the QRP signal just doesn't get through.

And the QRP operator makes it his business to learn enough about propagation to estimate his chances of success. When he gets on the air, he doesn't exactly know what to expect, but he's pretty certain about what *not* to expect! Learning about propagation can be tedious work, but some one who has been bitten by the "bug" doesn't mind. During the process he is gaining new insights that allow him to understand his experiences with QRP. Learning may be hard work, but it helps make sense out of the mystery of radio communications. It adds to the enjoyment and sense of achievement that is basic to QRP operating.

#### **Operator Skill**

QRP demands more attention to oper-

ator skills because the QRP signal is usually weaker than other signals on the band. Before the newcomer becomes successful, he has to master a bag full of techniques that enhance his chances of making contacts. This raises his calls/QSO's ratio to a satisfying level. QRO operators seldom have to consider that ratio. The QRP operator expects a low ratio because the odds are against him. Poor propagation, path loss and competition from stronger QRO stations stack the deck against him.

The need to develop new operating strategies and techniques to boost the calls/QSO's ratio presents a constant challenge in QRP. But it also makes every QSO important, raising each one above the level of the banal and routine. The QRP operator gets a flush of excitement when the other guy first answers him. Then he has to dig into his bag of techniques to make sure that the QSO lasts until the end. Not every QRP QSO does! A QRP'er's log is filled with comments such as "lost me in the QSB," "too weak on second go-around," "band changed," "W6—clobbered me" and the like. Completion of a QSO often requires repeats of information scrubbed by QRN or QSB. The QRP operator must "read" the situation and choose the techniques mostly likely to succeed.

Of course, I'm stressing the difficulty of QRP so none of you gets the wrong idea. But QRP operating isn't always difficult. That's what is so amazing and mysterious about it. Just imagine a quite typical QRP operating situation. You've lugged the QRP rig along on the family vacation. After the kids are in the sack, you sneak out on the motel's second floor balcony, reconnoiter the area, and tie one end of a wire to the railing. Now you slide along the shadows down into the parking lot and across to a tree at the edge. After furtively glancing around for the motel operator, you sling the other end of the wire over a branch. You walk nonchalantly back to the room with the air of a weary traveler getting a breath of fresh air. Of course, it's dusk and the #28 wire is invisible once it's up.

The signals are boiling in once you flip on the rig. After several futile calls, you hook up with a station 800 miles away and proceed with the usual exchange and then sign "QRP." The other operator gets excited, and the QSO develops into a solid half-hour of answering questions about QRP. She just won't let go because

she can't believe you're on the road and still in QSO with her.

You find nothing especially interesting about having you rig along with you. An HW-8 doesn't take much space. The miniature homebrew transceiver built especially for trips takes even less. Working the world with battery power adds to the adventure. Nothing especially interesting—this is just the way QRP is done!

#### **At Home**

At the home QTH, everything is maximized for efficiency, especially the antenna which is the critical link between the rig and the rest of the world. As a result, frequent solid QSO's occur. Bear in mind that most newcomers go the "legal limit" of five watts output to offset their lack of confidence, and rightly so. Confidence in QRP is built up only over a period of time. But once you've developed the skills and knowledge which insure success with QRP, the next step usually involves the old question: "how low can I go and still work out?" This is a way of adding even more challenge to QRP operation. The "bottom line" usually keeps dropping lower and lower, 4dB or so at a time. Operators like QRP veteran G4BUE have even dropped into the microwatts level to successfully span the Atlantic on several occasions! But microwatts aren't for most of us blokes with less than great antennas.

My own experience in milliwattling is quite limited compared to a lot of QRP'ers like Brice Anderson, W9PNE. He is the "granddaddy of milliwatters" and has WAC and WAS with various power levels down to a couple hundred milliwatts!

My antenna system is far from great—a pair of verticals mounted on a 12 x 65 foot mobile home roof. But I keep the array fine-tuned, and it does pretty well on DX work and really good on stateside stuff. I used to operate the QRP ARC QSO Parties at the full five-watts output. I was accustomed to running strings of QSO's endlessly as long as there were any stations left that I hadn't worked. *Like shooting fish in a barrel, though.*

I got interested in real milliwattling because the high power of 5-watts worked *too* easily. So, I dropped to 750mw during the next QRP Contest, and it was still too easy. Eventually I was down to 100mw and having my mind blown. Bear in mind, I've been running QRP for more than 30 years. You'd think that QRP didn't have

any surprises left for me. Boy! A whole new world of adventure opened down at 100mw! By the end of the first QRP contest with 100mw, I was flabbergasted to realize that I'd worked somewhere around 70 QRP'rs out of about 74 called!

It was rough going for the other guys during many of these QSO's, but they copied me all the same. True, I didn't manage to generate any strings calling me, but I got almost everyone whom I called. To top it off, late afternoon brought G4BUE on 14060 kHz with 500mw. We completed a solid trans-Atlantic QSO, 100mw to 500mw! I also managed GM3OXX, another QRP'r running 1 watt.

During these QSO's I even managed to alert the UK gang that I was on my way over for the summer—in other words, we passed some traffic across the Atlantic with 100mw! So, when I say that the excitement offered by QRP literally never is exhausted, no matter how long you've done it, I know what I'm talking about!

QRP really gets exciting when the guy on the other end is also running QRP. Running into another QRP'rs is a kind of "event" and not all that frequent. Then you get a dose of your own medicine—having to copy a weak signal. The pressure to make it a successful QSO is always at a peak because both of you want to share your kind of hamming, to find out what each other has done with what kind of rigs and antennas. Both of you hang in there no matter how tough it gets. For a change, you get to be the one who says "it's hard to believe that you're only running two watts!" And you really are impressed, even though you've worked hundreds of stations with your two watts! There's a special *esprit de corps* among QRP'rs that makes every new QRP'r that you work seem like an old buddy with an instant rapport.

### Solar Minimum: Why Start in the Pits?

Everyone knows that QRP success depends upon good propagation conditions. Naturally, someone thinking about trying QRP is likely to begin reasoning. Since the sunspot cycle is at a minimum, there is no point to getting started now. Wait until Cycle 22 builds up a bit, and then give it a try.

Now, that is quite logical, but it simply ignores the realities. Since I began publishing *The Milliwatt: National Journal of QRP* in 1970 and writing for *CQ* in 1974, I've been through two solar minimums. I've received literally thousands of pages of correspondence and reports from active QRP'rs. To be sure, they all have remarked about the deterioration of conditions going into and during the solar minimums. But I can honestly say that not a single QRP'r ever admitted that operating QRP during the minimums was as bad as he expected. In fact, the opposite is true.

The standard comment has been an expression of surprise that QRP has done so well *despite* such poor conditions.

Now, this isn't true of every kind of QRP operating. One exception is DX'ing, where poor conditions during the minimums definitely do suppress the success factor, at least if you measure that in terms of applications for DXCC QRPp (5 watts) and DXCC MILLIWATT (one watt) trophies. For example, only 7 DXCC QRPp trophies were awarded between 1972-1977, representing QSL's gathered through the Cycle 20 minimum.

Even then, Don Karvonen, K8MFO, was able to work the 100 countries and gather the QSL's for Trophy #3 in slightly over 50 days during 1976! John Akiyama, W6PQZ, alerted us to the fact that it could be done on SSB with his Trophy #4-All SSB in the same year. Once Cycle 21 began perking up, the lid blew off. Ron Moorefield, W8ILC, surprised the world of QRP in 1978 by claiming DXCC MILLIWATT Trophy #1-All SSB. The peak years of Cycle 21 helped him slide to DXCC 200 MILLIWATT #1 by 1980, again all on SSB.

Despite the deterioration of conditions that followed, W8ILC managed the incredible feat of gathering another 100 countries and DXCC 300 MILLIWATT Trophy #1-All SSB by February, 1984. The DXCC MILLIWATT Trophy has to be the most difficult award offered (in the absence of a QRP WAZ!) in amateur radio. Winners GM3OXX, G4BUE, KI4W and W4IV benefited from good to excellent conditions in winning theirs by 1981. EA8EY, JA1MCU, GM4ELV, and KH6CP/3 did most of their work during the bottom years. More recently, recipients OK1DKW and N6QR toughed theirs out during the very bottom!

The DXCC QRPp scene exhibits a more pronounced effect of solar activity. 54 trophies were awarded between 1979 and the end of 1983! Since then, only 13 have been awarded, but the important point is that even in the area of DX'ing, QRP isn't totally wiped out by the poor conditions of a solar minimum. I can personally attest to that. I worked my first 120 countries between 1972-75, near the bottom of Cycle 20. I wasn't much of a QSL'r, so I had to do it half over again when I got around to it in 1982-83! Seems I was busy with *other things* during the peak years of Cycle 21! I won't make that mistake again!

But even now, working DX isn't a problem despite my antenna system. What is the different between now and 1978-80? At least, in my experience, the variety of DX that is available is significant. Openings don't blanket the globe and are more geographical restricted, but the DX is still there.

Next time we'll look at stateside activity, nets, and what equipment it takes to go QRP. Have a joyous holiday season.

73, Ade

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## Low Noise, Coaxial Link Antennas for HF Receiving

BY RICHARD A. GENAILLE\*, W4UW

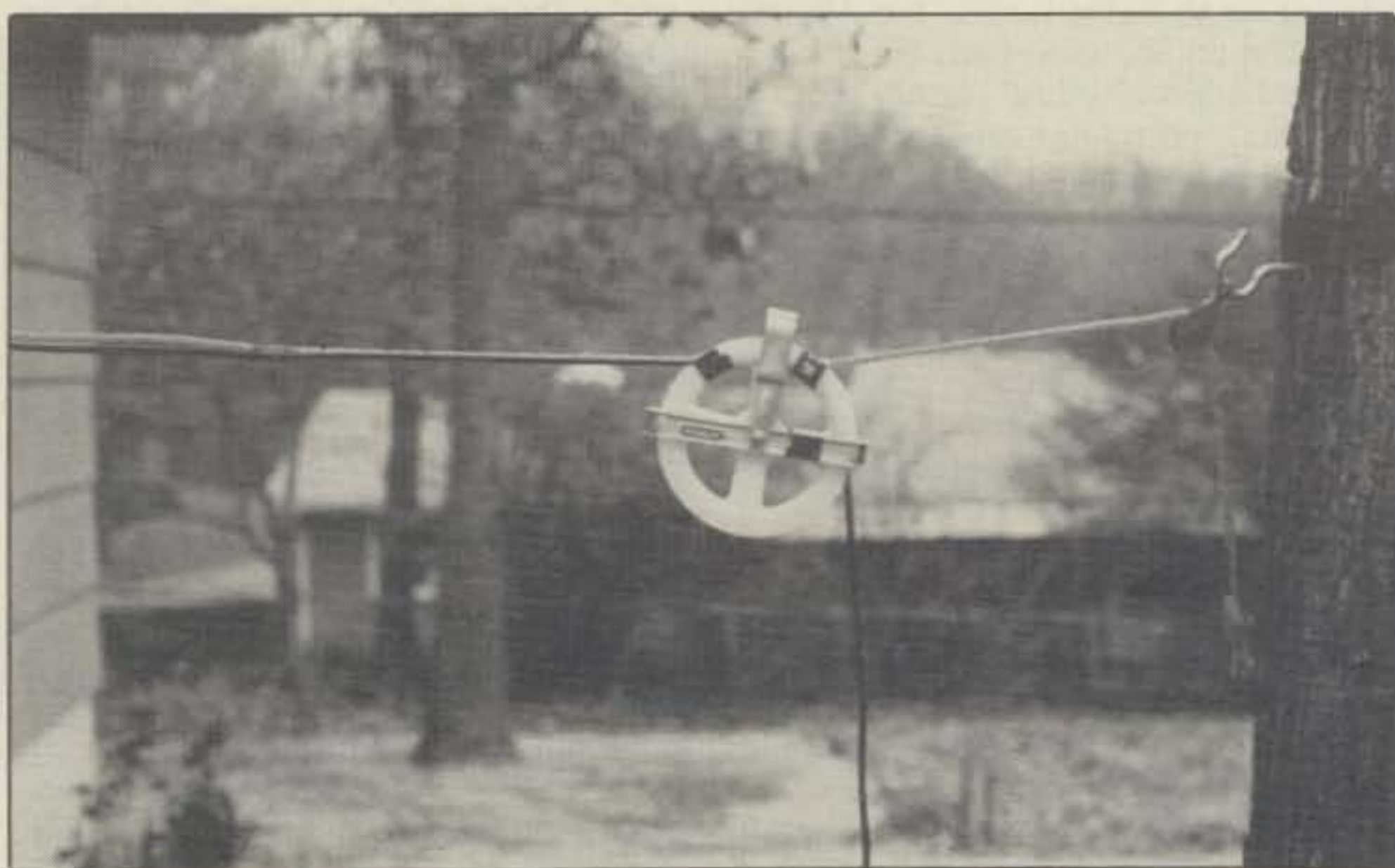
I undertook the challenge of developing a new low-noise receiving antenna for the 160-meter band. But the results I obtained, on 160 through 10 meters, were surprising enough to warrant a description of the antenna. Others might be stimulated into further experimental work along similar lines and perhaps come up with the "better mousetrap"! The possibilities of this type of antenna are interesting, since it is extremely simple to construct and certainly economical.

Avid amateurs have always been interested in low-noise receiving antennas. Many low-band DXers have been plagued by having to use antennas having relatively poor signal-to-noise ratios. My 60 foot vertical, folded unipole, which works reasonably well for transmitting, is quite unsatisfactory for weak signal reception especially on 80 and 160 meters.

I've had to resort to reasonable alternatives. One of those alternatives is the shielded and balanced loop antenna which, when properly constructed and used with sufficient preamplification, performs about as well as any antenna that can be erected on an average sized lot. I have constructed and used receiving loops for some years now with great success.<sup>1,2</sup>

Loop antennas were originally designed for direction finding purposes, but the sharp null of a properly designed loop gets distorted by surrounding metallic objects thus producing errors.

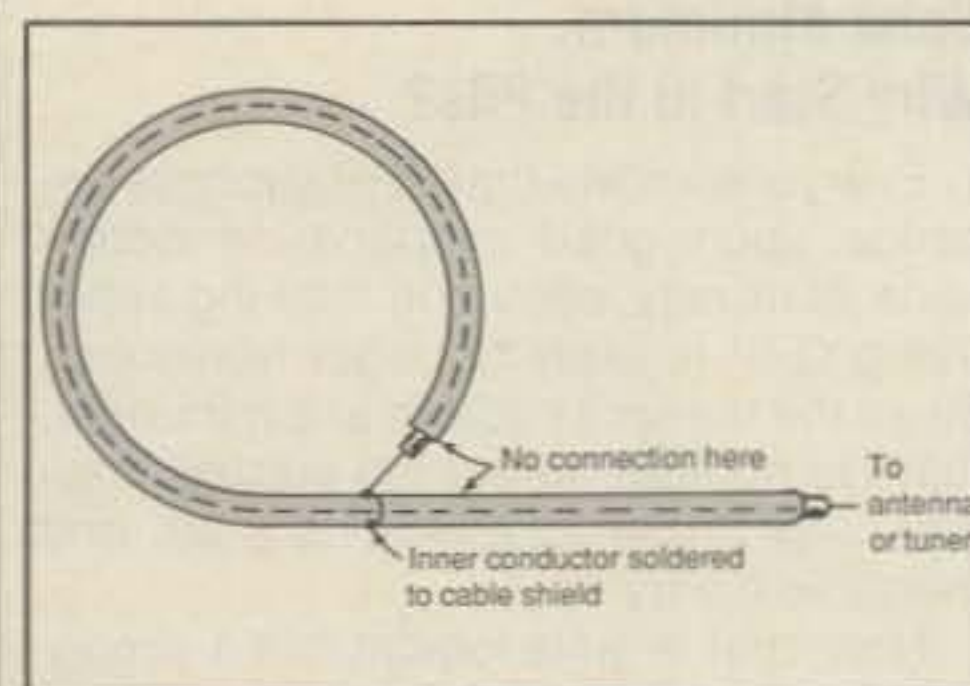
Shielding and balancing the loop eliminated the undesirable effects and also resulted in an improved signal-to-noise ratio. While the loop antenna is an excellent antenna for low noise reception, I believe that there must be other ways of obtaining low noise reception without the mechanical difficulties encountered in loop construction. It was with this premise that I developed the Coaxial Link Antenna.



*Catenary pulley and coax support pulley. Coax shown taped to polypropylene catenary.*

na. While decidedly simple, it just might surprise you if you build one similar to it!

Some thirty years ago shielded coupling coils, constructed of coaxial cable, were used as a means of inductively coupling electromagnetic energy from a tank coil. This link-coupling method was recommended to reduce the transfer of harmonic energy to the antenna system. A typical arrangement is shown in fig. 1.<sup>3</sup> This link-coupling scheme is the basis for the low noise, coaxial antenna. I asked myself if a small diameter coaxial link can couple energy from a tank circuit, can a larger link couple energy to and from free space? I constructed a 20 foot diameter link of RG-58/U coaxial cable and laid it on the ground in my front yard. I was extremely surprised when it performed as good, and in some instances better, than my 160 meter balanced, shielded and rotatable loop. It also received higher frequency signals! Needless to say, the results obtained with the hastily constructed link stimulated further interest



*Fig. 1— A shielded coupling link constructed from coaxial cable.*

and experimentation with two larger links.

Details of the construction of two experimental coaxial cable link antennas are provided herein. Some interesting test results established the links as being low noise receiving antennas as well as effective transmitting antennas.

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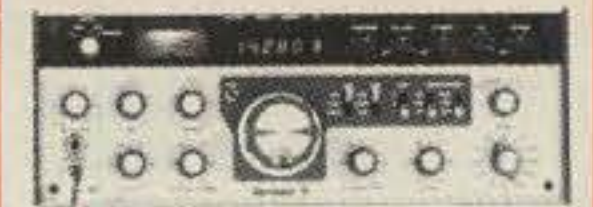
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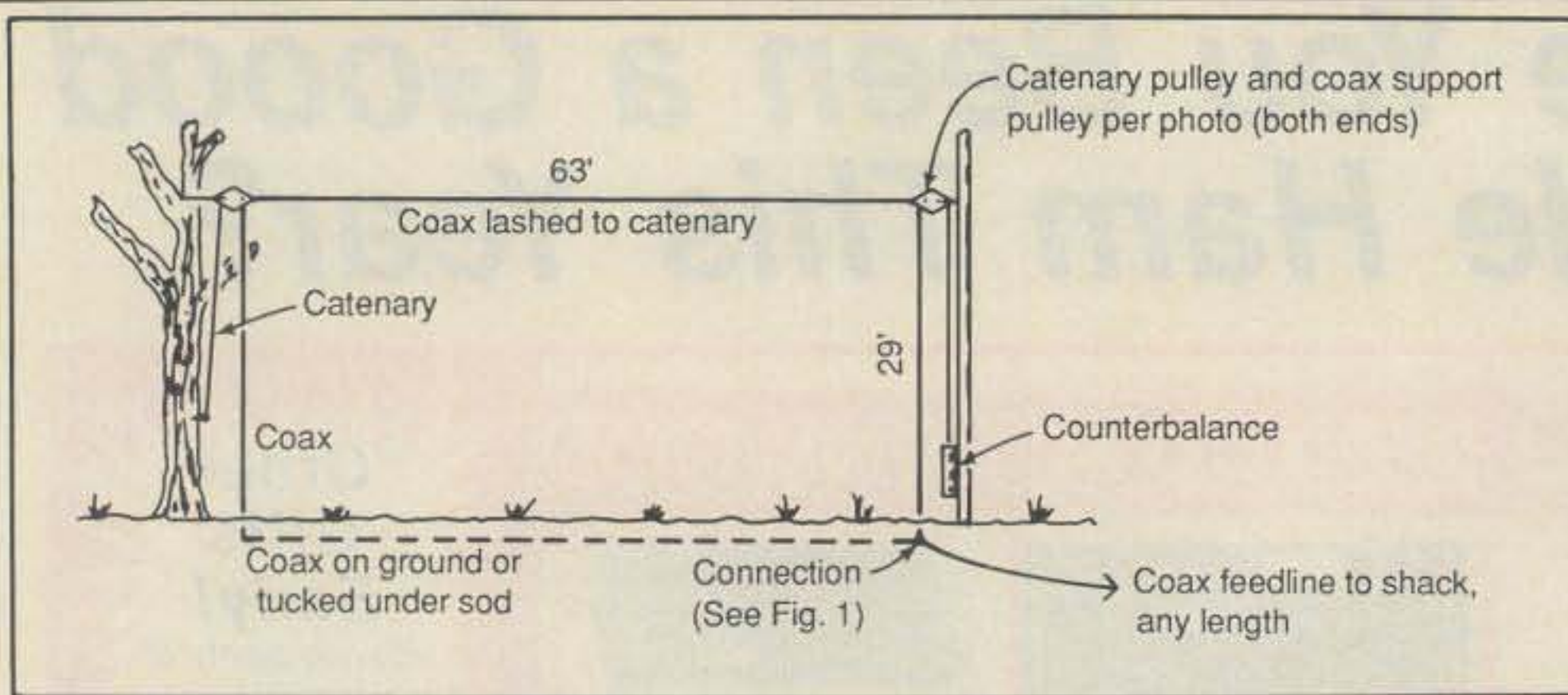


Fig. 2—The small coaxial link antenna.

I made comparisons against my present antenna system which consists of a 60-foot flagpole type steel mast with a TH6DXX mounted on top. The steel mast is used in a folded unipole configuration on 160, 80 and 40 meters and operates against a ground radial system consisting of some 6,000 feet of wire. The TH6DXX has an average gain of 8.7 dB over the 20, 15 and 10 meter bands. I used a TS-820 and SB-220 linear during the tests. The linear was previously modified to include operation on 160 meters.

The dimensions of the first link/loop constructed are shown in fig. 2. The link shown is rectangular in shape and installed in the vertical plane. I lashed RG-58/U cable to a support catenary made of 5/16 inch polypropylene rope, which is available in most hardware stores at a reasonable price. The catenary eliminates any stretching of the coaxial cable due to strain. An inexpensive plastic clothesline pulley, 5 inches in diameter, provides a gentle bend for the coax at each end as it heads downward. The method of assembly is shown in the photograph and worked quite well.

I ran the catenary through pulleys anchored in two oak trees so that I can raise and lower the catenary and the coax for

convenience during installation and testing. This appears to be a good way to install the system so that you can access both ends of the catenary at a convenient height. I anchored one downlead end of the catenary to one tree and the other end, at the opposite tree, fastens to a counterbalance to avoid snapping the catenary when the trees sway in the wind. (Doesn't everyone do that with their big horizontal antennas?) With this method of installation, the coaxial cable is protected from strain or breakage.

I constructed a second, and larger, coaxial link antenna and tested it along with the smaller one. The dimensions of the larger antenna are provided in fig. 3. This antenna was installed with the lower horizontal element about 10 ft. above the ground to allow for vehicle clearance. With limited space available, I could not space the antennas so as to reduce mutual coupling between the small coaxial link antenna (front yard), the large coaxial link antenna (back yard) and the rather permanent vertical antenna (back yard). Not much of an antenna test range but perhaps you can do better!

As they say about the insurance industry, "The large print gives it to you and the fine print takes it away." Now is the time

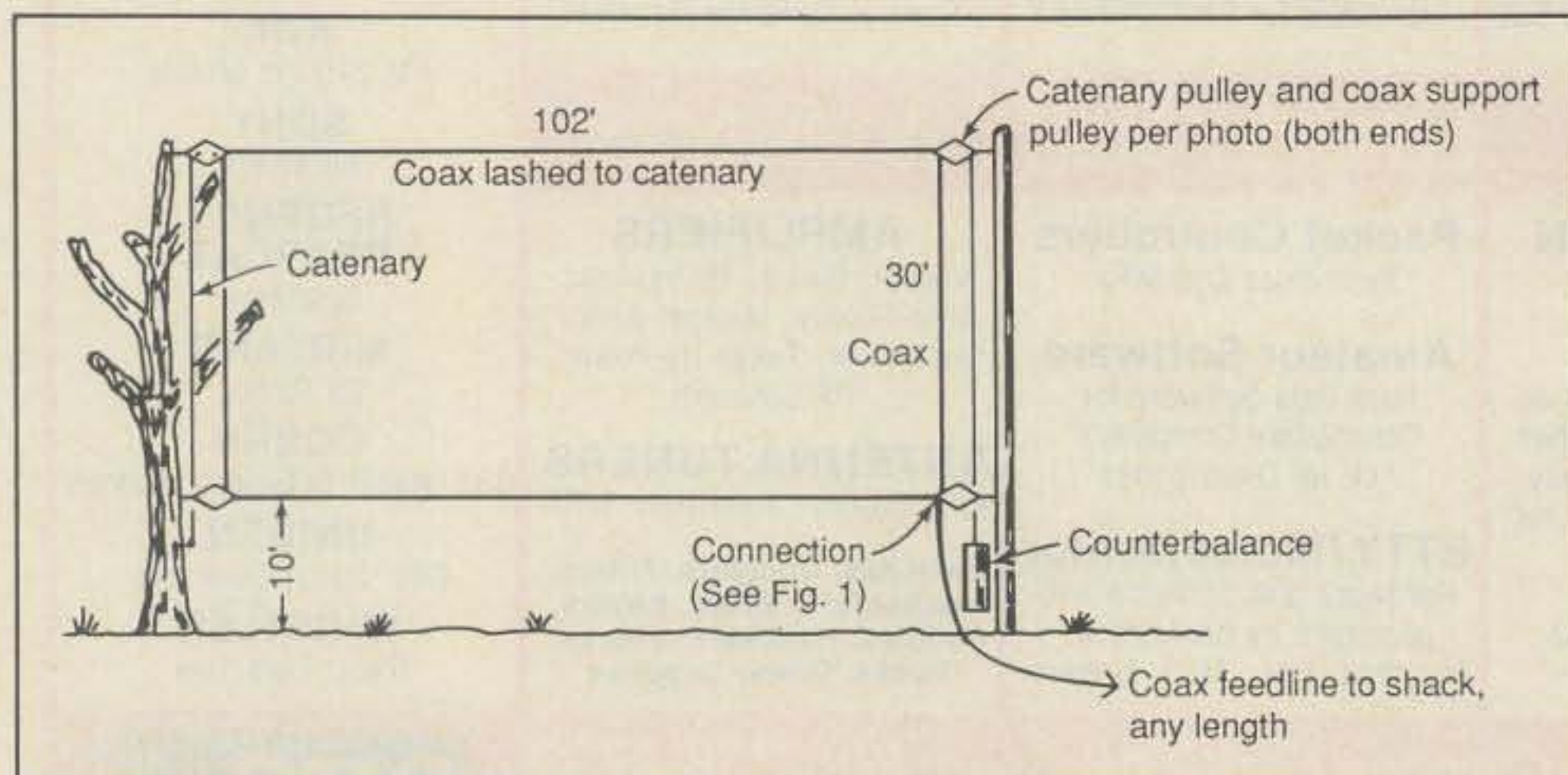


Fig. 3—The large coaxial link antenna.

to give you the large print! What I'll attempt to do is to show you, in tabular form, the results of the tests conducted on the various bands. Table 1 lists the various frequencies at which tests were made. Bear in mind that on 10 through 20 meters, both coaxial link antennas were compared against a beam with an average gain of 8.7 db. An Ameco PT-2 pre-amplifier was used for all receiving tests. Due to the close proximity of a high power broadcast station operating on 600 kHz, a high-pass filter was used before the pre-amplifier to eliminate "birdies" in the 160 meter band.

## 160 Meters

The antennas did not do well transmitting on the 160 meter band because of the high SWR. For simplicity, I made no attempt to lower the SWR by tuning them. Both coaxial link antennas provided low noise reception. I used 20 dB of pre-amplification for both antennas with the smaller antenna appearing to perform the best. As a matter-of-fact, the smaller antenna continues to be used for receiving on 160 since it performs as well, and sometimes better than my rotatable, balanced, shielded loop.

## 80 Meters

Basically, the large antenna outperformed the smaller antenna on transmitting on the 80 meter band by one S-unit. Neither antenna outperformed my 1/4-wave vertical, folded unipole on 80 meters; however, they may work better than many presently installed antennas for the 80 meter band and certainly would be likely candidates for emergency or field day operation. For low noise receiving, both coaxial link antennas, with or without pre-amplification, outperformed the vertical.

## 40 Meters

Both coaxial link antennas outperformed my 60 ft. vertical, folded unipole on both transmit and receive by a significant amount. The larger antenna did a fine job on transmit. Either antenna did very well for low noise receiving with or without pre-amplification. If I could do without my two half-waves in phase on 40 meters, I would have happily continued to use the large antenna. But I had only room enough for one or the other and chose the two half-waves in phase even though the large coaxial link antenna appeared to be omnidirectional. I will probably be sorry with the choice that I made!

## 20 Meters

The small and large coaxial link antennas were about 10 dB inferior to the TH6DXX beam on 20 meters on transmit, but bear in mind the 8.7-dB gain of the beam! In some instances the links outperformed the beam, on receive, prob-



ably because of their physical configuration. This was noted during QSB conditions. I used pre-amplification though not required, when receiving with the link antennas to provide S-meter readings on the par with the TH6DXX beam. There were many times when both antennas demonstrated their low noise characteristics. On these occasions severe power line noise masked receive signals, even though they were at least S-9. Switching to the coaxial link antennas made the difference in copying those signals! *The reduction in noise was dramatic, the noise had practically vanished!*

## 15 Meters

The small and large links were significantly poorer on transmit than the beam. That is not to say that they could not be used in this mode. I did not need the pre-amp, although it was helpful for bringing the S-meter readings up to the levels experienced with the beam. Both antennas exhibited excellent low noise characteristics for receiving on this band.

## 10 Meters

Neither coaxial link antenna performed well on transmit or receive on this band. While I have not tried, it may be that similar antennas of smaller dimensions may perform better on 10 meters. In any case it's worth a try. That's what amateur radio is all about! They worked on the 10 meter band but not well enough to brag about.

## "The Fine Print"

### A. Large Coaxial Link Antenna

1. Very good SWR on 40 through 10 meters. Excellent SWR on low end of 80 meter band which should make the CW people happy. SWR on 160 high but fairly flat. Could be helped by using tuner which would make final amplifier happy.
2. Good signal-to-noise receiving 160 through 10 meters. Pre-amp desirable on 160 and 10 meters.
3. Transmits on 80 through 10 with best results on 40 meters.

### B. Small Coaxial Link Antenna

1. Reasonable SWR on 80 through 10 meters. Not good for receiving on 10 meters even with pre-amp.
2. SWR high on 160 but flat across band. Tuner would be useful for final amplifier happiness.
3. Transmits reasonably well on bands 80 through 15 meters.

### C. General

1. The antenna and transmission line is all one piece of RG-58/U coax cable.

### \*\*\*Small Coaxial Link\*\*\*

***Performance**	S.W.R	Freq.	S.W.R	**Performance**
Received well with low noise.	4	1.8	5	Does not receive as well as small link antenna. Not good for transmitting.
Pre-amp helps.	4	1.85	5.1	
Not good for transmitting.	4	1.9	6	
Received better than vertical with pre-amp.	2.9	3.5	1.1	Received better than vertical with pre-amp. Tx report S-6 Vert. report S-9
TX report S-5	2.4	3.7	2.6	
Vert. report S-9	2.1	3.8	3.2	
Received better than vertical. No pre-amp req. TX report S-9+5 Vert. report S-9	1.8	3.9	3.5	Received same as small link. No pre-amp req. TX report S-9+10 Vert. report S-9
	1.7	4.0	4.1	
	2.5	7.0	1.8	
Sometimes better than beam in QSB. Very low noise. TX report S-9 Beam S-9+10	2.2	14.0	1.5	Sometimes better than beam in QSB. Very low noise. TX report S-9 Beam S-9+10
	2.0	14.15	1.5	
	1.5	14.3	1.5	
FB low noise receive with pre-amp. TX report S-8 Beam S-9+10	1.7	21.0	1.5	FB low noise receive with pre-amp. TX report S-6 Beam S-9+10
	2.0	21.2	1.3	
	2.0	21.3	1.3	
Not particularly good on receive or transmit. Smaller dimension link may work better.	1.7	28.0	1.1	Not particularly good on receive or transmit. Smaller dimension link may work better.
	2.3	28.3	1.4	
	2.25	28.5	1.6	
	1.8	28.7	1.6	
	1.5	28.9	1.3	

Table 1—Performance data and comparisons of both coaxial link antennas.

2. Virtually all band coverage. May even work well on WARC bands!
3. No tuner is necessary except if you want to try transmitting on 160 meters.
4. Low noise receiving on all bands.
5. Will apparently handle a kilowatt with no trouble.
6. Easy to construct and install.
7. Is not worked against ground so no extensive ground system appears to be required except a ground rod for lightning ground.

### D. Suggestions

1. Use a good grade of RG-58/U coaxial cable with maximum shielding. I used International Electronic W & C #4028 obtained from Certified Communications, Landrum, SC ("The Wire Man", Press Jones N8UG). The cable used has a solid inner conductor and over 90% shield.
2. Try building one of these antennas using your own dimensions to suit your particular location. Yours might work better than mine! (How about a multi-turn link?)
3. Try two identical size links at right angles to one another with the same central pivot point, goniometer

style, with transmission line phasing for directivity.

4. Build one out of 3 inch conductor centered with spacers to reduce dielectric loss. It might work quite well on the higher frequencies (my next project).
5. Build one from some surplus hard-line from your friendly CATV company.

The results of the tests made using the two experimental coaxial link antennas were surprising considering the simplicity of design of these antennas. I hope that others will be stimulated into constructing similar antennas and that someone will come up with a "better mousetrap". A special "thank you" to the fellows who were patient enough to help out with the on-the-air tests especially those who took the time out during contesting to make comparisons.

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1. Genaille, Richard A., "VLF Loop Antenna," *Electronics World*, January 1963.
2. Genaille, Richard A., "A Top-Band Loop Antenna," *CQ*, January 1969.
3. *The Radio Amateur's Handbook*, American Radio Relay League, Newington, Connecticut, 1953.

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  - Boom Length 6 Feet
  - No Lossy Traps
  - Element Length 12.5 Feet
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KT34A 4-el Broad Band Triband Beam	\$399.95
KT34XA 6-el Broad Band Triband Beam	\$589.95

## ROTORS

Daiwa MR 750 PE (16.1 sq ft rating)	\$289
Additional Motor Units	\$89
Alliance HD73 (10.7 sq ft rating)	\$119.95
Alliance U110 (3 sq ft rating)	\$49
Telex CD 45II (8.5 sq ft rating)	\$Call
Telex HAM 4 (15 sq ft rating)	\$Call
Telex Tailtwister (20 sq ft rating)	\$Call
Telex HDR300 Heavy Duty (25 sq ft rating)	\$Call
Kenpro KR500 Heavy Duty Elevator Rotator	\$189
Kenpro KR5400 AZ/EL Rotor Package	\$319

## ROTOR CABLE

Standard 8 cord cables \$ .19/ft (vinyl jacket 2-#18 & 6-#22 ga)	
Heavy Duty 8 Cond cable \$.36/ft (vinyl jacket 2-#16 & 6-#18 ga)	

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20G	\$48.00	45G	\$133.00
25G	\$56.00	55G	\$165.00

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Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	\$1049.
FK2558	58 ft.	13.3 sq. ft.	1099.
FK2568	68 ft.	11.7 sq. ft.	1149.
FK4544	44 ft.	34.8 sq. ft.	1389.
FK4554	54 ft.	29.1 sq. ft.	1469.
FK4564	64 ft.	28.4 sq. ft.	1579.

25G Double Guy Kit ..... \$279.

45G Double Guy Kit ..... \$299.

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

## TOWER/GUY HARDWARE

3/16 EHS Guywire (3990 lb rating)	\$ .15/ft
1/4 EHS Guywire (6650 lb rating)	\$ .18/ft
5/16 EHS Guywire (11,200 lb rating)	\$ .29/ft
5/32 7 x 7 Aircraft Cable (2700 lb rating)	\$ .15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	\$ .45
1/4 CCM Cable Clamp (1/4" Cable)	\$ .55
1/4 TH Thimble (fits all sizes)	\$ .45
3/8EE (3/8" Eye & Eye Turnbuckle)	\$6.95
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	\$7.95
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1/2 x 9EJ (1/2" x 9" Eye & Jaw Turnbuckle)	\$10.95
1/2 x 12EE (1/2" x 12" Eye & Eye Turnbuckle)	\$12.95
1/2 x 12EJ (1/2" x 12" Eye & Jaw Turnbuckle)	\$13.95
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502 Guy Insulator (1/4" Cable)	\$2.99
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HPTG6700 Guy Cable (6700 lb rating)	\$ .69/ft
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9902LD Cable End (for 6700 cable)	\$9.95
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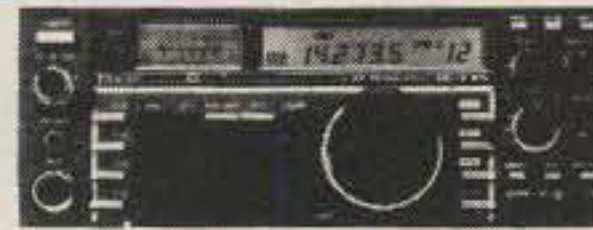
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Model	'Cont. Amps	ICS Amps	Price
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RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	196
RS50M	37	50	229

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



**r/c concept**  
**r/c 2-317 2M**  
**30W in = 170W out**  
**LIST \$299.00**

Model	Band	In-Out	List Price
2-23	2M	2-30W	\$112.00
2-217	2M	2-170W	\$299.00
2-117	2M	10-170W	\$299.00
3-22	220	2-20W	\$112.00
3-211	220	2-110W	\$299.00
3-312	220	30-120W	\$264.00

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AT 1200	\$ 229	AT 3000	\$ 499

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## A LOOK AT THE WORLD AROUND US

### Holiday Gifts For Radio Amateurs

The returning holiday season brings unlimited wishes of good cheer, worldwide friendship and visions of many fascinating goodies to be enjoyed during the exciting times ahead. We sincerely hope everyone had a great 1987, that this holiday season will add a perfect topping, and the rig or accessory of your dreams will add a special flair to your new year's activities. Pursuing that viewpoint, our column again features gifts in the amateur world.

Nineteen and eighty-eight promises to be a banner year for amateur radio. We're on the upswing of a brand new sunspot cycle, recently announced transceivers are absolutely phenomenal in capabilities, and Novice Enhancement is providing new blood. There has never been a more opportune time to get on the air with your dream rig, enjoy amateur radio to its maximum potential, and encourage one or two younger friends to also join our action.

#### Special Productions

Considering the widespread popularity of keys and keyers, we lead this year's array of unique items with the limited production German "Shurr Key" (fig. 1). If you're an avid CW operator or if you appreciate occasional "fun diversions," adding a handmade paddle like this gem to your setup is a great idea.

The high precision "Shurr Key" is made of polished-brass upper parts mounted on a heavy metal gray base. The contacts are silvered for long life, and the fingerpieces are beveled for a crystal-type appearance. The key's "feel" during operation is super smooth, just like a German auto.

All spacings and tensions are adjustable, and the bottom is fitted with non-skid feet. This key is made by Klaus G. Gramowski, Kalaerin-Augusta Allee 91, D-1000, Berlin 10, West Germany. The "Shurr Key" isn't produced in quantity, so you'll need to check with Klaus on delivery time of this quite "original item."

Our next item(s) for topping your favorite rig are the KAGIL "over the top" nylon dust covers (fig. 2). These anti-static covers are made to your supplied dimensions, or you can order them for specific makes/models of equipment.

Eastwood Village No. 1201 So. Rt. 11,  
Box 499, Birmingham, AL 35210

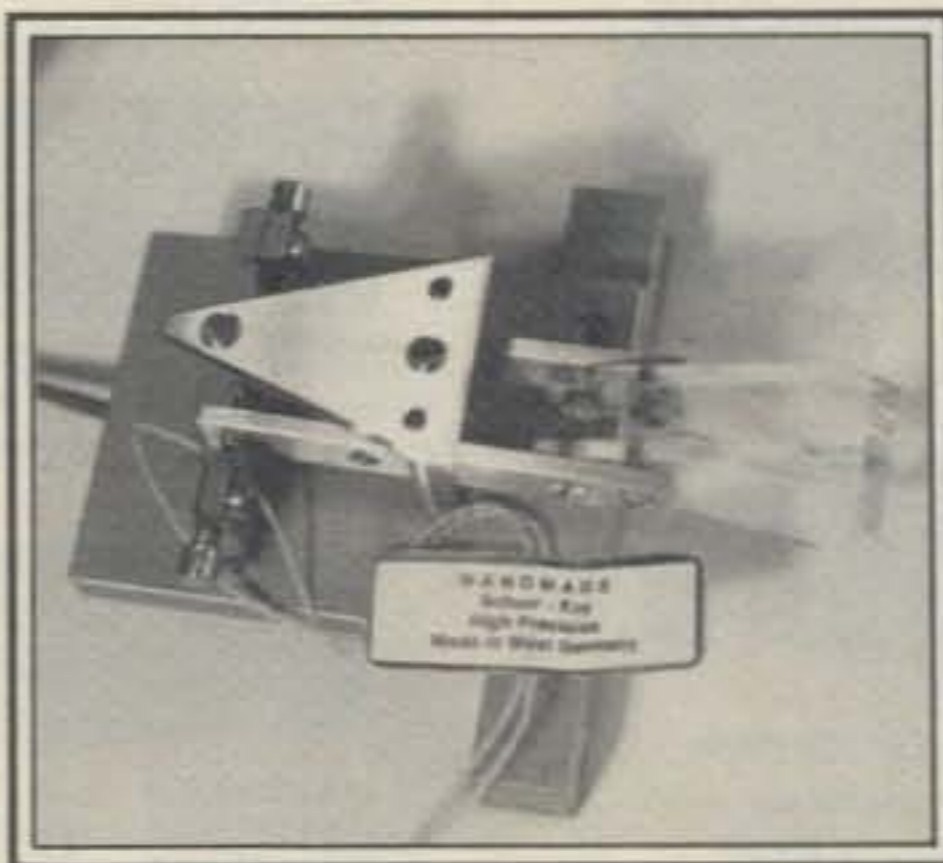


Fig. 1— The limited production "Shurr Key" made by Klaus Gramowski; a CW operator's dream!



Fig. 2— KAGIL's "over the top" dust cover shown protecting our favorite HF transceiver. Nylon cover is anti-static coated.

Since they are true custom covers, a wide selection of colors are available. You can even get added touches such as mike cable cutouts, windows for meters, monogrammed call sign and extra leeway to avoid tight fits. Mini covers are also available in matching colors for keyer paddles and similar accessories. Since KAGIL covers are custom items, delivery often entails a couple of weeks... but they're worth the wait. Their address is KAGIL, P.O. Box 06780, Portland, Oregon 97206.

#### New Gems

If the idea of working DX while lounging in the den or relaxing in a Jacuzzi piques your interest, check our MFJ's new Cordless Phone Interface shown in fig. 3. This little box connects to the microphone and

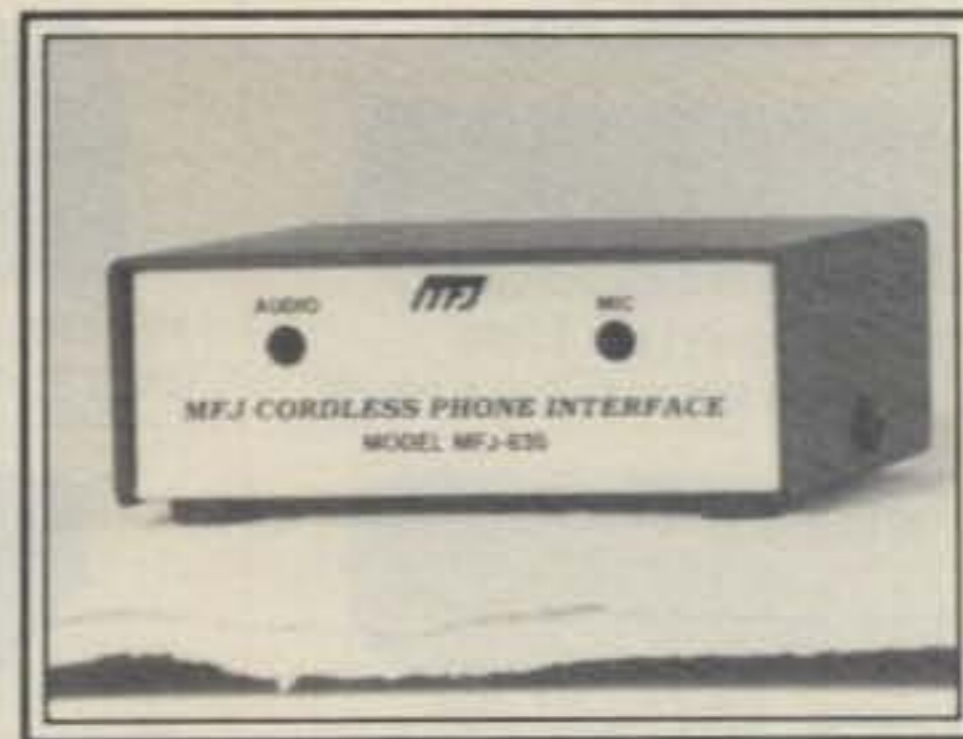


Fig. 3— MFJ's brand new Wireless Telephone Interface. Connect three cables and enjoy remote control DXing from your patio or pool.

speaker jacks of your SSB transmitter, and a cordless phone's base unit plugs into the interface's (standard type) RJ-11 modular jack. You can then enjoy remote operations anywhere within the wireless handset's range.

A cordless phone's full duplex capabilities and your rig's VOX makes handset-remote operating tremendous fun. You can listen continuously, then your rig switches to transmit when you talk. Switch on a deluxe transceiver's SSB monitor feature, and you can even "hear yourself" while transmitting. This inexpensive interface doesn't include remote up/down tuning, memory or band scanning, etc., but it's a dandy way to enjoy remote operating "roundtables" or nets.

SWLing is a continuously popular interest, and the shortwave bands are filled with a fascinating variety of broadcasts. A good receiver pulls it all in beautifully.

An immediately recognized name in this area is Grundig and their latest model, the Satellit 400 (fig. 4), is a true SWL's delight. This high fidelity portable covers the low, medium, and shortwave bands, plus the FM band; it includes direct keyboard frequency entry; 24 memories; scanning; LCD readout and on/off timers. It's powered by 120 or 240 V, 50 or 60 Hz, or batteries. If rechargeable batteries are used, the radio can play while recharging. One source of this unit is EEB, 516 Mill St., N.E., Vienna, Virginia 22180, phone 1-800-368-3270.

#### Stocking Stuffers

Okay, DX hounds... what's the local time right now in Guayaquil, Pago Pago and Karachi? (If you've never worked



Fig. 4- The Grundig Satellit 400 short-wave receiver. It's portable, powerful, and a stout performer.

those areas, maybe you should opt for a bigger antenna.) Every well-equipped station needs a snazzy world clock and ICOM's spiffy GC-5 (fig. 5) is a real gem. The clock is super easy to use and even includes an alarm for rabid DXers living in their shacks. A rear knob is used to initially set the clock's inner time ring, then you merely look around the face to spot a particular area and read its time directly on the ring.

Handheld talkies and holiday fun are a natural combination, and that statement is proven on repeaters across the country each December 25. While the kids are enjoying their new bicycles and *grenade launchers*, we're having a ball with our "go anywhere do anything" pocket rigs. The big news this year is that Novices can join in the fun. You are sure to find the features you want in a 220-handheld this season. Yaesu, Kenwood and ICOM offer portables with a wide range of features.

Someone introduced you to amateur radio or provided "Helping Elmer" guidance. Now's an ideal time to return that favor by helping another person. Ama-

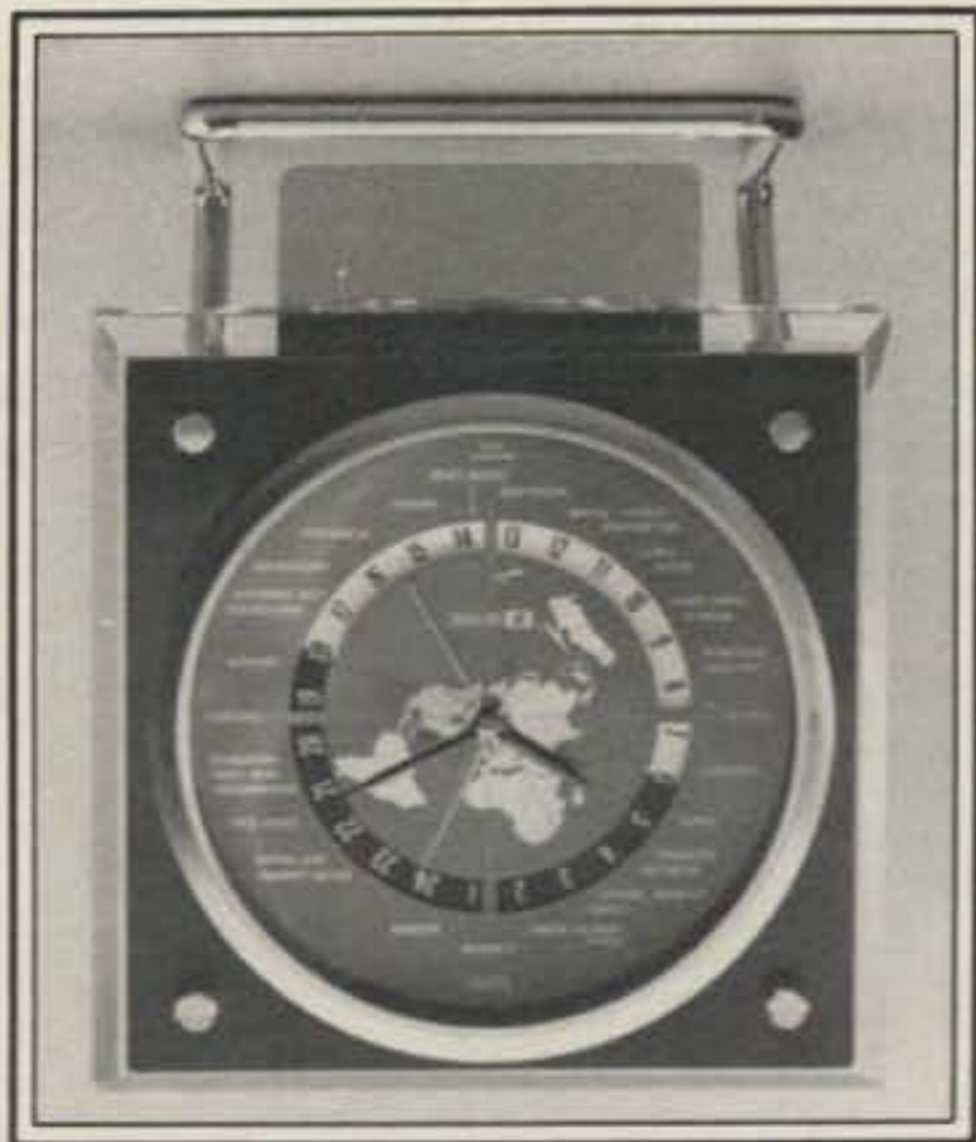


Fig. 5- Inaccurately logged QSO times lowering your QSL tally? ICOM's new GC-5 World Clock will keep you in time all the time.

teur radio is pleasantly contagious, and 10-meter voice privileges make Novice activity quite attractive. The more young Novices we have in amateur radio, the greater our chances of future survival.

Everyone has a couple of curious or semi-interested non-ham friends or relatives, and a Novice "starter package" could easily prove a door-opening gift they'll always remember.

There are numerous training packages around, but one of the best we've seen recently is the Maia/West Novice course reviewed in Oct. CQ. And it is available from Radio Shack as well as other sources!

Printed goodies are also great gifts for all amateurs, and the selection is absolutely unlimited. For instance, professional telegraphers will surely enjoy "Dots and Dashes", the Morse Telegraph Club's quarterly newsletter, available from W.K. Dunbar, Club President,

1101 Maplewood Dr., Normal, Illinois 61761. A five dollar yearly membership fee is required.

Amateur CW enthusiasts will likewise enjoy the quarterly "Morsum Magnificat" magazine available for \$7.00 (U.S.) from Tony Smith, G4FAI, One Tash Place, London N11 1PA, England. This mini-magazine is loaded with fascinating stories, key photos and old time schematics.

Finally, there's the best all around "twelve favorable returns" items any amateur could give or receive: a year's subscription to CQ. CQ is just plain fun to read. Tear out our subscription blank and add a special treat to the new year. You'll be glad you did.

My own family is quite small, but my family of amateur radio friends around the globe are the greatest in the world. Until we meet again on 30, 20 or 10, Happy Holidays... de K4TWJ!

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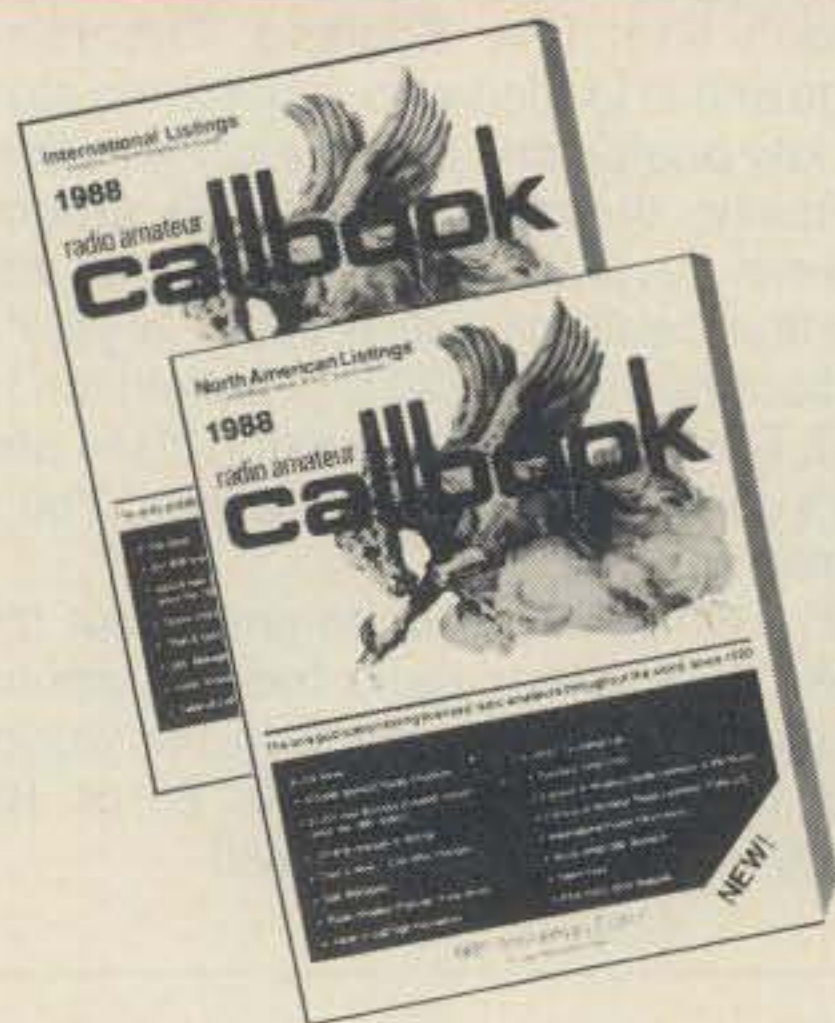
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The International Callbook lists 481,000 licensed radio amateurs in countries outside North America. Its coverage includes South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions).

The 1988 Callbook Supplement is a new idea in Callbook updates, listing the activity in both the North American and International Callbooks. Published June 1, 1988, this Supplement will include thousands of new licenses, address changes, and call sign changes for the preceding 6 months.

The 1988 Callbooks will be published December 1, 1987. See your dealer or order now directly from the publisher.

- |   |         |
|---|---------|
| <input type="checkbox"/> North American Callbook<br>incl. shipping within USA                 | \$28.00 |
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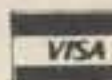
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## CQ Showcase

### Dual Band Docking Booster

Naval Electronics has introduced a new docking booster to mate with the Yaesu FT-727R dual band handheld transceiver. It senses which band the handheld is on and automatically switches in the appropriate GaAs FET



preamplifiers and PAs. Featuring 30 watts on VHF and 18 on UHF, the Booster connects to the 12-V automobile electrical system and an external antenna. A microphone clip is provided also. The Docking Booster is compatible with Yaesu's single band units such as the FT203, FT209, FT703, and FT709. For further information contact Naval Electronics, Inc., 5417 Jetview Circle, Tampa, FL 33634, or circle number 105 on the reader service card.

### Miniature TNC Announced

Pac-Comm has totally redesigned its TNC-2 clone, which uses unmodified TAPR TNC-2 software. Reliability, size reduction and lower cost are made possible through the use of an integrated circuit modem and simplified circuitry. The Tiny TNC-2 is approximately one-half the size of the original TNC-2. If ordered before Jan. 1, 1988, the price is only \$109.95 for a fully assembled unit with a tested 1200 baud unit ready for use on 10 meters and VHF. For more information, write Pac-Comm Packet Radio Systems, Inc., 3652 W. Cypress Street, Tampa, FL 33607, or circle number 101 on the reader service card.

### ICOM 220-MHz Repeater

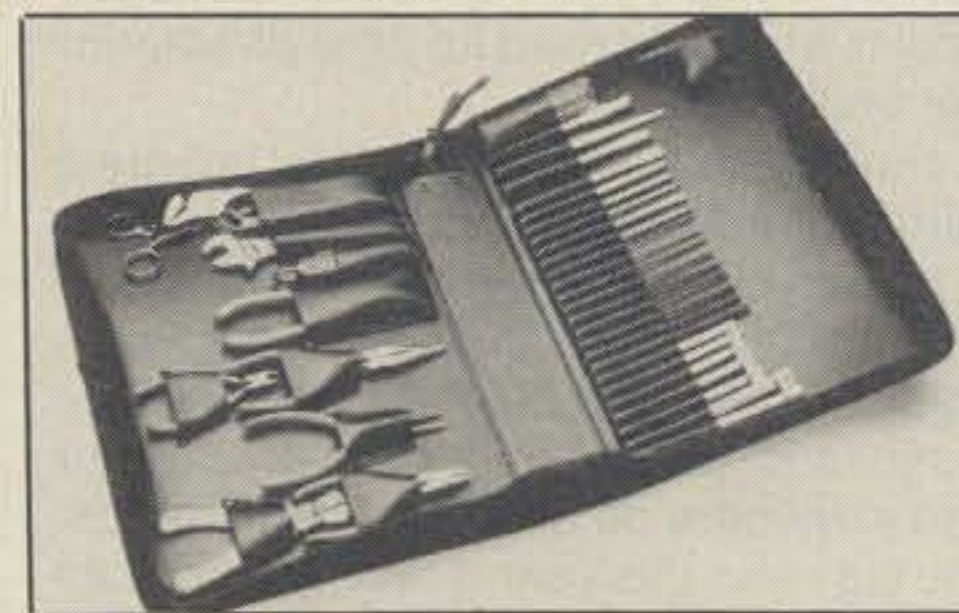
In response to the rapidly growing interest in 220-MHz activity, ICOM has introduced the RP-2210 220-MHz repeater. With frequency coverage from 216-236



MHz, the RP-2210 features a selectable CTCSS/carrier access system, DTMF control and 25 watts RF output power. For more information, write to ICOM America, Inc., PO Box C-90029, Bellevue, WA 98009-9029, or circle number 102 on the reader service card.

### Tools for Travel

Xcelite now offers a soft-sided tool case featuring 10 tools and 27 interchangeable screwdriver/nutdriver blades



and handles. Made of Cordura®, it is an attractive alternative to wood/vinyl cases. The kit is also available without tools. For more information contact: Xcelite Soft Kit, Box 728, Apex, NC 27502, or circle number 103 on the reader service card.

### Toroidal Power Transformers

Toroid Corporation of MD has introduced a new line of standard transformers with dual primaries for 115/230V50-60 Hz. Toroidal power transformers have only half the weight and volume of a conventional laminated power transformer. Due to its unique construction, the toroidal transformer generates insignificant



mechanical hum. Additional information is available from Toroid Corporation of MD, 6000 Laurel-Bowie Road, Bowie, MD 20715, or circle number 104 on the reader service card.

CIRCLE 62 ON READER SERVICE CARD

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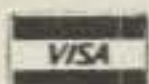
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## INFO ON AMATEUR RADIO LICENSING

### Alphabet Soup: What are VECs and VEs?

Over the years, Volunteer Examiner Coordinator (VEC) responsibilities have increased dramatically, as have the duties of the Volunteer Examiner. Today VECs completely handle the Amateur Radio Operator testing function. Except for acting as an overseer, the FCC is now out of the amateur testing business.

#### A VEC:

- Coordinates amateur radio operator license examinations above the Novice class.
- Accredits volunteer examiners who follow their amateur testing program.
- Provides VEs with testing materials, application forms, and test session report forms. Volunteer examiners may make up their own written and Morse code tests as long as they conform to the rules.
- Determines and reimburses expenses in connection with examination sessions.
- Provides Certificates of Successful Completion—blank forms that indicate that an applicant has successfully passed amateur radio operator examination elements or has upgraded.
- Collects, screens, and approves FCC Form 610 applications, test papers, and session reports from volunteer examiners. The VEC must also resolve defects in applications and reports.
- Forwards successful Form 610 applications to the FCC for license issuance.
- Maintains test session records which must be made available to the FCC upon request.
- Assists in developing and maintaining a common question pool system . . . periodically revising amateur radio operator test questions as needed. All VECs are required to use the same word-for-word test questions.

#### The Volunteer Examiner

A volunteer examiner (VE) is an amateur radio operator who prepares or administers examinations to applicants for amateur radio licenses. There are two types of VEs. One administers Novice examinations and the other must be approved (accredited) by a VEC to adminis-

ter Technician and higher class examination elements.

While teams of two General class level amateurs may conduct a Novice test session, it takes three Advanced or Extra class amateurs to examine applicants for higher class licenses. Our program only accredits Extra class VEs since only they can administer all written examinations and any of the telegraphy examinations above the Novice level.

#### A Volunteer Examiner must:

- Be at least 18 years of age.
- Not be related to the candidate being examined.
- Not be in the amateur radio equipment or license preparation business.
- Not be compensated, but may accept reimbursement for out-of-pocket costs—except for the Novice examinations.
- Be accredited when examinations are for the Technician, General, Advanced, or Extra class.
- Have a clean amateur radio operator compliance record. That is, no license suspensions or revocations.

The FCC added a new type of volunteer examiner to the VE/VEC System in January of 1987. We now not only have Administering VEs formed into teams of three accredited examiners who give examinations to candidates above the Novice Class, but also Preparing VEs.

A **Preparing VE** is an amateur operator who:

- Assists the VEC System in developing, revising, and maintaining the five different question sets for the Novice, Technician, General, Advanced, and Extra class written examinations or,
- Prepares the actual examinations, both written and telegraphy, for Amateur Operator licenses. Now VECs, VE teams, and Preparing VEs may all design the tests for amateur radio licenses.

A Preparing VE must hold a current amateur radio operator license higher (if there is one) than the examination being designed. §Part 97.517(b) specifies which amateur licensee class may assist in preparing the various amateur radio operator examinations (see Table I).

VE teams may use the examinations designed by outside Preparing VEs in their current and future test sessions providing the contents of the examinations have been kept secure against disclosure to potential test applicants.

The tests must be constructed according to a formula agreed upon by the collective VEC organizations. Proper test design involves selecting a specific number of questions from each of the nine topics covered in every written examination or according to the telegraphy test requirements outlined in §Part 97.21(b).

While it is legal for VE test teams and outside Preparing VEs to actually design the written test sets, in actual practice, VE teams usually use those provided by their VEC. Using VEC prepared written examinations is more convenient and ensures that the examinations have been properly constructed. The W5YI-VEC program has provisions for VE teams designing their own examinations.

According to the rules, the telegraphy examination is really a VE, rather than a VEC function, although VECs may provide the code tests to the VE team. While applicants must answer at least 74% of the written examination questions correctly, the rules do not specify how many telegraphy test characters must be copied in a row or how many questions about the transmitted code text must be correctly answered. It is generally agreed among VECs that an applicant passes the Morse code examination when the telegraphy text is hard copied at the prescribed speed for one minute or

Required for: Element: VE Class:	Novice 1(A) 5 wpm	General 1(B) 13 wpm	Extra 1(C) 20 wpm	Novice 2 Written	Technician 3(A) Written	General 3(B) Written	Advanced 4(A) Written	Extra 4(B) Written
Technician Class				X				
General Class	X			X				
Advanced Class	X			X	X	X		
Extra Class	X	X	X	X	X	X	X	X

Table I—Currently licensed operators of the above classes may assist in preparing these examination elements. For example, a Technician class licensee may submit question pool revision suggestions for the Novice (Element 2) written exam only.

National Volunteer Examiner Coordinator,  
P.O. Box 10101, Dallas, TX 75207



seven out of ten questions are correctly answered about the text.

The ARRL-VEC and W5YI-VEC testing programs account for about 80% of all amateur testing sessions conducted. The ARRL-VEC provides specific guidelines for the Morse code test while the W5YI-VEC program gives volunteer examiners general instructions only. W5YI volunteer examiners usually make up their own code tests and are authorized to use any answer format of their choosing. These formats include one minute solid copy, multiple choice, answering seven out of ten questions, or fill-in-the-blanks.

The rules also do not state that a specific code spacing format must be used. The ARRL-VEC uses the "Paris" standard for their 13 and 20 word-per-minute code tests and the "Farnsworth" timing standard for their 5 word-per-minute examination. The "Farnsworth" standard has faster speed code characters with longer spaces between them. The ARRL Novice code test, transmitted at 15 wpm with longer spaces, nets out to 5 words-per-minute. The W5YI-VEC program allows its volunteer examiners to use either standard. Most use the "Farnsworth" standard for all telegraphy examinations since the *code plateau* that exists at 10-12 wpm is eliminated if you learn the characters faster to begin with. Most code training courses emphasize the "Farnsworth" method. It makes little sense not to test the same way.

*Why do volunteer examiners for the Technician and higher examinations have to be accredited, while Novice level examiners do not?*

A good question, and one that we have wondered about also. The Extra class question pool covers many of the points one must know to participate in amateur testing above the Technician level. One would think that all Extra class amateurs would thus be qualified to act as a volunteer examiner for all license classes. Some VECs, however, require that their volunteer examiners demonstrate their test administering proficiency in some other way before participating in their testing program. This could be by reading a VE manual, attending a volunteer examiner training class, completion of a VE written test . . . or something of that nature.

Volunteer examiners also must certify to the VEC that they meet the minimum statutory requirements to become a volunteer examiner. While the same minimum VE prerequisite rules generally apply to Novice level volunteer examiners also, no approval by a VEC or the FCC is required prior to administering a Novice examination. The Novice program is also a completely separate examination program. I guess the answer to your question is that many VECs, whose testing program a volunteer examiner must follow, want to retain the right to accept—or to

reject—any individual who wishes to participate in their testing. The VEC does this by approving or accrediting VEs.

*Can we administer the Technician examination to a Novice licensee who brings no evidence of passing the Novice requirements to the test session?*

This is really a very common occurrence. Many applicants want to upgrade almost immediately after passing Elements 1(A) and 2. The Novice examina-

tion is usually administered by a team of two General class (or higher) VEs who do not have blank Certificates of Successful Completion of Examination (CSCE). The VE team mails in the successful Form 610 Novice application to the FCC leaving the applicant with no proof that the Novice examination was indeed passed. Actually there are many ways of handling this situation.

- The successful Novice application



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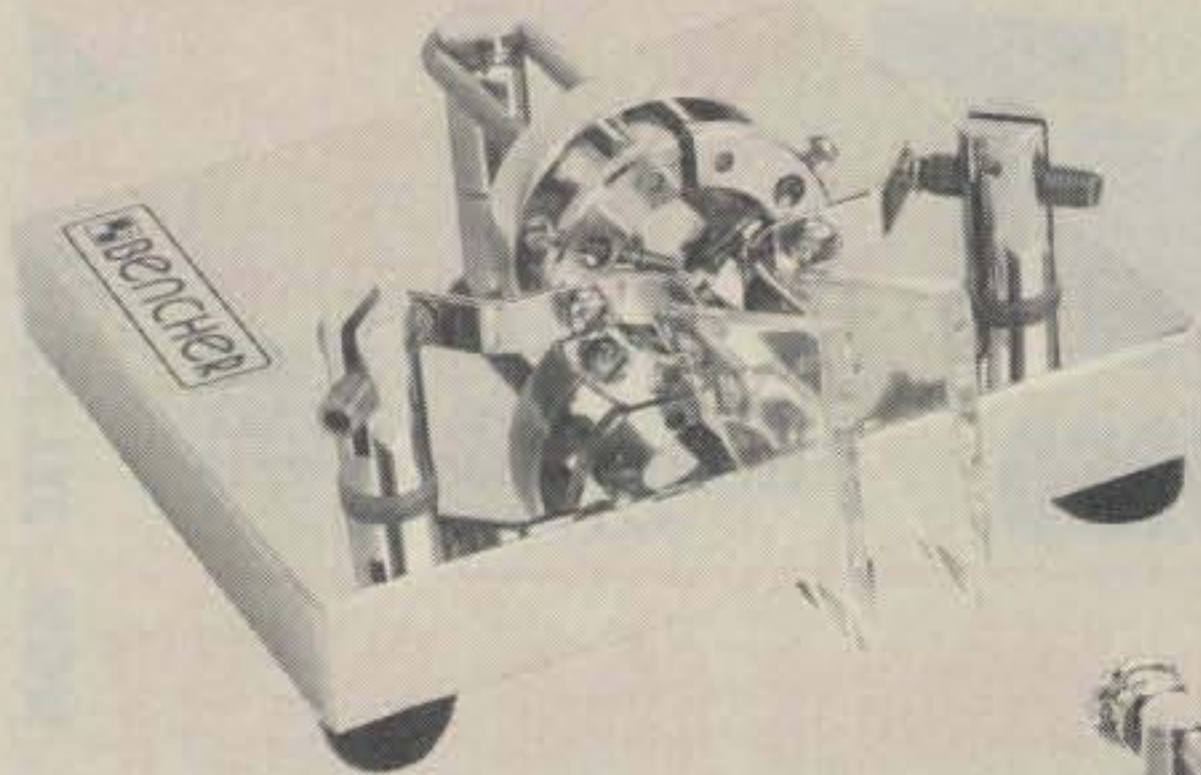
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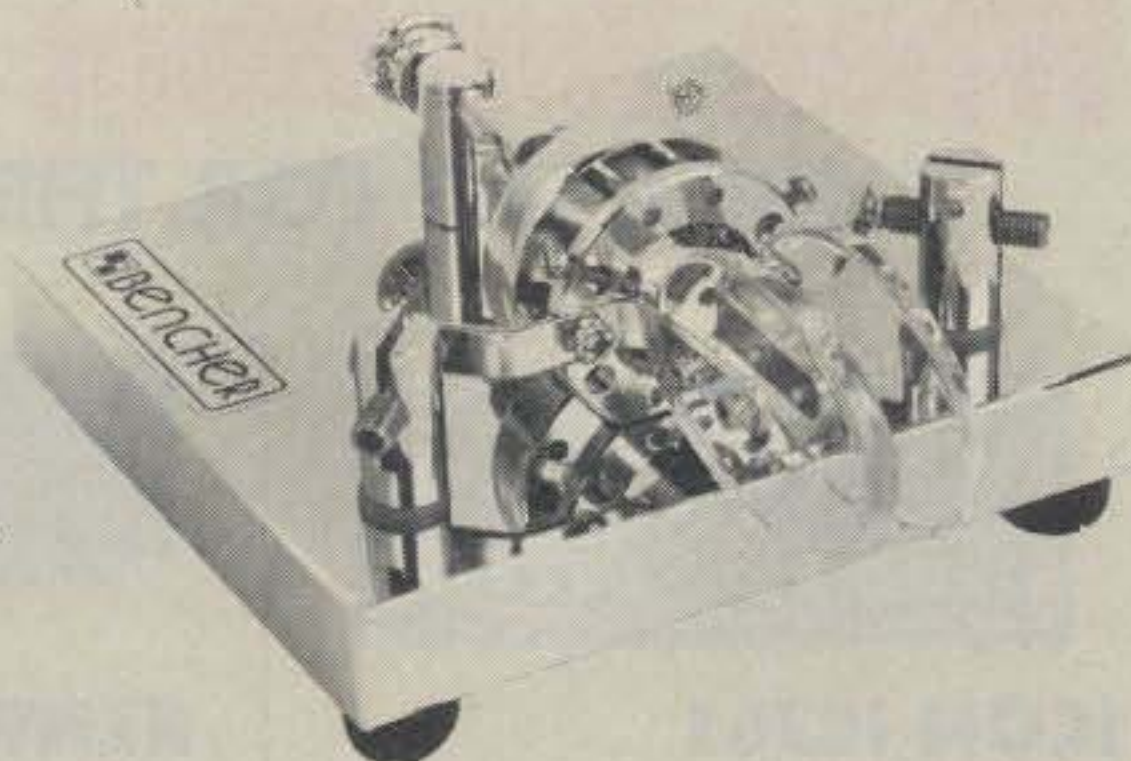
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could have been certified by the two VEs and given back to the applicant to bring to the (three VE) Technician session. The VE team would have appended the Novice application to the Technician upgrade. The first license issued by the FCC would then be the Technician level. This is the most desirable solution since it saves the applicant time (about two months) waiting for the Novice license to arrive so that it can be sent back to the VEC holding the Technician application. It also saves the FCC time and resources since only one amateur license needs to be issued.

- The Novice VE team could have given the applicant a photocopy of the successful Novice Form 610 to bring to the Technician examination session. After passing the Technician Element 3(A), the VEC would write the applicant and ask them to forward a copy of their Novice license once it has arrived.

- The Novice VE team could have given the applicant a signed letter by both VEs attesting that the applicant did indeed pass the Novice requirements.

- Even without the original or photocopy application—or a letter—the VE team still may test the applicant for the Technician level. The applicant should be advised that they will receive a letter from the VEC requesting that they forward their Novice license copy to the VEC office when it is received. If the applicant did not previously pass the Novice requirements, then the license will never be received and thus never be forwarded to the VEC. No upgrade license will be issued by the FCC unless the VEC appends the most previous license copy to the application.

Both the ARRL-VEC and W5YI-VEC have many Form 610 applications on hand awaiting Novice license copies. Some may never be forwarded since the applicant did not really pass the needed lower class license requirements and, therefore, will never receive the Novice license.

*Are there any differences between the examinations of the various VEC programs? Is there any advantage to one program over another?*

There is a difference in the Morse code examinations, but the written examinations are basically the same no matter which VEC coordinates the examination. This is because at their annual VEC Conference, the VECs agreed that only one question pool should exist. The FCC has not mandated that VECs must agree on a common question pool. Theoretically the written answer format could be different, but then again, the VECs agreed that we all should use the same multiple-choice answers. So there is really no difference in the written examinations of the various VECs. All license preparation material in the marketplace should be accurate for all written examinations no matter which VEC coordinated the examination session.



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# A Lightning Protection System For Your Shack

BY PETER ALTMAN\*, KO9G

**L**ightning is not a subject to be taken lightly. It can and does do considerable damage to amateur radio gear, household electronic equipment, and even computer software, to say nothing about the damage to home and other structures. Given the value of electronic devices in your house, and the cost of repairs brought on by direct, let-alone nearby, hits, adequate protection systems are certainly worth the time and investment.

This article covers the principles and installation of a lightning protection system based on ones developed for commercial radio installations. Such systems have provided direct-hit protection for installations up to several hundred feet high here in the Midwest, where electrical storms and thunderstorms are common, occurring even in winter months. It is derived from a presentation put together by one of the members of our local club.<sup>1</sup>

## First Things First

Lightning is "the large spark produced by an abrupt discharge of electricity through the air generally under turbulent conditions of the atmosphere." The charge moves up a pre-ionized path from ground to cloud and the current frequency exceeds 30 thousand amperes; 500 amps flow in the ionized channel between strokes.<sup>2</sup>

Lightning is also a series of alternating-current (AC) pulses with large amounts of energy distributed all the way across the spectrum—from DC to the microwave region. Thus, currents are readily induced in household wiring and electrical devices by near and not-so-near strikes. The fields can also be propagated for many miles through utility and telephone wires.

Lightning-induced currents take the lowest impedance path to ground. They are RF currents, and the difference between high- and low-impedance paths is a matter of very, very few ohms reac-

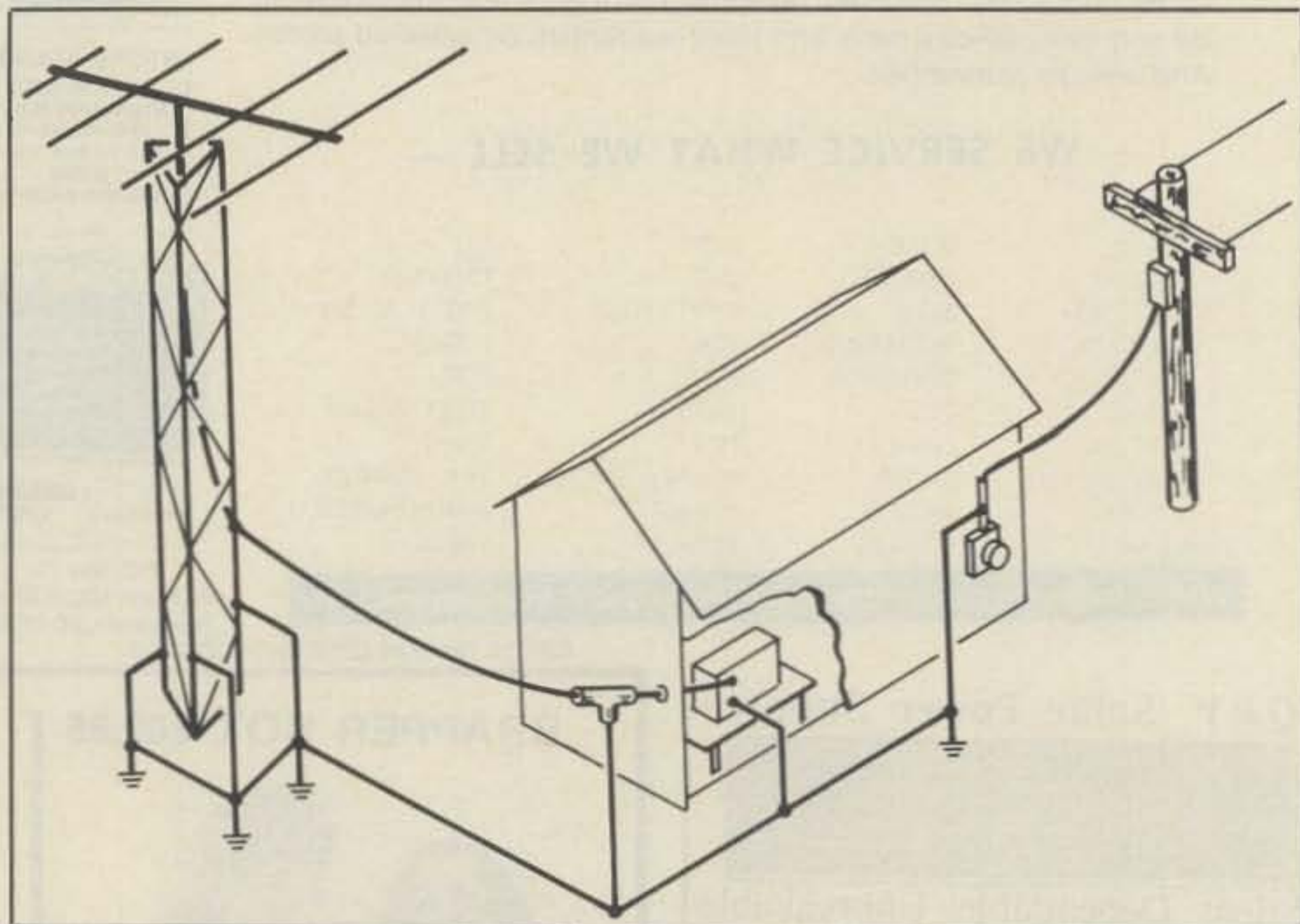


Fig. 1—A common ground tying tower, antennas, equipment, and AC service ground is essential.

tance. Even a corroded joint or sharp bend in antenna or ground leads is a high-impedance obstacle at higher RF frequencies. The objectives and methods of the lightning protection system described here, while focusing on tower-supported antennas, are relevant to any antenna system. These objectives are:

1. Provide a common, lowest-possible impedance path to ground for your antenna structure(s) and system, your home's electrical system, and your electronic equipment.
2. Provide the means to safely discharge lightning-induced fields before your gear and household electronics can be cooked.
3. Isolate your antenna system and amateur gear from house wiring—and vice-versa—with respect to lightning-induced currents.

## A Common and Solid Ground

The first step is to establish a solid,

common ground for everything: antenna supports and cables, household wiring, amateur radio and household electronic equipment, as shown in fig. 1.

A tower's concrete base is a great insulator. The reinforcing bars and tower bolts embedded in this base are not at ground potential by any means. Also, there is significant loss—high impedance—between tower legs (or tripod legs) as cross members and joints become corroded over time.

Tower-section joints should be bridged with ground strap or cable clamped to each leg above and below each joint; tripod legs are tied together with a continuous strap or cable clamped to each leg. Then each tower leg is grounded separately.

Next, 8 to 10 foot copper or copper-plated ground rods, at least  $\frac{3}{8}$  inch diameter, are driven into the ground 12 inches away from the tower base—one for each leg. Each rod is connected to the tower

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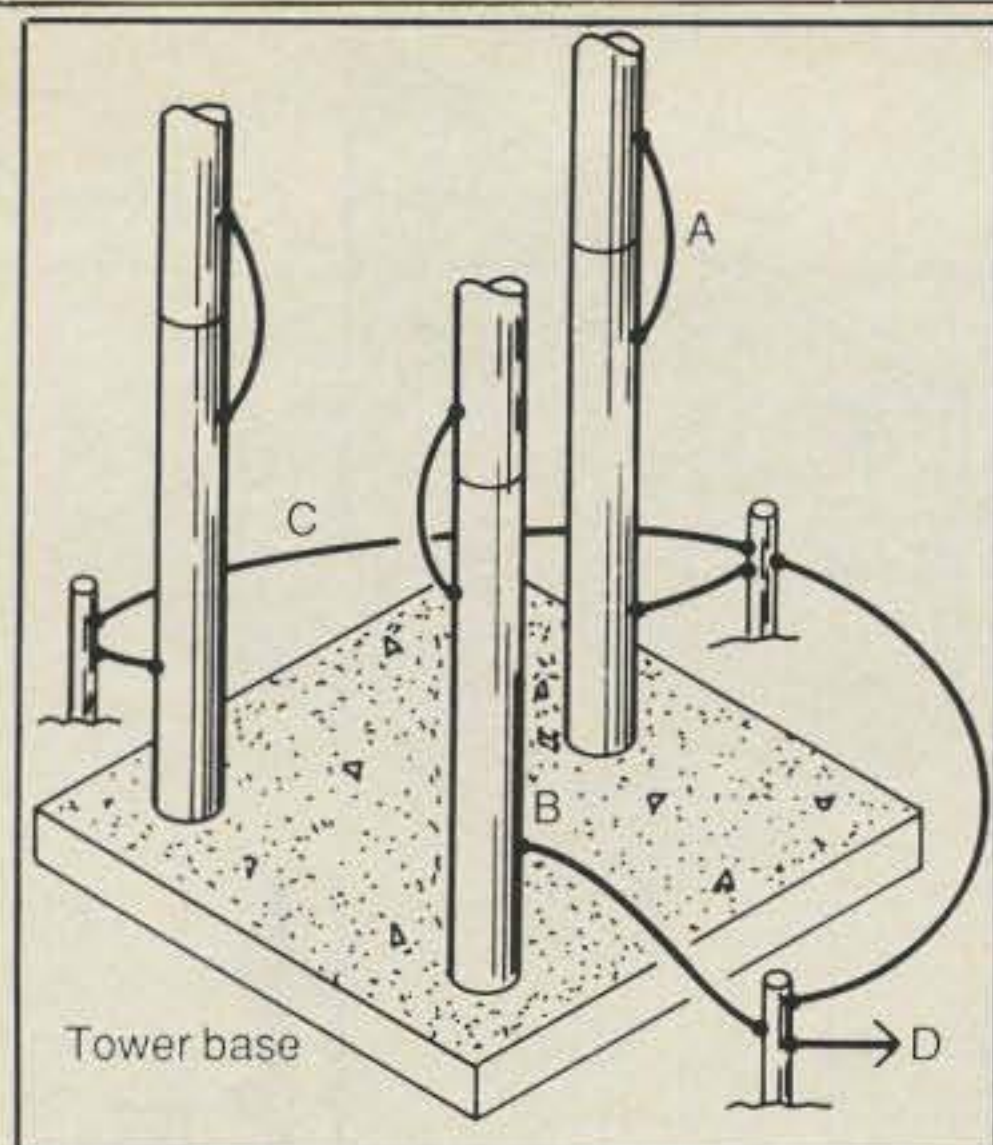


Fig. 2- (A) Tower section joints bridged with ground strap or cable. (B) Each leg grounded to own ground rod. (C) Rods tied together with continuous conductor. (D) All tied to service entrance ground.

with 0 or 00 gauge wire or similarly-rated flat copper braid strap as shown in fig. 2. Heavy crimp-on connectors are used at the cable ends and connections made to legs and ground rods with bolts, or ground cable may be secured to legs and rods with stainless hose clamps or cable clamps. All connections must be me-

chanically secure, clean, and weather-proofed with Co-ax Seal®, or similar compound.

Coax cable braid is out. It acts like an inductor and raises path impedance. Soldered connections are also out; the solder will vaporize if your tower is struck. Use it only for corrosion protection.

Once the tower sections and legs are bonded together and grounded, tie the tower-leg ground rods together with strap or cable, using the same method used to connect legs to rods. Then tie this entire antenna support ground to a common utility or water-supply ground point.

The common tie-point is your home's AC wiring ground—at the outside service entrance. ALL ground cables from your tower or other antenna support structures, as well as any other ground rods, are ultimately brought together here. They are tied (clamped) to either the utility-installed ground rod adjacent to the meter or to the heavy exterior conduit leading from the meter. An alternative, where ground-cable runs may be long or awkward, is the water-supply pipe to your house—before the meter and outside (assuming it is not rubber or plastic from a well).

When all of this is done, you will have a continuous, low-impedance ground established from the top of your tower in common with your house ground. Both ground rods and cable are available from

electrical contractors or possibly your utility company.

## Now Your Antenna and Rotator Cables

Coaxial cable shields and rotator cable shields must also be grounded with the shortest, lowest-impedance path possible. The objective is to prevent currents from flowing into your shack and/or household wiring.


Antenna and rotator cable shields may be tied to tower legs with ground straps. All ground ties must be straight and downhill and made mechanically and electrically secure. The method shown in fig. 3 is recommended for antenna coax, rather than breaking cable insulation. There's a bit more work adding PL-259's, but it saves cable degradation and also gives you a convenient way to add or change cable runs. Rotator cable shield may be grounded by clamping—not just soldering—a ground strap to the shield and running it to a tower leg.


Once cables have left your tower (with everything running in a downhill direction), you also want to add a bit more protection before they enter your house and shack. Make a one-turn loop in each cable segment between tower and shack. This will provide additional impedance for any lightning-induced currents. The loops are also "fuses" that can blow before your gear.

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" 2-317	30W	IN =	170W OUT
" 2-417	45W	IN =	170W OUT
<b>220 MHz</b>			
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" 3-112	10W	IN =	120W OUT
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Please send all reader inquiries directly.

Lightning arrestors or discharge devices should be installed in coax and rotator cables before they enter your house. Two types of arrestors are available for coax. One is a double-female device that provides a spark gap inside a metal tube. The other type is a gas-discharge device, such as a "Transi-Trap," marketed by Alpha Delta Communications (see ads in *CQ*, *QST*, and other magazines), which provides a voltage-dependent path to ground.

All arrestors must be securely grounded, either directly to your common ground cables or to ground rods (5–8 inch) which are then tied to your common ground system.

Rotator cables may be protected with low-voltage surge arrestors installed inside the rotator control box, one device for each conductor. They are designated GE V56ZA2. If unshielded rotator cable is used, these devices should also be installed inside the rotator housing.<sup>3</sup>

Why this attention to rotator cables? A local amateur, thoroughly familiar with tower installations, lowered his tilt-over tower and his antenna elements brushed against the 13K power lines at the rear of his lot. Sparks flew! It was discovered, after all the outdoor excitement, that damage was done inside as well. Currents flowing through connected rotator cable had gotten into his amateur gear and household wiring. Both the service panel and electronic equipment were damaged. Imagine what lightning could have done!

### Now To The Inside

With everything taken care of outside, you now want to make certain that wire-carried or induced currents can do as little damage inside as well. That means isolating and grounding everything.

A separate AC line should be used

from your service panel to shack, if at all possible. At least use a circuit that has nothing else on it—especially motors, if your computer is on line. This can help take care of RFI/TVI as well as helping lightning/surge protection.

A common ground bus—#8 copper wire, flat braided strap or even ½ inch copper pipe—is run from your operating position to ground. That ground is cold-water plumbing (before the meter, if possible), not hot water pipes or electrical conduit. Or, a separate ground rod. Each piece of equipment is tied to this bus, individually. Include transmatch, rotator control box, and power supplies. Avoid "up-hill" runs and sharp bends in ground wires.

Tie this ground bus to your outside tower/house common ground system. This is a must!

### Power Cords, Too

We're all aware that the solid-state devices inside your rigs, TV's, etc., don't take the electrical abuse that good, old vacuum tubes did—especially from static charges or voltage surges. Add to that software, especially in ROM's, for operating peripherals like your new TNC. You've got two ways to go.

You can remember to unplug everything and break out in a cold sweat in the middle of the night with the first lightning flash trying to remember if you did. Or, you can protect your equipment rather easily, plugged in or not.

As a first step, use three-wire AC power cords—even protecting "oldies but goodies" by replacing two-wire cords. And, use surge protectors and line-cord filters throughout, between your gear and the AC outlet(s). If you're a home-brewer, include MOV surge protectors as part of the project. Remember, these methods

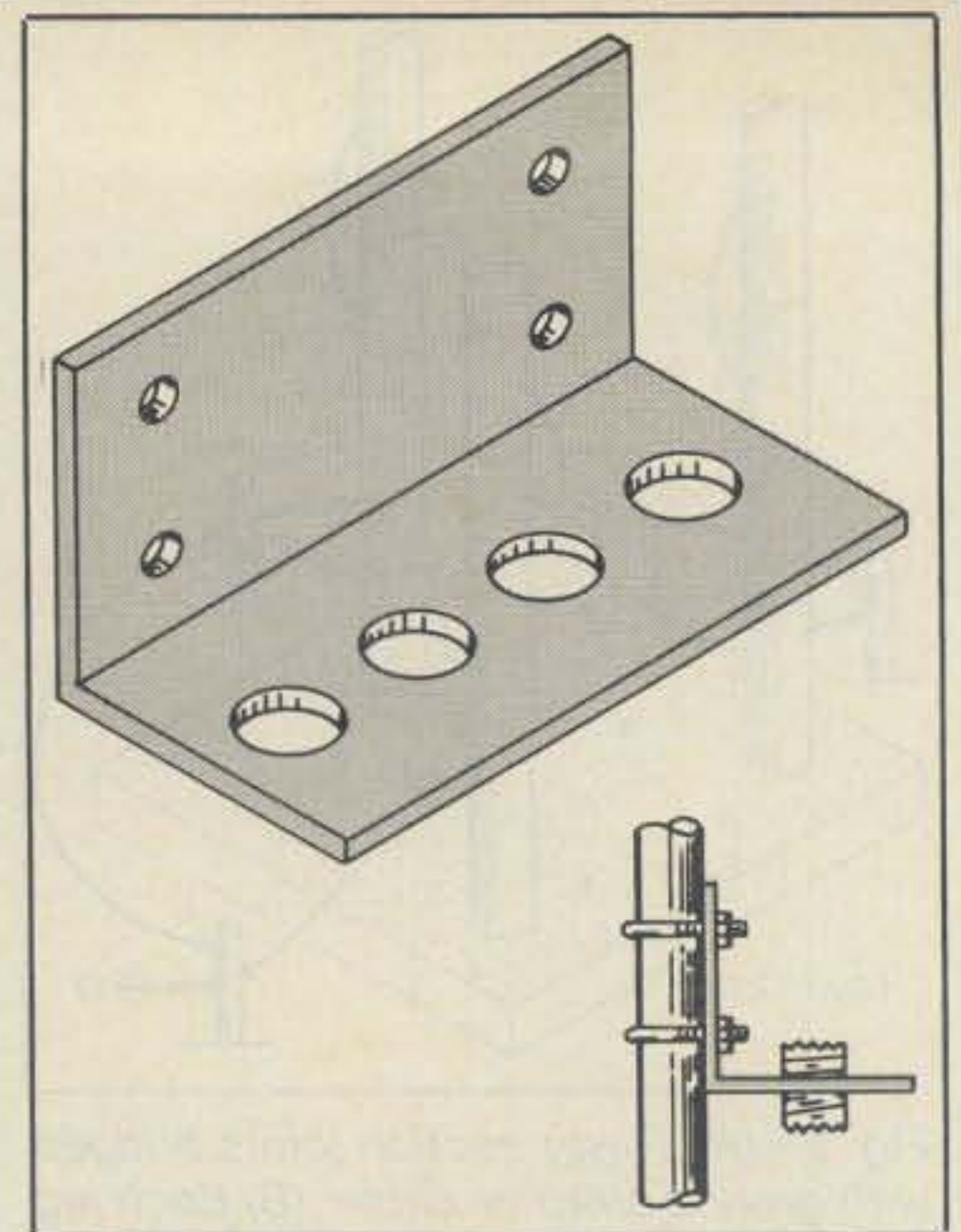


Fig. 3— One-quarter inch aluminum or steel angle plate drilled to accept coax feed-throughs as needed, and U-bolts to mount to tower leg. Mount so cable runs vertically to and from.

work best when you have proper equipment grounds.

### Wrapping It Up

Your investment in amateur radio and household electronics that are exposed to and easily damaged by lightning-generated currents is considerable. It is worth the effort to plan for their protection—and the protection of your house—and do it as thoroughly as possible.

A well-grounded system, regardless of your antenna system's complexity or simplicity, has additional benefits. It's a vital part of preventing or reducing TVI/RFI. Antenna efficiency can be improved. Operating and maintenance safety is increased. You will also be protecting equipment and software from switching and other nonlightning transients that often cause damage.

This system approach to lightning protection is not a "quick fix." You won't do it in a day, since your time is limited. Start with the tower and inside-the-shack grounds and work towards the middle as time and money permit. Once completed, you'll be secure for years to come.

### Footnotes

<sup>1</sup>Paul Sexauer, W9JTO, 29 W. 155 Lee Rd., West Chicago, IL 60185.

<sup>2</sup>"Lightning," *McGraw-Hill Encyclopedia of Science & Technology*, Vol. 7, 1982, McGraw-Hill, Inc., New York, NY.

<sup>3</sup>"Protect Your Equipment from Damaging Power Line Transients," Stuart and Collick, *QST*, Vol. LXVI, Feb. 1982, pp. 35–38, American Radio Relay League, Newington, CT.

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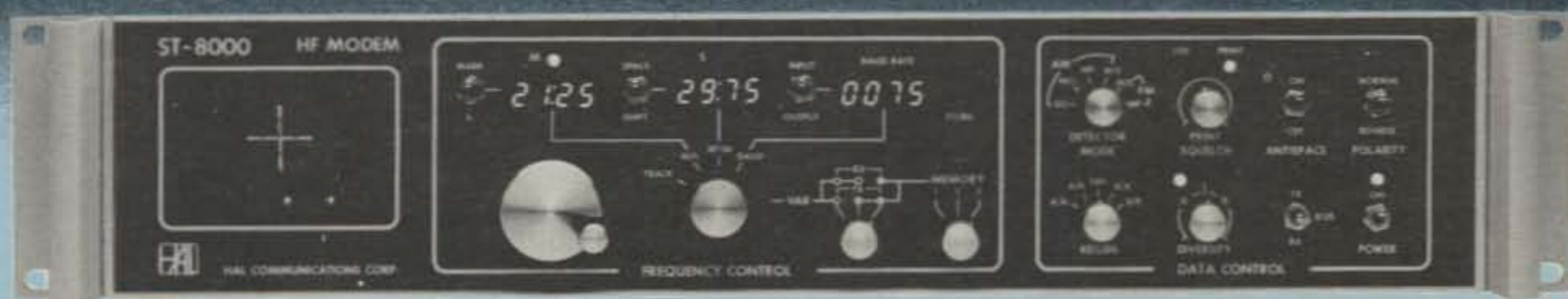
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## NEWS OF CERTIFICATE AND AWARD COLLECTING

### *G4HBI Visits Central Radio Club, Moscow*

**M**oscow is quite a different place than I had expected. Terry, G4VKV, and I departed for Moscow by British Airways. I was invited to view the flight deck, and half an hour before landing, I was invited back to the cockpit by the captain to sit-in while we landed. What a start to a holiday! We had left England at 0950 and landed in Moscow at 1250, plus 3 hours, making it a six hour flight. By the time we got to the hotel it was 1450 so there was just time to freshen up before our first meal in Russia.

We spent the next day, Friday, 13 March 1987, trying to find the Central Radio Club. We went to where we thought it was, and just didn't have any luck at all. Nobody knew of any such place as the Central Radio Club. It turned out to be on the other side of the city. In some ways it was a wasted day, though we saw a lot of the city.

Saturday, we had a visit from a friend from the Ukraine. He had taken 3 days holiday to be with us: one day to travel to Moscow, one day with us, and one day to travel back to the Ukraine. We breakfasted in our hotel then visited Red Square and VDNK, the Exhibition of Economic Achievements, a very impressive place, like an open air museum.

In the evening our friend had to leave to catch his train. We met up with yet another ham who lived outside Moscow. We caught a train with him and his wife to visit their house, and stayed the night. Really, we should have asked permission to travel outside Moscow, but we didn't want all the fuss. So we just went, and did not meet with any problems. Arriving at our host's house at 2330 hours, we met with real Russian hospitality there. For dinner, we were given a huge meal and did not get to bed until 0300 hours.

After breakfast Sunday, we visited some very beautiful buildings and then on to the house of our host's brother-in-law. Again, we were treated to typical Russian hospitality, a wonderful welcome for people they did not know, and could not understand. Only our host could speak English. Out came food, wine, and, of course, the customary vodka to toast peace and friendship. After about two hours it was back to our host's house for more feasting, drinking and lots of talking. About

333 South Lincoln Ave., Mundelein, IL 60060

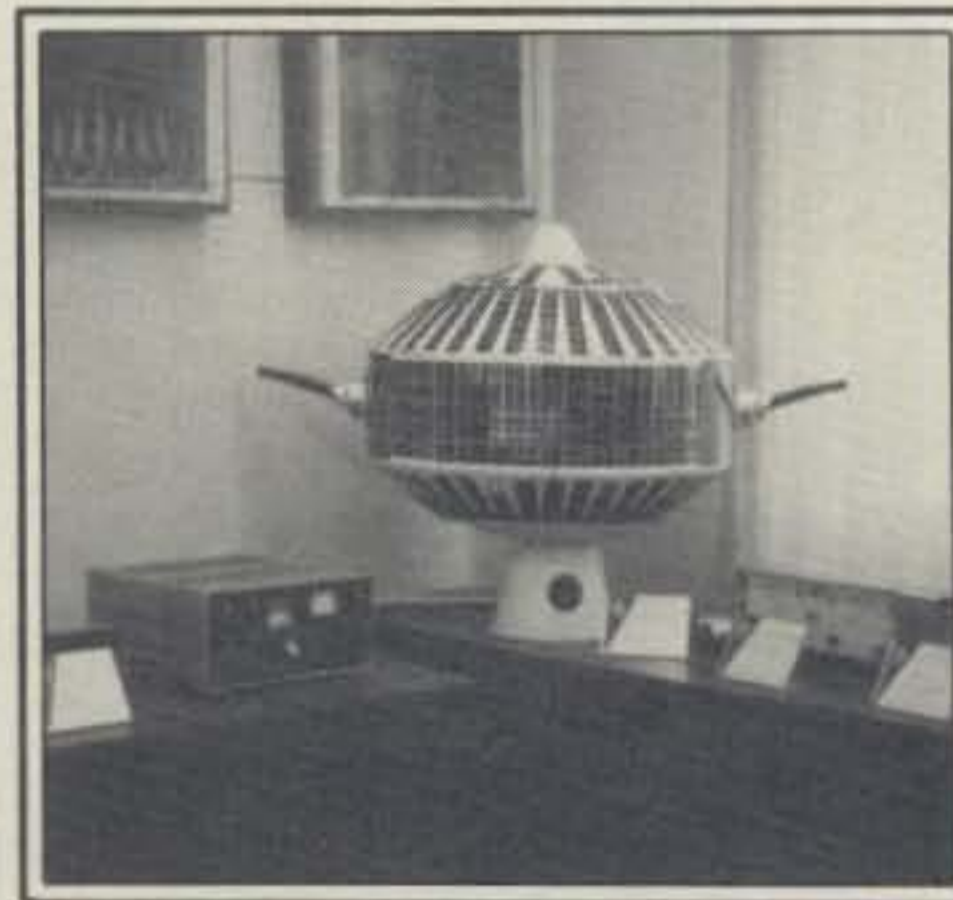


Staff members, Central Radio Club, L to R, UA3AJT, V. Bonderenko, interpreter; UA3DYL; UW3EE; UA3GM.

2200 hours we caught the train back to Moscow.

Monday we met with a ham from Latvia, and again there was much talking. We were picked up by car about mid-day by yet another ham after the Latvian caught his train back home. We were taken to the Central Radio Club where we were welcomed warmly. We were shown the QSL Bureau which is, in fact, two large rooms manned by five ladies full time. In 1986, they handled 5,000,000 QSL cards routed through P.O. Box 88. To see all those piles of cards was quite something. We were invited to check the "G" cards to see if there were any of ours, but we declined.

Then, they took us into the museum and club station, and we talked with some of the officials via an interpreter. They were most interested in all we had to say. We left to be taken to a restaurant by the two hams who brought us, as we had missed our mid-day meal and it was already late afternoon. After lunch, the friend with the car dropped us at a metro station, as he had to visit his wife in the hospital. We traveled back to the city center and did some shopping. (The shops stay open until 2100 hours.) After a few drinks at the bar and an emotional fare-



Model of Sputnik on display at Central Radio Club, Moscow, USSR.

well from the ham who was my real reason for making the trip to Moscow, we retired to our hotel for the night.

Tuesday we had breakfast, did some last minute shopping, and arrived back at the hotel just in time to clear our room, have our last meal on Russian soil, and head for the airport. The flight time to London passed more quickly because the lady in the seat ahead of us was most in-



## USA-CA Special Honor Roll

Boyd Stepler, WA9ROU  
All Counties #547, ALL SSB, 8-10-87

## USA-CA Honor Roll

3000		1000	
WA9ROU	579	NT7R	981
		W5OHF	982
		WA9ROU	983
2500			
KA5RNH	652	W4ILG	984
WA9ROU	653	HAODU	985
		OE5KE	986
2000		500	
WA9ROU	717	WA9ROU	2192
		UY5OQ	2193
1500			
W5OHF	802	F6DJV	2194
WA5RNH	803	AKOG	2195
AK2H	804		

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

terested in our trip and the reasons for making it. She was also quite interested in the fact that we were hams, and I spent a couple of hours telling her of our adventures. We caught the train from London at 2025 hours and arrived back home at 2330 hours, but didn't get to bed until 0230 hours: I just had to tell Doreen all about it.

Obviously this is a very condensed account of our six-day trip. Lots of things happened and we saw many wonderful sights, like Red Square and changing of the guards at Lenin's tomb. The people we found to be very warm, especially the policemen. When we approached to ask directions, the policemen saluted; then as I told them in my very best Russian that I was English and lost, they would break into a very big smile. Apart from the language and everyone wearing fur hats, I reckon you could have been almost anywhere. Moscow is teeming with people and it's quite an interesting place. I look forward to another visit to this lovely country.

73, Frank

## Awards Issued

Boyd Stepler, WA9ROU, made a clean sweep of it by claiming ALL Counties #547, USA-CA 3000 #579, USA-CA 2500 #653, USA-CA 2000 #717, USA-CA 1500 #803, USA-CA 1000 #983, and USA-CA 500 #2192, All SSB, dated 8-10-87.

Joseph Cannon, KA5RNH, added an endorsement to his certificate by claiming USA-CA 2500 #652, All SSB, dated 8-6-87.



Lino, CT3BM, Luis, CT4NH; and Miro, CT1UA important DXers and County Hunters at the QTH of CT1UA in Viseau, Portugal. (Photo courtesy of CT4NH.)

James F. Baker, W5OHF, filed his good application for USA-CA 1500 #802, Mixed, and USA-CA 1000 #982, All SSB, dated 8-3-87.

Warren H. Ash, AK2H, received USA-CA 1500 #804, All CW, dated 8-26-87.

O. Brian Schreen, NT7R, claimed USA-CA 1000 #981, Mixed, dated 8-3-87.

Al Blake, W4ILG, claimed USA-CA 1000 #984, Mixed, dated 8-10-87.

Istvan Bagyo, HAODU, filed his good application for USA-CA 1000 #985, Mixed, dated 8-18-87.

Adolph Kerschbaum, OE5KE, received USA-CA 1000 #986, Mixed dated 8-24-87.

USA-CA 500 certificates were issued to:

Boyd Stepler, WA9ROU, USA-CA 500 #2192, All SSB, 8-10-87.

Valery A. Momat, UY5OQ, USA-CA 500 #2193, All CW, 8-24-87.

Maurice Leray, F6DJV, USA-CA 500 #2194, All CW, 8-31-87.

David P. Held, AKOG, USA-CA 500 #2195, Mixed, 8-31-87.

## Awards Available

**West Kent Amateur Radio Society Award** (Amended Rules). The WKARS Award is available to licensed amateurs and SWL's (on a "heard" basis) for confirmation of QSO's with WKARS members, and also with other amateur radio stations located in the county of Kent.

To qualify for this award, applicants must accumulate 15 points. Points per QSO are as follows:

QSO with club station GIWKS, G3WKS, and GBxWKS - 5 points. QSO with present or past member of WKARS - 3 points. QSO with other Kent stations - 1 point.

This award is available for all CW, PHONE or MIXED modes, either HF (1.8 - 30 MHz), VHF (50 MHz - up) or mixed bands. It is also available for QRP (15 W), QRPP (3 W), or via satellite.

Do not send QSL cards. Send GCR list with the following data: Date, Time UTC, Frequency Band, Mode and QTH.

Fee: European stations, 1 IRC or 35p in Eng-

lish stamps; others, 2 IRCs or 70p in English stamps. Additional Band or Mode stickers, when applied for separately, are also 1 or 2 IRCs.

Present and past members of the WKARS (as of 1 July 1987) are GJ6TWF, K3HZO, LA0DO, VK6AIX, ZS6M, 5B4DN; G0's DBL, DEV, DJC, EBS, EMZ, FSX, GKW, GNN, GUV, HAU, HAX; G1's BGL, FQK, GJH, JBO, LTX, NZA, OBQ, PAZ, SWD, UNO UTH, VTN, VZK; G2's BT, UJ, AOL, BGU; G3's AIO, AMG, FVV, HCK, HOU, IOM, KIP, KOM, LMS, PEY, RST, TLB, TLG, TXZ, XPX, YOU, YPY, ZYP, ZZD; G4's IB, BIA, BKG, BMD, BOO, BUD, BWH, CCQ, CNE, DFY, DIX, DRB, DRV, DYF, EMV, ERW, EUK, FDC, FGU, FWG, FYG, GTN, HUW, IBQ, IJH, JFD, JZP, KIU, LNM, MXL, NAJ, OSH, OTV, OYW, PBF, PML, RPQ, RWT, SGI, SLD, UDW, UPI, XCZ, XDS, XIA, XRN, ZFP; G6's PS, TQ, BNJ, DUU, HFX, HVW, JUB, JZN, KLG, OOE, RHU, TBO, TBY, TKG, TWF, UJY; G8's KG, VG, CAA, CDD, CDP, DHP, FFG, GYB, IJH, IWP, JXG, JZN, KHf, KNA, KDA, KPU, KPZ, KQJ, KUV, LGS, LGW, LMV, MLZ, NOB, OFO, OPT, ORZ, PSS, PWO, RUX, SAS, SFR, UEH, UFY, UJM, VMG, VWN, WLH, WZK, XSC, ZXC.

Call signs G1xxx, G6xxx, G7xxx and G8xxx are VHF only stations. A GB prefix indicates a special event station.

Send application to Alexander Korda, G4FDC, 5 Windmill Court, North Street, Royal Tunbridge Wells, Kent, TN2 4SU, England, GB.

**New Zealand Awards.** The NEW ZEALAND ASSOCIATION OF RADIO TRANSMITTERS offers a number of attractive and colorful awards, five of which are featured below. The awards are available to radio amateurs world wide. Exchange of QSL cards is not required. What is required is a personally certified statement by the applicant that the QSOs claimed have been made. The following information on NZART awards is by courtesy of J.M. White, ZL2GX, Contest and Awards Manager, New Zealand Association of Radio Transmitters, 152 Lytton Road, Gisborne, New Zealand.



Worked All New Zealand Award offered by The New Zealand Association of Radio Transmitters.

**Worked All New Zealand (WAZL).** Contacts are required for 45 different Branches of NZART; except for overseas applicants, for whom only 35 are required. There is a special endorsement when WAZL is completed within a twelve month period. NB: Mobiles operating outside their own Branch Area must use the Branch Number of the area in which they are operating (for WAZL credit). Cost: \$2.00.

**New Zealand Counties (NZC).** The NZC basic award requires contacts with 20 different New Zealand Counties. Endorsements for 40, 60, 80, 100 are made with a special certificate

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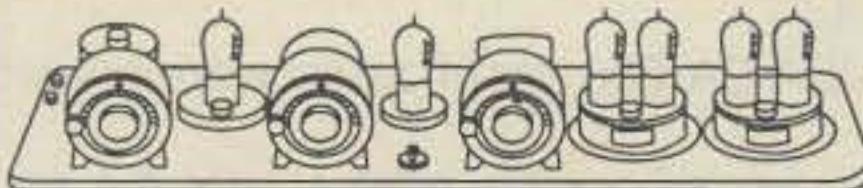
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New Zealand Counties Award by the Association of Radio Transmitters.



New Zealand Award, for specified numbers of contacts with New Zealand call areas.

for 112. A map showing counties and a checking sheet are available from NZART.

(1.) The initial certificate with any or all endorsements to 100 costs \$2.00. (2.) Separate endorsements to 100, after issue of the basic award, cost 20 cents for any group, or 1 IRC, plus SASE. (3.) Special certificate for "NZC 112" costs \$2.00. (4.) Checking sheets, which MUST be used and which are returned to applicant for record purposes, cost 20 cents (1 IRC). (5.) NZC "224" - the "224" Shield was instituted to recognize a very outstanding achievement, that of "double 112", with different stations contacted in the relevant counties for each NZC 112. Current cost is \$15.00. Applicants for NZC 224 must first hold TWO NZC 112 Awards. (6.) The operator on a "County DXpedition," whether Mobile or Fixed Portable, may claim that County for his own NZC credit. (7.) The original "Counties List" will be maintained irrespective of deletions or additions. The criteria will be the actual area of operation which must be determined by the honour of the operator. (8.) Overseas applicants: extra \$4.00 for airmail postage on "224" pla-

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**Five By Five Award (5 x 5).** This premier award has been instituted to recognize the increasing interest in Five Band DX operation. The initial award requires that the same station be contacted on five bands repeated with five different DXCC countries. A first endorsement is available after a further five has been contacted (total of ten) with an endorsement for 20 after another ten, and so on to 100.

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**RSGB HF Awards.** Effective as of 1 July 1987, the HF's Awards Manager, Radio Society of Great Britain, is Mr. Steve Emlyn-Jones, GW4BKG. All applications for awards, and other correspondence relating to the Society's awards program should be sent to The Awards Manager, P.O. Box 20, Bridgend, Mid Glamorgan, CF35, United Kingdom.

Please note also that (1) payment by check for awards is acceptable only if drawn on a British bank; and (2) the Islands on the Air (IOTA) Awards continue to be administered separately by G3KMA, to whom all communications on this award should be sent.

### Notes

We have received a letter from Andy, W3XE, telling us of an error made during his summer travels in Alaska. Through no fault of his own, Andy inadvertently "ran" the Second District on the CW County Hunters Net (14.070) on July 14 at 2000 hours. A local businessman told Andy that he was in the Second District; but Andy found out later that he was, in fact, in the Fourth District. Andy is correcting all MRC's received; and regrets this unfortunate happening.

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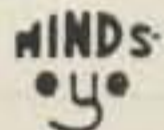
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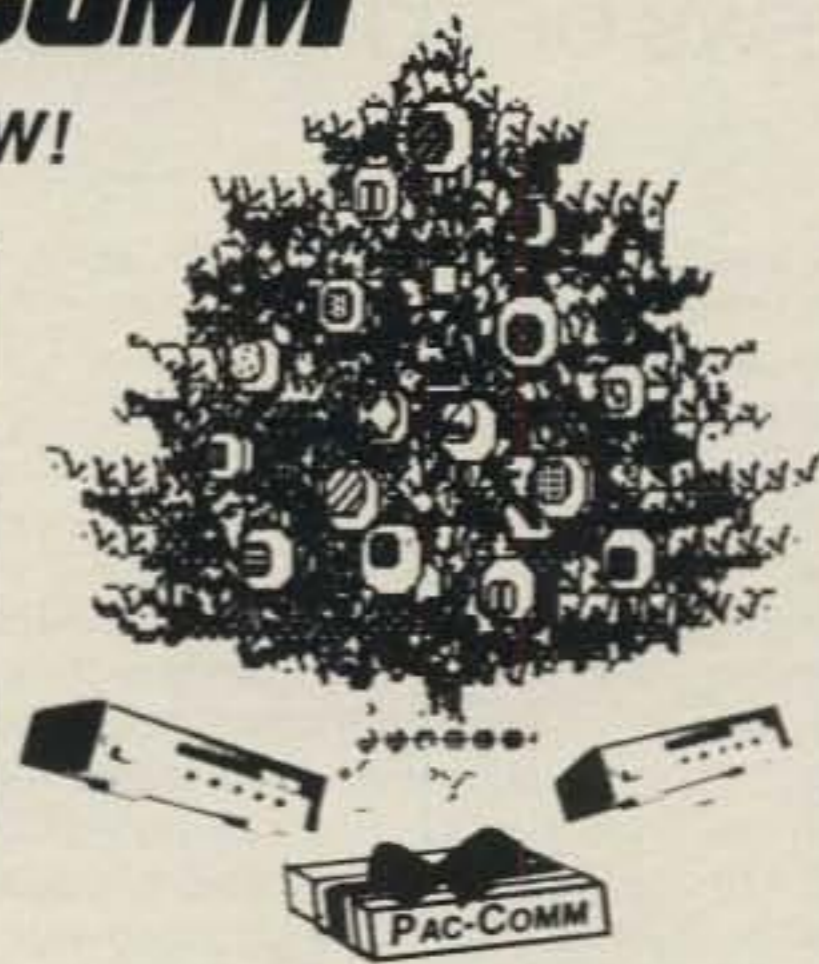
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## NEWS OF COMMUNICATION AROUND THE WORLD

*I've drunk delight of battle with my peers,  
Far on the ringing band of twenty,  
I am part of all I've worked  
I am a DXer! And I need help...*

The CQ World-Wide DX Phone Test had hardly ended when we got a visit from one of the Locals. His was a callsign that we could recognize, though we have never run across him at club meetings. He came with a worried look, a tightness across his eyes possibly indicating stress. "I am a DXer," the Local advised us, "and I need help."

We smiled. It is always good to meet another DXer. The good times are always remembered when DXers meet. "We are here to help you," we said in greeting, grasping his hand firmly, our left hands bracing his elbow. "What do you need? A new rig, a better antenna, a rare country, a schedule for a needed one? Any of these?" But it was none of these. This Local had a problem that was strange, possibly one even hard to comprehend.

"I am a DXer!" he proclaimed again, "and after the recent CQ World-Wide phone operation my family flatly told me that I had to get professional help. Something would have to be done or I might not like the consequences. I cannot understand the problem. No matter what I said, all they would tell me is that unless there were changes I would have to suffer the consequences. And I still don't know what they think is wrong. What am I to do? And what do they mean by 'the consequences'?"

We had to think this one over. In other times and other places we had come across gatherings where some would reluctantly stand up and stoutly proclaim "I am ..." something or another. But being a spectator and not a participant, it was difficult to understand or even appreciate the motivation. However, this one came speaking words which hardly indicated a problem. "I am a DXer!" bespeaks membership in a proud fraternity. But while the words were there, the pride was not. We had to know more.

"There must be more to the problem. Maybe if you would tell us about the events prior to the surfacing of the problem, we might be better able to understand. What did you do. What did the family do? Tell us about it. Tell us everything."

It was a good approach, we thought. Long ago we learned that there is a reason for everything and nothing happens without a reason. But there is difficulty at times in recognizing the reason. What is reasonable to you might be thought unreasonable by another. But it is always a good start—search for the reason. DXers are always reasonable; it is the others that you have to watch.

"What did I do?" he echoed. "Nothing much out of the usual. I went to work, came directly home every evening, did all the usual things. The last couple of weeks I have been



*This is Susan E. Anslow operating the station at the Holy Cross Mission in Bolahun, Liberia. After graduating with honors from Yale last summer, Susan went to Bolahun to be the business manager of the mission. Before her departure she learned that there was no licensed operator for the amateur station at the mission. With the intensive help of many amateurs in the Detroit area, Susan learned code and theory and was able to pass the Liberian exam on arrival. She is now signing EL5S. Look for her after 1900Z most nights of the week. The station had been active with Brother Laurence Harms, OHC, signing EL5A.*

down in the shack in the evening checking over the rig so it would be set for the CQ World-Wides, going over the antennas and especially the coax and connectors, running SWR charts on the low-frequency antennas. That was about all I did. I did spend a lot of time studying the bulletins for announced DX operations, cleaned up the operating desk so I could find things in a hurry, and even spent a couple of evenings working out the operating schedule which would give me the best chances for contacts and multipliers."

The Local stopped to mentally run over the list, checking for anything he missed. "Heck!" he continued, a plaintive note starting to show in his voice, "I really can't see that I did anything wrong. Certainly nothing that would make them tell me that I will have to change or face 'the consequences.' And what do you suppose they mean by 'the consequences' anyhow? Can you tell me?"

We thought that we might, but we did not want to worry him yet. 'Consequences' can mean a number of actions. Nails in the coax, power disconnected, wires in the rotator cable selectively severed. A lot of things can go wrong for a DXer in a contest from things that just happen. We did remember from years back when a pet squirrel had spent an afternoon checking out the shack, somehow finding a way to get into the sacred area. The chewed cables were ghastly to see, a gray tree squirrel having teeth that can chew through light aluminum sheeting. But it was the moisture problem in the new transceiver that was the worst. For years after there was speculation among the Locals down in the village as to how the squirrel would know where he could do the most damage with a change in humidity. But these 'consequences' did not seem to fit the problem at hand.

"What you tell us sounds absolutely normal for a DXer," we cautiously commented, "but what about the rest of the family? What were their activities? What did they do? Did they have plans for anything? Tell us about them." The Local sighed. We began to think that we might be on to something.

"Really, there wasn't much outside their normal routine. The kids are all in school in October, things have settled down after the summer, and while the XYL was thinking of Thanksgiving and Christmas, I was thinking of the CQ World-Wide. That brought some discussion, I guess. But mostly it was just the normal routine. The only thing else that I can remember is that the XYL's mother's birthday came on the Saturday of the CQ World-Wide. Maybe it was just the normal family routine, they living from payday to payday, myself living from contest to contest."

Again there was a pause and an obvious need for some reassurance. "With the CQ World-Wide Phone Test the last weekend in October, you can understand where my thinking was. Certainly you can understand all of this, can't you?"

"Your mother-in-law's birthday?" we said, thinking that this might be the clinker in the recounting of the placid family existence. "Where does she live?"

"Upstate about 150 miles. It takes an overnight trip to visit her, and during the school year that pretty much means a weekend visit. But this year her birthday fell on a weekend, and it had to be the weekend of the CQ World-Wide. Maybe there was a problem, but definitely there was no way I could go. Then the XYL flatly refused to consider driving up with the children without me to visit her mother. Is that reasonable?"

We were careful not to comment, not being sure just what was being judged. Was it the reluctance to visit the XYL's mother without the Local, or was it a failure to appreciate the necessity of being home for the CQ World-Wide weekend? It was a question that would call for some careful balancing. Sometimes these instances are difficult to weigh because of values involved that only a DXer might appreciate and understand. Obviously!

"It hardly sounds so," we commented. "But how do you feel about all of this? Does it bother you?" The Local was quick to advise that it did.

"Of course it does. Here I am in the middle of the CQ World-Wide Tests and I have always tried to do everything to help. I am always available down in the shack should they need me. I go to church with the family regularly on Sunday provided there are no big contests on. I always listen for the telephone when the XYL walks the dog in the evening. Every Spring I am ready to help her plan her garden work. Heck! Even when the house needed painting a year back, I took time out to go down to the paint store and haul the paint home for her. *What else do I have to do?*"

It was obvious that this one could be a fount of inspirational information. Certainly his record was exemplary, his sensitivity all that might be expected from a Deserving type, his priorities were strong and ordered, his spirit



## The WPX Program

### Mixed

1295	KB0G	1299	JR3IR
1296	VE7OR	1300	KA2AOT
1297	W9VA	1301	DL9OY
1298	HL4CCM	1302	WX5S

### SSB

1909	IN3QCI	1912	PY4OY
1910	DF1SD	1913	WX5S
1911	IK8EUX	1914	CT1CDL

### CW

2465	I1POR	2468	OH4OJ
2466	W9VA	2469	DF1SD
2467	FE2VV	2470	WX5S

### Endorsements

Mixed: 450 KB0G, W9VA, HL4CCM. 500 KB0G, W9VA, HL4CCM, KC7EM. 550 WA8SXM, KB0G, KJ6Z, W9VA, KC7EM. 600 KB0G, W9VA, KC7EM. 650 KB0G, W9VA. 700 KB0G, W9VA, K6UXO. 750 KB0G, W9VA, JA1WJ, G4PWA, AD8W. 800 KB0G, W9VA, JA1WJ, AD8W. 850 KB0G, W9VA, JA1WJ, KS3F, AD8W. 900 KB0G, W9VA, JA1WJ, AD8W. 950 KB0G, W9VA, JA1WJ, AD8W. 1000 JA1WJ, DF1SD, AD8W. 1050 DF1SD. 1100 DF1SD. 1300 WB4RUA. 1550 I1POR. 1600 I1POR. 1650 I1POR. 1700 I1POR. 1750 I1POR.

S.S.B.: 400 IN3QCI, DF1SD, PY4OY, CT1CDL. 450 KB4HU, IN3QCI, DF1SD, PY4OY, K3ZPF, CT1CDL. 500 KB4HU, IN3QCI, DF1SD, PY4OY, CT1CDL. 550 KB4HU, IN3QCI, DF1SD, PY4OY, CT1CDL. 600 KB4HU, IN3QCI, DF1SD, PY4OY, G4PWA, CT1CDL. 650 IN3QCI, DF1SD, PY4OY, KD9OT, CT1CDL. 700 IN3QCI, DF1SD, PY4OY, CT1CDL. 750 IN3QCI, DF1SD, PY4OY. 800 IN3QCI, DF1SD, PY4OY. 850 IN3QCI, DF1SD, PY4OY. 900 DF1SD, PY4OY. 950 DF1SD, I2EOW. 1350 I1POR. 1400 I1POR. 1450 I1POR. 1500 I1POR. 1850 WD8MGQ. 1900 WD8MGQ. 1950 WD8MGQ. 2500 ZL3NS.

CW: 350 OZ4RS, W9VA, FE2VV, OH4OJ, DF1SD. 400 W9VA, FE2VV, DF1SD, OZ4RS. 450 W9VA, FE2VV, DF1SD. 500 W9VA, FE2VV, NN7A. 550 W9VA, NN7A. 600 W9VA, NN7A, JA1OJZ. 650 W9VA, JA1OJZ. 700 W9VA. 750 W9VA. 2000 G2GM. 2250 N6JV.

15 Meters: N2CIC, WX5S  
 20 Meters: IN3QCI, W5AWT, WX5S  
 40 Meters: DF1SD, WN4KKN  
 80 Meters: DL-14687  
 160 Meters: W8DPM

Asia: IN3QCI  
 Africa: DF1SD, DL-14687  
 No. America: IN3QCI, W5AWT, G4PWA  
 Europe: IN3QCI, W5AWT, KS3F, WX5S  
 Oceania: DF1SD

**Award of Excellence Plaque Holders:** I0JX, WA1JMP, K0JN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YLW4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SM0DJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, K6JG, N4MM, I8YRK, W4CRW, SM0AJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA, ON4QX, WA8YTM, YU2DX, OK3EA, I4EAT, OK1MP, N4NO, ZL3GQ, VK9NS, DE0DXM, DK4SY, AB90, FM5WD, I2DMK, W4BQY.

**Award of Excellence Plaque Holders with 160 Meter Endorsement:** DK5AD, W3ARK, LA7JO, W4VQ, K6JG, W4CRW, N4MM, SM0AJU, KF2O, K5UR, OK1MP, N5TV, W8CNL, W1JR, W6OUL, W4BQY, W5UR, N4NO, W8RSW, N4KE, I2UIY, W8ILC, W1BUS, NN4Q, G4BUE, LU3YLW4, I4EAT, VE7WJ, W9NUF, N4NX, VK9NS, DE0DXM, K9BG, AB90, FM5WD, SM0DJZ, VE3XN.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, P.O. Box 1351, Torrance, CA 90505-0351 U.S.A.



*How do you tell DXers? They are tall, alert, distinguished, and obviously self-confident. You can really tell by reading their name tags. Here is the Executive Committee of the Liga Mexicana de Radio Experimentadores. From the left: XE1FK, Secretary Alfredo Beltran S.; XE1NJ, President Guillermo Nunez J.; XE1JA, Guillermo Perez de la Garza the vice-president; and XE1ATT, Treasurer Antonio Colunga R. LIGA has resumed publication of ONDA CORTA (Short Wave) and has named Gaston Becherano M. XE1GBM, as the LIGA IARU representative.*

was noble. "Tell us something. How many DXCC country counters do you have in hand? A couple hundred maybe?"

It was a close guess. "Two thirty four on the wall; seven worked but still waiting for the QSLs. You can see how important those CQ World-Wide DX tests are to me. That's the time when I always expect to catch some new ones. They are getting harder to find and I sure don't want to miss any at all. It sure is tough when things start getting in your way and you don't even know what is wrong. Don't you think that things should go better and especially for DXers during the CQ World-Wide?"

There could be no disagreement with such premises. "How about thinking things over and checking with us in a week or so. Maybe by then one of us will have come up with some answers." What we really were looking for was time. But then again, we might have been thinking of running the problem past the XYL here, though it was hard to believe that there might be a different viewpoint. But sometimes there are depths of understanding found in the minds of the XYLs of DXers, and sometimes viewpoints that were not expected.

"I will talk to his XYL," was the only promise we got in that area. But what the heck, it might be of some help in the matter, though we were not really sure why.

It was hardly more than a week and the Local was back. This time he came with a bounce in his step, the DX lilt in his voice. "Things have sure gone 180°. The XYL is smiling again, the problems are all gone, and I am ready for DX! Bring it on, tiger!"

This certainly was good to hear. We have always thought that time will straighten out most problems. All one need do is endure. "What happened?" Suddenly for us alone, it was almost as if time was passing again in review.

"Your XYL sure helped in explaining how things are for DXers. At home now we have worked out a schedule, this to ensure that I am in the shack for all the major DX weekends. Also, my XYL tells me that now she understands that once a DXer gets to the Honor Roll, the scenario goes from non-stop tuning to non-stop talking about the good old days. DXers

then enter into what generally appears to be a semi-retired status. She says that this will give us time for things we have planned over the years to do with the family and she will help me get on to the Honor Roll. How about that!"

We were impressed, but the Local was not yet finished. "You know, it does seem peculiar to me that one might lose some of the gung-ho spirit when you have worked everything. It does not sound right. But if she wants to think that way, it will be to my advantage, right?"

What could we say? We did know of a few DXers who seem to have faded when they got to the top. They sat there high in totals but low in current activity. Actually we could remember more than a few, but it would never happen to you or to us, never! But domestic tranquility must always be a plus, and we were happy to note that this one had not even once thought to stand straight and proclaim "I am a DXer!" Maybe there are cures. "Anything else?" we asked casually. Later, we were to wish that the question had not occurred to us.

"There sure is," the Local raced on enthusiastically. "The XYL is sure taken with that pet squirrel family of yours. She told me how they have lived for years in that big oak tree behind your QTH and how every morning they are at the back door for their walnuts. She was really amazed to learn how they will take the walnuts from your hand and how easy they are to tame and to train. It must be a wonderful experience. My XYL says that we are going to get a pair from you next Spring when there is a family increase in the squirrels. That sure will be nice, won't it?"

We could not reply. The chill of remembered

## The WAZ Program

### 20 Meter Phone

617	KD7O	621	TI2LTA
618	JA0CKE	622	WL7K
619	G4LVQ	623	K4ADN
620	VE7AHA	624	K0QQ

### 40 Meter Phone

42 ..... OH8SR

### 20 Meter CW

264	W0VU	266	NY5L
265	OZ2JI		

### All Band WAZ SSB

3134	5N9GM	3138	IK8ARF
3135	WB8HLI	3139	KC9YX
3136	I0KRP	3140	IK0APR
3137	PT7WZ	3141	KE5TF

### Phone/CW

6146	N6VF	6156	VE2EDK
6147	EA7CBE	6157	K7FC
6148	G4FAM	6158	XE2AQ
6149	JA0FLL	6159	WA4IUM
6150	JE3EDJ	6160	OK1ALW
6151	UP1BZZ	6161	AA6EE
6152	HB9DDZ	6162	NO6H
6153	W6LDE	6163	LZ2KK
6154	JA0EYP	6164	LA3IBA
6155	JA2VB		

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (39 cents) size 4 1/2 x 9 1/2 to the WAZ Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. 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 C.Q. awards is \$4.00 for subscribers and \$10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest CQ mailing label with your application.

## 5 Band WAZ

Standings as of September 1, 1987

New recipients of 5 Band WAZ with all 200 zones worked:

- 152. UP1BZZ
- 153. IT9ZGY

The top 10 contenders for 5 Band WAZ are:

- |               |                |
|---------------|----------------|
| 1. N4WW, 199  | 6. SP6JCY, 199 |
| 2. K6YRA, 199 | 7. W2YY, 198   |
| 3. W8UVZ, 199 | 8. K7UR, 198   |
| 4. K9CEB, 199 | 9. K9GX, 198   |
| 5. DJ9ZB, 199 | 10. G4BWP, 198 |

430 Stations have met the 150 Zone level.

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disasters had run down our spine, and the disordered pattern of the memory of other years suddenly was falling into place. Back then we never could figure out how the squirrels could get into the shack. The torn papers, chewed books, and mangled cables were bad enough, but it was when we turned on the rig during those contest weekends that we came face to face with dire tragedy. The heat from the rig along with the increased humidity left by the squirrels quickly drove us from the shack gasping for fresh air. Things continued smelly, and the whole weekend was washed out—those contest weekends and a number to follow.

For years the question had lingered. Why did it have to be us? And why did the squirrel have to pick that place... and more than once? Maybe we did not want to know the answer; maybe it would be better not to know. We rose to our feet, standing straight and tall as a DXer always should and said, "We are DXers and we always need help!"

Perhaps we were starting to understand. Perhaps it may take time for full understanding to come. But most of all one will have to acknowledge that one does have a problem. And sometimes more of a problem than one might wish. But always be strong. Face and acknowledge your problem. Stand tall and say, "I am a DXer!" It might help.

### Cocos-Keeling

VE3JPP passes along a reminder that VK9 Cocos-Keeling Islands will be active for two weeks starting November 25th. There will be two operators—Hans, VK9YH and Victor, VK9YV. The home call for Hans is F6GVD, while Victor is G3AAG.

Peter passes along the information that the team plans to listen the first ten minutes after the hour for QRP stations, while they will listen at the half hour for handicapped operators. No planned operating frequencies were known at the time of writing, but once they are on the air they should be easy to find. VK9YC is given as the QSL Manager, though you can also go direct to Hans whose home call is in the CB. SASE or SAE/IRC requested.

### Grenada

A group headed by Bill O'Kain will be on Grenada from February 17th to March 8th in 1988, this to be the ninth effort by K4LTA in the Caribbean. Early planning had others in the effort, these including Ruby O'Kain, N4FKO, the XYL of Bill; Mel, K4PJ; and Dave Short, W5PWG. There is a good possibility of more operators joining in the effort. Look for them to be on the air by February 18, and possibly sooner if travel plans fall into line.

Most of the action will be in CW and the phone activity may be found mostly on 20. The planned operating frequencies are as follows: for one 160 look for them in the DX window at 1825-30 kHz or at 1823 and 1833 kHz. Dave Short, W5PWG, will be giving special attention to the WARC bands, including 18 MHz. On 20, look for phone activity at 14195 and 1425 kHz. A weekday schedule at 2230Z will be at 21123 kHz for U.S. Novices or slow-speed CW operation.

The last time out in 1986 the group found good 160 openings to Central Europe, but the conditions to the Pacific and Asia were not the best. They are hoping for improved paths in that direction, this being the start of the new cycle and the lower frequencies will decline as the cycle develops. If you are looking for J3 Grenada for a 5BDXCC or a 6BDXCC, this may be the best opportunity for some time.

QSL routes will be determined later. Any queries about the Grenada effort can be aimed at Bill O'Kain, K4LTA, or David Short, W5PWG. The address for David is 119 Irwin Road, West Columbia, TX 77486. An SAE or SAE/IRC will be asked for when you send your QSL.

### Sahara Arab Democratic Republic

Heading into the Fall season this one was still on hold. Many were trying, but no one as yet had gotten over the bureaucratic hurdle. But keep the spirits up. Someone will make it one of these days. Off hand, it does seem that Rockall, the Pribilofs and North Korea are the only potential DXCC countries that have never shown on the DXCC list. But patience and longevity will bring even the most difficult one. Just start young.

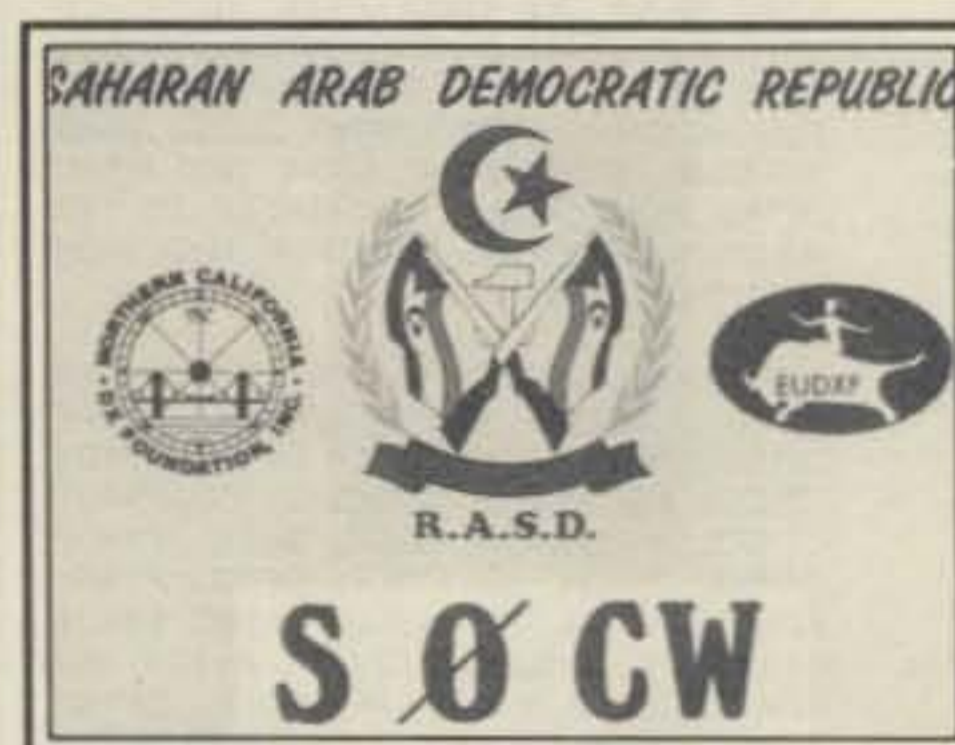
Almost as good as the operation, we are bringing you a couple of items. Look close by and you will find a photo of Baldur Dobrica, DJ6SI and his XYL Christa. Baldur has been trying to find the key to getting across the border with his gear. It does seem that he can do one but not the other.

Also for those who are interested in QSLs from rare countries, there is a view of the QSL for S0CW. There are not many of these out so far, but plans are going forward to increase the number.

If there are still any questions lingering, it might be noted that SADR, the Saharan Arab Democratic Republic, is what was once Spanish Sahara in northwest Africa. The country came into existence on February 27, 1976 when independence was gained and the new country proclaimed at the oasis Bir Lehlou. If you wonder what the problem is and why DXers are not welcomed with marching bands, keep in mind that there are some differences over who and what belongs to whom, and part of the former Spanish Sahara is occupied by Morocco. Eventually things will be sorted out. SADR has been recognized by 70 states, has the status of a neutral observer at the UN, and belongs to the Organization of Neutral Coun-



Here is Baldur Drobica, DJ6SI, and his XYL Christa. Baldur is a DXer heard from any exotic spots. He is in the CQ DX Hall of Fame, and he is determined to put S0CW on the air. Will he? You can count on it. The Saharan Arab Democratic Republic will be heard one of these days, and you most likely will be working Baldur.



Everything is in place. Time will bring the Saharan Arab Democratic Republic on the air and the QSL will be yours. A new country, the only thing holding up your getting the new DXCC counter, is someone getting permission to operate. Patience! Meanwhile, you can know what you will be getting.

tries and the Organization of African Unity. Even the International Court at The Hague has said that SADR should be given full membership in the UN.

Possibly one of these days soon things will straighten out. Baldur, DJ6SI, and Harry Jakob, DL8FM, are both top operators. When the photo of DJ6SI was taken at the International DX Convention at Visalia, he was asked how he manages to get so much rare DX on the air. His reply was pithy, maybe even tersely cogent. "Persist!" was all he said. It, for Baldur, has been enough.

### TG9VT

Possibly more than once you have wondered about the operator when you worked him in a DX country. There always has to be more than just a callsign, and sometimes the story behind the callsign can be quite surprising. Maybe you have worked John Troost, TG9VT, in a contest in other years. A short review of his life might be even more interesting than just thinking of him as a DX station.

John was born in Rotterdam in the early twenties. In 1940 the city was smashed between the warring armies. John says that he



Rob, WA3QLS

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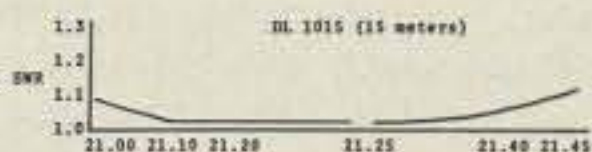
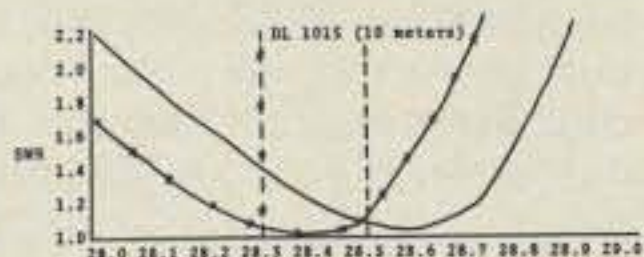
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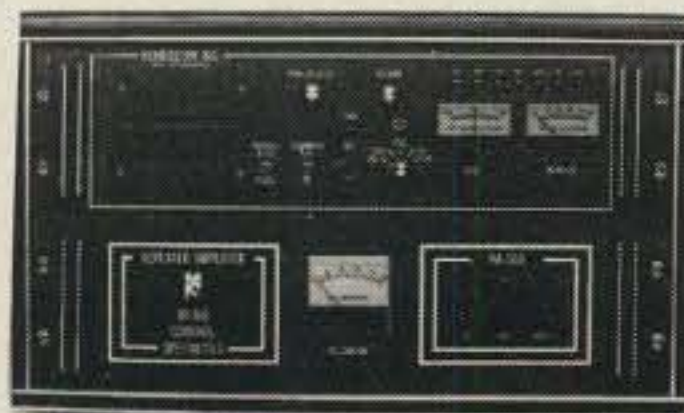
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## The WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ master prefix list. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be up-dated annually by addition to, or to confirm present total. If no up-date, file will be placed into "inactive" until next up-date. Lifetime Honor Roll fee \$2.00 (U.S.) for each mode, with no fees required for up-dates.

### MIXED

3217	YU2AA	1990	N2AC	1484	SM3EVR	1219	K2OLF	914	EA1CIM
3200	F9RM	1945	W9NUF	1470	K8LJG	1193	YU2TY	877	I2CZQ
2903	K2VV	1924	K5UR	1451	KL7AF	1185	W4UW	855	K9BQL
2805	W2NC	1922	WA8YTM	1442	N6JM	1159	A18S	848	W9JBR
2619	K6JG	1898	PA0SNG	1415	G4FAM	1156	N8BJQ	840	I2EAY
2573	VE3XN	1863	I2PJA	1374	W6OUL	1153	N2AIF	788	G4SDJ
2502	K6XP	1859	PY1APS	1347	I2UIY	1117	KC8CC	773	YU7DR
2401	N4NO	1841	W1NG	1345	YU7AJD	1108	YU1GR	759	OE1KJW
2372	W4BQY	1836	YT7DX	1322	NN4Q	1080	WD9IIC	747	KD8IW
2359	W9DWQ	1825	EA2IA	1304	AB90	1074	VK9NS	726	K18B
2297	YU2TW	1776	PY49D	1300	AC2J	1067	I1WXY	715	KL7VZ
2297	N4MM	1736	W0SFU	1293	SM0AJU	1027	N2CIC	714	K6UXO
2220	N6JV	1725	K9BG	1283	K2POF	1025	WD4RAF	695	W5ASP
2104	N9AF	1723	IN3ANE	1278	3A2LF	1018	DF6EX	670	YU1PJ
2072	I2PHN	1676	KF2O	1266	YU2CQ	1018	NE6I	668	N3KR
2069	N6CW	1603	CT1LN	1263	I1POR	1007	A16Z	668	YT7WW
2056	YU7BPQ	1600	N5TV	1249	W7CB	1004	PY2DBU	652	G4OBK
2007	YU1AB	1593	I2MOP	1246	YU1SZ	1000	K13L	650	W9IAL
2006	K0BLT	1553	SM6DHU	1234	SV1PL	978	I0AOF	637	F6HMJ
2002	I8YRK	1537	N6AW	1227	WB8ZRL	950	I1EEW		

### SSB

3122	F9RM	1761	I8YRK	1204	KC8YM	1020	SM0AJU	759	K8ZZU
2711	I0ZV	1740	VE1YX	1201	I8KCI	993	AG2K	758	I3ZSX
2460	K2VV	1699	W9DWQ	1200	KL7AF	984	W0ULU	752	K9BQL
2391	ZL3NS	1681	WF4V	1186	PY4OD	981	K8LJG	716	IT9ONV
2320	K6JG	1638	K5UR	1178	SM6DHU	965	IK5ACO	710	N2AIF
2257	K2POA	1599	I8YZP	1169	W4UW	962	W3GXX	698	G4KHF
2210	K6XP	1573	I2MOP	1144	I5ZJKL	942	I2EOW	698	I2KKL
2191	I0AMU	1508	CT1LN	1112	KK0L	939	WA2FKF	698	KC2FC
2170	CT1UA	1507	W9NUF	1111	CT1BY	935	N2CIC	694	A16Z
2073	N4MM	1483	NJ0C	1108	CT4UW	930	N4IB	686	W6YMH
2053	I2PHN	1470	WA4QMG	1106	AB90	929	I8WYD	665	AB1U
2005	I3ZKD	1457	CT1FL	1095	K5RPC	914	I1EEW	661	VO1AW
2003	W0YDB	1431	I4CSP	1088	KC8CC	900	I2TZK	659	I4UFH
1945	WD8MGQ	1412	W3ARK	1079	N2AC	827	W6OUL	657	KE6KT
1904	I4ZSQ	1406	KF2O	1071	NN4Q	813	WN5MBS	654	NE6I
1897	WD8MGQ	1399	W1NG	1060	CX9CO	808	KK5P	652	CP8HD
1859	I2PJA	1343	AC2J	1048	PP2ZDD	798	K3IXD	650	W5ILR
1844	OZ5EV	1307	EA2IA	1047	EA3AQ	792	YB3CEV	642	OE5BGL
1825	N4NO	1303	G4CHP	1035	WB8ZRL	790	WA8YTM	611	HR1FC
1820	CT4NH	1300	N5TV	1032	PY4VX	787	G4SDJ	605	VK9NS
1781	W4BQY	1283	XE1OX	1030	F6BVB	779	CT1AHU	600	KB4HU
1765	I6ZJC	1232	N2NC						

### CW

2562	W2NC	1674	YU7SF	1246	JA1KRU	947	W9PWM	777	EA5QR
2365	K2VV	1672	YU7BCD	1210	IT9VDQ	940	SM0AJU	744	CT1LN
2198	N6JV	1593	LZ1XL	1167	W1NG	940	W6OUL	711	I2EAY
2185	WA2HZR	1584	N4MM	1131	KF2O	936	N2AIF	707	WB8ZRL
2134	ON4QX	1525	K5UR	1125	SM6DHU	915	AB1U	705	OE1KJW
2092	N4NO	1519	PY4OD	1098	K2POF	905	VE1ACK	700	N4IB
1989	K6JG	1502	VO1AW	1050	KL7AF	904	NN4Q	693	NE6I
1973	N6CW	1500	W9NUF	1026	K8LJG	904	YU2CQ	663	LA7JO
1947	W9DWQ	1448	EA2IA	1026	F6HKD	899	I2UIY	656	K6UXO
1900	VE7CNE	1414	N4YB	1017	W1WAI	875	T14SU	654	W0JIE
1880	K6XP	1385	I1YRL	1011	AK9Z	871	A16Z	644	JA2GCW
1870	G2GM	1371	WA8YTM	1001	AK2H	854	KN7K	644	G3V00
1858	W4BQY	1309	I2DMK	1000	I7PXV	813	VE4AEX	634	OZ5UR
1836	W3ARK	1306	KA7T	984	DJ1YH	800	I8YRK	625	W6YMH
1801	N2AC	1300	N5TV	969	LA9XG	799	SM5DAC	602	VK9NS
1779	OZ5EV	1289	JE1JKL	969	G4FAM				

has changed a bit from the lovely antique and historic city he knew in his teens. In 1943 John was able to escape the occupation in Holland, making his way to Sweden, and he lived in that neutral country for a couple of years. But John wanted to get to England and enlist in the Free Dutch Forces. In 1945 he made it to England, enlisted in the U.S. Marines, and ended up at Camp Lejeune in North Carolina. By the time boot camp was over, the war was likewise, and John was discharged.

He returned to Europe, working for the United Nations in the attempt to locate and identify displaced persons in Germany. After a

couple of winters he opted for warmer climates, going first to Algeria for a year and then on to Libya from 1948 to 1951. He then returned to the U.S., living in Providence and New York. He completed his education with a MS degree in mechanical engineering and went to work for U.S. Rubber. From there, he went to Guayaquil, Ecuador, to run a plastic plant and got his first license as HC2JT.

While in Ecuador John won first place in the CQ World-Wide phone test and gained DXCC/Phone #2652. In 1968 he went to San Jose, Costa Rica to run a group of plastic plants. There he had the license TI2JTS which



This is John Troost, TG9VT, in Guatemala City. John left his homeland and native city of Rotterdam in WW II. He ended up in the U.S. Marine Corp, and was first licensed in Ecuador. He is a true-blue DX type, holds all the major awards, and is going to be up in front for the RTTY WAZ. There is more about TG9VT in the column.

he still holds. The plants were taken over by United Brands. It was known as the United Fruit Company, an operating unit of the parent company. In 1974 John was a senior vice-president of the company, living in Boston but desiring to return to Central America.

Back in Guatemala he went into business for himself, dealing in commercial fertilizers. This included a two-year-tour in Sao paulo getting a business started there. Guatemala City is now the permanent residence, the QTH being up 6000 feet in the hills overlooking the Central Guatemalan valley. There are two children at home (six- and eight-year-old boys) and a third is a student at Columbia University. His XYL is a native of Guatemala, and her call is TG9AHH.

TG9VT will be among the first to win the RTTY WAZ, currently being within a hair-breadth of gaining the award. John has 5BDX-CC #1715, RTTY DXCC #107, and SSB WAZ #2975. He has single-band WAZ for 20, 40, and 80. With only a handful of cards to go, he figures to fill out the needed ones on 15 and 10 as the sunspots in Cycle 22 head up. How close is that hair-breadth for the RTTY WAZ? He has sent in the cards for confirmation, and possibly by the time you read this he will have them in hand.

### Auckland and Campbell Islands

It is summer now in New Zealand, and the locals are thinking of a bit of DXing. Baz Kirkwood, ZL1BN, Roly Runciman, ZL1BQD and Ron Wright, ZL1AMO, are planning to head a bit further south to put Auckland and Campbell Islands on the air. The plans tentatively call for activity in February with some of the logistical problems and financing to be worked out. Some scientific personnel will also accompany the group. Some reports say that this might be the last effort ZL1AMO takes part in. He rather thoroughly covered the South Pacific in recent years. If everything falls into place, the callsigns used at Auckland and Campbell will be the prefix ZL9 with their home call suffix. Over the years Ron has operated from Lord Howe/LH, H44 Solomons, ZK1 Cook Islands, YJ8 New Hebrides, 3D2 Fijis, ZL/Chatham, ZK9 Niue, ZL8 Kermedec, Wallis, Western Samoa, Tonga, ZK3 Tokelaus, and probably a couple more. And he still has the

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 1557 ..... WA9RCQ

**CW**

706 ..... OH4OJ 707 ..... LZ1HY

**SSB Endorsements**

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310	I0ZV/317	300	NY5L/306
310	W9DWQ/316	300	K2JLA/306
310	N4MM/315	300	W6BCQ/304
310	W0SFU/315	300	WD8PUG/302
310	YU1AB/315	300	PY2DBU/300
310	W9SS/314	275	K2JF/297
310	K9BWQ/313	275	W0ULU/295
310	PY1APS/313	275	KE4HX/294
310	W8JXM/312	275	WD9GQV/287
310	W2CC/310	275	KS0Z/286
310	KB8DB/309	275	WA9RCQ/275
310	ZL1BIL/309	200	KF5AR/225
300	I4EAT/308	150	WD9ACQ/179
OSCAR	WD9IIC	3.5/7 MHz	KS0Z

**CW Endorsements**

310	W9DWQ/317	275	K9BWQ/286
310	SM6CST/313	275	W1WAI/281
310	DL1PM/311	200	NY5L/236
310	K1MEM/310	200	K2JLA/207
275	YU1HA/291	150	OH4OJ/180
275	WD9IIC/292	3.5/7 MHz	LZ1HY
275	N8MC/289		

Total number of active countries is 317. The basic award fee for subscribers to CQ is \$4. For non-subscribers, it is \$10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are \$1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply. Please make all checks payable to the awards manager.

logs for those operations, some dating back to 1981. Anyhow, look for something in February.

**Turks and Caicos**

VP5W will be on all bands 160 to 10 meters for the CQ WW CW Test and all the way to December 5th. Operators will be Len Gerald, K6ANP, Lyle Meek, WW6F, James Hicks, KK6X, and Bruce Butler, W6OSP. QSLing for contest contacts will be handled by WW6F. Before and after the CQ WW, the contacts will be QSLed to the CBA of the operators. Possibly other calls may be used besides the contest call of VP5W.

**HZ1AB**

Though this station has been on the air for a couple of decades, working it has not always been easy. Sometimes even the QSLing is a problem. Being tied to the military to some degree, some inter-service friction some time back brought a decision in one quarter to eliminate the station and turn the license back to the authorities. Difficulty in locating the license as well as high-level intervention, plus some rotation, kept the station going.

New management brought a new QTH, possibly better accommodations. Except, the radials for the allowed vertical antenna ran parallel to and across the AFRTS cables on the roof.

In the last year a new QTH was established adjacent to open country with room for towers to hold up the beams, and things are looking better. The station still operates the TS-430s,

the SB220 linear, and the Class 33 and KT34XA beams.

HZ1AB is on the air drawing the attention that it always has and is heard on CW and SSB. Look for them at 14180 kHz after 21000Z, maybe there is not set schedule, but start watching after 2100Z. It is reported that an FT-920 has been added to the station, and they are planning activity on 40 and down to 160. QSL to K8PYD, SASE requested.

**Some Short DX Notes**

Father E.J. Benedetti, HV2VO, of the Vatican Observatory, has been assigned to the Arizona territory and is currently at the Immaculate Conception Church in Douglas, Arizona signing N7FUV. He expects to have a 4-element Yagi at the 4050-foot level—4000 feet up the mountain, 50 feet up the tower. The International DX Assn. (INDEXA) reports that the tri-bander the association shipped to 5A0A for the university station was received. Bert Trzaska who handled the installation will attempt to make provisions for either he or Franz Langer, DJ9ZB, to put the station on the air for at least two weeks every year. Dany Prevostat, F6CZB, should be arriving at his new post on Amsterdam Island about the time you read this. Dany should be heard early in December, depending upon the weather at FT8Z Amsterdam and possibly the climate will be a bit different than his stop at J28 Djibouti. The Team Finlandia, which you worked in the CQ WW Phone Test, will be out again for the CQ World-Wide CW Test; watch for them, as they will always be good for counters and the needed multipliers.

ZF10PW was used by the Cayman Radio Club over the CQ WW Phone weekend and a special QSL card is available until January 31st. Send yours to Box 1029, Grand Cayman with the SASE. ZF1MM (VE5RA) and ZF9SV (VE7SV) have notified the Cayman QSL Bureau that they do not want and will not pick up the QSL cards on hand for them, something like 500. In ZF-land, only 1800-1825 kHz and 1975-200-kHz slots are permitted for 160. ZP450A was a special callsign used to celebrate the founding of Asuncion in 1537. If you worked that call, it was in Asuncion. If you worked that call but with a suffix, /B for example, it was out in the country somewhere. But all QSL to Radio Club Paraguayo, Box 512, Asuncion, Paraguay.

If you work 40, you should be well aware of the problem with foreign broadcast, often all the way from 7120 kHz to the upper band edge. At the ARRL Board meeting this summer, some changes were proposed for the 40-meter band but these were turned down. There was some thinking that CW and the digital modes would find a better home from 7120 kHz and up, while phone would encounter less problems in the 7.0-7.1 MHz area. A motion for the DX Advisory and the Membership Services to study a possible change was voted down by the board. You might give some thought to the matter should it again be put up for action.

Some have wondered about the PA0AGM/ST2 or the PA3AXU/ST operation, some there in the Sudan saying that visiting operators are not allowed to use their own callsigns. PA0GAM has been heard on the low end of 40 and 20 after 0400Z. What should you do if you hear them? Be brave. Work 'em first, worry later!

Tom Christain, VR6TC, continued his sched-

ules at 14178 kHz/0400Z Tuesdays with his QSL Manager, W6HS. Tom's XYL Betty sometimes also shows, sometimes even a bit earlier.

Back a decade or so there was an agonizing brief operation from Bouvet with only a few working 3Y1VC at Bouvet, LA1VC making his first stop there. The only W/K type to work the station was Vaughn Parry, W6ID, who, as he told it, "... was just tuning around, heard this station call, and worked it." No problem at all. Working Bouvet was and is always a pleasure, for some maybe even more so. But as Vaughn would often say, "I really did not need it. I already had Bouvet for DXCC credit."

In recent years a stroke slowed up Vaughn, his DXing pretty much confined to listening. He passed away last year, possibly remembered more for his being the only W/K to work that Bouvet effort and not needing it. Even Martii, OH2BH, felt that this needed memorializing and presented a plaque to W6ID for his accomplishment.

Remember! We write three months before the magazine's cover date. Write early and often. Water the mistletoe, polish the Christmas bells, and be ready to greet the Great Days of DXing coming with Cycle 22. Be a DXer! Enjoy the good times that only DXers know!  
73, Cass, WA6AUD

## QSL Information

There has been a call from The Bureau of Missing QSLs. One of the Deserving, George Lee, K5HT, for years has kept the vigil for TT9BL, "Dave" who was worked in May 1972. Though the years have been long, it would make his Christmas Season if you can help.

All ZF0 F.D.N. Exped. from September 9th to 13th go to Karl M. Leite, C.P. 385, Natal, R.N. 59001, Brasil.

All this with help from Bob Truhlar, W9LNQ.

F6AUS/E to F6AUS	XX9TDM to W7TIR
FR5ES/J to F6FNU	3C2A to AK1E
KG4AN to N8GG	3V8AQ to IK8DYD
LU7MAJ to WD9ILW	5N1MRE to K4ZKG
NP4JV/KH2 to N2AU	4N7N to YU5BPQ
OF0MA to OH0NA	8P6SG to 8P6AW
SP5EXA/JW to SP5EXA	ZF1BPW to Cayman Radio Club, Box 1029, Cayman Islands
TZ6CVY to F6CVY	ZP450A to Radio Club Paraguayo, Box 512, Asuncion
V31TP to WB0DLT	
V32FI to KA0YNN	
VP5W to WW6F	
W87PAX to W9SU	

## DX Ten Years Back

In December 1977 F6BBJ was in Mauritius and enjoying the Christmas season there. Jackie was to move on after the arrival of the new year, planning to visit Rodriguez, Mayotte, and possibly Mayotte. A group in San Antonio was sending up trial balloons for a possible Clipperton effort. Back then everyone mostly needed Clipperton, but things have changed.

A group of JY/9K2/HZ amateurs was planning an 8Z4-Saudi/Iraq Neutral Zone effort come February. That was a DXCC country then. Five years later on December 26, 1981 it became a non-country. They finally figured out where the border was. The Russian Woodpecker was heard out of Kiev, and while everyone was talking about it, the FCC was reported as saying it was getting few complaints. Not only the amateur frequencies were being violated, but the 10 MHz aeronautical channels were also being buzzed. ZS4MG was headed for Bophuthatswana to put ZS4MG on over the New Year. Frank Turek, DL7FT, and Thomas Moliere, DL7AV, were signing ST0RK in Southern Sudan. Ham Robinson, W4ZR, was work-

ing on President Duvalier to open Haiti to visiting amateurs. A new book was just published about the activities of Slim in Burma. VE3FXT was in Malawi and PY1RO was packing to go to Fernando de Noronha. SM0AGD was planning to be in Equatorial Guinea in early December. C3PO was reported, many working the station and wondering. It was the time that the movie Star Wars hit the movie screens. Now you may

understand. It has long been a secret, but from the hillside QTH here we can see the building where C3PO was animated. A lot of W/K call-signs with /VQ9 were showing from Diego Garcia. And ten years back there was DX at every marker on the band and the Golden Days of DXing were at hand. If you need confirmation, just ask any old or slightly worn DXer. Ah! Those were the days. . . .

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## PRINCIPLES, PRACTICES, AND PROJECTS FOR THE VHFER

### TVI

**J**ust the thought of it brings discomfort. Anyone who has had serious TVI/RFI problems will agree that it's not a lot of fun dealing with irate neighbors. They appear at your door to complain, often in high pitched tones. "If you don't stop interfering with 'Dynasty' (substitute 'the football game,' 'my soap opera,' 'the kids' cartoons, or whatever) right this minute I'm calling the police (substitute 'the FCC,' 'my lawyer,' etc.) and you'll be in big trouble. . . ."

I've been there. So have many of us. My experience has shown me that the two bands most likely to induce TVI complaints are 28 and 50 MHz. Bands like 3.5 and 1.8 MHz are more likely to cause interference to other common electronic equipment (radios, telephones, answering machines). Enough RF placed nearly anywhere in the spectrum might interfere with the normal operation of consumer electronic equipment of almost any kind.

Since this is a VHF column, I'll concentrate on the spectrum above 50 MHz. One of my least fond memories is a situation which came about in 1974-1975, three houses ago for me. I was very active on 6 meters, running about 600 watts to a 6-element Yagi mounted about 35 feet above ground. Since I lived on a steep hill, this placed the antenna about 75 feet above the street. Our neighborhood was not served by cable TV. We lived about 40 air miles from the nearest TV stations in New York City. Television reception ranged from very poor to excellent, depending on one's precise location, antenna installation, and so forth.

My own television reception was terrific, because we had the highest elevated house on the street. We were basically line-of-sight to the transmitters, and we used a high-quality log-periodic antenna mounted outdoors, about 35 feet above ground. In my own house, everything was "right." We experienced zero TVI from my transmitters or anyone else's.

My neighbors weren't so lucky. You would think the "Big One" had been dropped on the neighborhood every time I fired up on 6 meters. While I was very friendly with my immediate neighbors on my side of the street, I really didn't know the folks across the street at all. I'd wave "hello" if I passed them in the car. This was my first mistake: *A/ways* be on friend-

ly terms with your neighbors if you plan to operate on 6 meters.

#### Double Shot of My Neighbor's Love

One day, during the 1974 January VHF Sweepstakes, the homeowner from across the street appeared at my door with a loaded shotgun. He threatened to use it immediately if I didn't stop interfering with his TV reception. Luckily, I was on friendly terms with the municipal police, who came to my aid rather quickly. I advised them I had been threatened with a gun by my lunatic neighbor. Somehow, I still hadn't learned his name. The police visited me first, to record my complaint. Next, they let him know that they were keeping an eye on him. A 38 caliber revolver has better range and accuracy than a shotgun.

I returned to the air, rather shakily, a few minutes later and continued working 6 meter meteor scatter. This involves a lot of transmitting, usually with as much power as possible. I think I finished the contest, but my enthusiasm was somewhat dampened by the morning's experience.

Sound familiar? I'm sure it does, to a number of 6 meter enthusiasts. How do we prevent or solve such problems?

#### Be Friends First

Obviously, the first and possibly most important step in preventing TVI/RFI from becoming a large-scale problem is to be on the best possible terms with everyone in town. Be friendly, helpful, and popular. Help neighbors with their snow shoveling, tire changing, fence painting, or whatever in an intentional effort to win them over. Some people are so bitter that they'll shun an outstretched hand or forget yesterday's favors—but most aren't.

Once most of your neighbors know and like you, it is time to dazzle them with your technical expertise. Show them your station and explain what it does. Show them your license and explain how amateur radio differs from CB and other services requiring no examination. It's nice to have a few magazine articles handy describing how hams helped save lives in various disasters.

An explanation regarding how radio propagation and antennas work, in lay terms, is often well received. I usually use a pitch like this: "Radio waves propagate differently than light waves, but at

higher radio frequencies the differences are not that great. The most important difference is that solid objects of any material not visibly transparent will prevent the transmission of light, while radio signals are not as adversely affected by many materials other than good electrical conductors."

(Use a flashlight and a piece of cardboard to demonstrate the point.)

"If radio waves were as abruptly interrupted by materials as light waves are by this piece of cardboard, indoor radio and television antennas would never work. We'd all need huge towers to support our antennas. They would need to be installed high enough to be visually line-of-sight to the radio and TV transmitters whose signals we're trying to receive.

"This might mean that while people living near the transmitters would need only small antenna towers, people living fifty miles away, or even close in but in deep valleys, might need towers a thousand feet tall!

"Luckily, most radio propagation isn't so poor as to require this. But houses, trees, and so forth do absorb radio and television signals to some degree. Proximity to the earth's surface influences antenna performance, too. It has been determined that high frequency antennas, to be effective, must be elevated as high as possible above the ground. This goes equally for transmitting and receiving antennas, or ones that perform both functions as is usually the case with amateur radio operations.

"For these reasons, I have outdoor (or tower-mounted) antennas, and you should, too, if you expect good television reception and are not connected to a cable service." This can lead to a brief discussion on the merits of very high antennas, if you happen to have them."

Speaking of cable services, I've found them to usually be an asset in the reduction of TVI problems. While there are exceptions, a properly installed and maintained cable TV system would provide strong, interference-free signals. Underground cable systems are the most immune to interference from outside sources. If you live in an area where cable service is available, it would be a wise move to be the cable company's best salesman. Convince all your neighbors to subscribe. After doing exactly this, I've reduced my TVI complaints to a new low: none.

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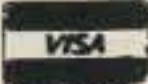
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"Another problem is that good receivers, like the ones I use, are very expensive. They cost more than most people would consider paying for a radio or television set. But they work very well.

"My TV set, by contrast, was very inexpensive. Yes, it is a color console with 117 channels and wireless remote control. But it is *not a good receiver*. Its manufacturer devoted a lot of effort to making its picture very clear and bright, its sound full and natural, and its cabinet attractive. But that doesn't make it a good receiver, any more than having a beautiful new car makes it capable of winning a race.

"You know how that free telephone you got from a new magazine subscription isn't nearly as high quality as the old ones you have from Bell Telephone? How it

doesn't sound as good, or developed some problem when it was only months old? Well, that's roughly how all our consumer electronic products are built—cheaply. Their manufacturers *spend so much* on glitter, marketing, advertising, and distribution that there isn't much money available for building a high quality product. That "free" telephone is worth exactly what you paid for it. And my \$500 TV set is worth about as much as the free phone.

"Nobody bothers to manufacture a really good television set (or clock radio, intercom system, wireless alarm, or a multitude of other products). Marketing surveys indicate that few consumers would be willing to pay for what they'd cost. So we all suffer with relatively low-quality products we receive for the prices we're

willing to pay. Actually, it's amazing that a 25 inch color TV console with stereo sound, cable-ready tuning, and wireless remote control could possibly cost only \$500. If they were really good receivers, they'd cost ten times that much.

"So, while my receivers, which cost considerably more money and do relatively little compared with my whizz-bang TV set, are capable of rejecting interference from unwanted sources, my television set—and yours—cannot.

"My TV set—and yours—can't tell the difference between Channel 2 and Channel 1. You say there is no Channel 1? Not on your tuning dial, maybe, but there is a Channel 1, and I'm licensed by the FCC to transmit on that channel. When I do so, it is not only possible, but likely, that unless we take certain precautions, your appliance will have trouble rejecting my radio signals. It just won't be able to tell the difference between me and WCBS-TV in New York (*substitute appropriate call sign and location*). Pretty crazy, huh? Luckily, there are measures we can take *together* to make this situation livable."

Now your neighbor's snagged. You've explained the problem and offered a tentative solution. Better still, you've developed some sort of rapport with your neighbor.

I suggest this kind of dialog for good reasons, and they're based on personal experience, both as a ham and as a seasoned salesman. First, it always pays to put yourself on the same level as the party with whom you're speaking. Avoid speaking "up" or "down" to anyone. Second, you've allowed for the fact that you personally have exactly the same problems as your neighbors do; you're all using the same kind of television sets (or whatever), and there isn't any one superior brand. Third, you're educating your neighbors; even though they may resist this education, some of what you've said will probably sink in.

You might want to grab a copy of a recent *Consumer Reports* that reviewed television sets. Note that the staff of even this prestigious magazine judges TV sets not only by picture and sound quality, but also by freedom from interference. The very fact that they even rate products based on this attribute should be indicative of the existence of a problem. Television sets, and other consumer electronic items, can be interfered with.

Of course, if you go through all this neighbor training and then have no problems at all, you may feel a bit foolish for having wasted your time and theirs. But if you intend to operate 6 meters, and if you have neighbors, the time invested will usually pay off.

I've found a few *old tricks* to work quite well in dealing with TVI. And now, for the first time anywhere, I'll share them with you—next time.

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## A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

### Modem Protection and More

There are several things you need to have if you want to go "online" to explore the universe of information that can be accessed via telephone lines. In addition to the computer itself, you need a communications card (depending on your particular computer), a communications software or terminal program, a telephone line, and a modulator/demodulator, commonly known as a modem. This is the device that interfaces your computer with Ma Bell's telephone lines.

Modems come in a bewildering variety of configurations. Relatively inexpensive ones handle communications data transfer at 300 and 1200 bauds (roughly, baud = bits per second), while other (and more expensive) devices handle communications at 2400 baud or higher.

Many have specialized features such as automatic dialing (autodial) and auto-answer, automatic redial of busy numbers, and even a built-in command language set (for more sophisticated and automatic operation). Modems range in price from about \$25 up to several thousand dollars, and the communications software programs to support them range in price from absolutely free public domain programs to those costing upwards of \$1,000.

Let's assume that you already have a modem or have plans to add one to your computer system. What do you need to do to protect your modem from telephone line power surges that can destroy it, your communications card, and possibly even circuitry in your computer if not checked?

Most of us routinely protect our computers, ham gear, and other sensitive electronic equipment from nasty power-line surges that can damage the equipment. Typically, we install multiple power distribution boxes for our gear which contain metal oxide varistors (MOVs) or other devices that absorb all but the worst of these surges and thus offer protection against damage except from direct or near-direct hits. But few of us apply similar protection to the telephone line for the well-being of the modem (or of the phone patch, for that matter).

Realistically, no damage should occur during an electrical storm if the phone line is properly installed and protected by

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```
W8FX          A - ADD          PREFIXES
              B - EDIT
              C - DELETE

Reports & Other Outputs
D - Export Band & Mode      E - Export Continent
F - Master List of All Prefixes by Band and Mode

Utilities
G - Change Call            I - Specify Subdirectory
H - Setup Printer          J - Information

Enter your choice (A-J,Q)uit):

File last used on Tuesday,  5 May 1987 at 07:09
Today is Tuesday,  5 May 1987                Current time: 07:10:23
```

Fig. 1— Shown above is the Main Menu screen from W2XQ's Prefixes program designed for the IBM-PC.

the telephone company. Most home telephone circuits are protected above 1000 volts by a "carbon block" at the point the phone line enters the house; the block is designed to short to ground when the voltage exceeds 1000 volts.

Nevertheless, it's a good idea to unplug modems when there is an electrical storm in the area. Why? FCC rules for modems require that they absorb an 800 volt surge without interfering with the tele-

phone line. This doesn't mean that the 800 volt surge won't zap the modem, just that the modem will not short out and hang the line if it gets hit. Also, the FCC rules don't prohibit the modem from passing the 800 volts along to the computer via the RS-232 serial interface. All this is little consolation to you if your system takes a hit!

Too, microprocessors and other solid state devices are often "blown" by tran-

```
PREFIX FILE

Prefix:          Adding...          Continent:

CW:              SSB:
10:              10:
12:              12:
15:              15:
17:              17:
20:              20:
30:              30:
40:              40:
80:              80:
160:             160:

Deleted from Honor Roll (Y/N)?:      Autodate: 05/05/87

To EXIT enter Q in the prefix.
Press [PgDn] to complete the screen.
```

Fig. 2— Above "screen dump" shows the Prefixes program screen used to add prefixes to the database. The screen is accessed as choice "A" in the Main Menu (fig. 1).

No - 99 - 100

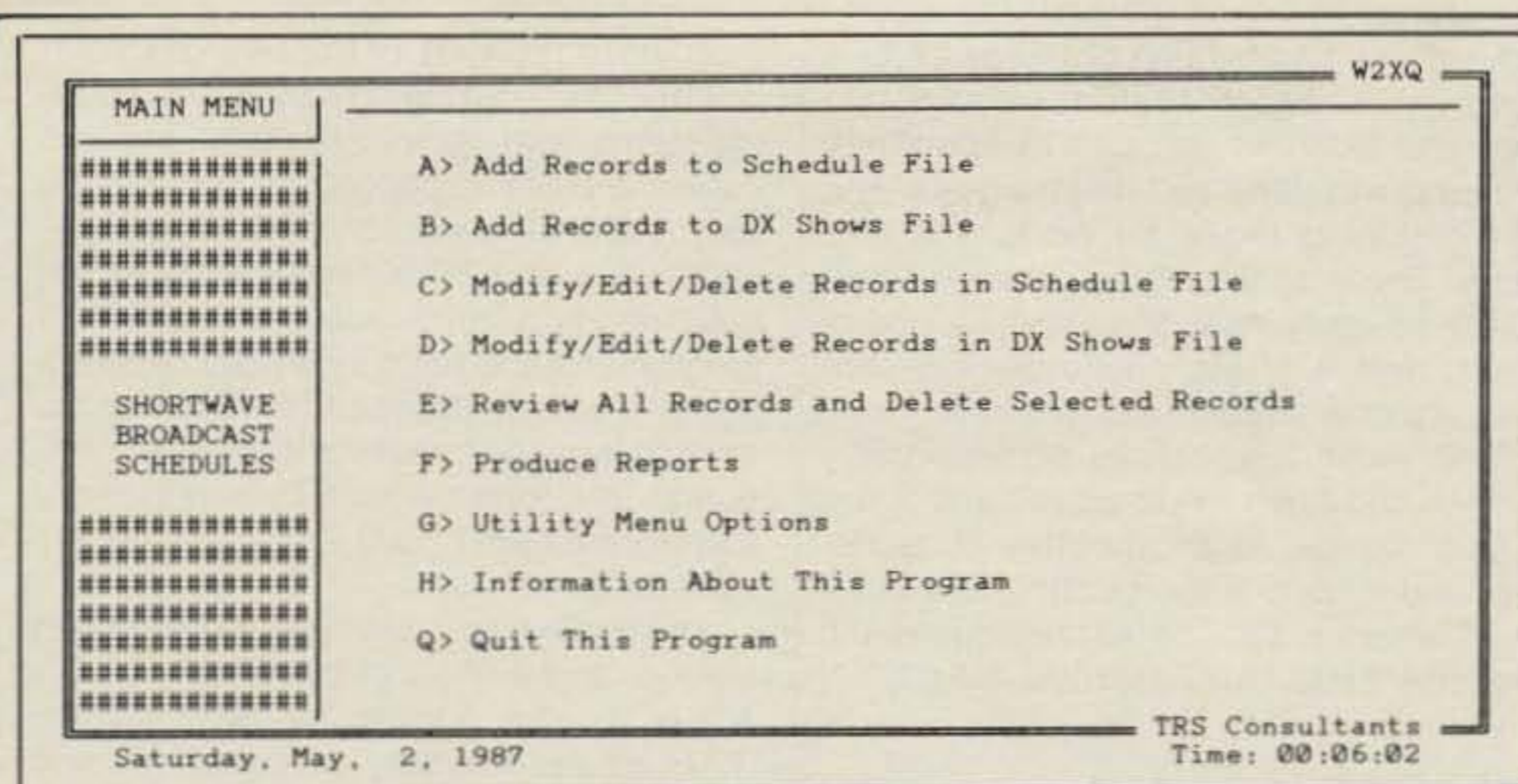


Fig. 3— Shown above is the Main Menu from W2XQ's Shortwave Broadcast Schedules program for the IBM-PC.

sients that are insufficient to trigger a lightning arrestor, but are strong enough to affect individual components. While cases of a telephone line surge passing through the modem to damage the computer are rare, this can happen, and you can eliminate that possibility by disconnecting the modem whenever weather conditions dictate.

Another possibility, at least until such time as modems are routinely protected internally or are furnished with an internal switch so that both sides of the line can be disconnected from the modem, is for you to install a small DPST switch on the phone line to the modem. This will ensure that the device is really disconnected from the line.

Interestingly, there can be surprisingly high voltages on the telephone line even under normal conditions. Various AC-DC combinations of battery and ring voltages can result in legal peak voltages of slightly over 300 volts appearing on the line. Thus, realistic overvoltage protection should start around the mid-300 volt level; a lower cutoff might interfere with the normal operation of the phone line.

Protecting the phone line using fuses is not very practical, since current in the line can vary widely, and you may find yourself replacing any realistically rated fuse too frequently. Also, by the time the fuse blows from a potentially damaging surge or transient condition, damage would probably already be done. In order to protect your modem, computer, and other equipment from such surges, you may wish to install a 340-360 volt MOV such as sold by GE, Thomson-CSF, Panasonic, Siemens, and others. These are widely available from electronic parts houses and mail-order firms that stock semiconductor products.

An effective installation requires the use of three MOVs, one across the Tip and Ring wires (usually, the red and green wires), and one MOV from each of these

lines to ground, forming a triangle. Keep the MOV leads short, and be sure to use a good ground. Install the MOVs on your side of the "network interface," if you use one, to keep your local telephone company happy.

If you don't want to make up your own protector, you may wish to purchase a commercial unit. Several heavy-duty impulse suppressors for both single- and double-pair lines are available from Poly-Phaser Corporation, 1425 Industrial Way, P.O. Box 1237, Gardnerville, NV 89410. These are expensive, ranging from about \$90 up, though they are rated to handle gargantuan surges of 10,000 amps on each side of the line.

A more modestly priced modem protector is offered by JADE Computer (4901 W. Rosecrans Ave., Box 5046, Hawthorne, CA 90251-5046) that is priced at about \$42. And Radio Shack has a budget-priced (\$12.95) unit for single-line equipment using RJ11C jacks; it's part #43-102.

### From The Bookshelf

*How to Look It Up Online.* If you're not afraid to use your modem after the little discussion we had about telephone line transients (!) you may be interested in Alfred Glossbrenner's latest PC communications book. It's not a ham book at all, though I have chosen to mention it here in that many hams use their computers for landline as well as over-the-air communications, and the series of PC communications books he's authored constitute an absolute "must" for the serious landline telecommunicator. (His previous books include *The Complete Handbook of Personal Computer Communications*, *How to Buy Software*, and *How to Get Free Software*, all of which we have mentioned in the column at some time in the past.)

The theme of his new book lies in "getting the information edge with your PC"—

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how to use the many online public communications utilities and databases to best effect in getting information you need, whether it be for home, business, school, or other use. The author tells how online information is sold, what to expect from the databases, and what tools and techniques to use in looking things up online. He covers some of the major databases one may have the need to "access" such as DIALOG, NEXIS, ORBIT, Dow Jones, and many others. He also covers how to obtain different types of data, including procedures for searching books, magazines, newspapers, directories, indexes, and even government documents.

For the person with the need, Glossbrenner's thick (486-page) book is a bargain at \$14.95. It should be available in the computer book section of larger bookstores, but if you can't locate it, write to St. Martin's Press, 175 Fifth Avenue, New York, NY 10010.

*Antique Radio Classified.* If you buy, sell, or collect old radios, this magazine may be the ticket for you. Billed as the antique radio hobby's largest-circulation monthly magazine, it is published specifically for people in the "radio collecting" hobby. It has as its purpose stimulating the growth of the hobby through the buy-

ing, selling, and trading of radios and related items, and it includes various articles and features, notices of upcoming radio conventions and flea markets, and ads including those for parts and services. The magazine also devotes some space to early ham gear and TV equipment, and it offers subscribers a free 20-word classified ad each month.

This is an interesting, professionally printed and illustrated magazine. It offers a free sample to prospective subscribers, and a special six-month trial sub for newcomers is \$9. Contact *Antique Radio Classified*, P.O. Box 2, Carlisle, MA 01741.

### Software Snapshot

*Two from W2XQ.* Thomas R. Sundstrom, W2XQ, sent us a nice letter some time ago, along with two novel software packages he developed for the IBM-PC. One deals with recordkeeping for CQ's WPX Award and the other with tracking English language shortwave broadcasts.

The Prefixes program's purpose is to allow you to manage amateur radio prefixes in connection with the CQ WPX award. CQ's WPX award has endorsements for band, mode, and continent, with a list of active prefixes being kept current by the award manager. Part of the

problem in applying for the award is that it is labor intensive, and requires completing forms with up to 500 calls listed on each sheet of an application. The original award and all endorsements, as well as updates to the WPX Honor Roll, all require similar clerical work. The Prefixes program, coupled with a computer spreadsheet program, produces output that the spreadsheet can easily and quickly manipulate into forms which Tom says meet the requirement of 500+ calls on a single sheet of paper.

The Prefixes program is for the serious WPXer, and it requires an IBM-PC or PC-AT, or a close compatible, with at least 320K of free memory. It also requires a wide-carriage (132-column) printer to print the report produced by the program. You need to have a copy of a spreadsheet such as Lotus 1-2-3™ or one of its "work-alike" number crunchers. The program is \$20 postpaid.

Fig. 1 shows the Prefixes program main menu, while fig. 2 depicts the screen used to add prefixes to the database.

A second program which Tom offers is of particular interest to shortwave listeners (SWLs). The program, Shortwave Broadcast Schedules, complements publications such as the *World Radio-TV Handbook* and *Radio Database International*. Shortwave Broadcast Schedules contains about 350 entries from 50 countries, listing English language broadcast times, frequencies, and target areas.

You can add, edit, and delete records as schedules change, using your own data or updated data files available directly from Tom or through his landline remote bulletin board system (RBBS). You can print out schedules in different ways, such as by country or by transmission start time.

The Shortwave Broadcast Schedules program is priced at \$15 postpaid, and quarterly update disks are available for a nominal charge. It is a compiled dBASE III™ program, designed to run on IBM and Compaq PCs, ATs, and close compatibles. A full 640K of memory is recommended, as is a hard disk or two disk drives. Fig. 3 shows the program's Main Menu screen.

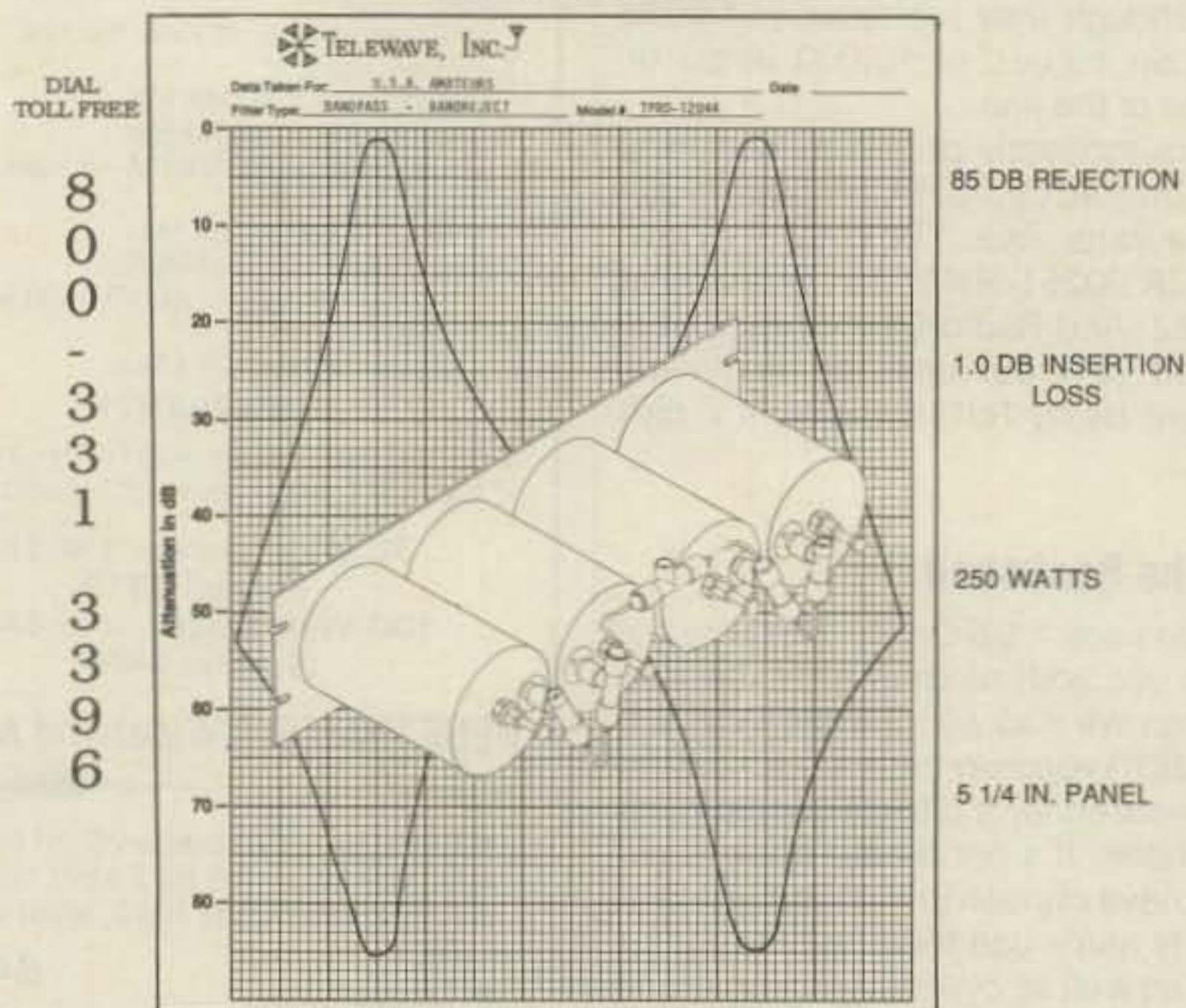
Tom operates the Pinelands RBBS at 609-859-1910 at 2400, 1200, or 300 baud. Among other items, he has the Sweden Calling weekly electronic newsletter and the monthly DX newsletter of the Frankford Radio Club on the board.

If you're interested in obtaining either the Prefixes or Shortwave Broadcast Schedules program, contact Thomas R. Sundstrom, W2XQ, at TRS Consultants, P.O. Box 2275, Vincentown, NJ 08088-2275. I would also assume that you should be able to contact Tom through his bulletin board.

Please have a happy and joyous holiday season. Drive safely.

73, Karl, W8FX

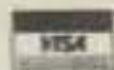
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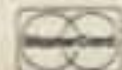
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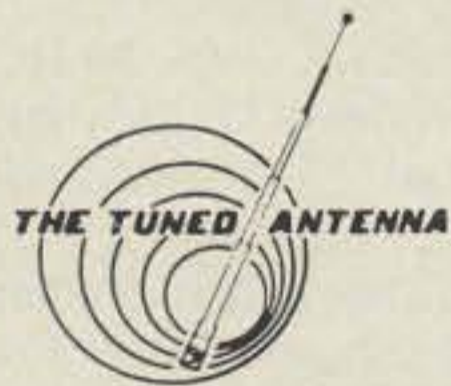


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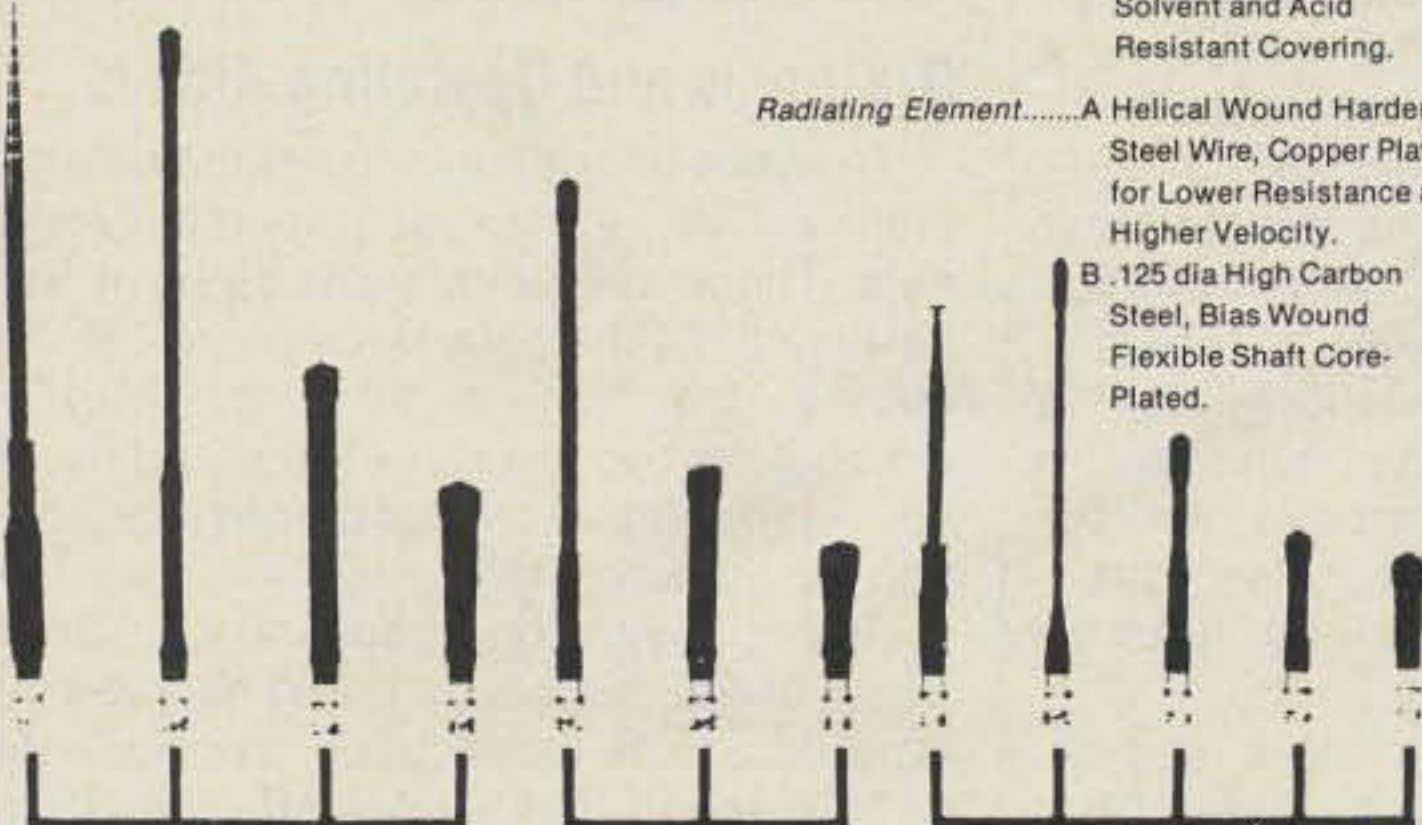
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## "HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

### Slow Speed Nets

One of the best ways to increase code proficiency is to practice some form of CW each day. One of the best ways to do that is to participate in CW nets. I can almost hear the groans as I type. "Sure I am going to participate in a CW net. I can barely manage 7 WPM, and those guys are hot shots. They might *slow down* to 30 WPM for a newcomer, but what good would that do me?"

There are numerous nets just for operators who want to work at a slower speed. Most of these "slow nets" serve their immediate area. Some only serve one or two counties in a state. On the other end of the spectrum, there are a few slow nets that serve wide areas.

Let's back up a bit and define just what a "net" is. "Net" is short for network. In radio terms, a network is a group of stations that meet on a predetermined frequency at a predetermined time. Most net schedules call for either daily or weekly meetings. Networks are usually organized for some particular purpose.

The majority of the amateur radio nets meet for the purpose of passing "traffic." "Traffic" in radio terms simply means messages. Usually, these messages come from other stations, or even from nonamateurs. Many clubs set up demonstration radio stations at public events such as fairs. One message that you might hear on a net would be something like this: "Having a wonderful time at the Podunk Combined World Fair and Worm Rodeo. Wish you were here. (signed) Bill and Carol."

#### A Typical Traffic Net

Compared to other types of operation, nets are usually much more structured. A Net Control Station (NCS) will direct the activities of the net. What that means is that one station is in charge of the net when it is operating. Other stations participating in the net do not transmit until the NCS tells them to do so.

The NCS is usually someone familiar with the net and its operation. She/he knows the geography and knows most of the net members. The NCS's goal is to transfer the messages ("pass the traffic") as efficiently as possible so that they go quickly to their destination.



*This is Erkkka Jaakkola (KA7WZR), who earned a Novice license while staying at the home of Roy Myers, Jr. (WA7UZZ) in Tacoma, Washington. Erkkka learned the code in Boy Scouts. While studying to pass the written portion of the Novice test, the technical words proved difficult in English; he eliminated this problem by obtaining the equivalent of a Novice licensing manual, written in Finnish. He attended three two-hour licensing sessions at a local amateur radio club (W7DK), and then he passed the Novice exam. He operated as soon as he received his license. Erkkka contacted amateurs in 37 states and 10 countries in about 2 months.*

If you are listening on frequency at the beginning of the net, the first thing you will hear is the NCS asking for check-ins. Then you will hear other stations respond. Operating procedures vary from one net to another, but things typically go something like this. After the NCS calls for check-ins, a station wanting to check in will send one letter from his call sign suffix. Two or three stations may transmit at once, but the NCS probably can pick out one of the letters. The NCS transmits the letter heard, and the station checking into the net then transmits his/her entire call sign along with any traffic to "list" for the net. NCS acknowledges this information and sends another letter or asks for check-ins.

All this sounds much more complicated than it really is. If you listen for a day or two, you will quickly get the rhythm of the net. Each one is a little different. Within a few minutes the NCS will have a list of stations in the net and any traffic. NCS then directs station A to send his traffic to station F, who lives in the town

that the message is addressed to. Station F telephones the recipient with the message.

#### Slow Nets in the Big Picture

ARRL was originally formed by Hiram Percy Maxim, 1AW, for the purpose of passing traffic. (Back then, call signs started with a number.) Down through the years, traffic has remained one of ARRL's prime concerns. Today, ARRL operates the National Traffic System (NTS), which allows amateurs to reliably pass traffic from one corner of the country to another, or to any spot in between.

Messages for distant parts of the country go from local nets to regional nets to national nets and back down. You will find the slow-speed CW nets operating at the local level, if they are affiliated with NTS. Some aren't, and are referred to as independent nets.

Having "real" traffic to pass helps keep interest high in net operation. It gives a sense of purpose to the activity. When interest is high, it facilitates learning. Combine that atmosphere with the regular practice that net operation affords, and your CW speed will naturally increase rapidly.

But how slow is "slow?" Will the NCS really slow down to my level? Sure, that is the purpose of the net. Slow-speed nets are kept at a speed comfortable for those in the net. When you check in, make sure that you are transmitting *no faster* than you can receive. When transmitting to you or the net in general, NCS will use the slowest station's speed.

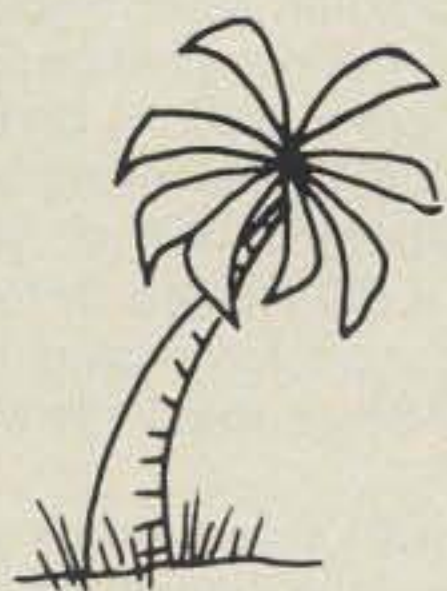
#### Q-Signals and Operating Aids

To make things move quickly and efficiently, CW nets employ special Q-signals. These special signals all have the letter "N" as the second element. For instance, the NCS might send "QNE" which asks the entire net to stand by. If you need to leave the net before it closes, you would send "QNX."

Additionally, somebody noticed that many of the messages being handled by amateurs were identical or almost identical. To speed things up, traffic handlers developed standard numbered messages that ARRL adopted. If you copy the text of a message as "ARL Forty Six," it is a routine message. Its meaning is simply "Greetings on your birthday and best wishes for many more to come."

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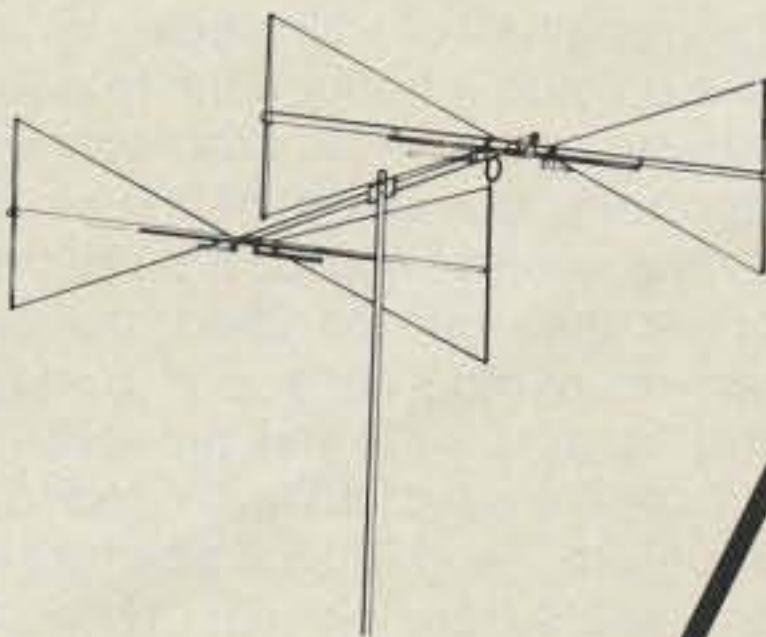
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Even at slow speeds, message handling can go quite quickly by using the special Q signals and the numbered radiograms. Most nets that pass traffic will probably be using the special Q-signals and numbered radiograms.

This is all very good, but where can I find out about what slow speed nets are operating in my area? It's going to take me a long time to figure these things out on my own. Right? Wrong?

Every year ARRL publishes the *Net Directory*, which lists all the nets (fast, slow, phone, RTTY, NTS, independent etc.) that they are aware of. As you read this, the 1988 *Net Directory* should be ready for mailing. You can get a copy postpaid by sending \$1 to ARRL, 225 Main St., Newington, CT 06111. While you are at it, ask them for FSD-3 (list of numbered radiograms) and FSD-218 (list of Q-signals for nets). Both these operating aids are free.

In addition to listing nets, *The Net Directory* has a number of articles for net neophytes. One of these excellent articles gives details for checking into slow-speed CW nets. If this column has whetted your appetite for a slow-speed CW net, *The Net Directory*, FSD-3, and FSD-218 will be just what you need to get the ball rolling.

Another source of information on net operation that you may be interested in is



*This is 15-year-old Leo Corley (WU50) of Odessa, Texas. He was first licensed as KA5ZIT in April of 1986. He upgraded to Technician and General licenses during June and July of 1986, retaining the same call sign. Leo upgraded to an Advanced license (KF5QL) during August of 1986. He upgraded to an Extra Class license in January 1987. His father (WU5N) is justifiably proud of Leo. Leo has contacted 17 states and 4 countries so far. His best DX contact is ZK1XV in the South Cook Islands.*

*The ARRL Operating Manual.* The third edition of this classic has recently been released. This new edition is expanded to nearly 700 pages and contains detailed information on most popular modes of operation. It is a reference book that should be a welcome addition to any active amateur's library. *The ARRL Operating Manual* is available at your local dealer or direct from ARRL for \$15 plus \$2.50 shipping and handling (US).

### Photographs Wanted

Photographs of Novices in their shacks provide introductions to a few of the newer amateurs. Photograph size is unimportant, but good definition, contrast, and subject matter are important. Color pictures can be used, but black-and-white photographs are preferred. Operating activities and achievements plus a self-introduction, are needed with each picture. Send SASE if a picture must be returned. A free one-year *CQ* subscription (or renewal) is awarded to the one amateur whose picture I select as the winner for the month. If you are a subscriber, please enclose the mailing label (or copy) from your latest *CQ* issue. One award is made each month, no matter how many photographs are printed. DX amateurs, who frequently work the American Novice bands, are also urged to submit photographs.

### CQ Novice Century Club

*CQ* is pleased to announce the formation of the *CQ* Novice Century Club, a new award program intended to encourage

activity on the Novice bands. The rules couldn't be much simpler: Novice operators need only to work and exchange QSL cards with 100 different stations on any or all of the Novice bands using any mode. Simply prepare a list of your claimed QSOs on a *CQ* Novice Century Club Award application form (available from *CQ*; send SASE marked "Novice CC").

Have the listed QSLs verified by two Technician class or higher licensees, and send the application to the *CQ* Novice Century Club Manager, c/o *CQ* Magazine, 76 North Broadway, Hicksville, NY 11801. There is no application fee.

That's all there is to it. You'll receive a handsome, numbered certificate attesting to your activity on the Novice bands. It's our way of saying "Welcome, my friend, to the wonderful world of Amateur Radio Operating!"

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This handsome parchment paper, hand-lettered award attests to the achievement of making and confirming "two-way communications using the US Novice bands and privileges with Amateur Radio stations in at least twenty-five of the forty *CQ* Zones." *And an achievement it is! It's far from being an impossible challenge, however.*

The editors of *CQ* are proud to announce the newest achievement award in a wide array of world-class awards, the WNZ award. WNZ stands for "Worked Novice Zones" and is available *only* to holders of a US Novice or Technician class license for proof of contact with at least 25 of the 40 *CQ* Zones as defined by the WAZ rules. All contacts must be made using the Novice 80, 40, 15, or 10 meter bands, using modes authorized for those bands, and using transmitter power authorized for the Novice or Technician license. All contacts must be made as a Novice or Technician, although at the time of submitting the actual application for the WNZ Award, the licensee may have upgraded to a higher class of license. Contacts must be made prior to passing the higher grade examination and receiving authorization to operate with General or higher class privileges.

The WNZ Award is available as a mixed mode, CW only, or SSB only award. Rules for the WNZ are essentially identical to the standard *CQ* WAZ rules. Use the regular WAZ application and mark "Novice" on the top margin. Thus, the WNZ Award may be used to fulfill part of the application requirement for the WAZ Award when the operator is finally able to confirm the remaining 15 Zones.

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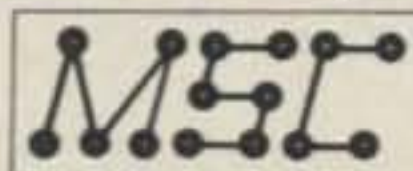


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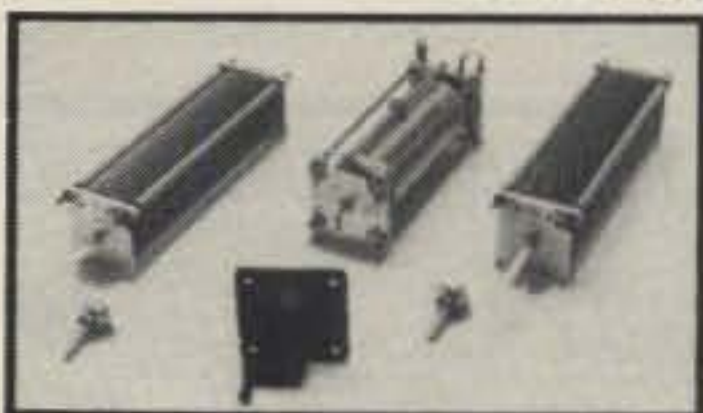
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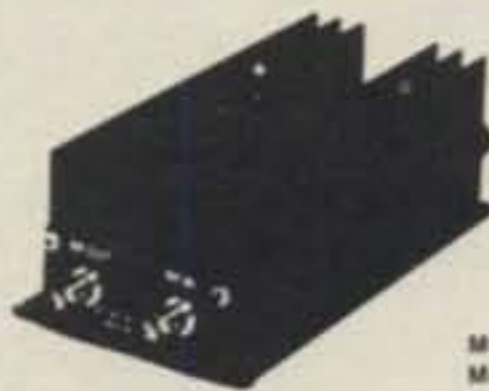
CIRCLE 138 ON READER SERVICE CARD

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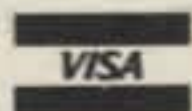
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CIRCLE 10 ON READER SERVICE CARD

## THE SCIENCE OF PREDICTING RADIO CONDITIONS

### 1987 In Review

#### BULLETIN

For those subscribers who will receive this issue of *CQ* before the *CQ* Worldwide DX Contest CW weekend of November 28-29, here is an updated day-to-day forecast for the Contest. There is an increasing possibility that the period of radio storminess previously expected to occur during the Contest weekend will hold off until later this week. I am now calling for improved conditions, fairly stable at mostly *Low Normal*, but with some *High Normal* conditions also possible. Unless nature trips us up, it now looks like a really good weekend for the CW Contest period. Good luck!

The year 1987 will go into the record books as the first year since 1979 that witnessed increasing solar activity, and the first full year of a new sunspot cycle, Cycle 22.

The new cycle began during September, 1986, and is estimated to have reached the mid-30 level by the end of 1987. The cycle is expected to pick up intensity during 1988, reaching the mid-70 level, or possibly higher by the end of the year.

Table 1 lists the *smoothed sunspot numbers* recorded throughout the recently ended cycle, Cycle 21, from its beginning in June, 1976 to its demise in September, 1986. The same data appears in graphical form in fig. 1.

The cycle was the second most intense ever recorded, with a peak count of 165. The most intense cycle, with a peak of 201, was Cycle 19.

It took 3.5 years for Cycle 21 to rise from its beginning to its peak value, which is considerably faster than the 20 previous cycles recorded, for which the average is 4.8 years. It took 6.8 years for the decline of Cycle 21, which is only slightly longer than the average 6.2 years for previously recorded cycles. Cycle 21 was a short cycle, with 10.3 years from its beginning to end. The life of an average cycle is 11.1 years.

How is Cycle 22 expected to compare with Cycle 21 and with previous cycles?

#### LAST MINUTE FORECAST

Day-to-Day Conditions Expected for December 1987

Propagation Index .....	Expected Signal Quality			
	(4)	(3)	(2)	(1)
Above Normal: 2, 22, 26	A	A	B	C
High Normal: 5-6, 8-10, 15, 21, 23-24, 27	A	B	C	C-D
Low Normal: 1, 3-4, 7, 11-12, 14, 16-17, 20, 25, 31	A-B	B-C	C-D	D-E
Below Normal: 13, 18, 28, 30,	B-C	C-D	D-E	E
Disturbed: 19, 29	C-E	D-E	E	E

Where expected signal quality is: A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

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

E—No opening expected.

#### HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good-to-fair (B-C) on December 1st, excellent (A) on the 2nd, good-to-fair again (B-C) on the 3rd and 4th, good (B) on the 5th and 6th, etc.

The experts are already making their predictions, and we will review some of them in next month's column.

The Royal Observatory of Belgium reports a monthly mean sunspot number of 39 for August, 1987. This results in a

smoothed sunspot number of 24, centered on February, 1987. This is an increase of 7 numbers over January's level. The intensity of a sunspot cycle is measured by the smoothed numbers, which are averaged over a 12-month period. A smoothed sunspot number of 35 is forecast for this month, but it could possibly be higher. The Algonquin Radio Observatory in Ottawa, Canada reports a mean 10.7 cm solar flux level of 90.3 for August, up 6 points from January's reading.

#### December Conditions

The new sunspot cycle has already risen to a level where daytime DX conditions on 10 and 15 meters should be noticeably better than they were during the past three winter seasons. An increasing number of 10-meter DX opening should be possible during the daylight hours, mainly to southern and tropical areas, but to other areas as well.

Fairly good 15-meter DX openings are expected to most areas of the world during the daylight hours. The band may also occasionally remain open towards the west during the early evening.

Twenty meters should open for DX in almost all directions for an hour or two after sunrise, and remain open to one area of the world or another through the daylight hours and into the early evening. When conditions are High Normal or better, 20 meters may remain open towards the south and the west during the hours of darkness to about midnight, or later.

With static levels at seasonally low values in the northern hemisphere, and the

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1976	—	—	—	—	—	12*	13	14	14	13	14	15
1977	17	18	20	22	24	26	29	33	39	46	52	57
1978	61	65	70	77	83	89	97	104	108	111	113	118
1979	124	131	137	141	147	153	155	155	156	158	162	165@
1980	164	163	161	159	156	155	153	150	150	150	148	143
1981	140	142	143	143	143	142	140	141	143	142	139	138
1982	137	133	129	124	120	117	115	109	101	96	95	95
1983	93	90	86	82	71	71	66	66	68	68	67	64
1984	60	56	53	50	48	47	44	40	34	29	25	22
1985	21	20	19	18	18	18	17	17	17	17	17	22
1986	14	13	13	14	14	14	14	13	12**			

\* Beginning of Cycle 21

@ Maximum Value

\*\* End of Cycle 21

11307 Clara Street, Silver Spring, MD 20902

Table 1—The Saga of Sunspot Cycle 21

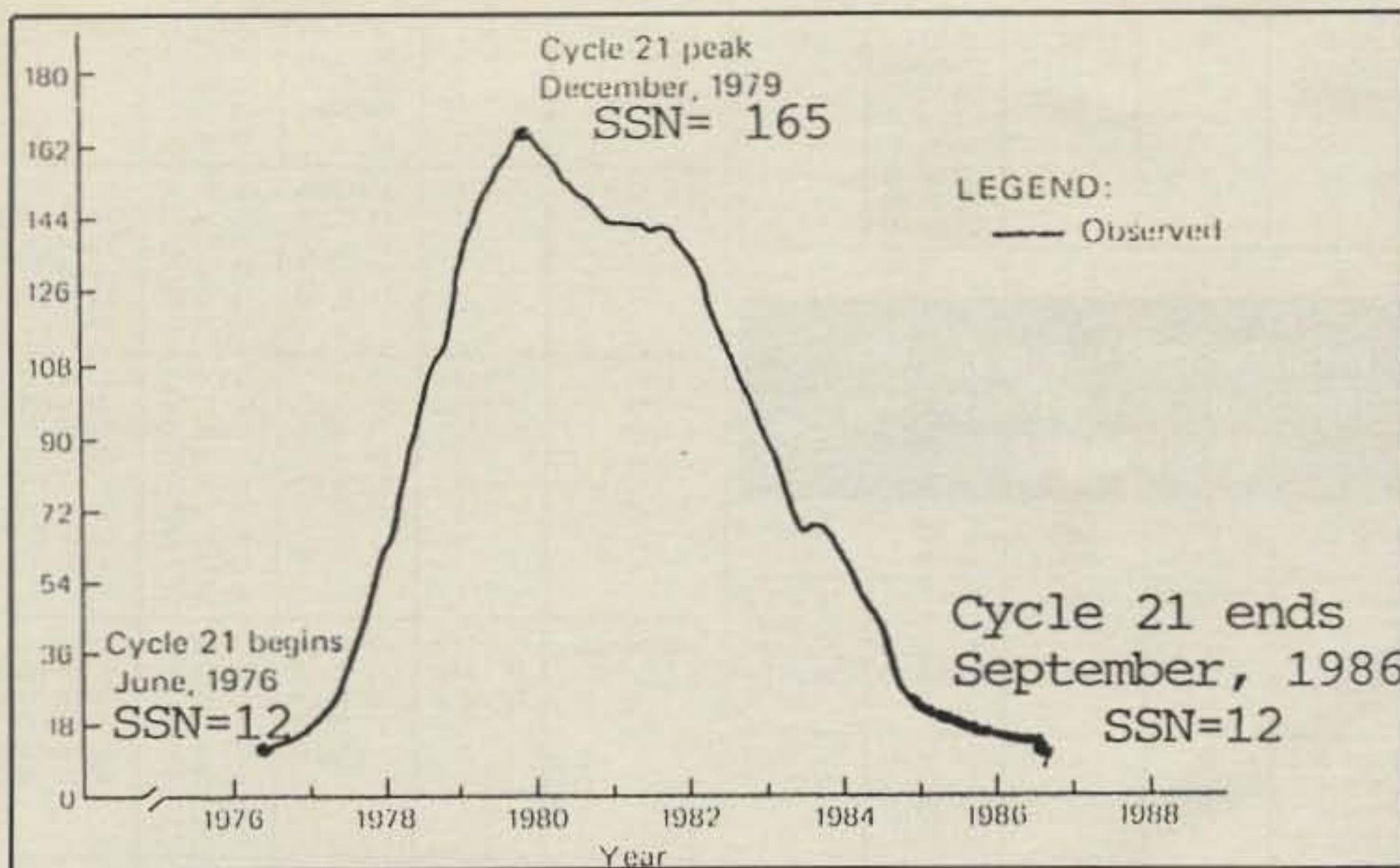


Fig. 1—Completed Sunspot Cycle 21 in Graphical Form.

hours of darkness at a maximum, a considerable seasonal improvement is expected in DX conditions on the 40-, 80- and 160-meter bands during December. Forty meters should open for DX during the late afternoon hours, with the first signals coming from Europe and other areas in a northeasterly direction from the USA. During the hours of darkness DX should be possible to many areas of the world. The band should peak shortly before sunrise to Oceania and to other areas in generally southerly and westerly directions.

Fairly good DX conditions are also expected on 80 meters. Openings with relatively strong signals should be possible from many areas of the world during the hours of darkness, with conditions expected to peak as the sun rises at the easternmost terminal of a DX path. Even the 160-meter band is expected to have its share of DX during December. Some openings are likely to take place when the transmission path is entirely in darkness, or when part of the path is in darkness and the other either in twilight or dawn.

For short-skip openings of less than 250 miles, try 80 meters during the day and 160 meters at night. Between 250 and 750 miles, the best bet is 40 meters during the day and 80 at night. Between 750 and 1300 miles, try 20 during the day, 40 during the evening, and 80 later in the evening and until sunrise. For openings between 1300 and 2300 miles, 20 meters looks best during the day, 40 during the evening to about midnight, and 80 for the remainder of the dark hours and until sunrise. Short-skip openings should also be possible on 15 meters between distances of 1300 and 2300 miles during much of the daylight period. An increasing number of 10 meter openings should also be possible over these distances during the afternoon hours.

**December 1987 to February 1988  
Time Zone: EST (24-Hour Time)  
EASTERN USA TO:**

Reception Area	10 Meters	15 Meters	20 Meters	40/80* Meters
Western & Central Europe & North Africa	09-11 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-13 (2) 13-14 (1)	06-07 (1) 07-09 (4) 09-11 (3) 11-13 (4) 13-14 (3) 14-15 (2) 15-17 (1)	15-16 (1) 16-17 (2) 17-19 (3) 19-00 (4) 00-02 (2) 02-03 (3) 03-05 (1) 17-19 (1)* 19-20 (2)* 20-02 (3)* 02-03 (2)* 03-04 (1)*
Northern Europe & European USSR	08-10 (1)	07-08 (1) 08-10 (2) 10-12 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-14 (1)	16-19 (1) 19-23 (2) 23-03 (1) 19-02 (1)*
Eastern Mediterranean & Middle East	08-10 (1)	08-09 (1) 09-10 (3) 10-11 (2) 11-12 (1)	06-09 (1) 09-10 (2) 10-13 (3) 13-15 (2) 15-17 (1)	18-20 (1) 20-22 (2) 22-00 (1) 20-23 (1)*
West Africa	09-11 (1) 11-13 (2) 13-15 (1)	07-08 (1) 08-09 (2) 09-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	18-22 (1) 22-00 (2) 00-03 (1) 03-04 (2) 00-02 (1)*
East & Central Africa	10-13 (1)	08-10 (1) 10-12 (2) 12-13 (3) 13-15 (2) 15-16 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	18-00 (1)
Southern Africa	09-10 (1) 10-12 (2) 12-13 (1)	07-09 (1) 09-12 (2) 12-14 (3) 14-15 (1)	07-09 (1) 12-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	18-19 (1) 19-21 (2) 21-00 (1) 19-22 (1)*
Central & South Asia	Nil	08-10 (1) 17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 18-21 (1)	06-08 (1) 20-22 (1)
Southeast Asia	Nil	08-11 (1) 17-19 (1)	06-07 (1) 07-09 (2) 09-12 (1) 19-21 (1)	06-08 (1) 20-22 (1)
Far East	Nil	16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-21 (1)	05-08 (1) 05-07 (1)*

**HOW TO USE THE DX PROPAGATION CHARTS**

- 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.
- The predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An \* indicates the best time to listen for 160 meter openings; \*\* indicates best times for 10 meter openings.
- 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:
  - Opening should occur on more than 22 days
  - Opening should occur between 14 and 22 days
  - Opening should occur between 7 and 13 days
  - 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.
- 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. Appropriate daylight time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 5 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.
- The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP 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 10 dB loss, it will lower by one level.
- 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.

South Pacific & New Zealand	13-17 (1)	11-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	03-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	01-02 (1) 02-04 (2) 04-07 (3) 07-08 (2) 08-09 (1) 04-05 (1)* 05-07 (2)* 07-08 (1)*
Australasia	16-18 (1)	09-12 (1) 15-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-18 (1) 18-20 (2) 20-22 (1)	03-05 (1) 05-07 (2) 07-09 (1) 05-08 (1)*
Caribbean, Central America & Northern Countries of South America	09-10 (1) 10-12 (2) 12-14 (1) 14-16 (2) 16-17 (1)	07-08 (1) 08-11 (3) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-07 (2) 07-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-06 (1)	17-18 (1) 18-19 (2) 19-21 (3) 21-04 (4) 04-05 (3) 05-06 (2) 06-07 (1) 19-20 (1)* 20-22 (2)* 22-02 (3)* 02-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	09-12 (1) 12-15 (2) 15-16 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (4) 16-17 (3) 17-18 (1)	13-14 (1) 14-15 (2) 15-17 (3) 17-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-03 (1) 05-06 (1) 06-08 (2) 08-09 (1)	19-21 (1) 21-02 (2) 02-05 (1) 21-03 (1)*
McMurdo Sound, Antarctica	Nil	07-10 (1) 16-18 (1)	07-09 (1) 17-18 (1) 18-22 (2) 22-00 (1) 00-02 (2) 02-03 (1)	00-05 (1)

**December 1987 to February 1988  
Time Zones: CST & MST (24-Hour Time)  
CENTRAL USA TO:**

Reception Area	10 Meters	15 Meters	20 Meters	40/80* Meters
Western & Southern Europe & North Africa	09-11 (1) 08-09 (2) 09-11 (3) 11-12 (2) 12-13 (1)	07-08 (1) 08-09 (2) 09-12 (3) 11-13 (2) 12-13 (1)	06-08 (1) 08-09 (2) 09-12 (3) 11-13 (2) 13-15 (1) 22-00 (1)	16-18 (1) 18-20 (2) 20-00 (1) 00-02 (2) 02-03 (1) 17-20 (1)* 20-01 (2)* 01-02 (1)*
Northern & Central Europe & European U S S R	Nil	07-08 (1) 08-10 (2) 10-12 (1)	07-08 (1) 08-11 (2) 11-13 (1) 23-01 (1)	17-19 (1) 19-22 (2) 22-01 (1) 19-00 (1)*
Eastern Mediterranean & Middle East	Nil	08-11 (1)	06-09 (1) 09-12 (2) 12-14 (1) 22-00 (1)	18-20 (1) 20-22 (2) 22-23 (1) 20-22 (1)*
West & Central Africa	08-10 (1) 10-12 (2) 12-13 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-11 (1) 11-13 (2) 13-16 (3) 16-17 (2) 17-19 (1) 22-02 (1)	18-21 (1) 21-23 (2) 23-01 (1) 19-22 (1)*
East Africa	10-12 (1)	07-11 (1) 11-13 (2) 13-14 (1)	06-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-19 (1)	19-23 (1)
Southern Africa	08-09 (1) 09-12 (2) 12-13 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-15 (2) 15-16 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-20 (1) 23-01 (1)	18-19 (1) 19-21 (2) 21-23 (1)
Central & South Asia	Nil	08-10 (1) 19-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-22 (1)	06-08 (1) 19-21 (1)
Southeast Asia	Nil	08-11 (1) 17-20 (1)	07-08 (1) 08-10 (2) 10-12 (1) 16-17 (1) 17-19 (2) 19-20 (1)	04-07 (1)
Far East	Nil	07-09 (1) 16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 15-17 (1) 17-19 (2) 19-21 (1)	02-04 (1) 04-06 (2) 06-07 (1) 04-07 (1)*
South Pacific & New Zealand	12-14 (1) 14-16 (2) 16-18 (1)	10-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-15 (1) 15-17 (2) 17-20 (3) 20-21 (2) 21-22 (1) 02-04 (1)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1) 03-07 (1)*
Australasia	14-15 (1) 15-17 (2) 17-18 (1)	09-11 (1) 13-15 (1) 15-17 (3) 17-19 (2) 19-20 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-18 (1) 18-21 (2) 21-22 (1)	02-04 (1) 04-07 (2) 22-03 (3) 03-06 (1)*
Caribbean, Central America & Northern Countries of South America	08-10 (1) 10-14 (2) 14-16 (1)	07-08 (1) 08-09 (2) 09-13 (3) 13-16 (4) 16-17 (2) 17-19 (1)	06-07 (2) 07-11 (3) 11-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-06 (1)	18-20 (1) 20-22 (2) 22-03 (3) 03-05 (2) 05-07 (1) 19-21 (1)* 21-01 (2) 01-04 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-11 (1) 11-15 (2) 15-17 (1)	07-08 (1) 08-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-19 (1)	05-06 (1) 06-08 (2) 08-10 (1) 12-14 (1) 14-15 (2) 15-17 (3) 17-19 (4) 19-20 (2) 20-22 (1) 22-00 (2) 00-03 (1)	19-21 (1) 21-02 (2) 02-05 (1) 21-04 (1)*

McMurdo Sound, Antarctica	Nil	07-09 (1) 16-18 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-18 (1) 18-22 (2) 22-00 (1) 00-02 (2) 02-03 (1)	22-05 (1)
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**December 1987 to February 1988  
Time Zone: PST (24-Hour Time)  
WESTERN USA TO:**

Reception Area	10 Meters	15 Meters	20 Meters	40/80* Meters
Western & Southern Europe & North Africa	07-09 (1)	07-08 (1) 08-10 (2) 10-11 (1)	05-07 (1) 07-10 (2) 10-12 (1) 23-01 (1)	18-20 (1) 20-23 (2) 23-01 (1) 19-23 (1)*
Central & Northern Europe & European USSR	Nil	07-09 (1)	06-07 (1) 07-10 (2) 10-13 (1) 23-01 (1)	17-00 (1) 19-23 (1)*
Eastern Mediterranean & Middle East	Nil	07-09 (1)	06-07 (1) 07-09 (2) 09-11 (1) 21-23 (1)	18-21 (1)
West & Central Africa	09-12 (1)	07-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	06-10 (1) 10-13 (2) 13-16 (3) 16-18 (2) 18-19 (1)	18-22 (1)
East Africa	Nil	08-11 (1)	08-10 (1) 13-16 (1) 21-23 (1)	18-20 (1)
Southern Africa	08-11 (1)	06-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	07-11 (1) 11-13 (2) 13-16 (3) 16-18 (2) 18-19 (1) 00-02 (1)	18-20 (1)
Central & South Asia	Nil	09-11 (1) 17-19 (1)	08-10 (1) 17-19 (1) 19-20 (2) 20-21 (1)	05-07 (1) 18-20 (1)

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

\*Predicted times of 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a forecast rating of (2) or better.

This month's column contains DX Propagation Charts valid through mid-February, 1988. Short-skip Propagation Charts for December, 1987 appeared in last month's column.

**VHF Ionospheric Openings**

Some auroral-type VHF ionospheric openings are very likely to occur during December, especially during periods of radio storminess, when HF conditions are Below Normal or Disturbed. Check the *Last Minute Forecast* at the beginning of this column for days that are expected to be in these categories during December.

Expect quite a bit of meteor ionospheric activity during the month. *Geminids*, classified as a major meteor shower, should begin on December 12 and last for about three days. Maximum intensity is expected on December 13, with a meteor rate of about one a minute. Ionization produced by these meteors entering the earth's atmosphere should make possi-

ble meteor-type openings on 6 and 2 meters. A second, but somewhat less intense, shower period is expected later in the month. Called *Ursids*, it should last from December 22-23, peaking on the 22nd. A meteor rate of approximately 15 per hour is expected during this shower.

A secondary seasonal peak in sporadic-E propagation usually takes place during December (the major peak occurs during the summer months). This could result in some fairly good ionospheric short-skip openings on 6 meters between distances of approximately 800 and 1400 miles. Conditions should peak during the early evening hours, but some openings may occur at other times as well.

**Seasons Greeting**

The Editor of this column would like to take this opportunity to extend his warmest wishes for the Holiday Season, and his best wishes for improved propagation conditions during 1988.

73, W3ASK

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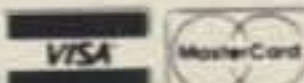
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# Contest Calendar

a monthly feature by  
FRANK ANZALONE, W1WY

## NEWS/VIEWS OF ON-THE-AIR COMPETITION

Over the past 30 or more years we have announced more competitive amateur radio activities than any other publication. Rules have progressively improved, and now all major contests have a clause that clearly spells out reasons for disqualification. These include taking credit for excessive duplicate contacts, not complying with rules and regulations, using excessive power, unsportsmanlike conduct, etc. Probably the most abused but easiest to detect is "taking credit for duplicate contacts." Rechecking your log before submitting it should solve that problem. Now that computers are used to do the checking, your chances of beating the system are slim (although we did a pretty good job in the old days when computers were unheard of).

Rules and regulations. This is very seldom enforced obviously due to the fact that time is not taken to check for violations.

Using excessive power. This is a rather difficult one to check. Back in the old days the FCC was known to send out field units to check suspected stations operating in a contest. That's seldom done in this day and age. They don't have the time or manpower. It's the so-called honor system now, and it has been quoted that there is no honor in love, war, and DX contesting.

Unsportsmanlike conduct. Who is going to interpret or judge whether or not the conduct of an operator meets acceptable standards? Unlike other sporting events where the judge is on the scene and can make a visual decision, that is not possible in radiosporting.

Of late, my contest operating has been limited in time and not competitive. However, I have taken time to observe what is going on, and there have been many instances of questionable operating, even though some of it could be excused in the heat of competition.

As a final analysis, the disqualification clause in radio contesting may look very impressive in print, but in most cases it is not very practical to enforce.

That should do it for this time. Any comments?

It's hard to believe that this is being written for the December issue and that holiday greetings are in order. Have a most pleasant Holiday Season and best wishes for the New Year.

14 Sherwood Road, Stamford, CT 06905

### Calendar of Events

- \*\* Nov. 28-29 CQ WW DX CW Contest
- \* Dec. 4-6 ARRL 160 Meter Contest
- \* Dec. 5-6 TOPS 3.5 MHz Contest
- Dec. 5-7 Telco. Pioneers QSO Party
- Dec. 12-13 ARRL 10 Meter Contest
- Dec. 13 ARCI QRP CW Sprint
- Dec. 27 Canada Day Contest
- Jn. 1- De.31 U.B.A. SWL Competition
- Jan. 2-3 "73" 10 Meter SSB Champ.
- Jan. 9 & 10 "73" 15&20M. SSB Champ.
- Jan. 9-10 European YL-OM Contest
- Jan. 10 ARCI QRP SSB Sprint
- Jan. 16-17 "73" 160 M. SSB Champ.
- Jan. 16-17 Texas QSO Party
- Jan. 16-17 Michigan QRP CW Contest
- Jan. 16-17 AGCW-DL QRP CW Contest
- Jan. 16-17 Hungarian DX CW Contest
- Jan. 16-17 White Rose SWL Phone
- Jan. 23&24 "73" 40&75M. SSB Champ.
- Jan. 23-25 ARRL VHF Sweepstakes
- Jan. 29-31 CQ WW 160 M. CW Contest
- Jan. 30-31 French DX CW Contest
- Jan. 30-31 YL-ISSB CW QSO Party
- Jan. 30-31 White Rose SWL CW
- Feb. 13-14 QCWA CW QSO Party
- Feb. 13-14 Dutch "PACC" Contest
- Feb. 13-15 YLRL YL-OM Phone Contest
- Feb. 20-21 ARRL DX CW Contest
- Feb. 26-28 CQ WW 160 M. SSB Contest
- Feb. 27-28 French DX Phone Contest
- Feb. 27-29 YLRL YL-OM CW Contest
- Mar. 5-6 ARRL DX Phone Contest
- Mar. 12-13 QCWA Phone QSO Party
- Mar. 12-13 RSGB Commonwealth
- Mar. 19-20 YL-ISSB Phone QSO Party
- Mar. 20-21 Wisconsin QSO Party
- Mar. 26-27 CQ WW WPX SSB Contest

\* Covered last month.

\*\* See Sept. and Oct. issues.

Deadline for the March issue is December 15th and January 15th for the April issue. It's to your advantage to send all material to my home address.

73 for this time, Frank, W1WY

### Telco. Pioneers QSO Party

1900Z Sat. to 0500Z Mon., Dec. 5-7

This is the 23rd annual QSO party of the Telephone Pioneers of America, and the 10th year it is sponsored by the John D. Burlie Chapter #89.

Members may be worked on each band and each mode if they are in different chapters, but only one contact is permitted between stations in the same chapter.

**Exchange:** QSO number and chapter number.

**Scoring:** One point per QSO on each band and each mode, and one multiplier

### 1987 CQ World-Wide DX Contest 7 MHz Trophy Sponsors

#### Phone

World: Fred Laun, K3ZO—K7ZZ Memorial (new)  
U.S.A.: Stanley Cohen, WD8QDQ (call correction)

#### CW

World: Inside DX Bulletin, N2AU (new)  
U.S.A.: Jan Perkins, N6AW—W6AM Memorial (new)

for each different chapter worked. There are 115 TPA and 15 USTPA chapters.

**Frequencies:** A wide selection of frequencies may be used by all classes on all bands, 1.8-28 MHz and the UHF bands. A detailed breakdown is available from W8TB.

It is suggested that members who have not received this announcement from their chapters write to Ted Phelps for additional detailed information.

**Awards:** There is a wide selection of certificates for Life Members, Active Members, and Pioneers. Chapters in Canada have an awards program, and also the Burlie Chapter #89 is offering awards.

It is suggested that members who have not received this announcement from their chapters write to Ted Phelps for additional detailed information.

Mailing deadline for all entries is January 15th to: Ted Phelps, W8TP, c/o John D. Burlie Chapter #89, Telephone Pioneers of America, 6200 East Broad Street, Columbus, OH 43213.

### ARRL 10 Meter Contest

0000Z Sat. to 2400Z Sun., Dec. 12-13

This is the 15th annual 10 Meter Contest organized by the ARRL.

It's a worldwide activity in which DX stations are permitted to work other DX stations. You are not limited to working W/K's and VE's only.

The same station may be worked once on phone and again on CW; no cross-mode, however. A maximum of 36 hours operating time is permitted out of the 48-hour contest period for all stations.

**Categories:** Single operator, mixed mode, phone only or CW only. Multi-operator mixed mode only.

**Exchange:** W/VE stations (including KH6 and KL7) send RS(T) and state or province. DX stations (including KH2,



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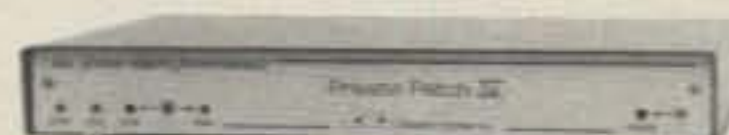
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**Scoring:** Phone QSOs are worth 2 points, CW 4 points, and Novice 8 points.

**Multiplier:** Fifty U.S. states, VE call areas, DX countries, and ITU regions, counted separately on phone and CW.

**Final Score:** Total QSO points times the state, province, DX country, and ITU region multiplier.

**Awards:** Certificates to the top single operator in each category for each ARRL section and DX country, and to the top multi-operator station in each ARRL division and each continent, and for Novices.

Indicate the multiplier only the first time it is worked. Dupe sheets are required for logs with 500 or more QSO's. The usual disqualification criteria will be observed. A large SASE will get you log and instruction forms. Mailing deadline for all entries is January 18th to: ARRL Communications Dept., 10 Meter Contest, 225 Main Street, Newington, CT 06111.

## ARCI QRP "Homebrew" CW Sprint

2000Z to 2400Z Sunday, December 13

Like the Summer Sprint this is also a shorty, only 4 hours. The emphasis is on the use of homebrew equipment and like the previous Sprint rules are lengthy and complicated. Following is a basic summary, but again I advise you to get a detailed copy from KA5NLY.

**Classes:** Single operator, single and all band only.

**Exchange:** RST and state, province, or country. ARCI members will include their membership number, non-members their output power. Call must be followed with "HB" or "C" indicating equipment used.

**Scoring:** Contacts with members 5 points. Non-members 2 points. If on a different continent 4 points. Add 5 more points if station worked is also using homebrew equipment.

**Multiplier:** Sum of different states, VE provinces, and countries worked on each band.

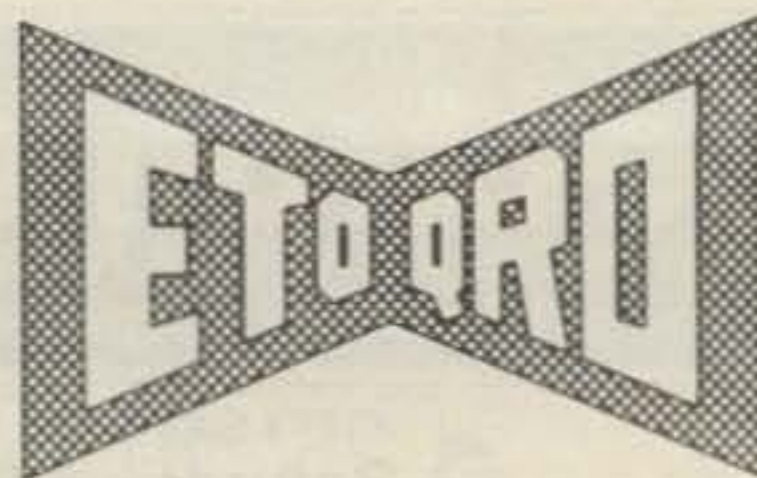
**Power Multiplier:** 4 to 5 watts output  $\times 2$ , 3 to 4 watts output  $\times 4$ , 2 to 3 watts output  $\times 6$ , 1 to 2 watts output  $\times 8$ , less than 1 watt  $\times 10$ . Over 5 watts is a check log. Output based on  $\frac{1}{2}$  of input power.

**Power Supply Multiplier:** Battery supply  $\times 1.5$ , Solar/natural  $\times 2$ .

**"HB" Bonus:** 200 if transmitter is homebrew, 300 if receiver, 500 if transceiver used on each band.

**Final Score:** Total QSO points  $\times$  state, province, country,  $\times$  power multiplier,  $\times$  power supply multiplier + "HB" Bonus.

**Frequencies:** 1810, 3560, 3710, 7040, 7110, 14060, 21060, 21110, 28060, 28110, 50060 kHz.



## ETO AND ALPHA GO FACTORY DIRECT!

The new ALPHA 86, and all other ETO amplifiers including the forthcoming ALPHA 87 AND 88, will be sold factory direct *only*, from now on. There are several important reasons. WHY BUY DIRECT FROM ETO?

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### TROUBLE BUSTER!

Call Ray Heaton, NJ0G (ex-WA0DYZ) if you're considering a new linear. Ray has been answering the ALPHA sales and service lines for over a decade. He has a wealth of information and advice concerning various amplifiers and their applications. He also has up-to-date delivery information on new ALPHA's.

ALPHA owners also call Ray when they need help. He's Mr. Service in the ALPHA world and can resolve most problems in a few minutes. If factory service is needed, Ray knows all the techniques to insure fast turnaround. And ETO stocks almost any part that might be needed.

### CAREER OPPORTUNITIES! HELP WANTED!

ETO needs immediately a licensed amateur—good with people and knowledgeable about high power linear amplifiers—to help Ray Heaton expand our customer sales and service operation. If you qualify, please call Ray directly.

We also have openings for RF power design engineers, technicians, and manufacturing & marketing specialists. Please send resume to Steve Christensen at ETO.



Ray Heaton

### FACTORY FRESHNESS

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The great new ALPHA 86 is rated to deliver *twice* as much long term average power output as an ALPHA 76CA and incorporates such important new features as PIN diode T/R switching and fully tuned input. We're proud to be able to offer it, despite all the new features and six years of rising costs, for only 11% more than the price of *that same '76CA back in 1981*. Innovative engineering and selling direct make it possible.

### AND THE NAME IS...

Many of you associated the name *POWER LINES* with the specter of QRN, high electric bills, and other spooks in hamdom's anxiety closets.

Several suggested including *ETO* in the name of this column. Our choice: *ETO/QRO*—loosely translated,

"MORE POWER FROM ETO!"

### THANK YOU...

for many notes offering encouragement and expressing pleasure at our return to a more aggressive role in amateur radio. Key chains will be in the mail shortly.

73,



*Dick Ehrhorn*

Dick Ehrhorn,  
W4ETO

Alpha 86 offers these very special reasons to buy one now:

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**Awards:** Certificates to the top 5 all band and single band overall winners and to the top scores in each state, province, and country with 2 or more entries.

Include a summary sheet showing the scoring and other essential information. Sample log forms are available as is a copy of the results. Include a large SASE for each.

Mailing deadline is January 12th to: Eugene Smith, KA5NLY, Pentagon P.O. Box 46599, Washington, DC 20050-6599.

### Canada Day Contest

0000 to 2400Z Sunday, December 27

Sponsored by the Canadian Amateur Radio Federation, this contest is open to all amateurs. Everyone works everyone on both sides of the border. Rules have been restructured to quote, "make for a better contest."

**Classes:** Single operator—All Band,

CW, SSB, and both modes. Single band, CW/SSB. Multi-operator—Single transmitter and multi-transmitter, all band only.

**Exchange:** Name, RS(T), QSO no., province, territory, state, or country. Multi-multi stations use separate QSO no. for each band.

**Scoring:** 10 points for each Canadian contact, 4 points for contacts with stations outside of Canada, and 20 points can be claimed for working each official station using the VCA or TCA suffix.

**Multiplier:** Each Canadian province/territory worked on each band and mode.

**Frequencies:** 1825/75, 3525/3775, 7075/70/155, 14025/150, 21025/250, 28025/500, 50040/125 kHz.

**Awards:** Certificates to winning stations in each class, in each province/territory, DX country, and each US call area. Trophies for top scorers, all band, CW, SSB, and both modes. Single band 14 and 7 MHz. And multi-single and multi-multi stations.

Include a summary sheet with your entry showing the scoring, etc., and the usual signed declaration that all rules and regulations have been observed.

Mailing deadline is Jan. 30th to: CARF Contest, Att: John Clarke, VE1CCM, 16 Keefe Ave., Sydney, Nova Scotia, B1R 2C7 Canada.

### U.B.A. SWL Competition

Jan. 1 to Dec. 31, 1988

We often hear from SWL's complaining that very little coverage is given to their hobby. This one should keep them busy for the whole of 1988.

There are five categories: Single operator, phone, CW and RTTY, SSTV, and all modes for clubs and multi-operator.

Use all 6 bands, 1.8–28 MHz.

There will be certificates and trophies for winners in all categories and areas.

The U.B.A. suggests that you use their special log forms. Your requests for more detailed information and log forms should be directed to the Contest Manager, Marc Domen. Include 3 IRC's if in Europe, 4 IRC's for all other areas.

Contest Manager: Marc Domen, ONL 6945, Gebr. Blommestraat 14, Borgerhout, B-2200 Antwerpen, Belgium.

### "73" Magazine World SSB Championship Contests

A series of six single band contests organized by *73 Magazine* will determine the single band SSB World Champion on each band, 10 through 160 meters.

Rules are the same for each one, and since they are all scheduled for the month of January, we will treat them as a single entry.

2nd annual **10 Meters** (48 hours)  
0000Z Sat. to 2400Z Sun., Jan. 2–3

4th annual **15 Meters** (24 hours)  
0000Z to 2400Z Sat., Jan. 9  
4th annual **20 Meters** (24 hours)  
0000Z to 2400Z Sun., Jan. 10  
9th annual **160 Meters** (48 hours)  
0000Z Sat. to 2400Z Sun., Jan. 16–17  
7th annual **40 Meters** (24 hours)  
0000Z to 2400Z Sat., Jan. 23  
7th annual **75 Meters** (24 hours)  
0000Z to 2400Z Sun., Jan. 24

**Classes:** Both single and multi-operator, single transmitter. Stations may operate the full contest period regardless of their classification.

**Special 10 meter:** Novice single operator, limited to 250 watts PEP, 28.3 to 28.5 MHz, can compete with each other.

**Exchange:** RS report and state, province, or territory for the 48 US states and 13 Canadian areas. RS and country for DX stations, including Alaska and Hawaii. Ten meter US Novice, RS and state, and consecutive QSO number.

**Points:** Contacts within own continent, 5 points. Outside own continent, 10 points. Five Bonus points for each US Novice contact in the 10 meter contest. Novice stations are easily identified as they are the only ones giving out contact numbers.

**Multiplier:** One for each US state, Canadian area, and DXCC country worked (excluding the US and Canada).

**Final Score:** Total QSO points times the multiplier points.

**Awards:** A plaque to the World Champion winner on each band (minimum of 500 contacts). Certificates in each class in each US state, Canadian area, and DXCC country (minimum of 200 contacts).

**Disqualification:** Taking credit for duplicate contacts in excess of 3% of the total made can mean disqualification. There is a stiff penalty of 100 QSO points for each duplicate contact for which credit has been claimed, and failure to comply with rules and regulations and unsportsmanlike conduct.

A summary sheet showing the scoring and other essential information and a dupe sheet for entries with 300 or more contacts is required.

It is suggested that you send a large SASE to the Contest Chairman, Bill Gorney, KE7C, 2665 N. Busby Road, Oak Harbor, WA 98277 for official forms.

Mail separate entries to the individual directors listed below postmarked *no later* than February 18, 1988.

10, 15, and 160 Meters—Russ Blair, KE7KF, 2113 East 10095 South, Sandy, UT 84092.

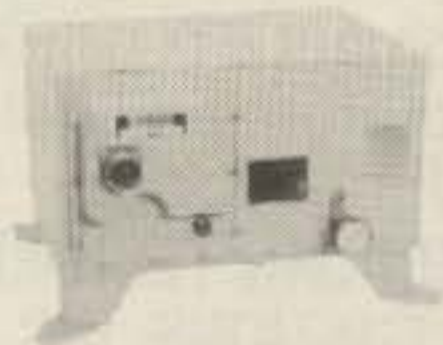
20 and 75 Meters—Ron Johnson, WE7H, 68 South 300 West, Brigham City, UT 84302.

40 Meters—Dennis Younker, NE6I, 43261 6th Street East, Lancaster, CA 93535.

(The National CW and SSB Championship will be held each year on Labor Day weekend.)

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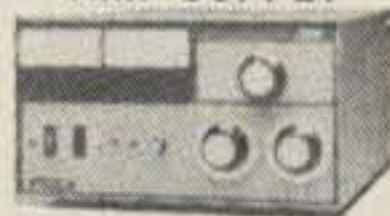
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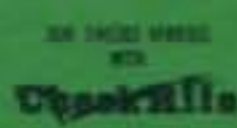
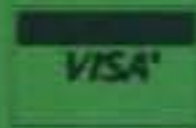
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Covers 80-10 meters.

#### • VS-1 voice synthesizer (optional)

#### • Superior receiver dynamic range

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- Adjustable dial torque
- 100 memory channels

Frequency and mode may be stored in 10 groups of 10 channels each. Split frequencies may be stored in 10 channels for repeater operation.

#### • TU-8 CTCSS unit (optional)

Subtone is memorized when TU-8 is installed.

#### • Superb interference reduction

IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and optional filters fight QRM.

#### • MC-43S UP/DOWN mic. included

#### • Computer interface port

#### • 5 IF filter functions

#### • Dual SSB IF filtering

A built-in SSB filter is standard. When an optional SSB filter (YK-88S or YK-88SN) is installed, **dual** filtering is provided.

#### • VOX, full or semi break-in CW

#### • AMTOR compatible



#### Optional accessories:

- AT-440 internal auto. antenna tuner (80 m—10 m)
- AT-250 external auto. tuner (160 m—10 m)
- AT-130 compact mobile antenna tuner (160 m—10 m)
- IF-232C/IC-10 level translator and modem IC kit
- PS-50 heavy duty power supply
- PS-430/PS-30 DC power supply
- SP-430 external speaker
- MB-430 mobile mounting bracket
- YK-88C/88CN 500 Hz/270 Hz CW filters
- YK-88S/88SN 2.4 kHz/1.8 kHz SSB filters
- MC-60A/80/85 desk microphones
- MC-55 (8P) mobile microphone
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**OLDTIMERS!** N6AW is compiling information for a series of articles and a book about W6AM. If you have a story to tell about Don Wallace, jot it down. If you have pictures of Don or his station from past years, please make a copy. (Costs reimbursed.) Send to: Jan D. Perkins, N6AW, 6200 E. Ocean Bl. #7, Long Beach, CA 90803.

**HAM Programs** for C-128, C-64, VIC-20, Plus/4, TI99/4A. Apple. Send large SASE: EPO SOFTWARE, 7805 N.E. 147th Ave., Vancouver, WA 98682.

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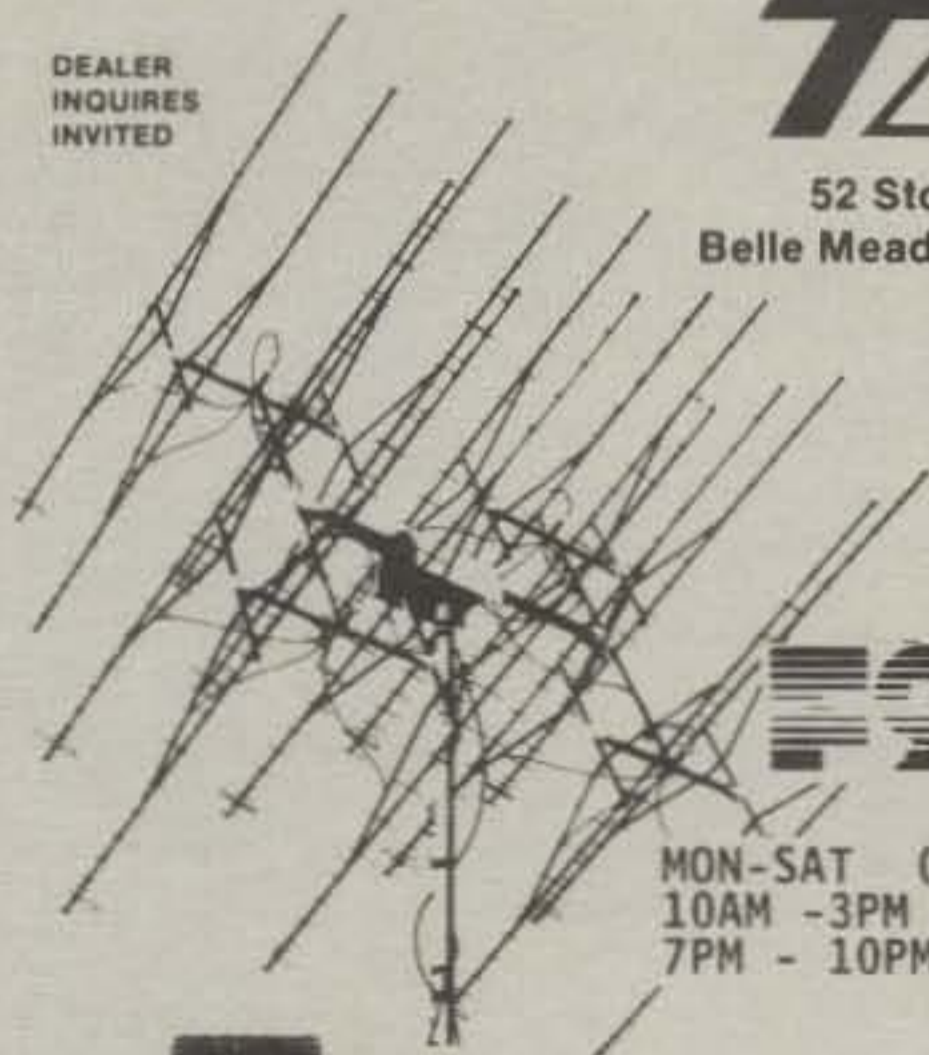
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Drive frequency is continuously monitored by the processor and adjustments made to ensure maximum amplifier output at all times. As you talk, the amplifier’s tuning is constantly adjusted as required. Powerful gearhead motors drive the bandswitch, tuning, and loading capacitors.

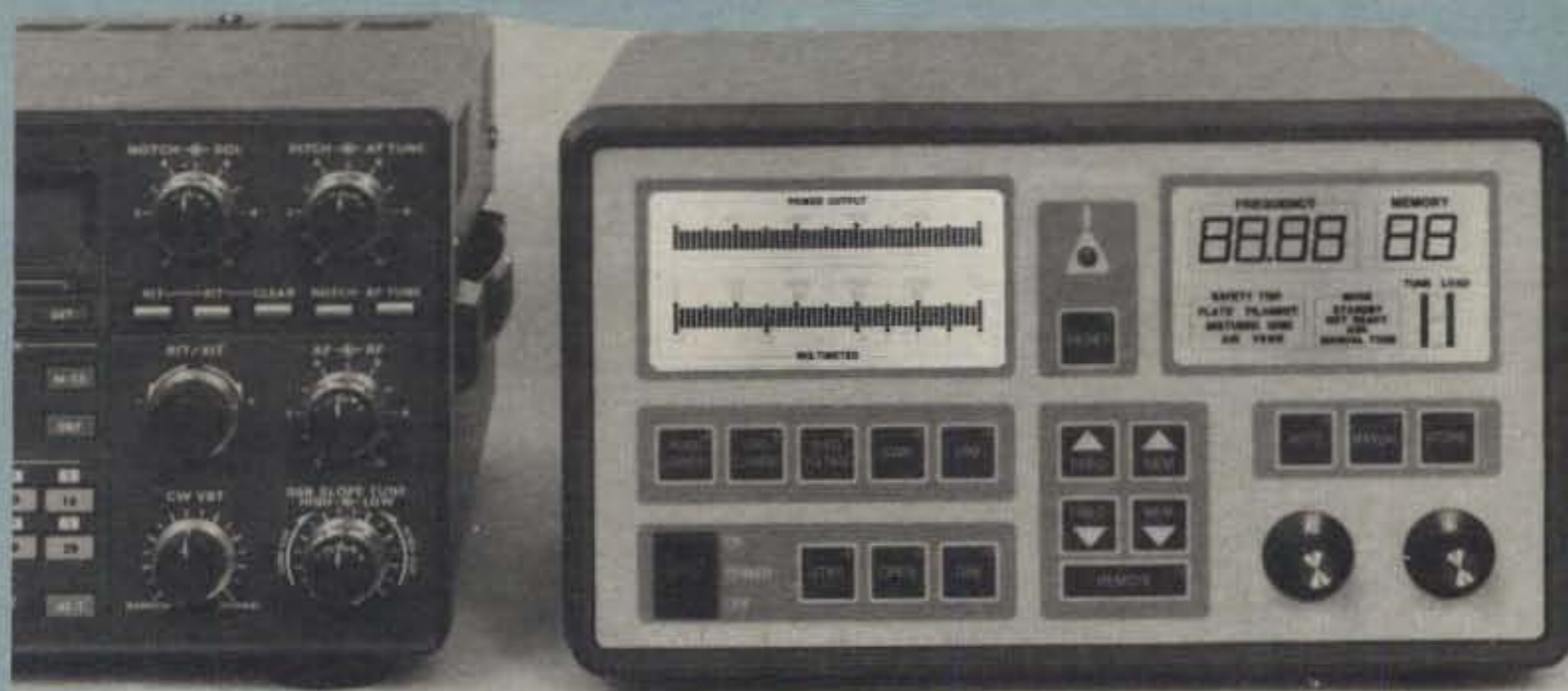
**HIGH QUALITY.** The 230A is manufactured to the same standards as the 230C, the commercial/military version.

**VERSATILITY.** The RF/power supply may be remotely located near your AC source and/or antenna cables. The small microcontroller takes little room at the operating position.

**PROTECTION.** The processor monitors tube parameters to ensure ratings are not exceeded. The operator is alerted if any parameter is getting close to a safety trip point.

**FULL QSK.** Choose QSK operation and our unique design allows “real QSK” with complete safety...no worries about burned vacuum relays, etc.

Pair of EIMAC 3CX800A7’s for high efficiency, low distortion operation. Pi-L output for high harmonic suppression.



230A Microcontroller by  
ADVANCED RADIO DEVICES

Remote RF/power supply  
deck is not shown.

TS 940 courtesy of EEB, Vienna, Va.

## FEATURES

- Two custom, easy-to-read, back-lighted LCD displays which provide all metering, alarm and status information.
- Built-in VSWR computer with readout on the LCD display.
- Accessory connectors for RS-232C control and antenna switching.
- HEAVY DUTY hypersil power transformer with full wave rectification and Radio Switch 86 series bandswitch.
- Automatic safety monitoring for VSWR, grid and plate current, airflow, filament voltage, and efficiency.
- Easy modification for 10 meters if you qualify.
- Remote control. Place RF/power supply deck up to 250 feet from the microcontroller with optional cable. (15 foot cable furnished.)
- Modular construction for ease of maintenance.

Factory direct sales for lowest cost.

Introductory prices: 230A, \$3695. 230C, \$5500.

1 year guarantee.

## SPECIFICATIONS

**FREQUENCY.** All amateur bands from 1.8 to 21 Mhz (to 30Mhz for export)

**DRIVE.** 50-80 watts for full power.

**INPUT VSWR.** 1.5:1 or less on all amateur bands. Slightly higher for WARC.

**HARMONIC SUPPRESSION.** -55dB

**INTERMOD PRODUCTS.** -35dB down.

**DUTY.** Continuous on all modes including RTTY.

**ALC.** Full ALC with exciter to prevent exceeding power limits.

**INPUT POWER.** 220-250VAC, 60Hz, 20 amperes max.

**DIMENSIONS.**

Microcontroller: 10 wide x 6 high x 8 deep (inches).

RF/power supply deck: 14 wide x 22 high x 13 deep (inches)

All interconnect cables are furnished for ease of set up.

In addition to the above, the 230C provides continuous frequency coverage from 1.8 to 30 Mhz with a no time output rating of 2250 watts PEP. Three 3CX800A7’s are utilized.

*Please call or write for additional information. We love to talk about these amplifiers!*

# ADVANCED RADIO DEVICES

103 Carpenter Drive, Sterling, Virginia 22170 (703) 478-3100 FAX (703) 478-3105

CIRCLE 116 ON READER SERVICE CARD

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THE U.S.A.



**HIGH PERFORMANCE LOG PERIODIC ANTENNA  
ONE ANTENNA COVERS 50-1300MHZ!!**



- LIGHTWEIGHT
- EASY ASSEMBLY
- SMALL SIZE

WIDE COVERAGE  
LOW VSWR  
HIGH GAIN

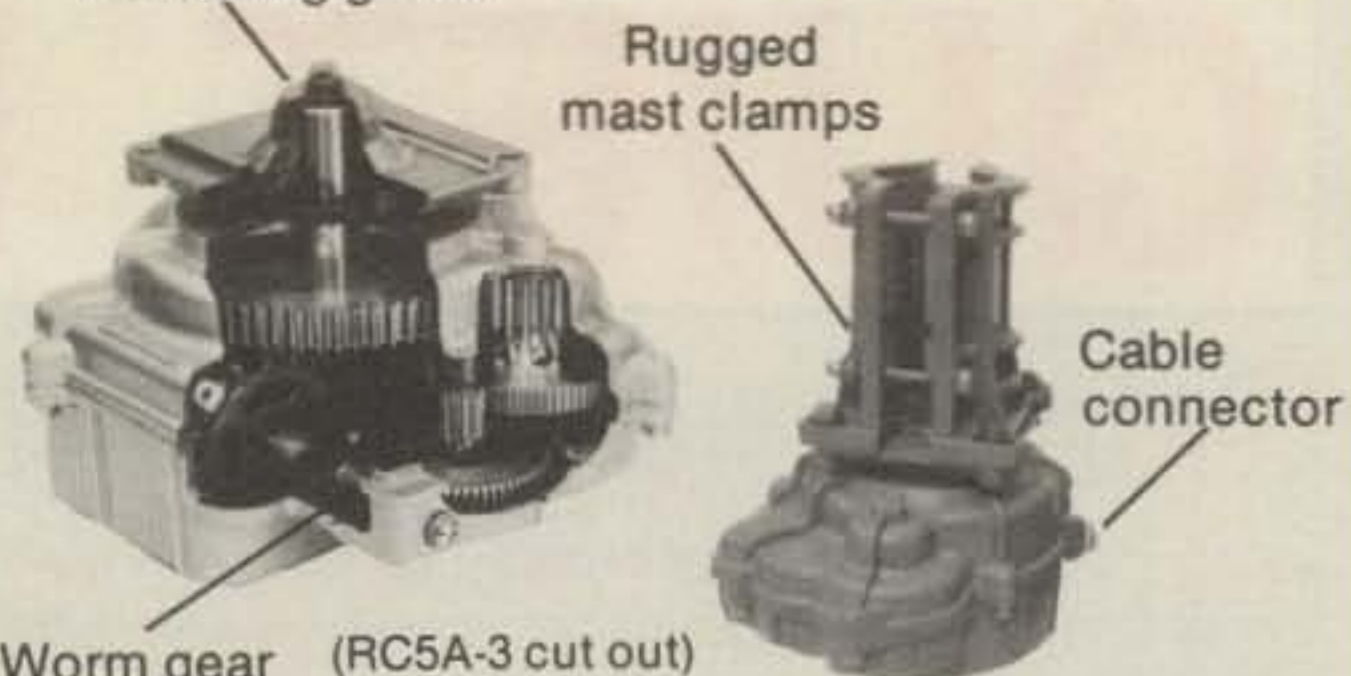
(CLP5130-1 Illustrated)  
Model not included

- CLP5130-1 50-1300 MHz 25 el. 500W 6' Boom \$199 UPS  
CLP5130-2 105-1300 MHz 20 el. 500W 4'6" Boom \$119 UPS

Operate on 6m, 2m, 1 1/4 m, 70cm, 900 MHz and 1.2 GHz using only one antenna and one feedline. No tuning is required and the VSWR is 2:1 or less across the entire frequency range with excellent forward gain. The boom is made of high quality aluminum and the elements are pre-cut for easy assembly. Each model can be mounted for either vertical or horizontal polarization. Create VHF/UHF log periodics are great for the amateur bands, scanners and numerous other applications.

Unique mast centering guide

**ROTATORS**



Worm gear (RC5A-3 cut out)  
No brake!

(Lower mast bracket available)



**RC5A-3**

RC5-1	10 sq. ft.	\$229
RC5-3	10 sq. ft. preset	\$299
RC5A-2	25 sq. ft.	\$373
RC5A-3	25 sq. ft. preset	\$436
RC5B-3	35 sq. ft. preset	\$736

(All rotators are UPS shippable)

See Lew McCoy's Review In August 1987 Issue Of CQ.

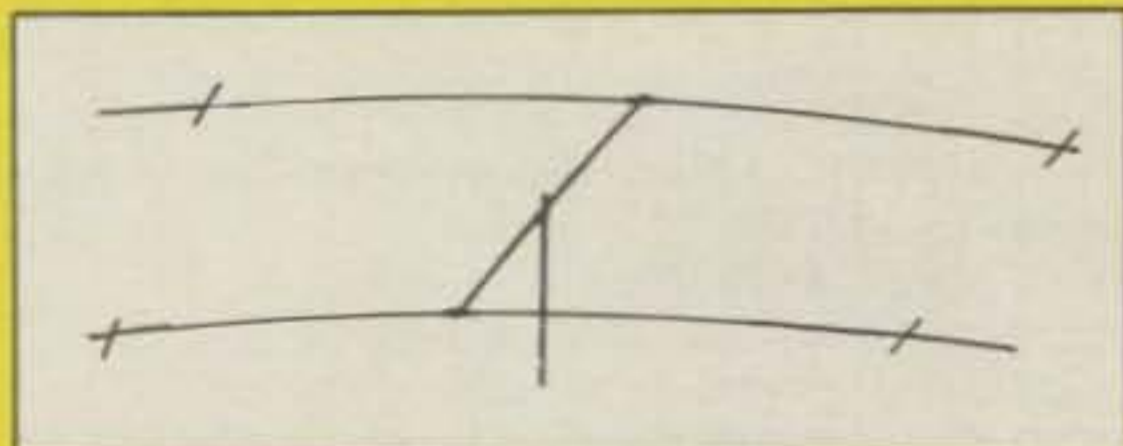


Creative Design Co., LTD.®



CV-48 is a ruggedly built 40 and 75 meter vertical. Overall length of 40'8" means full size performance on 40m. Antenna comes with radial system. An optional adaptor for 80m is available. Handles 2KW PEP.

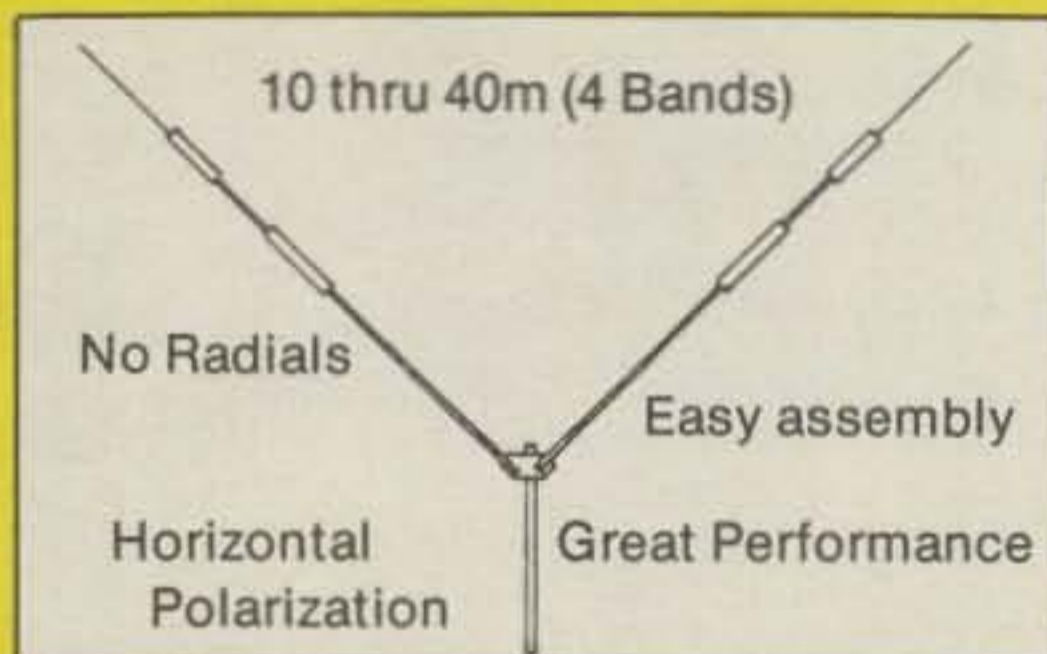
CV-48 \$251 UPS AD-385 (adaptor) \$63



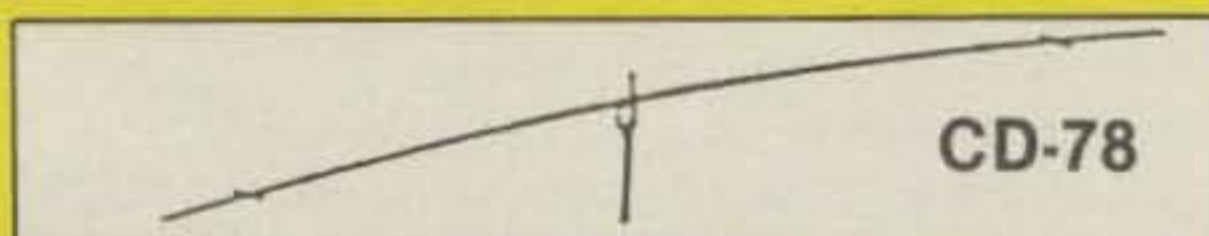
Unique 2 element phased arrays offer excellent gain and front to back ratio compared to standard parasitic antennas.

- AFA75-1 75 meters 29'6" boom \$1842  
AFA40 40 meters 16'8" boom \$ 344

**730V-1**



The 730V-1 is a V-dipole consisting of two 19 ft. heavy duty, self-supporting elements and bracket with an efficient balun that is ready for mounting on a standard TV mast. The V-dipole is superior to standard vertical antennas in gain, noise and efficiency. \$148 UPS



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**Full Coverage, Maximum Performance.** The superb IC-R71A is your front row seat to worldwide SSB, CW, RTTY, AM, and FM (optional) communications and foreign broadcasts in the 100kHz to 30MHz range. It features passband, IF Notch, low noise mixer circuits, and 100dB dynamic range. The pacesetter IC-R7000 receives today's hot areas of

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**The IC-R7000** is a high band monitor's masterpiece. Its **99 tunable memories** are complemented by **six scanning modes**. It even scans a band and loads memories 80 to 99 with active frequencies without operator assistance! Additional features include selectable scan speed and pause delays, wide/narrow FM reception, and high frequency stability. Many professional services use IC-R7000's as calibration references.

**Options.** IC-R7000: RC-12 remote control, EX-310 voice synthesizer, CK-70 DC adapter, MB-12 mobile bracket. IC-R71A: RC-11 remote control, EX-310 voice synthesizer, FM module, CK-70 DC adapter, MB-12 mobile bracket, FL-32A 500Hz, FL-63A 250Hz, and FL-44A filters.

**See the IC-R7000 and IC-R71A** at your local authorized ICOM dealer.

\* Specifications of IC-R7000 guaranteed from 25-1000MHz and 1260-1300MHz. No coverage from 1000-1025MHz

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Our group decided to upgrade our repeater system and I was the one asked to investigate.

We've always tried to have the best system around so it was time to make some changes. We needed a control system that was reliable, easy to hook up, cost-effective, and something that would free the technical guys for more interesting projects than just keeping the equipment running.

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operation is remarkable. Not to mention the most sophisticated autopatch ever designed for amateur use. Later we added the Digital Voice Recorder for personalized IDs, bulletin boards, and voice mail.

ACC's products are state-of-the-art commercial quality and built to last. Workmanship so solid even the military uses them.

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I feel good about recommending Advanced Computer Controls' repeater controllers. After all, it's my club's money that was spent and my reputation that was on the line.

2356 Walsh Avenue • Santa Clara, California (408) 727-3330

CIRCLE 135 ON READER SERVICE CARD

WANTED: Transformer TF 1A0 5YY and vibrator 6v 100CPS FSN 6130 249 5699 for Jeep Receiver Power supply PP 308 URR. Will consider Receiver complete or power supply. Forsyth, 4667 Dolphin Dr., Lake Worth, FL 33463.

HENRY T2000 2KW Amplifier \$500. I'll ship stateside. KB8PK, 616-868-6792.

QUEBEC FREQUENCY DIRECTORY covers 30 to 900 MHz (police, ambulance, fire. . .) \$17.95 ppd (cdn currency). USA add \$2.00 for shipping. Gilles Thibodeau, P.O. Box 193 H, Lac-Megantic, Quebec G6B 2S6.

WANTED: Whippy Labs Inc. 6 Meter Receiver. Have the Xmtr. It is Model #63000 and called "Lil Lulu." Must be clean, no mods, working or not. Also need books for both. Contact Bill Lipfird, KB4MIL, 220 Blue Ridge Rd., Black Mountain, NC 28711.

AZDEN SERVICE by former factory technician. Fast turn-around, PCS-300 NiCads \$34.95 Southern Technologies Amateur Radio, Inc., 10715 SW 190 St. #9, Miami, FL 33157 (305-238-3327).

WANTED: Used Low power 10-100w 7-7.5 MHz transmitter in working condition. P.O. Box 62, Tryon, NC 28782.

FOR TRADE: Sony "Watchman" pocket-size TV, exc., trade for programmable scanner. Doug, WB8SCD, Henry St., Ravenswood, WV 26164 (304-273-4280).

IC-730, PBT, HM-7, \$425. Kenwood VB-2530 amp, MS-1 mobile charger, \$65. Want: IC-735. FOB K1LEC (802) 886-8121.

WANTED: Swan Mark 6B linear, RCA Voltohmistor or Simpson 270, Pro-Search Digital Rotor Display, Escort Radar Detector, K0MK, 218-865-6541.

WANTED: E.H. Scott communications receiver. Ollie, K2BBK, (716) 461-4246.

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COMPLETE CW, RTTY, ASCII, Outfit. Including INFO-TECH Keyboard Model #300, Tri-Mode, Converter Model #200E plus Sanyo 9 inch monitor M#4209. With all manuals, \$425.00 you ship. "GUZ," WB2EZU, 5084 Chapman Pkwy., Hamburg, NY 14075.

FOR SALE: YAESU FT-ONE with RAM, CW keyer, FM unit, all filters, mint cndx, \$1150. N4KS, Box 6772, Tahoe City, CA 95730-6772.

WANTED: Hallicrafters HA-5 VFO in good working condition. C. Hays, 3675 Estates Drive, Florissant, MO 63033.

COLLINS 75-S3-B Ham Band Receiver \$375, Side Band Engineers SB-34 transceiver with SB-2-LA linear 10-8 mtr \$275, Central Electronics 100V linear transmitter \$225, Hallicrafter HT-33A 1 KW linear amplifier \$225, set of Riders service manuals Vol. 1 abridged 1-5, Vol. 6 thru 23 \$125, Shure mod. 440SL push-to-talk microphone \$20, Hallicrafter mod. S-38C receiver .55 thru 30 MHz (no manual) \$25, two Heath mod. GDA-20-1 transmitters and one mod. GDA-20-2 receiver for garage door opener (3 units) \$12, Waterman S-11-A 3 inch pocket scope \$15. All in good condition. All with manuals except where noted. U pay shipping. T.K. Brown, RD1 Box 225, Forksville, PA 18616.

WANTED: Collins S-Line mechanical filters F455FA-21 (2.1 kHz) and F455FA-15 (1.5 kHz), also Collins Directional Wattmeter 302C-3. John Hines, W1ULE, 100 Cranberry La., Cheshire, CT 06410.

WANTED: DRAKE equipment good/bad. Used list/SASE. J. Bedlovics, 241 Dover St., Bridgeport, CT 06610.

WANTED: Hammarlund HQ-145 communication receiver, Knight T-50 CW transmitter for parts. Also would like to start a Commodore 64/128 Users Group for Ham Programs. Don Traves, WB4CVH, 38 Elmwood Place, Goose Creek, SC 29445.

FOR SALE: XITEX model SCT-100 Video terminal, CW, RTTY, ASCII, also homebrew copy of ST-6 RTTY terminal. M. Breyfogle, W0MDM, Estherville, IA 51334. Best offer.

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- #1300HC Model 1300H factory assembled 1-1300 MHz counter, tested and calibrated, complete including Ni-Cad batteries and AC adapter/battery charger ..... \$150.00

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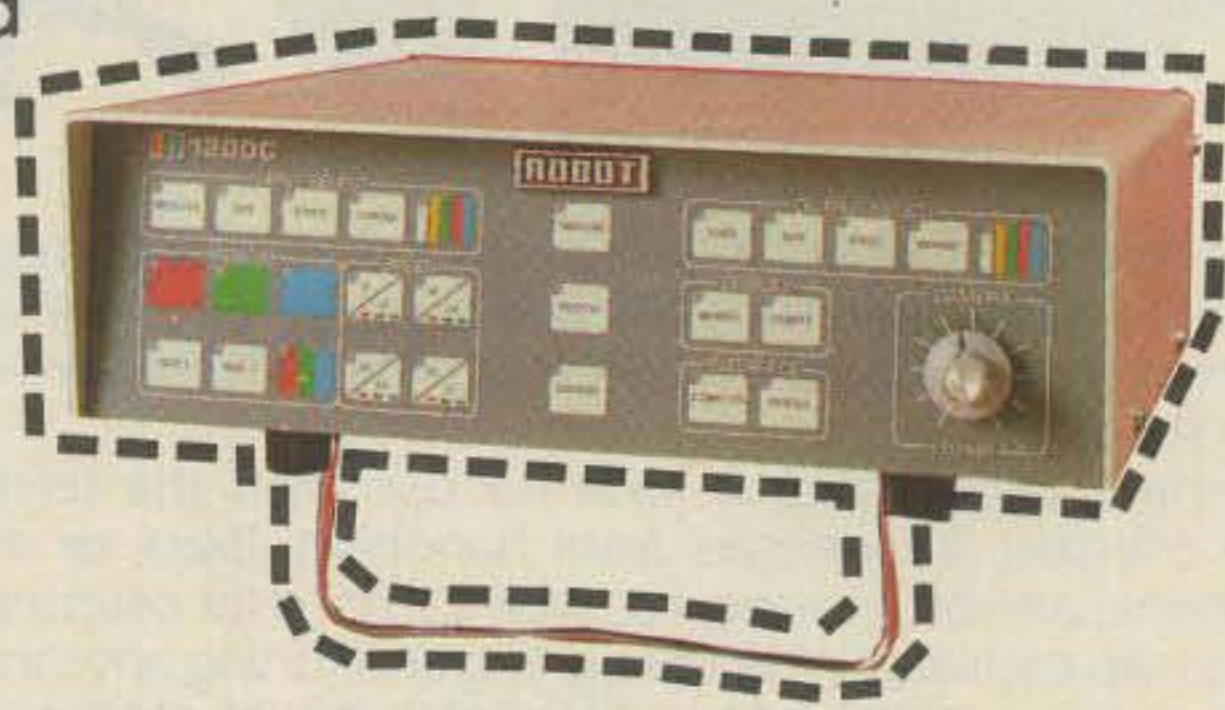
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# R-X NOISE BRIDGE

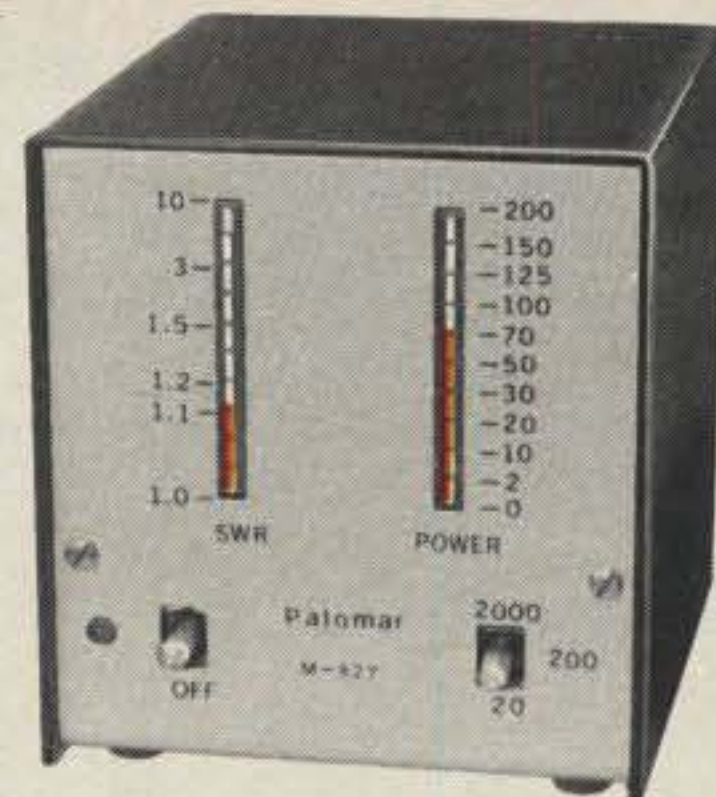


### •Learn the truth about your antenna.

The Palomar R-X Noise Bridge tells you if your antenna is resonant or not and, if it is not, whether it is too long or too short. It gives resistance and reactance readings on dipoles, inverted Vees, quads, beams, multiband trap dipoles and verticals from 1 to 100 MHz.

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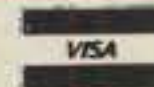
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- SSB, CW, FM, AM, RTTY
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# IC-761 HF Base Station Transceiver



## ICOM IC-761 A NEW ERA DAWNS

- Built-in AC Power Supply
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- SSB, CW, FM, AM, RTTY
- Direct Keyboard Entry
- 160-10m/General Coverage Receiver
- Passband Tuning plus IF Shift
- QSK up to 60 WPM

The IC-761 ushers in an exciting new era of amateur radio communications; an era filled with all the DX'ing, contesting, and multi-mode operating pleasures of a fresh new sunspot cycle. The innovative IC-761 includes all of today's most desired features in a single full-size cabinet. This is ham radio at its absolute best!

**Work the World.** The IC-761 gives you the competitive edge with standard features including a built-in AC power supply, automatic antenna tuner, 32 fully tunable memories, self-referencing SWR bridge, continuously variable RF output power to 100 watts in most modes, plus much, much more!

**Superb Design, Uncompromised Quality.** A 105dB dynamic range receiver features high RF sensitivity and steep skirted IF selectivity that cuts QRM like a knife. A 100% duty cycle transmitter includes a large heatsink and internal blower. The IC-761 transceiver is backed with a full one-year warranty and ICOM's dedicated customer service with four regional factory service centers. Your operating enjoyment is guaranteed!

**All Bands, All Modes Included.** Operates all HF bands, plus it includes general coverage reception from 100kHz to 30MHz. A top SSB, CW, FM, AM, and RTTY performer!

**Passband Tuning and IF Shift** plus tunable IF notch provide maximum operating flexibility on SSB, CW, and RTTY modes. Additional features include multiple front panel filter selection, RF speech processor, dual width and adjustable-level noise blanker, panel selectable low-noise RF preamp, programmable scanning, and all-mode squelch. The IC-761 is today's most advanced and elaborate transceiver!

**Direct Frequency Entry Via Front Keyboard** or enjoy the velvet-smooth tuning knob with its professional feel and rubberized grip.

**Special CW Attractions** include a built-in electronic keyer, semi or full break-in operation rated up to 60 WPM, CW narrow filters and adjustable sidetone.

**Automatic Antenna Tuner** covers 160-10 meters, matches 16-150 ohms and uses high speed circuits to follow rapid band shifts.

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