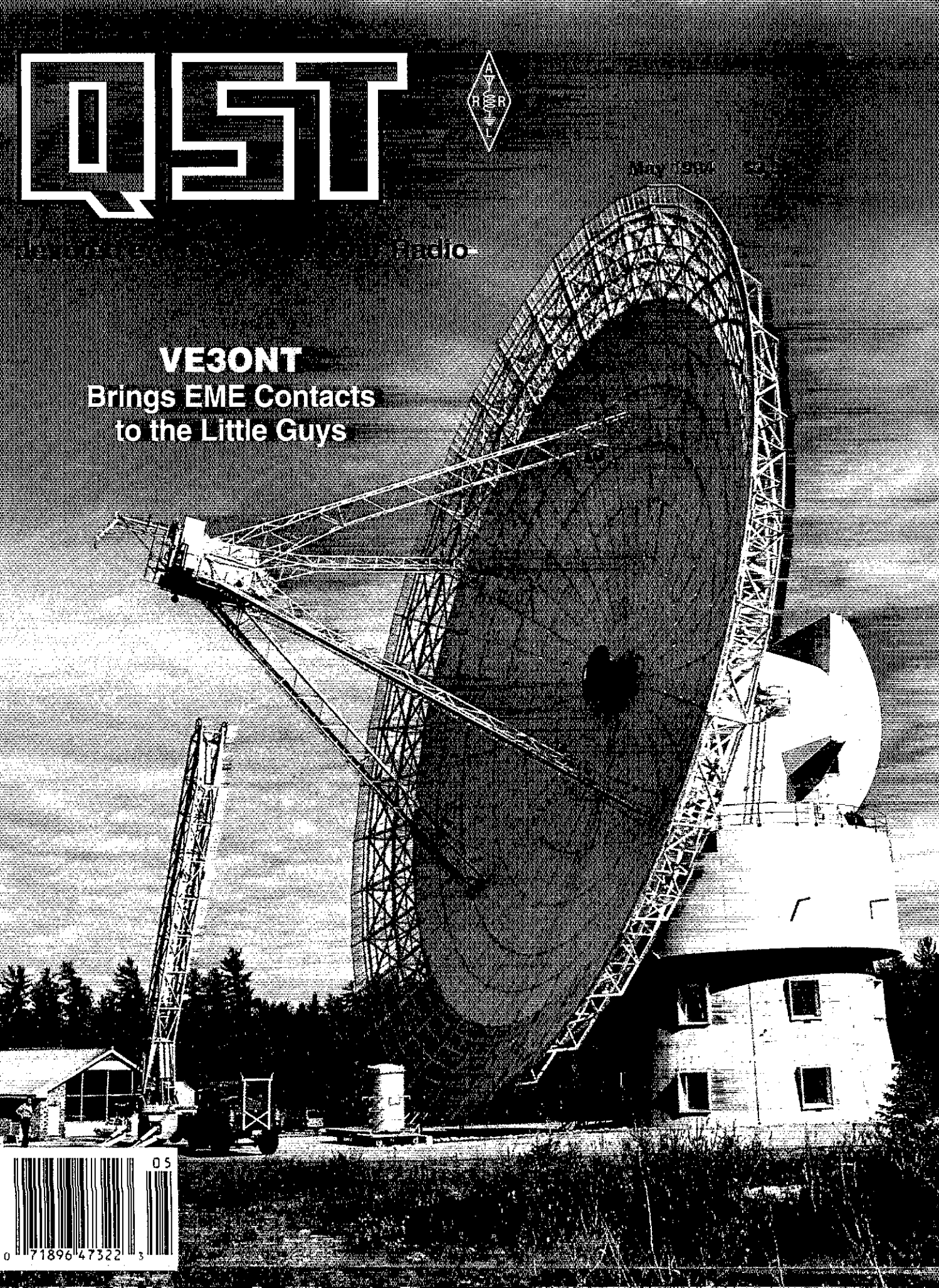
QST

May 1998

Radio

VE3ONT
Brings EME Contacts to the Little Guys



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Kenwood's TM-733A -

Faster and Faster!

TM-733A

FM DUAL BANDER

9600 baud

Theft Deterrent

Features

- Max. 50W output (144MHz), 35W (440MHz)
- 6-line programmable memory
- 72 memory channels
- Time-Operated & Carrier-Operated scan/stop modes
- Dual receive on same band (VHF+VHF or UHF+UHF)
- Built-in DTSS selective calling with page
- ASC (Auto Simplex Checker)
- Built-in CTCSS encoder & optional TSU-8 decoder
- Key function display
- Automatic band change
- AIP (Advanced Intercept Point)
- Cross-band repeater
- Selectable frequency step (5, 10, 12.5, 15, 20 or 25kHz)
- Wireless clone function
- Incremental MHz key
- S-meter squelch
- Tone alert system with elapsed time indicator
- Separate speaker terminals for each band (switchable)
- Auto repeater offset (144MHz)
- Repeater reverse switch & offset switch
- 3-position RF output power control
- Dimmer control
- Auto power-off

*This device has not been approved by the Federal Communications Commission. This device is not and may not be offered for sale or lease, or sold or leased until the approval of the FCC has been obtained.

*An optional accessory kit is required to mount the front panel separately from the main unit.

Kenwood's new FM dual bander, the TM-733A (144MHz/440MHz), is specially tailored for hassle-free mobile communications with a unique "6-in-1" programmable memory. Six entire operating profiles—including everything from frequency range to dimmer level—can be stored, ready for instant recall. So there's virtually no need to adjust your settings. The detachable front panel has a high-visibility LCD with key function display to make on-the-move operation even easier. Of course, this compact transceiver has a full complement of sophisticated features, including 72 memory channels, DTSS selective calling and page functions, ASC (checks whether you can switch from a repeater to simplex communications), AIP (Kenwood's exclusive circuit for enhancing RX performance), and a jack for 1200/9600bps packet use. And as well as receiving simultaneously on VHF and UHF bands, the TM-733A can receive two frequencies on the same band (VHF+VHF or UHF+UHF). There's even an optional quick-release kit as an added anti-theft measure. So check out the TM-733A-a sensation bred from inspiration.

KENWOOD COMMUNICATIONS CORPORATION
AMATEUR RADIO PRODUCTS GROUP
P.O. BOX 22745 2201 East Dominguez St. Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
6070 Kestrel Road, Mississauga, Ontario L5T 1S8

KENWOOD

94ARD-0893

Kenwood's TM-942A/742A/642A—

Triple Triumph

Good things come in threes. Like Kenwood's distinctive TM-942A (144MHz/440MHz/1200MHz), TM-742A (144MHz/440MHz), and new TM-642A (144MHz/220MHz)—high-performance FM multibanders that demonstrate the best in mobile communications technology. Besides offering triple receive and display capability, the TM-942A can even receive all three bands simultaneously. For the TM-742A and TM-642A, you can choose one of several optional band units, enabling triple band operation with the same triple simultaneous receive. Top-notch features include 101 memory channels (all available for split operation), automatic band change, DTSS with page, and S-meter squelch. There's even a wireless remote control function. Yet operation is remarkably simple, thanks to sophisticated microprocessor control, high-visibility illuminated keys, and clear status displays. You wouldn't expect any less from Kenwood. But there's more: you can mount the controls and display separately from the main unit (requires optional kit) for unique 3-way convenience.

Features

- Max. 50W output (144MHz), 25W (220MHz), 35W (440MHz), 10W (1200MHz)
- 101 memory channels & memory bank system
- Independent SQL & VOL controls for each band
- Automatic band change
- Built-in DTSS selective calling feature with page
- Selectable frequency step ■ 8 scan modes per band
- Time Operated & Carrier Operated scan stop modes
- Direct frequency entry with supplied microphone
- Tone alert with elapsed time indicator
- S-meter squelch, noise squelch & auto squelch
- Cross-band repeater ■ Muting for sub-band circuit
- Multiple lock functions ■ Wireless remote control function
- Built-in CTCSS encoder & optional TSU-7 decoder
- Date & time display, stopwatch, alarm & on/off timer
- 3-position RF output power control
- Auto power-off with warning beeper ■ Time-out timer
- Separate control & display units (optional cable kits)

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OUR COVER

This 150-foot dish at the Algonquin Radio Observatory provided enough punch to give many hams their first two-way moonbounce contacts. A party of enthusiastic Canadian amateurs of the Toronto VHF Society brought new meaning to the term "big gun" when they operated VE3ONT in the Seventeenth ARRL International EME Competition last October and November. More details about the station appeared in the World Above 50 MHz column in October 1993 and January 1994 *QST*; this month, there are more pictures in Up Front in *QST*, and the complete contest results are on page 117. *(photo by Peter Shilton, VE3VD)*

CONTENTS

May 1994
Volume LXXVIII Number 5

TECHNICAL

NEWS AND FEATURES

NEW HAM COMPANION

OPERATING

DEPARTMENTS

Year's "All-Star" Line Up, With over 40 years

DEMAND THE BEST

DJ-580T *Best Performance*

The Right Features: Alinco's DJ-580T offers powerful user friendly features that make operating easier. Many new radios available today are so complex that an instruction manual needs to be carried with the radio. We have designed the DJ-580T to be user-friendly, but also sophisticated: It has the features you need, without any useless bells and whistles. This radio can receive 130-174 MHz, 420-474 MHz, and can be modified to receive AM from 118-142 MHz. Other outstanding features include cross-band repeat function, full duplex operation, backlit keypad, 8 scanning modes, CTCSS encode / decode, and DSQ for private paging.

The DJ-580T will deliver a solid 5 Watts of power with the optional 12V battery, and our EMS-8Z Remote Speaker Microphone offers remote control of memory channels and scanning features.

DJ-F1T / DJ-F1TH *Best of Both Worlds*

Small size combined with durability? It sounds like Alinco is breaking the rules again.

Most of the 'micro' handhelds that we've checked out seem to suffer from the same problems: Weak audio, flimsy construction, difficult to use keypads, and poor performance. The DJ-F1T overcomes these problems, offering reliability and performance that surpasses any handheld radio available today. Our unique 'clam shell' battery design allows for a full size keypad for convenient use, and a large speaker for outstanding audio quality. All this is packed into a cast aluminum frame and tough poly-plastic case that has set a new industry standard for durability.

Standard features include: 40 memory channels (odd splits on all), 3 output power levels, DSQ code squelch and private paging, illuminated DTMF keypad, CTCSS encode, Automatic Power Off, and 8 scan modes. The DJ-F1T will receive 130-174 MHz and can be modified to receive AM from 118-142 Mhz.

Better Products, Better Service.
See for yourself why people are coming to ALINCO.

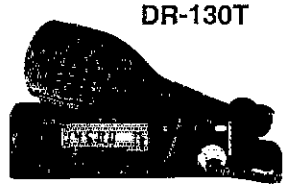
ALINCO ELECTRONICS INC.
438 Amapola Ave., Ste. 130
Torrance, CA 90501
Phone: (310) 618 - 8616
Fax: (310) 618 - 8758

Other Great Products from ALINCO

DJ-G1T

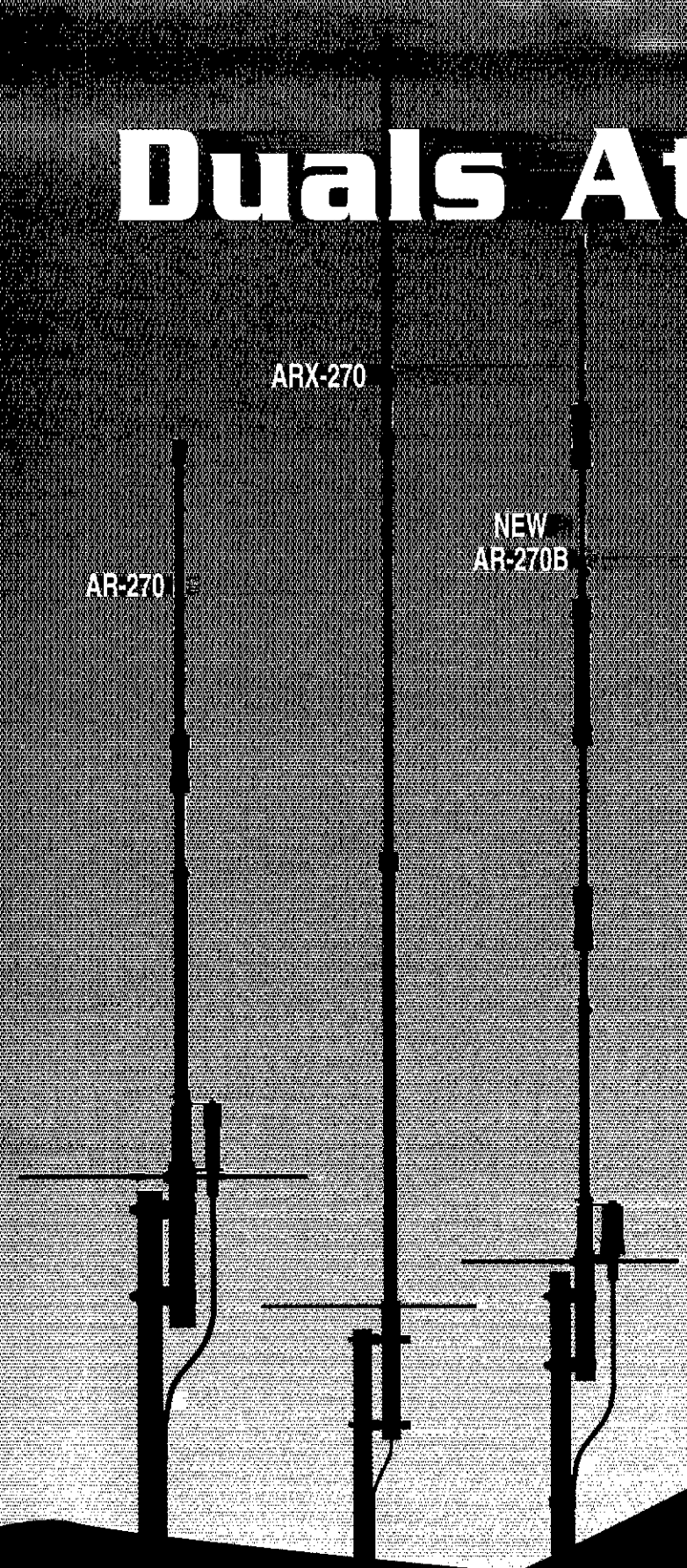
DR-600T

DR-130T



DJ-180T

Duals At Dawn



Up To The Challenge

The challenge for Cushcraft engineers was to develop a line of 70cm/2m verticals with enough diversity in price and performance to suit any ham's needs. The task having been met, we now offer 3 models of dual band verticals: two aluminum and one fiberglass.

Choose Your Dual Band

If your space or budget is confined, then the AR-270 is the right choice. The "Dual Wonder" is less than 4 feet tall and mounts just about anywhere.

If, on the other hand, you're looking for top of the line performance, the ARX-270 is the way to go. It's a 16-1/2 foot 3-piece fiberglass antenna that's factory tuned and assembled in minutes.

If the AR-270 isn't quite enough and the ARX-270 is more than what you had in mind, the all new AR-270B is the perfect middle ground. This antenna captures the best of both worlds with great performance in an 8 foot high package.

Cushcraft also offers the CS-270M dual band mobile antenna. This compact performer features the best components and the latest in 70cm/2m technology.

Whichever antenna is right for your situation, you can rest assured that performance and durability are built in. After all, it's a Cushcraft.

AVAILABLE THROUGH DEALERS WORLDWIDE

cushcraft
CORPORATION

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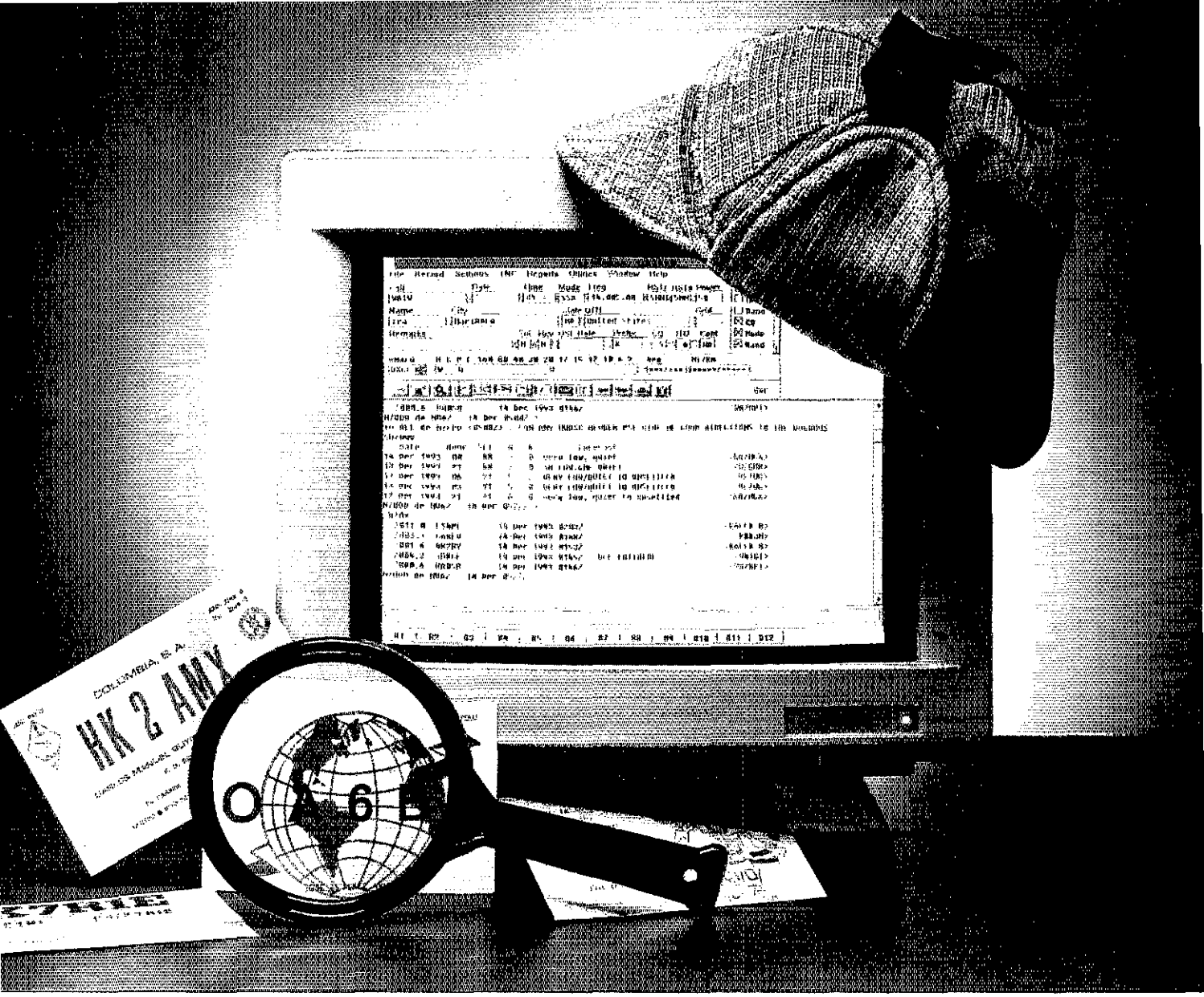


Award Tracking is Elementary

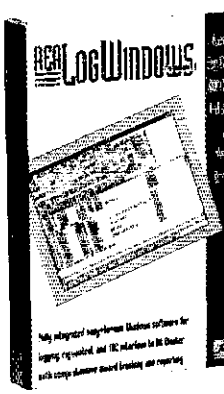
Remove the mystery from QSO logging with AEA Log Windows™. This fully integrated, easy-to-use Windows program combines the functions of logging, rig control, and DX Cluster monitoring with award tracking and reporting.

Switching to Log Windows is easy with complete import and export filters for most major logging programs. A powerful relational database tracks all your QSO information, letting you search records by call sign, prefix, date, zone, and more!

Discover an ingenious packet cluster interface that supports any data controller while in the dumb terminal mode; it also supports mouse-based spot grabbing and message reading.

Automatic award tracking makes tracking your status much less puzzling. Awards tracked include: DXCC mixed, phone, CW, FSK, and bands; CQ mixed, SSB, CW, FSK, and bands; WAS mixed, SSB, CW, FSK, and bands; and VUCC for VHF and UHF.

Let us clue you in on just how easy award tracking can be! Call AEA's Literature Request Line at (800) 432-8873 for more information, or call us direct at (206) 774-5554. Contact your favorite ham radio equipment dealer for best pricing.



AEA

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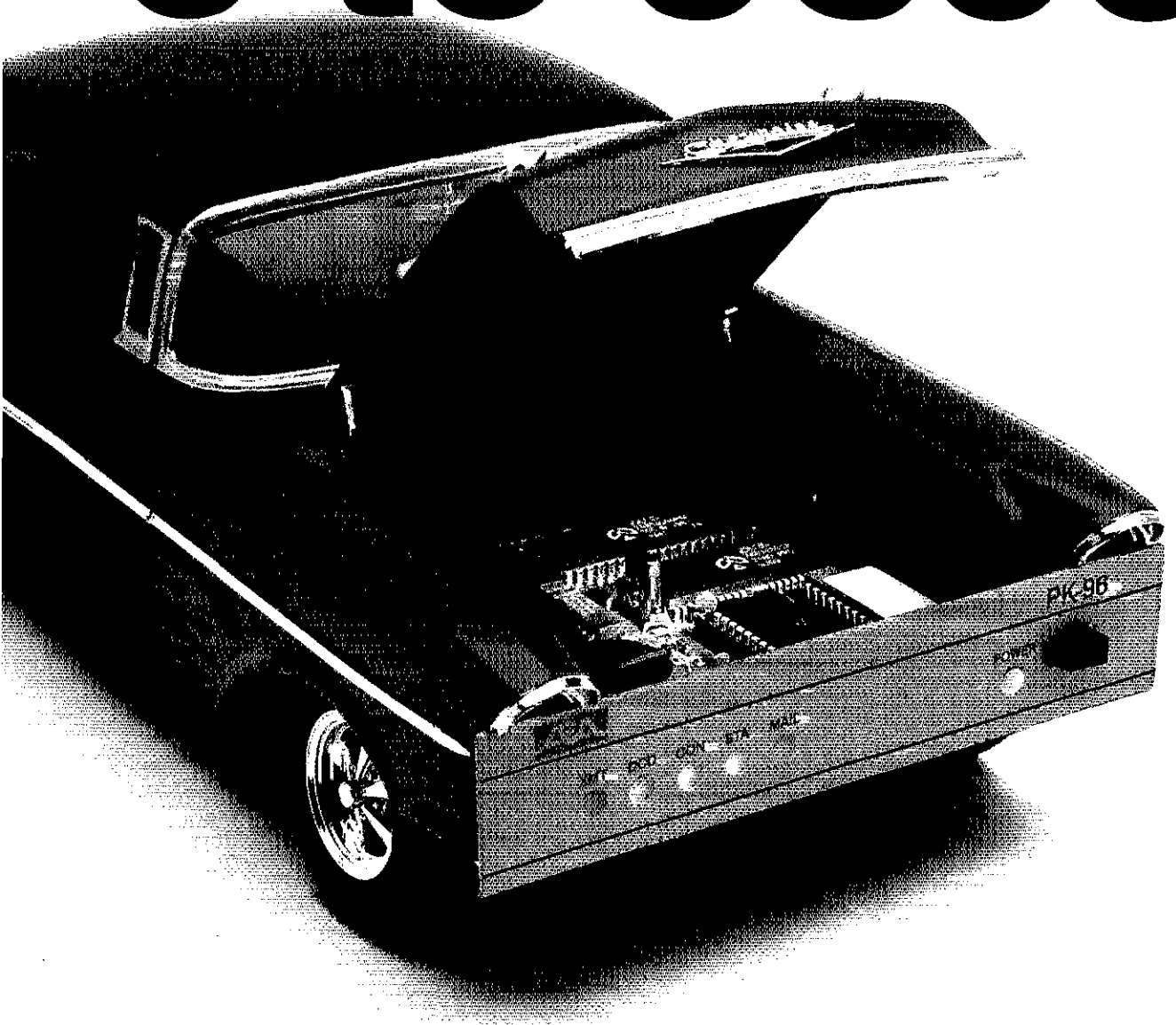
0 to 9600



With Packet Transmission

Satisfy your need for speed with the new PK-96 9600 baud packet controller from AEA.

This high-performance machine comes standard with 1200 baud AFSK tone signaling, as well as 9600 baud K9NG and G3RUH compatible direct frequency modulation. The PK-96 makes an excellent terrestrial or satellite data controller. It can be used for high-speed data links to eliminate bottlenecks and increase system capacity.

Big capability in a small package is what you get from the PK-96. Under the hood, there is a 18K battery-backed MailDrop which is easily expandable to 100K. MailDrop allows you to automatically control third-party traffic and receive and reverse-forward messages.

Bring your system up to speed. Call AEA's Literature Request Line at (800) 432-8873 for more information, or call us direct at (206) 774-5554. Contact your favorite ham radio equipment dealer for the best pricing.

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"It Seems to Us..."

QSL?

I admit it! I *like* QSL cards. In 32 years on the air I've accumulated thousands—make that tens of thousands—of these colorful, postcard-sized mementos, and I've sent even more.

Most of the QSL cards in my collection came through the bureau system, and confirm a brief contact with an overseas amateur. Probably we will never meet face to face. Probably our languages and cultures are different. But our shared interest bridged those gaps and brought us to the same point in time and frequency, to experience the miracle of radio communication and possibly to the realization that we're not so different after all. His QSL card in my shack, and mine in his, are testimony to shared human experience and shared interest at a very personal level.

Some of these cards are pretty special to me....

I have the QSL for my very first contact, on 80 meters with another Novice about five miles away, earned the hard way after days of fruitless calling with a poor antenna and mistuned transmitter. There's another dated just a few weeks later to confirm my first DX contact, with PY5ASN in Brazil (who gave a *lot* of American Novices our first DX thrill), evidence of a 13-year-old's rapidly developing skills.

There's one from my main Elmer, confirming my first bicycle-mobile contact, using a CB walkie-talkie he'd helped me convert to 10 meters. I filled that card out myself; Bud Ward, W1GEA, had cerebral palsy, and his ingenuity in overcoming physical limitations didn't extend to handwriting. Looking at my childish scrawl on that otherwise ordinary card reminds me of how much I owe him.

There's the QSL for a contact on the afternoon of November 22, 1963, with an amateur in Louisiana who told me President Kennedy had been shot. Everyone remembers where they were when they heard the news; I have a unique, permanent reminder.

There are lots of cards commemorating initial contacts with strangers who later became friends, here and abroad. There are many from friends who are now Silent Keys.

There are, of course, the QSLs that we all talk about more often: the cards that represent some sort of operating achievement, confirming rare countries or extraordinary propagation events. Just this year I collected my first Japanese cards for 160 meters–hardly an accomplishment from some parts of the country, but still worth a brag here in New England. Almost as much fun were contacts with Virginia and North Carolina while running 100 milliwatts on 2 meters last summer, during an exceptional opening brought about by a coastal hurricane. Each of those QSLs testifies to a pair of good ears on the other end, and reminds me to be willing to answer weak callers and to respond to all QSL requests, no matter how mundane the QSO; what to me may be a routine contact may be pretty special to the person on the other end.

Enough reminiscing. This isn't about the past; it's about the future.

QSL cards came to mind this month because we've been talking about new membership services we could offer. The QSL bureau is invaluable for exchanging cards with foreign amateurs; if you do a lot of that, it's worth the price of League membership all by itself. There is no equivalent service for exchanging cards with other US amateurs, in part because, until fairly recently, it would have been construed as illegal competition with the US Postal Service.

In a recent survey we asked amateurs whether they would find a domestic QSL bureau service to be a valuable membership benefit, and got a mixed response. A minority of members (but still quite a few), and fewer nonmembers, said they liked the idea, but most did not attach a high priority to it.

In committee discussions another thought has emerged: is there really any point to helping amateurs exchange bits of paper? If the reason for wanting a QSL card is to get credit toward some operating award–and that's certainly a major motivation–shouldn't we instead be working toward an electronic substitute? A growing percentage of amateurs have computerized logs; why not use those data files to confirm contacts, and eliminate the need for the costly, time-consuming, and possibly archaic exchange of QSL cards?

If you want something more personal, digital imaging is at the point where it doesn't take a visionary to anticipate the day when we'll be exchanging high-quality color images routinely via the "information superhighway" (or even better, by radio). The QSL album or shoebox of the future may be a Photo CD disk, viewed through your TV set or computer monitor.

In short, is a domestic QSL bureau a desirable service, or yesterday's solution when we should be looking for tomorrow's?

What's *your* answer?—*David Sumner, K1ZZ*

"200 watts, real cross band receive, even two flywheel-weighted main knobs!"

"Yaesu did it again!"

"Right, there's only one real performer – the FT-1000."

FT-1000
All Mode HF Transceiver

- RF Power Output: Up to 200 Watts
- True Cross-band Dual Receive: Two Large Tuning Knobs
- Front Panel RX Antenna Switch: For Beverage or Loop
- Direct Digital Synthesis (DDS)
- Automatic Antenna Tuner: Built-in, 30 Memories
- Frequency Range: 100kHz-30MHz (RX), 160-10 meters (TX)
- 100 Memories: Independent ATU and Mode/IF Filter Memory
- CW Spot and Two CW Key Jacks for Maximum Convenience
- Dynamic Range: 108 dB
- Optional Digital Voice Recorder (DVS-2): 16 Seconds Each RX/TX
- **Accessories:**

SP-5 External Desk-top Speaker
LL-5 Phone Patch Unit
MD-1C8 Desktop Microphone
YH-77ST Stereo Headphones
FL-7000 500W Linear Amplifier
DVS-2 Digital Voice Recorder

Hear signals you've never heard before.

You're a competitor. You want optimum receiver performance and you want "muscle" on transmit. First with 200 watts – more power than any competing transceiver – and "hand warm" at maximum RF. It's easy to see why the FT-1000 has been judged "best overall" by top DX'ers worldwide.

For elite-class contesting and DX operation, exclusive features maximize your score. Dual Receive – Watch a multiplier or new country on one frequency, run QSOs on another. Diversity Reception – Use two antennas at different heights or opposite polarization. Extensive Cascaded IF Filtering – For "low end" battles. Dramatic front panel design features two flywheel-weighted tuning knobs, RX antenna selector and two large displays.

A perfect blend of electronics and human engineering, the FT-1000 is the Best of our Best!

To hear signals you've never heard before and get the competitive edge, see your Yaesu dealer today.

YAESU

Performance without compromise.℠

Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

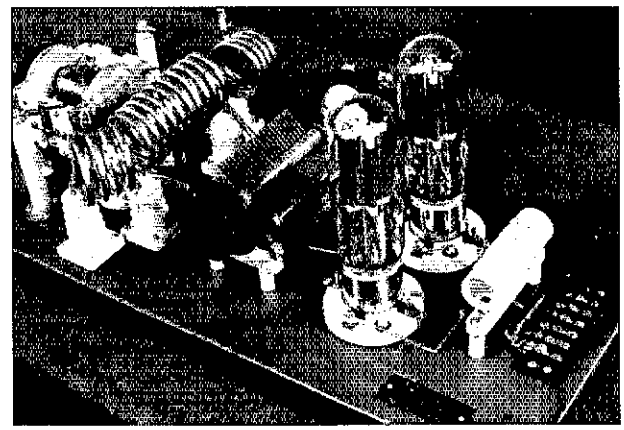
UP FRONT in QST

Take a hike! What were you doing between June 26 and November 18, 1993? Tod Bloxham, KB7QDZ, of Bellevue, Washington, was walking from Canada to Mexico on the Pacific Crest Trail. The 18-year-old amateur, shown at the southern terminus of the trail, is reported to be the youngest solo hiker and possibly the youngest ham to conquer the "Everest of Hikes," covering the 2700 miles in 147 days. Most hikers travel from Mexico to Canada because of the seasonal progression of the weather, but Tod had just graduated from high school and had to make the trip the other way because he started so late in the season. He kept in touch with other amateurs and his family via repeaters and autopatch. During the last few days, the rugged adventurer slept in six inches of snow with no tent. Tod used only one pair of shoes, but they were starting to go bad.

COURTESY OF RAY LAMB, W8LKX

STAN ROHRER, W9FQN

A long, quiet winter: Ray Lamb, W8LKX, sits in his backyard in Cincinnati, with his new transceiver, his headphones on and his tower ready to be put up—if only the weather would cooperate. Ray took this photo in February, so let's hope he's on the air and didn't miss the chance to work 3Y0!



BRUCE VAUGHAN, NR5Q

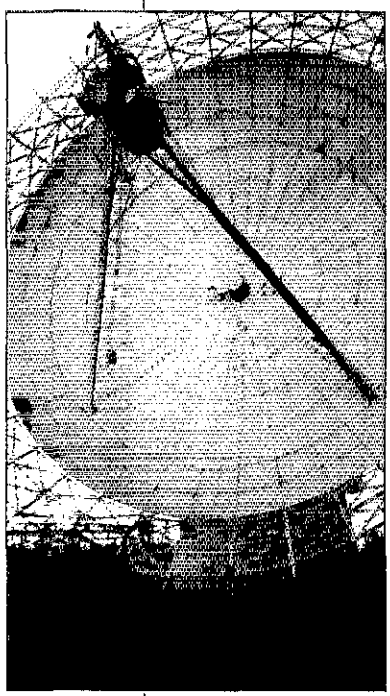
Yesterday's alive and well: Long-time *QST* author Bruce Vaughan, NR5Q, of Springdale, Arkansas, *knows* how to build old-time radios. This is only part of his large collection of commercial and home-brew nostalgia. The transmitter is a push-pull design taken from November 1930 *QST*.

As evidenced by the photos, Bruce is a lifelong (and well-traveled) photographer. He's crazy about old radios (obviously!), old cameras and jazz—preferably performed live.

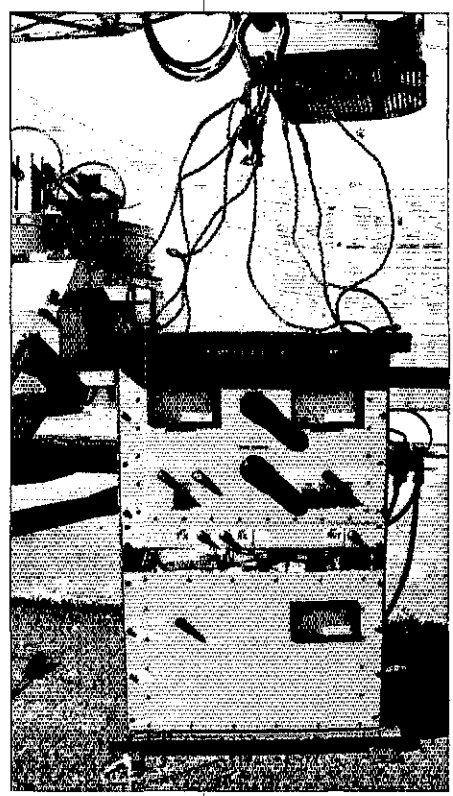
VE3ONT

PHOTOS BY DANA SHTUN, VE3DSS

Bunch of bouncers: Here's the team that put grid square FN05xw into many new moonbouncers' logs (l-r): Dennis Mungham, VE3ASO; Bob Morton, VE3BFM; Heather Shilton, VE3EMS; Peter Shilton, VE3VD; Kevin Hobbs, VE3KDH; Don Falle, VE2DFO; Craig Morton; Dana Shtun, VE3DSS; Hans Peters, VE3CRU; and Mike Owen, W9IP/2.

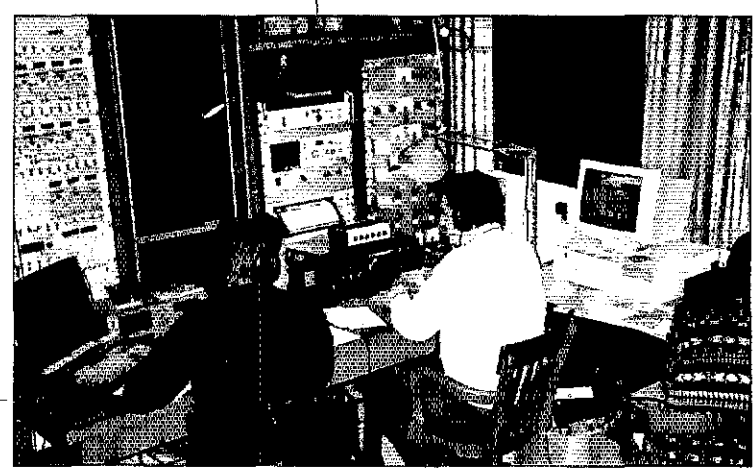


Typical Canadian EME antenna: Heather is dwarfed by the 960-ton dish, 150 feet across (46 meters), of the radiotelescope in Algonquin Park Space Complex at Lake Traverse in Ontario.

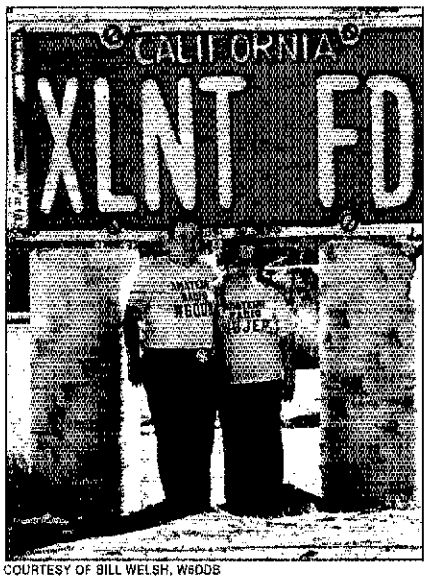


Don't aim this at the local repeater! It was hard to miss the 144-MHz signal generated by VE3VD's 8877 amplifier and 4000-V power supply into the big dish. Even hams without sophisticated moonbounce stations made contacts with VE3ONT.

Pulling 'em out of the noise: Mike (l) operates on 2 meters with Dana logging, as Bob listens on the second receiver.



It looks like NASA Mission Control: But the only thing this crew launched into space was RF. Dana, Mike and Don (l-r) man the shack. Multiop VE3ONT did quite a job during the 17th ARRL EME Competition October 9 and 10 and November 6 and 7, 1993. See the complete results in this issue.



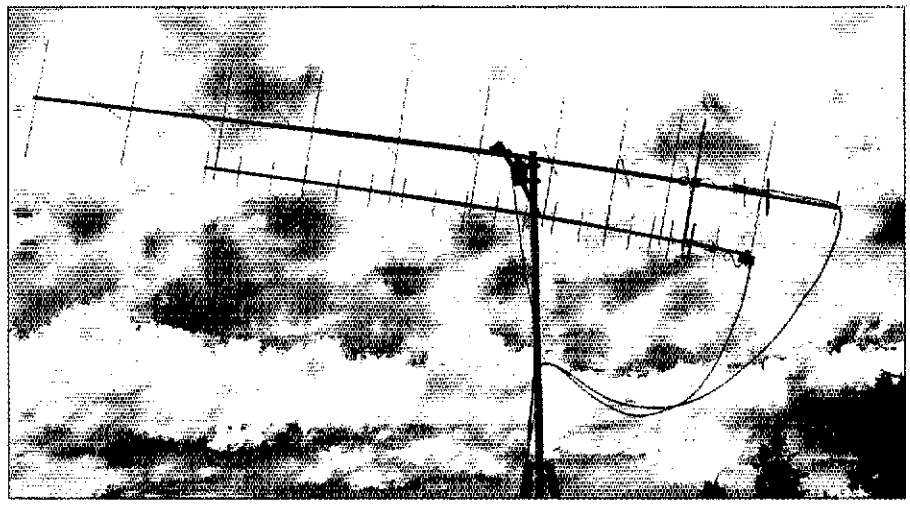
COURTESY OF BILL WELSH, W6DDB

Excellent Field Day? The people who put up this sign intended it to mean "Excellent food" in the adjacent cafe, but what ham will pass it without thinking of the June classic? Bill Welsh, W6DDB, and his wife, Marie, W6JEP, of Lancaster, California, had to stop for this photo. Wonder if they tried the FD and was it, in fact, XLNT?

COURTESY OF MISSY HOLLENBECK, AAØOF

Hands-on learning: Proudly displaying signs that proclaim their goal, enthusiastic members of the Andover (Kansas) Middle School ARC learned a few things about emergency communication when they operated a Novice/Technician Field Day station last summer. They also ran a special-event station, KFØSG, for Greater Andover Days, October 1 to 3. Club sponsor Missy Hollenbeck, AAØOF, teaches Amateur Radio as a class at the school.

It's a busy month:
Field Day is June 25-26, 1994!
The ARRL June VHF QSO Party is June 4-6!


WILLIAM CANDLEY, AA6QL

Man against the elements—all 40 of them: Ominous skies form the backdrop for the VHF/UHF/OSCAR array at the Oregon Tualatin Valley ARC's 1993 Field Day site. This active ARRL Special Service Club is sponsoring the Northwestern Division Convention June 4 and 5 in Seaside, Oregon.


GARY BAILEY, WA4IOB

Tougher FCC inspection measures? The Commission isn't using helicopter gunships (yet), but Gary Bailey, WA4IOB, of Snellville, Georgia, spotted this Army chopper buzzing his antenna site as he and Fred Runkle, K4KAZ, of Buford, operated Limited Multiop atop Hawk Mountain in northern Georgia during the 1993 September VHF Sweepstakes. US Army Rangers use the area for mountain training, with the permission of the US Forest Service. Are you ready for to get on the bands above 50 MHz? The ARRL June VHF QSO Party is coming up—see the complete rules and details of the plaque program in this issue.

Ameritron *doubles* average SSB power . . .

NEW AL-80B kilowatt output desktop linear can double your average SSB power output with high-level RF processing . . . it also runs cooler because its Eimac 3-500Z tube completely turns off between words . . .

Ameritron's all NEW AL-80B kilowatt *output* desktop linear can *double* your average SSB power output with high-level RF processing using Ameritron's exclusive *Dynamic ALC™*.

You get cooler operation because the AL-80B's exclusive *Instantaneous RF Bias™* completely turns off the Eimac 3-500Z tube between words. It saves hundreds of watts wasted as heat.

You get a full kilowatt PEP *output* from a whisper quiet desktop linear. It's a compact 8½"H x14"D x15¼" W and plugs into your nearest 120 VAC wall outlet. Covers all bands 160-15 Meters, including WARC and MARS bands (user modified for 10/12 Meters with license).

You get 1000 watts *output* on SSB, 850 watts *output* on CW, 500 watts *output* on RTTY, an extra heavy duty power supply, genuine Eimac 3-500Z tube, nearly 70% efficiency, tuned input, Pi/Pi-L output, inrush current protection, multi-voltage transformer, dual Cross-Needle meters, QSK compatibility, Two-Year Warranty, Made in USA, plus much more for only $1195.

Dynamic ALC™ doubles average SSB power

The AL-80B's exclusive *Dynamic ALC™* gives you high-level low-distortion RF processing. When activated, it can more than double your *average* SSB power and produce up to 6 dB improvement in intelligibilty. It maximizes your talk power without distortion and splatter.

A convenient front panel control lets you adjust your output power level.

Instantaneous RF Bias™ eliminates heat

The AL-80B's exclusive *Instantaneous RF Bias™* completely turns off the Eimac 3-500Z tube (except filaments) between words and dots and dashes. It eliminates hundreds of watts wasted as heat to give you cooler operation and longer component life.

Gutsy Heavy-Duty Power Supply

The guts of the AL-80B is its heavy ***heavy*** duty power supply. A 26 pound transformer using a high silicone steel core, computer grade capacitors, heavy duty bleeders and ten 3 amp, 1000 V power rectifiers give you a stiff 2700 volts fully loaded. Many amplifiers using *two* 3-500Zs use such small power supplies they don't deliver much more power output than the AL-80B.

NEW! $1195 Ameritron AL-80B Suggested Retail

Genuine Eimac® 3-500Z Tube

The AL-80B uses a *genuine* Eimac® 3-500Z tube warranted by Eimac® -- not cheaper, less reliable 3-500Zs used by some competitors.

600 WATTS OUT . . . $649

A tough low cost linear with REAL transmitting tubes!

Ameritron's new AL-811 linear amplifier gives you plenty of power to bust thru QRM. You get a quiet desk top linear that's so compact it'll slide right into your operating position -- you'll hardly know it's there . . . until QRM sets in. And you can conveniently plug it into your nearest 120 VAC outlet.

You get three tough vertically mounted 811A transmitting tubes, extra heavy duty power supply, all HF band coverage, pressurized ventilation, tuned input, dual illuminated meters, adjustable ALC, standby switch, transmit LED, UPS shippable and much more.

Select the 3 tube 600 watt out AL-811, $649 -- or the new 4 tube 800 watt out AL-811H, $795.

70% efficiency

The AL-80B is built on a rugged steel chassis. It has a separate RF compartment that's fully shielded to keep RF from leaking out. This keeps RFI and TVI to a minimum.

Superb RF design and layout, Hi-Q tank circuit and commercially rated RF power components give you nearly 70% plate efficiency over the entire operating range. Your power goes into your antenna instead of heating up your amplifier.

A whisper quiet internal fan draws in cool air over power supply components and pressurizes the 3-500Z tube compartment to remove heat for longest life.

Tuned Input lets your rig deliver full output

A 50 ohm broadband Pi-Network *tuned input* is used.

Pi/Pi-L Output Network

A carefully designed Pi/Pi-L output network using the optimum Q for each band gives you exceptionally smooth tuning, extremely wide matching range, full band coverage and peak performance at all power levels.

Has ball bearing vernier reduction drives with logging scales on plate and load controls.

Step-Start Inrush Protection™

Step-Start Inrush Protection™ stops damaging inrush current with a start up sequence that's *easy* on your tube and power supply components.

Multi-Voltage Power Transformer

Ameritron's exclusive *Multi-Voltage Power Transformer* lets you optimize for different line voltage. You can select from 14 different *primary* voltages from 90 to 140 VAC and 205 to 250 VAC.

Dual Illuminated Cross-Needle Meters

Ameritron's dual illuminated cross-needle meters give you *four separate meters* to monitor your operating conditions -- you can tell right away if something is wrong.

QSK Compatible

The fast *custom* T/R (transmit/receive) relay in the AL-80B switches nearly as fast as some vacuum relay QSK T/R switches.

For *lightning fast* QSK operation use the optional external Ameritron *electronic PIN diode* QSK-5 T/R switch or the internal QSK-5PC. Please contact Ameritron for details.

Plus more . . .

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

Has transmit LED; 12 VDC, 200 mA jack; 12 VDC keying relay for solid state and tube rigs; tough, nearly indestructible Lexan-over-aluminum front panel. Two year limited warranty.

AMERITRON offers the best selection of legal limit linears!

These 3 rugged linears all use a super heavy duty hypersil power supply capable of 2500 watts!

Ameritron's most powerful amplifier

AL-1500 **$2625** Suggested Retail

Ameritron super power amplifier uses the herculean Eimac® 8877 ceramic tube.

It's so powerful that 65 watts drive gives you full legal output—and it's just loafing because the power supply is capable of 2500 watts PEP.

Ameritron's Dual 3-500Z linear

AL-82 **$1995** Suggested Retail

This linear gives you full legal output using a pair of Eimac® 3-500Zs. Some competing linears using dual 3-500Zs don't give you 1500 watts because their lightweight power supplies can't use the tubes to their full potential.

Ameritron's 3CX1200A7 linear

AL-1200 **$2095** Suggested Retail

Get ham radio's toughest tube with the Ameritron AL-1200—the Eimac 3CX1200A7. It has a 50 watt control grid dissipation—12 times tougher than the 4 watt rating of the 3CX800A7—yet you get the same full legal output as you get from a *pair* of 3CX800A7s.

AMERITRON brings you the finest high power accessories!

Legal limit antenna tuner

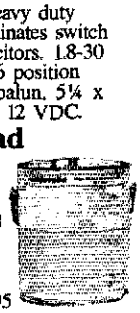
ATR-15 **$399** Suggested Retail

Ameritron -- *the high power specialist* -- brings you the ATR-15 antenna tuner that's designed for legal limit amplifiers. Heavy duty silver plated bandswitch virtually eliminates switch failure. High power transmitting capacitors. 1.8-30 MHz. Peak reading SWR/wattmeter. 6 position antenna switch. Selectable 1:1 or 4:1 balun. 5¼ x 13¼ x 13½ inches. Meter lamps uses 12 VDC.

Legal Limit Dummy Load

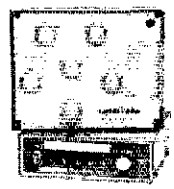
Oil cooled 50 ohm dummy load. Handle 1500 W for 5 min. SWR under 1.2 up to 30 MHz. Low SWR to 400 MHz. 7½" H x 6 5/8" D. **ADL-1500X** without oil, $39.95. **ADL-1500** with oil, $59.95

ADL-1500X **$39.50** Suggested Retail



Remote Coax Switches

RCS-8V **$149** Suggested Retail



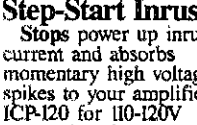
RCS-8V, DC-UHF 5 KW Coax Switch. Replace 5 coax feedlines with one with this Remote Coax switch. Weatherproof box mounts outdoors on your tower or mast. Attractive control unit sits on your operating desk. Low SWR to 450 MHz. Low loss. Rated at 5 KW to 30 MHz, 1 KW at 150 MHz. **RCS-8VN, $169.95** with "N" connectors.

RCS-4, $134.50. 4 position HF switch. Similar to RCS-8V. No control cable needed. Handles 2500 watts PEP.

RCS-4 **$134.50** Suggested Retail

QSK-5 Pin Diode T/R Switch

$349 QSK-5 Suggested Retail



Self-contained, connects externally to most HF amplifiers. Handles 2.5 KW PEP, 2 KW CW. Six time faster then vacuum relay. 6x4x9½ inches.

Step-Start Inrush Current Protector

Stops power up inrush current and absorbs momentary high voltage spikes to your amplifier. ICP-120 for 110-120V or ICP-240 for 220-240 VAC.

ICP120/240 **$79** Suggested Retail

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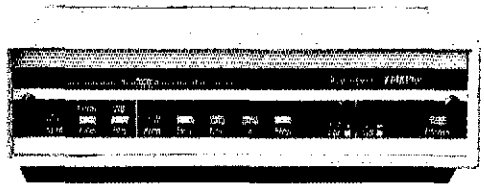
Pactor is fast. G-TOR is more along these lines.



Kantronics KAM Plus with lightning fast G-TOR

The KAM Plus strikes again. It's now available with lightning fast G-TOR, a Kantronics innovation. More than twice the speed of Pactor in most band conditions, this error-correcting mode is the fastest HF mode available in a stand-alone TNC.

In addition to G-TOR, the KAM Plus operates the other popular modes and is capable of operating an HF mode and VHF packet at the same time. The KAM Plus also features more than 100K of personal mailbox space. And like most Kantronics products, the KAM Plus is small, portable and equipped with a NEWUSER command set and on-line helps.

KAM Plus with G-TOR. Together, the two are taking HF digital communications by storm.

Kantronics

For more information, contact your authorized Kantronics dealer or Kantronics at 1202 E. 23rd St., Lawrence, KS 66046-5006 913-842-7745 FAX 913-842-2021.

The 1994-95 ARRL Repeater Directory... Built for Repeater Users — Built for You

We've re-engineered the design for faster acceleration to the listings and information you're looking for by using a chapter format. Open the cover and you'll find more horsepower than ever before. This year's standard equipment package comes fully loaded.

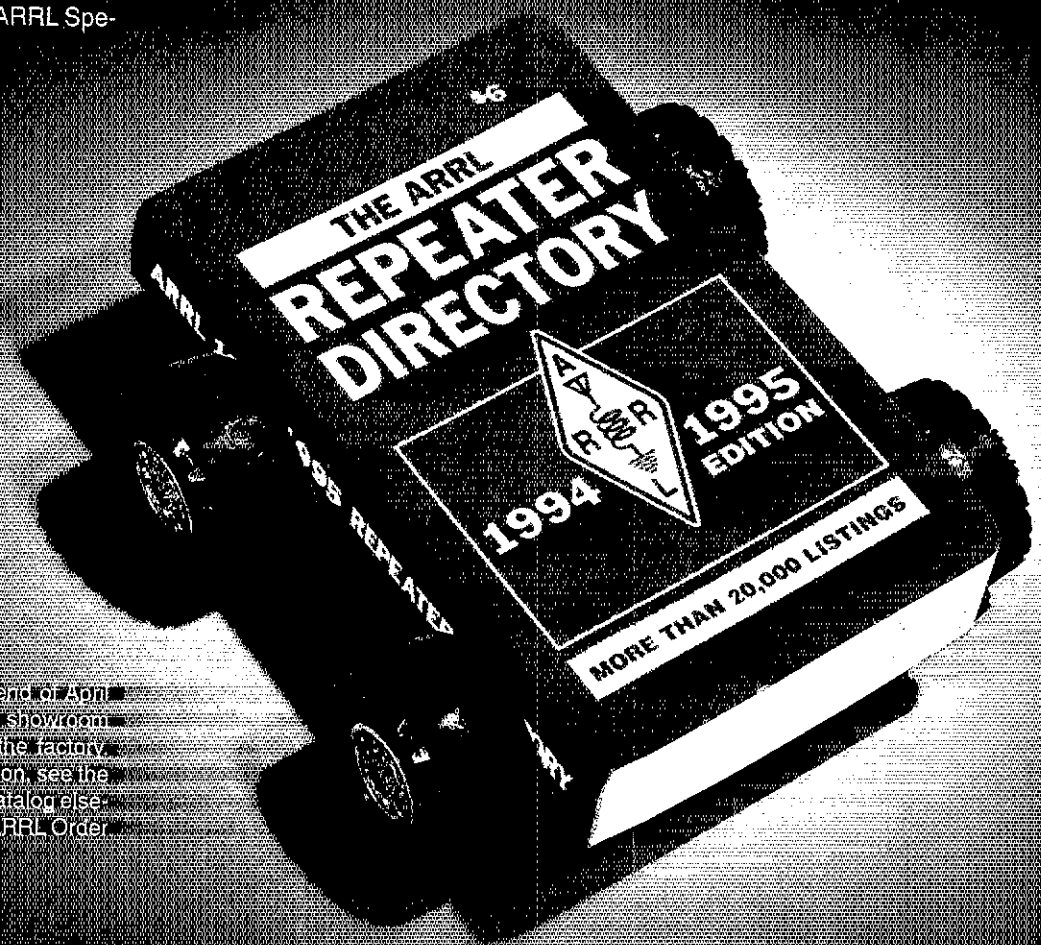
Get better mileage with more listings and wider coverage than ever — more than 20,000 listings of FM repeaters (packet radio systems, ATV sites and propagation beacons are listed separately).

You'll never drive alone with a complete listing of ARRL Special Service Clubs — wherever you go there are addresses, meeting times and locations.

New accessories include: listings of Frequency Coordinators, council officers and ARRL officers; suggested band plans; spectrum management committees and other handy repeater user info.

Best of all, we managed to pack everything in to the same sleek compact style. No "sticker shock" because $6.00 takes it away.

No matter where you're headed, get more mileage from your radio—take the new ***1994-95 ARRL Repeater Directory*** along for the ride.



Take delivery at the end of June at your ARRL dealer showroom or order direct from the factory. For ordering information, see the ARRL Publications Catalog elsewhere in this issue. ARRL Order No. 4718

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$50 Free Value *Speaker-Microphone* (CMP115)

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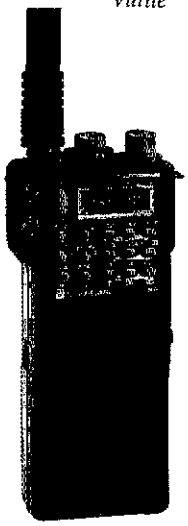
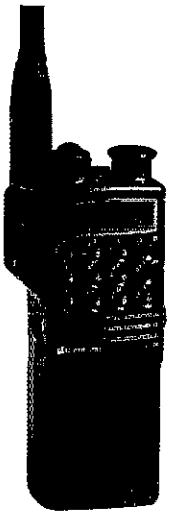


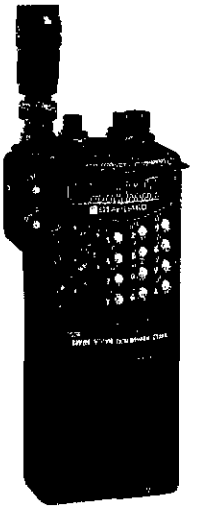
C158A • 2 Meters
The Affordable HT
FREE* Speaker-Mic!

C188A • 2 Meters
The Slim-Line HT
FREE*Speaker-Mic!

C288A • 220MHz
The Slim-Line HT
FREE* Speaker-Mic!



C178A • 2 Meters
(+ low power 440)
Dual-Band HT
FREE* Speaker-Mic!

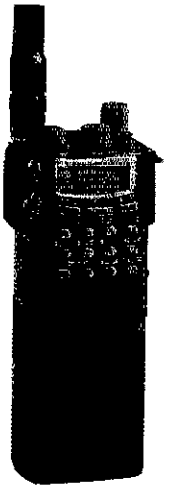


C558A • Deluxe
2 M & 440MHz
Twin-Band HT
FREE* Speaker-Mic!

$50 Free Value *Battery Separation Cable*

(CAX160) with purchase of C168A or C468A:

C168A • 2 Meters
Deluxe Small HT
FREE* Cable!



C468A • 440MHz
Deluxe Small HT
FREE* Cable!

$25 Free Value *Soft Case* (CLC520)

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FREE* Soft Case!

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FREE* Soft Case!

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ARRL HQ is open from 8 AM to 5 PM, Monday through Friday, except holidays.

To reach ARRL HQ by mail or courier, send to: ARRL, 225 Main St, Newington, CT 06111-1494. Our voice telephone number is 203-666-1541, and our fax number is 203-665-7531. You can reach us electronically via MCI Mail (2155052), The ARRL BBS (203-666-0578), Compuserve (70007,3373), America On Line (ARRLHQ), GEnie (ARRL.HQ), BIX (ARRL), and Prodigy (MGTS39A).

MEMBERSHIP INFORMATION

ARRL membership, including a subscription to *QST*, is available to individuals at the following rates: $30 per year in the US and possessions, $42 elsewhere, payable in US funds. Age 65 and over, with proof of age, $24 US, $36 elsewhere. First Class and airmail rates are available upon request. Licensed radio amateurs age 21 and under may qualify for special rates; write for application. Address membership inquiries to the Circulation Department.

Publications Delivery—Direct changes of address and questions about delivery of *QST*, *QEX*, *NCJ* and *The ARRL Letter* to the Circulation Department.

Back Issues—Back issues of *QST* are available for $3 each, postpaid, from the Circulation Department.

QST EDITORIAL

Writing for *QST*—If you're interested in writing for *QST*, send a stamped, self-addressed envelope (SASE) along with a written request for our free author's guide. *QST* accepts unsolicited manuscripts; please include your name, call sign, address and daytime telephone number. Address inquiries and submissions to the *QST* Editor.

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Strays and Up Front in *QST*—Direct Strays and Up Front in *QST* submissions to the *QST* Features Editor. Be sure to include your name, address and daytime telephone number. Photos and other material cannot be returned unless accompanied by a written request and return postage/packaging.

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Direct questions about FCC Rules and Regulations, antenna ordinances, third-party agreements, and reciprocal operating permission to the Regulatory Information Branch. An SASE will speed your reply.

VOLUNTEER EXAMINATIONS

Contact the Volunteer Examiner Department for information on: the location of examination sessions in your area if you have an amateur license and want to upgrade; becoming a volunteer examiner; and examination accommodations and/or Morse code exemptions for the disabled.

EDUCATIONAL ACTIVITIES

Contact the Educational Activities Department (EAD) for general information on Amateur Radio. EAD can tell you how to become licensed and how to locate Amateur Radio clubs, instructors, licensing classes, and examiners in your area; recommend study materials; and help you promote Amateur Radio activities to the general public.

League Lines

Members of the ARRL Amateur Radio Emergency Service (ARES) were active and visible during and following tornadoes that struck several southeastern states on Sunday, March 27.

In Alabama, more than 70 amateurs in 10 counties participated in the state's 2-meter weather-spotting net and in damage assessment following the storms, according to Herb Griffin, N4ZOV, president of the Calhoun County ARA, an ARRL Special Service Club. The National Weather Service in Birmingham received the reports via W4CUE, the repeater station of the Birmingham ARC.

Carol Boothe, KE4HJU, was cited by Griffin and others for yeoman service as net control on the 2-meter net, conducted through repeater station WB4GNA, with its wide coverage from the highest point in Alabama, atop Mt Cheaha.

In northern Georgia, where the state's ARES net was activated Sunday afternoon following reports of tornadoes in Alabama, amateurs manned local ARES nets in 12 counties in the storm's expected path. Local 2-meter net reports were funneled to the Georgia ARES Net on 3975 kHz, with liaisons to Alabama and South Carolina. From there, weather reports were relayed to state Red Cross Headquarters in Atlanta. Georgia ARRL Section Emergency Coordinator Dot Fennell, KA4HHE, told an interviewer from WJCL-TV in Savannah about Amateur Radio's role in storm communications. "Doppler radar is wonderful," she said, "but the human eye is still the best weather instrument."
The ARRL welcomes reports and photos from amateurs involved in these operations.

The annual ARRL Headquarters Open House is Sunday, June 5, from 10 AM to 3 PM. As usual, it's on the same day as the Newington Amateur Radio League's flea market, which runs from 9 AM to 1 PM. W1AW will be open, too.

At press time, the final recommendations of the ARRL* Ad Hoc *Committee on PR Docket 93-305 (call sign selection by amateurs) were being reviewed by members of the ARRL Board of Directors prior to an April 9 meeting of the Executive Committee. The position adopted by the Executive Committee or the Board (by mail vote) will be reflected in the League's comments to the FCC, to be filed by the April 21 deadline. Thanks to the hundreds of ARRL Members who shared their views with the *ad hoc* committee! More information is in a story on page 94.

The new edition of the* ARRL Repeater Directory *debuts again this year at the Dayton HamVention. The 1994-95 edition has been reorganized for easier use "on the run" and has more than 20,000 listings of FM repeaters, packet and ATV systems, and propagation beacons.

The Radio Society of Great Britain has scheduled its 1994 International HF and Islands on the Air (IOTA) Convention for October 7 to 9, 1994. Included this year is a 30th birthday party for IOTA. The convention will be held at the Beaumont Conference Centre in Old Windsor, Berkshire, the same location as last year. More than a dozen speakers have already signed on. For information, contact E. N. Cheadle, G3NUG, Further Felden, Longcroft Ln, Felden, Hemel Hempstead, Herts HP3 0BN; telephone/fax: +44 442 62929).

Check those DXCC application forms; the current form is MSD-505(194) for all new and endorsement applications. Please *do not* use older forms because they lack spaces for critical information needed for processing at HQ.

Officials of ARRL affiliated clubs are asked to* please *advise HQ when your club officers or their addresses change, so we can effectively support your efforts. We can't help if we can't find you!

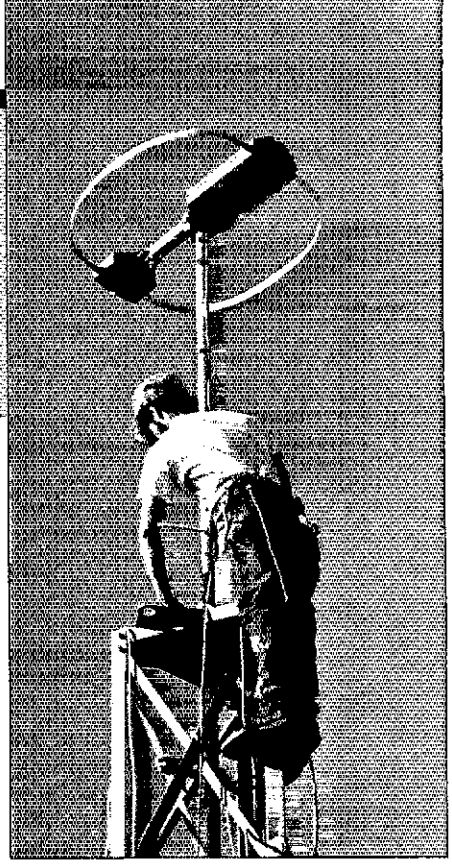
Speaking of club officers, watch your mailbox in early May for a mailing concerning ARRL-sponsored club liability insurance–there's plenty of time to acquire this broad, inexpensive coverage *before* Field Day!

Washington State has new legislation to protect amateurs. On March 23, the governor signed Senate Bill 5697, a bill that, according to its backers, limits the ability of municipalities to enact antenna and tower regulations by pointing out the federal preemptions of the FCC's PRB-1. Credited with promoting this legislation are Dr Ralph Shumaker, WX7T, and members of the Mike and Key Club of Seattle, according to ARRL State Government Liaison Frank Price, KD7AC.

The US amateur population held steady in January, as the first of a large number of licenses that were due for renewal for the first time in 10 years expired. The FCC added 2398 licensees and deleted 2282, leaving 631,726 licensed amateurs at the end of the first month of the year.

The FCC has reaffirmed a $17,500 fine against a Chambersburg, Pennsylvania, man, Andrew R. Yoder, who the Commission says "willfully and repeatedly" operated an unlicensed broadcast station on 7415 kHz in 1990 and 1991. Yoder had filed an application for review of the May 1992 FCC forfeiture order; in March the FCC denied the application and gave Yoder 30 days to pay the fine.

An Enchanted Sweepstakes Expedition



Handyman Tony puts the finishing touches on the IsoLoop, which is mounted on a 20-foot rooftop tower.

In recent years, I've been troubled by the growing use of "muscle" in the November Sweepstakes competition. Although antenna and station improvements are justifiably at the heart of everyone's year-long preparations for the contest season, I often hear of operators who won't get into Sweepstakes, the premier domestic contest, because their stations aren't "big enough" to be "competitive."

Is this fear real—or imagined? Are there ways to configure a station, using easily erected antennas, that can still "sting like a bee" when the going gets tough? What are the minimum hardware requirements to put out an "adequate" signal for contest and/or emergency work?

These and many other questions led me to consider a new challenge in Sweepstakes, a contest that I've enjoyed and succeeded in over the past 25 years. The answers to these questions are relevant to emergency, vacation and Field Day planning. Every good contest effort is educational, but even I was not prepared for the sensational learning experience I savored in Puerto Rico—the "Land of Enchantment"—during the 1993 CW November Sweepstakes!

The Station ("You're Going to Use *What*?")

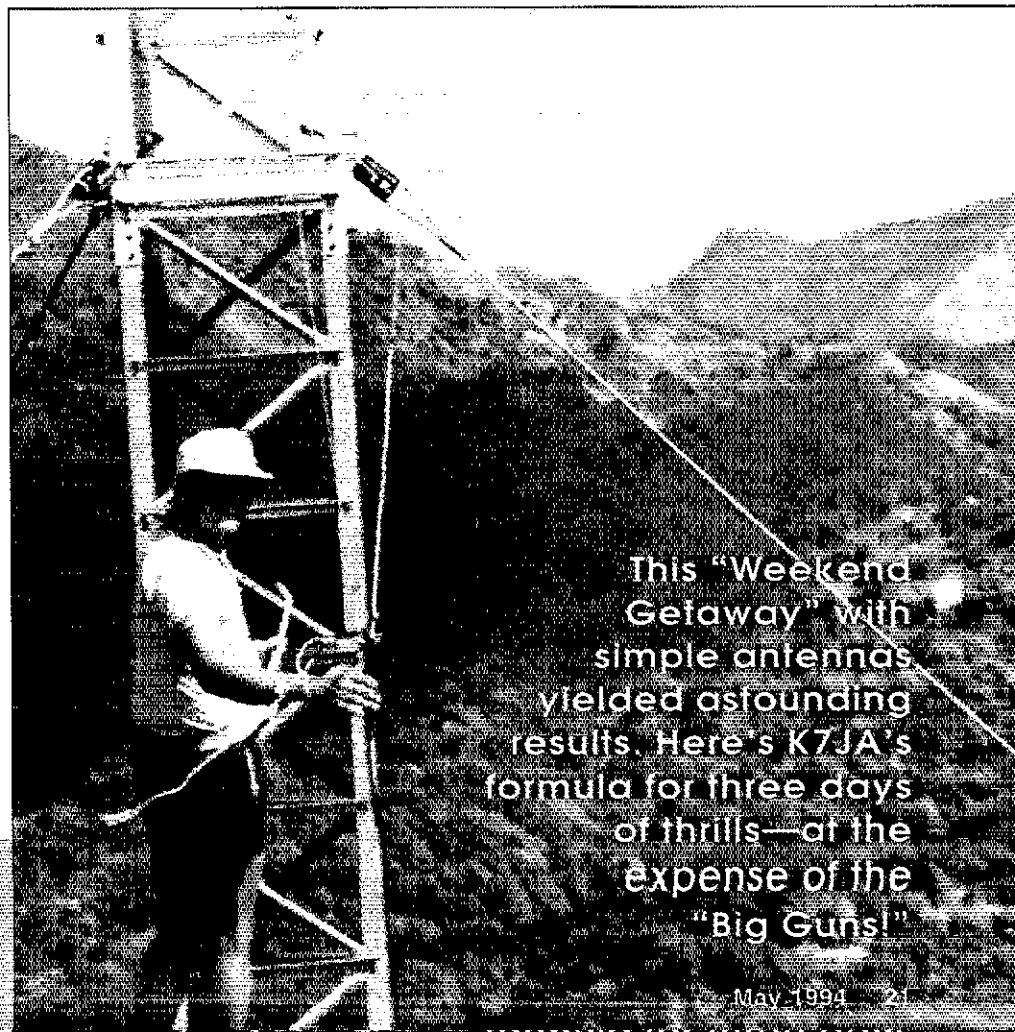
I wanted to have *fun* in this contest. Not wanting to be disappointed in whatever results came from my effort, I resolved to use an antenna system so small that *any* QSOs that made it into my log would be a delight!

For 20 through 10 meters, I chose an AEA IsoLoop. Compact, lightweight and easily transportable, the Isoloop belongs to the family of "magnetic antennas" that seem too small to work. I've always been fascinated by the possibility that such an antenna *might* work, yet frustrated by product evaluations and magazine articles that only compare mini loops to dipoles at 30 feet, or something similar.

My interest was in knowing how many contacts would be in my log at the end of the most QRM-intensive weekend of the operating year. Besides, if I did manage to beat anyone in the contest, I knew it would be very satisfying, because I would undoubtedly have the smallest antenna on the bands!

Following the tragic death of my longtime friend Jim Rafferty, N6RJ, I was approached by Rod Proctor, N7UDD, president of Advanced Electronics Applications (AEA), who asked me what I thought would be a meaningful, lasting

Pedro, NP4A, ties off the feedpoint of the 40-meter loop.



This "Weekend Getaway" with simple antennas yielded astounding results. Here's K7JA's formula for three days of thrills—at the expense of the "Big Guns!"

By Chip Margelli, K7JA
8652 Cerulean Ave
Garden Grove, CA 92645

Photos by the author

way for his company to remember Jim to the amateur community. I recommended the donation of an IsoLoop to the Northern California DX Foundation, something that would allow Jim to be a part of future DXpeditions, an activity he loved so much. Rod thought that this was an excellent plan, and I arranged to give the NCDXF's new IsoLoop its maiden voyage in the 1993 CW Sweepstakes, with N6RJ clearing the way to the F layer for me!

For the low bands, I assembled a 40/80-meter fan dipole antenna and built a 40-meter loop as a hedge against varying takeoff angles. The wire antennas, coax and the IsoLoop's IT-1 auto-tuner joined patch cords, an MM-3 keyer, paddles and accessories in a small (but heavy!) suitcase.

A larger suitcase was filled with injection foam to form-fit an FT-1000D, my favorite contest companion. Adjusting the rig to limit the power output to 150 W (to avoid any possibility of exceeding the voltage limit of the IsoLoop's tuning capacitor) also ensured no late-night excursions beyond the 150-W limit of the contest's "A" (low-power) entry category.

The Site

After several false starts regarding airline reservations to the Caribbean (if the whole thing bombed I could have at least found a pina colada!), I booked a Wednesday-evening "red-eye special" to San Juan, my destination being the mountaintop QTH of Pedro Piza Jr, NP4A. Pedro's magnificent station was devastated, like so many others in the region, by Hurricane Hugo. His antennas were all down, including his brilliantly engineered 3-element full-size 80-meter Yagi; at least there would be no temptation to use existing big-gun antennas! Fortunately for my low-band wires, most of Pedro's towers were still standing, so skyhooks would be available.

Pedro thought I was crazy ("Come on, Chip, let's put up some beams so you can win!"), but once we agreed on the insanity of the idea (and that of its originator), all the elements were in place for a five-day jaunt to Puerto Rico, which I hoped wouldn't be "Chip's Waterloo."

The Strategy

Any Amateur Radio operation succeeds when a chain of factors combines in a favorable manner. A cold winter day can be offset by hot propagation; a modest antenna can be enhanced by a great location; an intrepid operator can find weakness in an opponent's massive hardware. In the days preceding my departure, I pored over propagation forecasts, reviewed old Sweepstakes logs and read with considerable interest the article on compact loop antennas by John Belrose, VE2CV ("An Update on Compact Transmitting Loops"), which fortuitously appeared in the November 1993 issue of *QST*.

I determined that Pedro's QTH should be worth about one S unit compared to a flatland station. Moreover, I reasoned that the omnidirectional pattern of the small loop antenna might have a competitive advantage over the "pointy" antennas used by others in the contest. A 6-element monobander might have 10 dB gain on the nose, but the little loop might be louder in VE8 if the other chap's big Yagi is pointed at VE1!

Sure enough, predeparture tests of the loop, mounted on a pole strapped to my chimney, showed it to be about 10 to 12 dB below my 20- and 15-meter monobanders at about 70 feet—not too bad! But when the beams were turned 45° away from the station of interest, the signals received on the loop were at least as strong as those received on the beams. Some stations off the sides of the beams were inaudible except with the loop, where they were solid copy. Because I needed to cover a 70° "swath" in azimuth (Hawaii to Nova Scotia is 74°), this aspect of the loop's performance, compared to that of a typical beam, was very interesting.

Above all, if someone needed Puerto Rico badly enough, *he would find a way to hear me*. As I pondered these variables, my confidence grew. There was great promise in this enterprise. I *believed*!

Friends Around the World

The hours passed quickly on Delta flight 188, and soon I was shaking hands with Pedro at the San Juan Airport. I mused to myself that Pedro must have been surprised that I wasn't wearing a straitjacket....

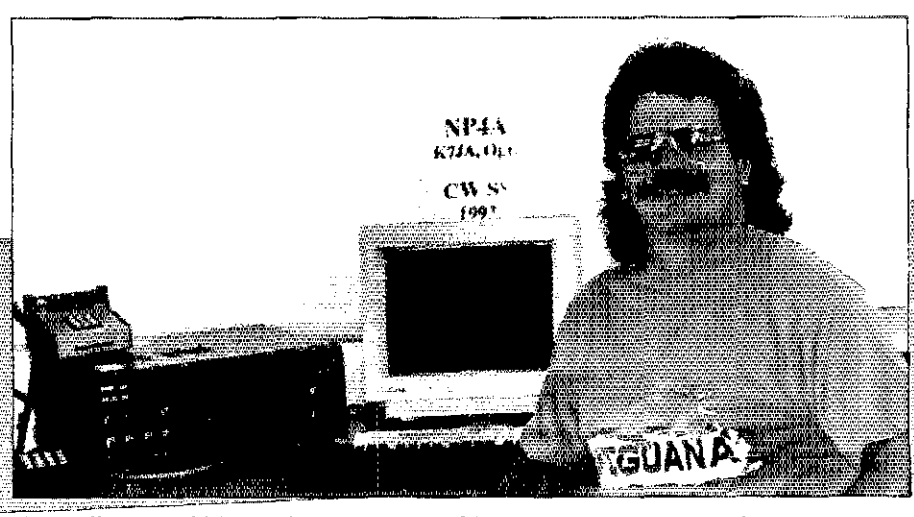
We stopped by the home of Oscar, KP4RF, who had generously offered me the use of his computer for the contest. After an hour of discussing radios, computers and "old times," Pedro (who used to hold the call KP4RF!) advised that we had best set off across the island toward Ponce, which lies at the base of "Mount Piza," our destination.

Meeting us in Ponce were Pedro's lovely wife Ines and his junior operators Carmen and Pedrito. The Pizas are my second family in the Caribbean, and I was pleased that the simplicity of my antenna plans meant that there was no tower work to fret over this Thursday afternoon. A traditional Puerto Rican lunch and leisurely conversation with dear friends were much more important in the grand scheme of things.

That night, I was sung to sleep by the lilting "to-tweeeet" of the tiny Coquí frogs indigenous to Puerto Rico. Their song sounded much like a high-pitched "di-dah," and I smiled in bed that night, safe in the knowledge that Nature seemed to be on my side. It was to be a propitious weekend; the Coquís had it all under control!

Table 1
K7JA's QSOs by Band

Band	QSOs
80	8
40	674
20	202
15	496
10	8
Total	1388 QSOs



The author used his tried-and-true FT-1000, an AEA IsoLoop mini antenna, and the call sign and hospitality of NP4A to win in the low-power category of the 1993 November Sweepstakes.

The Setup

Friday's sunrise meant it was time to build a station from the ground up! This normally daunting task was completed in less than three hours, thanks to my modest antennas.

The IsoLoop's 50-foot RG-8X feed line and auto-tuner control cable were uncoiled and deemed long enough to reach the second-floor bedroom from a small roof tower on top of Pedro's house (which happened to have a mast already mounted inside it!). Pedro's helper Tony threw the IsoLoop over his shoulder, scampered the 20 feet to the top of the roof tower and quickly had the loop secured to the mast. He looked down and asked, "Estamos?"

I looked up at him and said, "Yes, Tony, we're on the air!"

Sunspots being what they are these days, I knew that 40 and/or 80 would be important to this effort, so we devoted three tower climbs to erecting the 40/80 dipole between two of Pedro's towers, and a quad loop on a third. Little adjustment was needed on the wire antennas, and by 10 AM I was taking photographs. What an easy DXpedition!

The quick antenna installation gave me plenty of "lazy" time Friday and Saturday. There is no doubt that the relaxation time ahead of the contest was in my favor, further offsetting the antenna factor.

Sting Like a Bee...

It was 2059 UTC on Saturday, November 6. As I set the dial on the FT-1000D to 21.0351 MHz, I wondered to myself, "Can I really hold a frequency with this setup?"

At 2159 UTC I had 101 QSOs in the log. I was still on 21.0351, and I had a pileup. Yippee!!!

The hours rolled by, my multiplier bell rang out each new section as it was worked, and I grinned to myself as I noted "Bravo" (high-power) stations I was ahead of: K3LR, K2KIR, K4BAI, N6UR, K5LZO, CH7CC and K1DG. It was 0000 UTC, and my little antenna had provided me with enough signal to give me my best—and most satisfying—start ever!

Forty played great, 80 played not at all (everyone was a dupe). I looked forward to getting back on 20 meters in the morning so I could play "giant killer" again. I topped 1000 QSOs before 1630 UTC, driven by the pure thrill of it all. I never once had to worry about where my beam was pointing—everyone was coming in from all directions! And when VY1JA called in on 40 with a little more than an hour to go, giving me the coveted Clean Sweep, the multiplier bell rang and rang and rang!

The smallest antennas I had ever used in Sweepstakes produced my best CW score ever: 1388 QSOs with all 77 sections, for a claimed score of 213,752. I looked up at Pedro one minute after the contest and said, "Leave the beams at home, boys and girls!"

The Aftermath

As I prepared to board my flight home Monday afternoon, Pedro looked at me and said, "Chip, I thought you were my friend."

I was both shocked and puzzled by such a question from someone I consider my brother. "What are you talking about, Pedro?" I asked curiously.

"Ines looked up at the little loop this morning before we left," he replied. "She asked me, 'Chip won the contest with this little antenna, did he?' She then told me that she would get me 10 of them for Christmas, and she wants furniture, a jacuzzi and a Jaguar! I had been thinking about getting her a new 80-meter beam!"

Oops!

The Lessons

- The minimum requirements to be competitive in Sweepstakes are "Pretty Minimal!"
- Antennas that "Spray" can be advantageous over antennas that are "Pointy."
- From an emergency-preparedness standpoint, even a simple antenna, properly conceived and tested, can do the job. The tiny IsoLoop antenna I used was sufficient to hold a frequency on 20 or 15 meters during the heaviest band usage you'll ever encounter—the first six hours of Sweepstakes—and to provide contacts throughout the United States and Canada.
- Being rested and relaxed is better than being pooped from antenna work. This goes for a contest, a family vacation trip where a radio comes along, or a disaster situation such as the aftermath of a hurricane.
- If you can't operate from where you live, go somewhere else. Like Wyoming?
- When contemplating the use of modest antennas, planning and study are crucial to success. Reading VE2CV's article in November 1993 *QST* probably bought me one to two S units with the compact loop by showing me the preferred (horizontal) mounting method for my desired takeoff angle.
- A visit with good friends, and a contest operation, *can* successfully coexist. "The Amateur is Balanced," remember?
- I'm not quite sure why there is a "Bravo" category in Sweepstakes anymore. Just how many contacts did *you* make with your kW and beams?
- Anyone with the proper attitude (not necessarily the biggest arsenal) can have a great time in a contest. The ARRL and other contest sponsors have not created these competitions with the winners determined in advance, which is what makes them fun and interesting!

In Closing

Amateur Radiosporting events offer an unparalleled chance to be creative. Creativity is at the very heart of successful competition, and the practical value of lessons learned in the pursuit of fun and glory is considerable. Creating a seemingly impossible challenge is often the best way to learn something about your hobby—and about yourself.

The results may surprise you! QST

Amateur Radiosporting events offer an unparalleled chance to be creative!

Yukon DXing with Flair

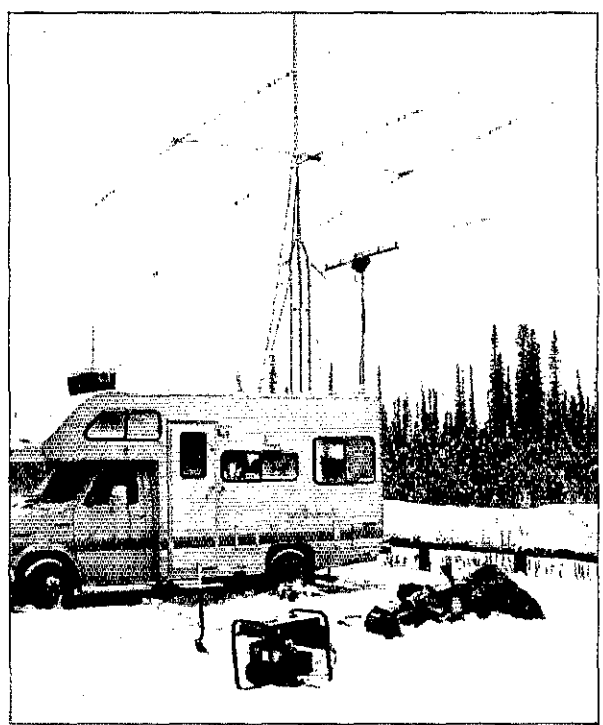
If balmy fall Sweepstakes weather has you down, why not head to the Yukon? If the mercury plunges to –40°F, it'll still be above freezing in your motor home—if the generator doesn't fail, that is.... Oh, and bring a radio while you're at it!

By John Reisenauer, NL7TB
1961 Norene St
Anchorage, AK 99508
Photos courtesy of the author.

The Yukon conjures visions of unspoiled, majestic wilderness and square-jawed Mounties—but to us (John, NL7TB, and Kent, NL7VJ) it also means DXpeditions and contests. The McKenzie brothers of the Great White North we're not—what we *are* is a pair of Alaska hams hellbent for Yukon DX adventures.

The main objective for our latest Yukon excursion was to shatter our previous VY1 records on CW and RTTY. We took every conceivable precaution to make sure Mr Murphy wouldn't accompany us on this adventure (he's been known to grace us with his presence). The antennas were thoroughly inspected and all connections tightened, the generator was serviced and all the gear checked out before we left Anchorage. We even practiced setting up the tribander and tower on the motor home roof. The neighbors gave us some peculiar looks! The only thing we weren't sure of (besides propagation) was how the generator would perform in extreme cold. Yukon winters squeeze the life out of the land and anything in their paths. Temperatures of –30°F are common for extended periods. We know from experience!

This trip would be unique: Besides working the ARRL Sweepstakes phone contest, we'd have more on-air time for CW and RTTY; we also planned to try 30,17 or 12 meters to attempt an HF packet link with Anchorage. We were more mobile and in a self-contained vehicle. Our power source was more reliable and our antennas were up much higher, giving us an edge. Up here, every bit counts!



The Sweepstakes scene at VY1QST. From this frozen rest stop on the Alcan Highway, NL7TB and NL7VJ handed rare Yukon QSOs to nearly a thousand appreciative contesters.

My computer would be invaluable for logging, working digital modes and generating QSL labels. My good friend Bill, VY1AU (Yukon QSL Bureau Manager), made arrangements for Kent and me to use a "special" RAC call, VY1QST. We would represent our radio club (the South Central Radio Club (SCRC), of Anchorage) for the first time in the Yukon. Most importantly, improved equipment and strategic planning would greatly reduce our outdoor set-up time. If you've ever assembled and installed a tribander in below-zero weather, you're on our frequency!

Getting There—the Adventure Begins

We drive most of the night on icy Alaska highways full of moose and caribou, past great blue glaciers. After crossing the Yukon border, our eyes search the nameless white peaks and trackless valleys for that "perfect" spot to set up

Cold Weather Radio Gear

Hooking up radio gear and antennas in a killer deep freeze is not anyone's idea of fun! To make setting up as easy as possible, we took a few liberties with the hardware:

We modified our little Cushcraft tribander by pinning the elements directly to a fabricated element-to-boom plate with spring-loaded clips. We also color-coded each element-to-boom connection and marked the driven element's orientation. A permanent balun was mounted to the boom, making for a quick feed-line termination. As proven during Field Day, it only took five minutes to fully assemble the beam. This "quick assembly" design by KL7CC proved itself again.

From the roof of the motor home, we merely tilt the tower "top section" to a vertical position, tighten the hinge bolts and tie off the guy ropes. Next, the mast (which is stored inside the tower) is pushed up through the tower a foot or so and the antennas are installed. We now push the mast up about five more feet and lock it in place. The entire antenna installation is done in less than 20 minutes.

Our coax cables are rolled in 5-foot-diameter coils and stored in the RV until it's time to hook up the antennas. The insulation on cables, especially coax, can crack and break in cold weather if not properly handled (a lesson learned from a previous trip).

Our "inside" equipment included the following: FT-757GXII and FT-747GX HF transceivers, an SB-220 linear amplifier, a laptop computer, a KPC-3 TNC and KL7Y's 5-kW generator.

camp. We prefer to camp along the Alcan Highway somewhere close to the border (plan A) where we can spread out the antennas and not worry about generator noise. If the snow is deep, we'll park in Ida's Motel and Cafe parking lot (plan B) in Beaver Creek, 25 miles "inland." Ida's establishment has seen quite a bit of ham activity over the years (including three previous Sweepstakes operations: NL7TB, NL7VJ/NL7TB and KL7Y)—it's a DX oasis in an otherwise hostile environment!

We find a rest area one mile north of Ida's that suits us just fine. In the sprawling, isolated Yukon Territory, there are only a handful of hams. Now, 450 miles from home, there are two more.

On the Air—a Trial Run

It's 1900Z November 18, and we're working 20-meter CW from the frigid Yukon as VY1QST. First in our log is K6YO. The beam and dipoles are aimed toward the Midwest as the pileup starts—we hit pay dirt! The many months of intense brainstorming are now reality. The long-awaited feeling of accomplishment is almost indescribable. If you've ever been on an exciting DXpedition, you know the feeling. Being on the only permanent road into Alaska adds to the excitement.

Our first DX is PY2EVN. Later, we switch to 20-meter RTTY and work N5TVN, N5YIK and many others. JA3DLE/1 is our first RTTY DX. Two hours later, 20-meter phone is buzzing with news of VY1QST. Big pileups are now monster pileups. At times, we hear only a "roar"—only the "tail-enders" are getting into our log. When it rains, it pours!

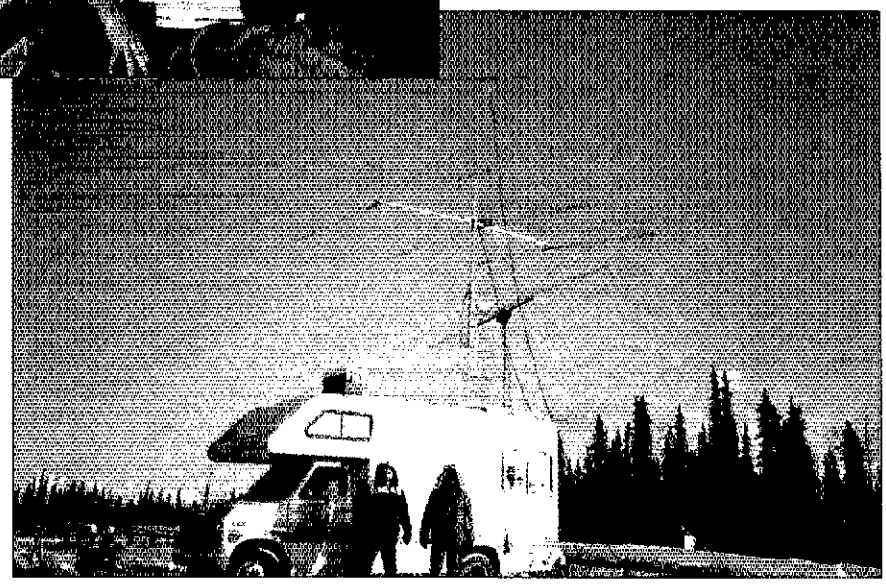
Our first 80-meter contacts are with fellow SCRC buddies in Anchorage and Whitehorse (KL7CC, KL7HF, KL7Y, KL7D, NL7C and VY1AU) on skeds. Our second attempt on an HF packet link to NL7C's DX *PacketCluster* (via KL7CC's temporary gateway in Anchorage) is successful on 40, then later on 80 meters. We "spot" ourselves and link with VY1AU in Whitehorse.

The temperature is 10°F when we make camp at 6 AM, and at 9 AM, it's dropping again. I'm surprised to hear WA4NTM say, "I've been looking for the Yukon for 15 years" as we hand him his 579 report! I don't have the heart to tell him we had worked three VY1's from here already.

Somewhere between a Midwest pileup and a sudden burst of wind, a Royal Canadian Mounted Police (RCMP) truck pulls up next to us. We're parked in a rest area just 20 feet off the Alcan Highway, remember? I have visions of Kent and me taking down the antennas...our trip going down the tubes.

I welcome the RCMP officer inside and offer him a cup of coffee. I also beat him to the punch with, "I suppose you're wondering what we're doing here," as he eyes our equipment. We explain the importance of ham radio (we should be politicians!) and that we represent our Alaska Radio Club and the Yukon Territory in an important contest. I didn't hesitate to mention that this is an annual outing.

"Inside" VY1QST.



If the authors look as though they "froze" for the camera, well, that's not far from the truth.... Temps in VY1-land—even in November—routinely plunge to –40°F at night!

The officer asks how long we'll be here and if all that "noise" (Kent turned up the volume on the rig) was for us. Even though the "roar" of the pileup doesn't impress him, he says, "Have a good time" as he shakes his head and leaves. You can imagine our relief!

Day two sees some short openings on 17 meters, which we don't hesitate to take advantage of. WA7ZWT and N7DN are first in our CW log, followed by KC6OWG and several others on phone. Fifteen and 20 meters continue to be hot on and off all day "up here." Many JAs and all US call areas are in the log.

The JAs are S7 off the side of our beam, and we see no reason to change direction now. We receive many "10 over S9" reports, and some "20s!" What's a winter radio trip without humor? We joke about being at least a hundred miles in any direction from the nearest stoplight. Numerous times we hear, "You guys must be crazy—but we like what you're doing." Kent and I shake our heads in agreement and give each other the thumbs up—QRZ!

The most commonly asked questions are, "How cold is it there?" and "Will you be on for the Sweepstakes phone contest?" I have a short contact with my friend Butch, NN2T, to assure him we were /VY1 and where to find us in the contest. He says, "Caught your many spots on New Jersey packet—you guys are big news." Packet radio is definitely an insurance policy for us! WJ6Q/M couldn't believe how loud we are and that he has worked the Yukon!

Just two operators and little sleep make for "long days." We take turns napping, refueling the generator, cooking and doing dishes when the pileups die down. We carefully monitor the fuel requirements of the generator—we don't want to lose our computer logs to an unplanned outage. We cook simple meals and use paper plates to minimize our radio down time. The most inconvenient of times are outside "nature calls," especially when it's a crisp 38° below zero. A closely monitored thermometer is attached to a feed line just outside the rear window of the RV (our operating position faces the highway).

The Contest Begins!

It's day number three and we are primed and ready for Sweepstakes—this is why we're here! We're trying to start the contest with fresh throats by not working a lot of phone before the contest—one of us accomplished that! By some stroke of luck and much relief to Kent, I manage to regain my

"You're a dupe—I can't believe I just turned down the Yukon!"

voice two hours before the contest.

Our big generator is draining nearly eight gallons of fuel per day: We don't have enough to get us through the contest. Kent sets off on foot to Beaver Creek, one mile down the road (it's 22 below zero, a fairly nice day in these parts) with a five-gallon gas can in each hand. Later, while cooking breakfast, I see him slowly trudging toward the motor home with the precious fuel. Do I feel guilty? Not!

Many hams chase us from band to band to add VY1QST to their logs. The best band conditions for us during Sweepstakes are on 15 and 20 meters. At contest time it's –28°F and the wind is rocking the motor home when we pick up multipliers for the Yukon and North Dakota (contacts 1 and 2, thanks VY1AU and W0VV for standing by). Later on, W4MYA had us repeat his exchange: He's so excited that he dumps his computer! AB6YL asks, "Is it still –28°F?" Only five hours into the contest, 285 Qs under our belt, we need seven multipliers for a clean sweep.

On 80 meters it's VE7SZ with "thanks for a clean sweep"—we'll hear that a lot in the hours to come. A bit later we work the Anchorage gang on 80 meters for contest points. It's now almost –40°F and we are becoming concerned. The motor home's engine runs all the time now; the temperature gauge barely crests the "cold" mark. The propane furnace in the RV is hardly keeping us warm. What was once a two-man DX team (one at the mike and one at the computer) is now a solo effort: One of us must tend to the heaters.

We eventually run out of propane for the furnace, so we have to rely on the vehicle's heater (more QRM on 40 now) and two electric heaters. We run the amplifier at half power as the generator hovers near maximum load. The heaters (1500 W each) barely keep up.

Day Four

A small but noticeable warming trend greets us this morning, our fourth day in our "rest area DX camp." It's only –25°F now, and the Northern Lights are in full view as I refuel the generator.

Throughout the day we'll see the bands fade in and out many times. We tune endlessly on different bands looking for Puerto Rico. Searching for KP4 cuts into our QSO count, but it's the only section we need for a clean sweep. By 10 AM, 15 meters is hot; we know that KP4CZ is on.

The heat wave has pushed the temperature up to a balmy –15°F. Maybe we'll see warm weather when the antennas have to come down later. By 11 AM, 10 meters is wide open. We find only a few stations that we haven't worked on other bands. We drop to 15 meters and do our "hunt and pounce" thing on new stations. AB6EQ says, "You're a dupe—I can't believe I just turned down the Yukon!"

All bands crash an hour before the contest ends. We're exhausted and our fuel supplies are running low. It's time to pull the plug on our VY1 operations. We enjoy a little 2-meter banter on our H-Ts while taking down the antennas. It's –10°F, and it's time to head for civilization (well, Anchorage, that is!).

If luck was with you this past 'phone Sweepstakes, you have one of these in your QSL card collection.

NL7VJ dutifully checks the 5-kW generator. It's not running hot at –38°F! Note the stop sign at the entrance to the Alcan Highway.

It's History

We worked hard for our 1500+ Qs (930 contest Qs—missed Puerto Rico for the clean sweep...) and had a great time! Several times during our four-day operation we experienced many DX runs of 50, a few of 100 and a couple of 200 or so. We averaged about 20 Qs an hour overall, 39 during the contest. I know this is no big deal down south, but "up here," under entirely different conditions, it's our best rate in years.

In the stillness of this pristine wilderness, the feeling of solitude can be overwhelming. At times, the Northern Lights gave such a spectacular performance we could only wince in awe.

Although there's no T-shirt shop to prove it, we again made Beaver Creek the "DX Hotspot of the Yukon!" We'd like to thank all the "professional" operators who stood by when asked, contacted us, spotted us on packet, or supported us in any way. I was pleased to find my mailbox stuffed with VY1QST QSL cards when I arrived home! Another Yukon DXpedition is history!

Special thanks to Bill, VY1AU; Jim, KL7CC; Dan, KL7Y; Jim, NL7C; and Del, KL7HF—your support contributed to our success! QST

A Look at

Digital Audio Broadcasting

Soon, turning on your car radio may involve a lot more than sampling local AM and FM stations. When digital audio broadcasting—inexpensive, nationwide, CD-quality music, talk and data via satellite—is unveiled, dial surfing may never be the same. Will your local stations survive?

By Kirk Kleinschmidt, NTØZ
QST Assistant Managing Edito
Photos courtesy of CD Radio, Inc

As we near the end of the 20th century, the march of technology is progressing at a relentless, unprecedented rate. As the curve gets steeper and steeper, new technology pushes aside the old. The older players scramble to keep their long-established turf, and the new players look for ever-new ways to sidestep the status quo. The result is a "techno turf war," the scope of which we can still only imagine.

The turf war and technology discussed here concerns digital audio broadcasting (DAB), also called digital satellite broadcasting (DSB), digital satellite radio (DSR) and a host of other nicknames. (For a closer look at a related turf war, see "Cellular Radio and the Modern Amateur" by Norman Stone, WGIC, in March 1994 *QST*. It's about the race to provide second- and third-generation cellular telephone services in the multibillion dollar US telecommunications arena. Much of the technology examined in detail in Stone's article is relevant to DAB and DSB.)

Broadcasting: Pretty Much the Same—Until Now

Before we dive into new broadcasting technology, this is a good time to remember that broadcasting—whether AM, FM or TV; domestic or international—has remained conceptually unchanged from its earliest days.

Technology has kept pace, but prior to the relatively recent appearance of digital transmission modes, almost every broadcast transmitter around the globe emitted an analog AM or FM signal (TV uses both).

The new digital modes, most of which are similar to the spread-spectrum and time-domain multiple-access (TDMA) techniques being tested for second- and third-generation cellular telephone systems, offer CD-quality sound and the ability to compress and multiplex many stereo programs on a single "channel." This new technology will likely replace conventional broadcasting in its entirety sooner or later.

In the interim, however, designing, building, testing and legislating digital broadcasting systems is a "wild, wild west," full of intrigue, secret deals and megadollar speculation!

DAB and DSR: How They Work

There are two main branches on the DAB tree, and each uses related technology. The first branch is CD-quality digital radio delivered to your car or house directly via satellite. The second involves existing terrestrial broadcasters switching to digital transmission systems, exclusively, or in addition to conventional AM or FM transmissions.

Car Radio Via Satellite

This is the original DAB concept: One or more high-power geosynchronous satellites beams CD-quality stereo signals directly to your house or car.

Four US companies have petitioned the FCC to allow them to set up DSB operations. Each would use one or more satellites to blanket the US with digitally compressed (using spread-spectrum and/or TDMA transmission techniques) music and talk programming.

In the US, S-band frequencies from 2310 to 2360 MHz are sought; overseas, the use of two other bands is planned, one near 1500 MHz, another near 2500 MHz.

The FCC is considering the four proposals, but has not given its go-ahead to any of the petitioners. Technical standards, rules and regulations for the new broadcast service, and political considerations have slowed the process.

CD Radio Inc, in Washington, DC, is one of the four companies applying to the FCC for permission to begin operation. CD Radio Systems (a division of CD Radio Inc) President Robert Briskman says his company, which was first in the FCC-application race, would feature 30 CD-quality music channels beamed to all parts of the country via two satellites.

According to Briskman, the benefits would be many: no commercials, nationwide coverage and diverse, commercial-free programming. Some of these benefits are already available in metropolitan areas; with DSB, they'd be available in rural areas, too.

"Users would be able to subscribe to our service for five to ten dollars a month," Briskman says, "and the cost for a satellite receiver for your car should be about $250, in mass production." The antenna? It's the size of an Eisenhower silver dollar! (See photo above.)

Because the receiving antenna is so small, the satellite has to put out alot of power. CD Radio Systems Vice President Richard Cooperman says his company's space-borne transmitters would pump out about a kilowatt each—into high-gain antennas—for an EIRP of nearly a megawatt!

Briskman assures us that the technology to build the satellites is already available. "The cost to build and launch two satellites

and maintain initial support services is expected to total about $480 million," he says. Costs for the three other companies' systems range from $400 million to $800 million.

(Two cable TV-based digital music services are already in operation. Subscribers, according to a recent column in *OMNI*, already exceed 20 million. The *OMNI* column says that more channels and more cable-delivered digital audio services are planned.)

Eureka 147: a Hybrid System

Favored by Canada and European countries, Eureka 147 is a DSB system with a twist: In addition to direct-to-vehicle transmissions, signals will be received by ground-based repeaters, which will rebroadcast the CD-quality programming in a more conventional manner. (Many of the countries interested in Eureka 147 are leaning toward using it for terrestrial digital broadcasting services.)

The European-developed system uses a 6-MHz-wide, spread-spectrum signal that contains up to 20 CD-quality stereo pairs. Because the signal is spread spectrum, ground-based repeaters can operate on the same frequency, keeping things simple.

Terrestrial Digital Broadcasting

The more down-to-earth variant of DAB would allow existing AM and FM broadcasters to keep things "business as usual"—with the addition of a digital stereo signal "underneath" their existing analog signals.

The technology that makes this possible is called in-band on-channel (IBOC) or in-band adjacent-channel (IBAC). A very weak digital spread-spectrum signal is transmitted underneath (IBOC) or alongside (IBAC) an existing AM or FM signal.

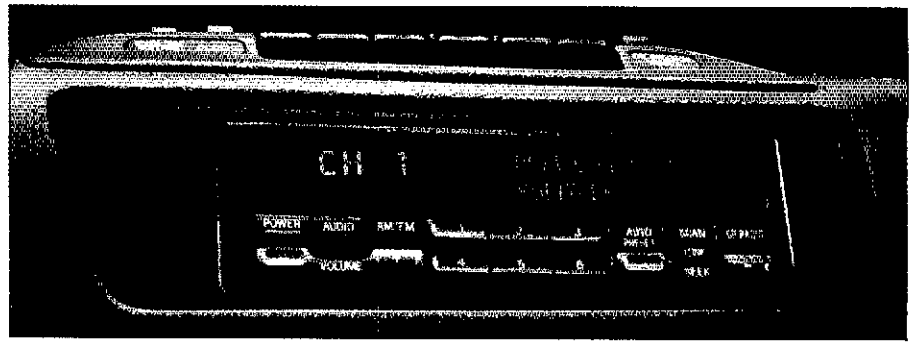
The digital signal is so weak and spread out that conventional receivers never know it's there, but receivers designed to recover the digital data reproduce it just fine. With the touch of a button you can switch between the analog and digital "programs."

In addition to providing a higher-quality stereo signal, spread spectrum IBOC and IBAC digital systems also offer greatly increased protection from fading and multipath distortion—an important consideration for terrestrial broadcasters, who have to deal with tall buildings, uneven terrain and so on.

The benefits of digital radio are not universal, however. Two potential challenges are fading and signal degradation. When analog FM signals become weak, they steadily degrade with increasing distance; the signals gets "noisy." With digital signals, degradation is abrupt: One second everything's fine, then—poof—the signal is gone! In fringe areas, a digital signal could rapidly pop in and out. Imagine someone turning your radio on and off as fast as they can, and you'll get the idea.

VOA/NASA/JPL: An Experimental DSR Research System That Works Right Now!

By now you're probably thinking, "Wouldn't it be nice if someone had a DSR test system that works?" Well, thanks to cooperation among the Voice of America, NASA and the Jet Propulsion Laboratory, you can wonder no longer.



Tomorrow's digital radio receivers will add a new dimension to automotive audio—in sight and sound!

Starting several years ago, spurred by the VOA's desire to explore leading-edge shortwave radio broadcasting systems, the three agencies got together to set up an experimental DSR system using time on a NASA tracking and data relay satellite.

Operating near 2 GHz, power levels with the test satellite are lower than those required for future commercial systems, but initial tests were successful using the 7 watts of power and a narrow spot beam from the NASA bird.

VOA Broadcast Satellite Programming Manager Don Messer says it's important "to remember that the VOA is not designing an operational system. We're not in competition with any existing companies. Everyone can benefit from our experimental work."

The VOA/JPL test system is based on modern digital broadcasting technology. It uses a "narrowband" 200-kHz-wide QPSK signal for each CD-quality stereo channel.

As part of the project, two years ago, VOA/NASA/JPL developed a prototype satellite receiver for future use in cars and even tabletop radios: The VOA/JPL Digital Sound Receiver is now being tested.

As with most digital audio systems, audio quality can be varied by reducing or increasing the signal's data rate.

Testing: The Race is On!

All of the DAB/DSR systems discussed here, and several others, are being evaluated at the NASA Lewis Research Center in Cleveland, Ohio. Heading up the tests is Thomas Keller, former vice-president of engineering for PBS.

The tests could be finished as early as the fall of this year. It's expected that two techniques will emerge as the winners, at least for US markets: one terrestrial, one satellite.

As the finish line draws near, companies are jockeying for the home stretch position, tweaking and tuning their systems. There's a *lot* of money riding on the outcome.

Timelines and Political Molasses

I've stayed away from mentioning exactly when all of this new technology will be available, because the answers to those questions are often more political than technical.

When DSR became feasible several years ago, local broadcasters, under the banner of the National Association of Broadcasters, threw a fit. Nationwide CD-quality radio, the NAB said, would leapfrog the existing broadcast industry, eroding markets and creating chaos.

When it comes to IBOC and IBAC techniques, however, the NAB is more embracing—no doubt because those digital systems would ride along with local broadcasters' signals, creating new revenue sources, maintaining local involvement, and so on.

CD Radio Systems President Robert Briskman disagrees with the NAB's outlook on direct satellite broadcasting, foreseeing a "peaceful coexistence," much like the relationship between local TV stations and fee programmers such as HBO.

"You would tune to local stations for funny DJs, local news and sports, and so on," he says, "and you would listen to your favorite CD-quality satellite music channel as your interests demand."

So, although the new technology has been successfully demonstrated, industry experts say it will be at least 1997 (and probably longer) before you can go to your local car audio store and pick up a DAB/DSR/AM/FM/Cassette super radio.

And, as if the wait's not long enough, international political challenges loom on the horizon: Many countries are planning to implement DAB/DSR technologies on varying frequencies that may be incompatible with established radio services of neighboring countries.

Thanks

Putting together even this introductory article on DAB/DSR would have been almost impossible without the help of many industry experts. In addition to those quoted in the article, I'd like to thank John Reiser, WQ4L, of the FCC's Mass Media Bureau; consultant Ed Reinhart; Capital Cities/ABC Engineering VP Al Resnick, K3PXR; and Paul Rinaldo, W4RI, the League's Technical Relations Manager.

And by the way, I sure hope the "light jazz" channel stays in the DSR channel roster. *Hint, hint!* QST

Key Components of Modern Receiver Design—*Part 1*

Today's Amateur Radio receivers routinely achieve performance untouched by earlier generations of ham gear. Can our already excellent equipment be improved still further?

By Dr Ulrich L. Rohde, KA2WEU
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The fact that many presentations have dealt with receiver capabilities and improvements over the years might seem to imply that all receiving problems have been solved and that the technology is mature. On the other hand, a look at the components actually used in the front ends of current receivers by different manufacturers indicates that just the opposite is true. While improvements have been made in mixers, amplifiers and synthesizers—and from a systems point of view there have been some subtle implementations of individual circuits—there is still work to be done! How else can one explain that different receiver designs—with similar block diagrams, and brought to market with the best of intentions—sound different on the air?

Modern ham equipment seeks to achieve high dynamic range in relatively standard, seemingly well-established ways. Nonetheless, I have discovered that it's useful to reevaluate the definition of dynamic range, and how AGC and gain distribution affect it. As part of this discussion, I will show how to overcome the effects of a form of intermodulation distortion long thought unimportant in ham circles—a species of RF IMD that noticeably degrades reception even in high-end Amateur Radio MF/HF transceivers.

Likewise, we may benefit by revisiting the influence of oscillator phase noise on dynamic range, and the well-known interdependence of fast PLL settling time and phase noise. After discussing my findings, I will propose a hybrid synthesizer arrangement—a DDS-driven PLL system—and show how commercial CAD can now accurately predict the SSB phase noise of oscillators and provide the ability to optimize it.

Dynamic Range Types and Issues

There are several types of dynamic range. The first one, and probably the easiest to understand—"AGC range"—concerns whether a receiver is capable of maintaining a constant audio output level over a large input-signal amplitude range. The traditional school of thought requires AGC action to commence at 1 or 2 μV, leading to a condition where signals that produce an excellent signal-to-noise ratio may show absolutely no S-meter indication—a most undesirable effect. The reason for this is inappropriate receiver gain distribution—generally, a lack of gain at the second IF. Maintaining constant audio output must involve gain control at the receiver's second *and first* IFs, and possibly even at its input. I will address this issue later.

Intermodulation-Distortion Dynamic Range

The output of a linear stage tracks the input signal decibel by decibel, with every 1-dB change in its input signal(s) corresponding to an identical 1-dB output change. This is the stage's *first-order* response.

Because no device is perfectly linear, however, two or more signals applied to it *intermodulate* to some degree, generating sum and difference frequencies. These *intermodulation distortion* (IMD) products occur at frequencies and amplitudes that depend on the order of the IMD response as follows:

- *Second-order* IMD products change 2 dB for every decibel of input-signal change,[1] and appear at frequencies that result from the simple addition and subtraction of input-signal frequencies. For example, assuming that its input bandwidth is sufficient to pass them, an amplifier subjected to signals at 6 and 8 MHz will produce second-order IMD products at 2 MHz (8 – 6) and 14 MHz (8 + 6).
- *Third-order* IMD products change 3 dB for every decibel of input-signal change,[2] and appear at frequencies corresponding to the sums and differences of twice one signal's frequency plus or minus the frequency of another. Assuming that its input bandwidth is sufficient to pass them, an amplifier subjected to signals at 14.02 MHz (f_1) and 14.04 MHz (f_2) produces third-order IMD products at 14.00 ($2f_1 - f_2$), 14.06 ($2f_2 - f_1$), 42.08 ($2f_1 + f_2$) and 42.10 ($2f_2 + f_1$) MHz. The subtractive products (the 14.00 and 14.06-MHz products in this example) are close to the desired signal and can cause significant interference. This is why our receivers' third-order IMD performance is so important.

It can be seen that the IMD order determines how rapidly IMD products change level per unit change of input level. *N*th-order IMD products therefore change by *n* dB for every decibel of input-level change.

IMD products at orders higher than three can and do occur in communication systems, but the second- and third-order products are most important in receiver front ends.

Intercept Point

The second type of dynamic range concerns the receiver's *intercept point*, sometimes simply referred to as *intercept*. Intercept point is typically measured by applying two or three signals to the antenna input, tuning the receiver to count the number of resulting spurious responses, and measuring their level relative to the input signal.

Because a device's IMD products increase more rapidly than its desired output as the input level rises, it might seem that steadily increasing the level of multiple signals applied to an amplifier would eventually result in equal desired-signal and IMD levels at the amplifier output. Real devices are incapable of doing this, however. At some point, every device *overloads*, and changes in its output level no longer equally track changes at its input. The device is then said to be operating in *compression*. Pushing the process to its limit ultimately leads to *saturation*, at which point input-signal increases no longer increase the output level.

The power level at which a device's second-order IMD products equal its first-

[1]Notes appear on page 32.

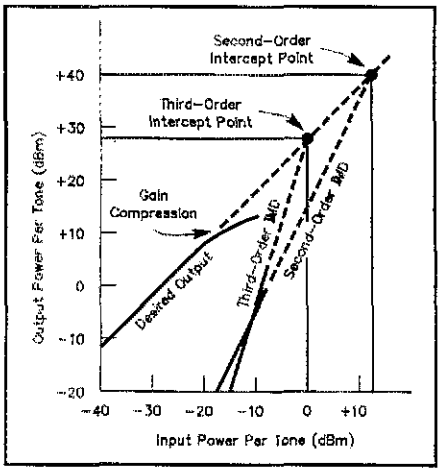

Figure 1—A linear stage's output tracks its input decibel by decibel on a 1:1 slope—its *first-order* response. *Second-order intermodulation distortion (IMD) products* produced by two equal-level input signals ("tones") rise on a 2:1 slope—2 dB for every 1 dB of input increase. *Third-order IMD products* likewise increase 3 dB for every 1 dB of increase in two equal tones. For each IMD order *n*, there is a corresponding *intercept point* IP_n at which the stage's first-order and *n*th order products are equal in amplitude. The first-order output of real amplifiers and mixers falls off (the device overloads and goes into *compression*) before IMD products can intercept it, but intercept point is nonetheless a useful, valid concept for comparing radio system performance. The higher an amplifier or mixer's intercept point, the stronger the input signals it can handle without overloading. The input and output powers shown are for purposes of example; every receiver exhibits its own particular IMD profile. (*After W. Hayward,* Introduction to Radio Frequency Design, *Figure 6.17*)

order output (a point that must be extrapolated because the device is in compression by this point) is its *second-order intercept point*. Likewise, its *third-order intercept point* is the power level at which third-order responses equal the desired signal. Figure 1 graphs these relationships.

Input filtering can improve second-order intercept point; device nonlinearities determine the third, fifth and higher-odd-number intercept points. In preamplifiers, third-order intercept point is directly related to dc input power; in mixers, to the local-oscillator power applied.

Intercept point can be confusing because it can be specified in terms of input or output power. Intercept point should be referred to device *output* because that's where the trouble occurs, but input intercept is commonly given. Therefore, if an amplifier or a mixer has a particular intercept point—let's say +30 dBm at 10 dB gain—and then its gain is increased by an additional 10 dB, its dynamic range *decreases* by the amount of the gain.

A good example of this confusion is the highly acclaimed Plessey SL6440C active mixer. DeMaw and Collins[3] evaluated this device with 200-Ω input and output terminations. Their findings were based on a device gain of 8 dB, maximum, and an output intercept point of +30 dBm. By the time the SL6440C's output impedance is raised to 1.5 kΩ on each collector, all other things being equal, its intercept point deteriorates to about +10 dBm. The additional gain favors the intermod products, degrading the intercept point by 20 dBm and destroying the mixer's dynamic range. It's therefore highly desirable to keep mixing and amplification functions separate—mixer first, amplifier second. A smart way to accomplish this is to put a crystal filter between the two to band-limit the spectrum, and thus the signal power, applied to the post-amplifier. More on this concept later.

Blocking and Desensitization

Because of its noise sidebands, a receiver's synthesizer mixes adjacent-channel signals into the IF chain as noise even though the signals themselves fall outside the IF passband. The result is a degradation of receiver noise floor known as *blocking* or *desensitization*.[4]

In addition, synthesizers are frequently *dirty*—spectrally impure—specifically if complicated mix and divide arrangements are used. Even most modern direct digital synthesizers do not take advantage of configurations that minimize unwanted spurious response. In this article, I will look at a way of drastically improving a synthesizer's output purity while reducing costs at the same time.

Tone Spacing and Measurement Results

Dynamic-range characteristics that involve two or more signals also depend on the signals' frequency spacing. In the standard case, where the desired, low-level signal is bothered by a stronger signal, a receiver's performance drastically varies as a function of the spacing between the two. Most receiver measurements of this type are conveniently done at a test-signal ("tone") spacing of 20 to 25 kHz. Real life is often not so generous! Strong signals may be spaced only a few kilohertz apart, and the receiver's first-IF ("roofing") crystal filter (say, 15 kHz wide) does not protect the second mixer as a much narrower filter, like the 2 to 4-kHz units commonly used for SSB, would do. In a radio using a 15-kHz first-IF filter and a 2.5-kHz second-IF filter, the second mixer must therefore digest the signal energy in 12.5 kHz of spectrum invisible to circuitry after the second-IF filter. The wider roofing filters (Figure 2) used in some amateur equipment makes life even harder for the second mixer.

The standard AGC approach derives its control voltage from second-IF energy and does not even acknowledge the existence of these signals. The current trend to replace IF stages with digital signal processing will aggravate this situation even more because A-to-D converters do not respond gracefully to signals that exceed their dynamic range. AGC attack time can therefore be particularly critical in DSP-equipped receiving systems even if the AGC range is otherwise adequate.

How to Deal with These Issues

What Do We Find

Is the receiver's AGC, selectivity and gain distribution proper? Figure 3 shows the front-end and IF block diagram of a reasonably standard transceiver design—that of the recently introduced Kenwood TS-50 transceiver. The first IF stage of its receiver (TX-RX Unit Q17, a 3SK121 MOSFET) receives AGC, but that this AGC is derived from the output of the radio's *second*-IF chain. For the reasons described earlier, this system cannot protect the TS-50's second mixer from overload caused by signals inside the roofing filter passband and outside the passbands of the switchable filters that head its second IF. A further drawback of this AGC method is that Q17's third-order intercept point worsens as its gain is reduced—a characteristic intrinsic to MOSFETs that are gain-controlled in this way. Using a differential amplifier or PIN-diode attenuator as the gain-controlled stage would avoid this.

Radios constructed along similar lines often suffer from:

- Insufficient AGC range. Listen to a full-carrier, double-sideband AM signal, modulated at least 50%, at a level of 100 mV or more. You will likely hear distortion because many receivers' AGC circuitry run out of control range by the time incoming signals reach this level.
- Overload related to insufficient AGC if a 20-mV signal that appears 5 kHz away from a properly tuned-in CW or SSB signal falls inside the roofing filter passband and outside the second-IF filter.
- Desensitization caused by LO spurious signals and phase noise, which can allow strong nearby carriers to raise the receiver noise floor. Does your all-band transceiver allow you to tune to an input frequency of 5 or 10 kHz instead of 500 kHz or higher? Interesting time and standard-frequency signals can be received below 50 kHz, but designers of receivers and transceivers usually disallow tuning

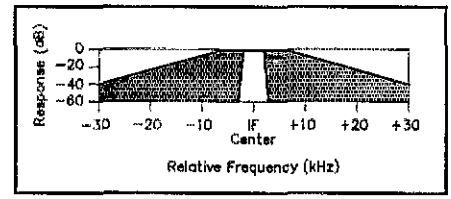

Figure 2—Signals that fall within the passband of a receiver's *roofing filter* (shaded and unshaded zones under curve) but outside the passband of subsequent narrower filters (unshaded zone) can overload the circuitry between them.

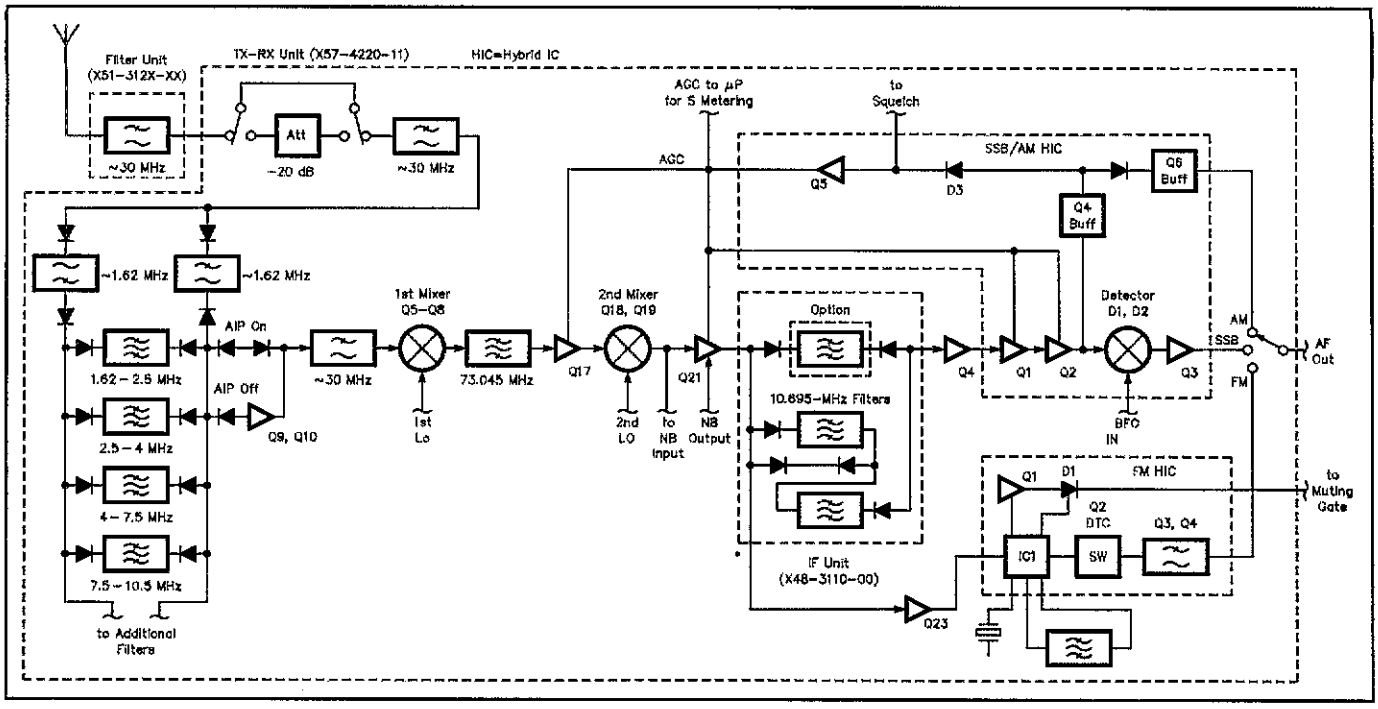

Figure 3—In keeping with general practice in Amateur Radio transceivers, Kenwood's TS-50 applies only second-IF AGC to amplifier stages between its roofing and second-IF filters.

below 100 kHz because of their limited synthesizer purity. Your radio's firmware-set lower tuning limit directly reflects how "good" its synthesizer really is.

The Right Approach

Distributed AGC

Figure 4 shows a partial block diagram of a receiver with distributed AGC that includes second-mixer overload monitoring. One AGC loop operates at the front end and protects the input stage with an electronically controlled attenuator. In most radios, this attenuator is *manually* operated from the front panel and offers a gain-reduction range of perhaps 30 dB in 5, 6 or 10-dB steps. Many operators find its use somewhat confusing because it changes the S-meter indication. Modern microprocessor-controlled radios should be capable of selecting the proper attenuation level and correcting the signal-meter indication appropriately.

Signal-Strength Metering

S-meter calibration, indication and use have long been somewhat emotional issues in Amateur Radio. I strongly recommend that we redesign our signal meters along the lines of those used by our professional colleagues, calibrating them from −20 dBµV (0.1 µV in 50 Ω) to +100 dBµV (100 mV in 50 Ω)—a 120-dB range. Such a system requires that a receiver's AGC system have enough pre-detector gain so that the AGC operates on IF noise alone. Note that, per Table 1, −20 dBµV is close to the extrapolated definition for S0 of about 0.07 µV.[5]

Aside from its objectivity, this arrangement offers the advantage of allowing true comparisons between signals, and accurate system-parameter measurements (such as antenna front-to-back ratio, useful characterization of which is all but impossible with most S-unit-based signal indicators).

In addition to good second-IF AGC and controllable input attenuation, implementing a 120-dB-range signal meter in a multiconversion receiver requires AGC at the radio's *first* IF. Previous attempts to do this were based on PIN-diode attenuators and have not been followed through by many designers.

The major drawback of the diode-

Table 1
S-Unit Equivalents Based on S9 = 50 µV in 50 Ω

S9	50 µV
S8	25 µV
S7	12.5 µV
S6	6 µV
S5	3 µV
S4	1.3 µV
S3	0.75 µV
S2	0.3 µV
S1	0.15 µV
S0	0.07 µV*

*Extrapolated from S1 value; see text and Note 5.

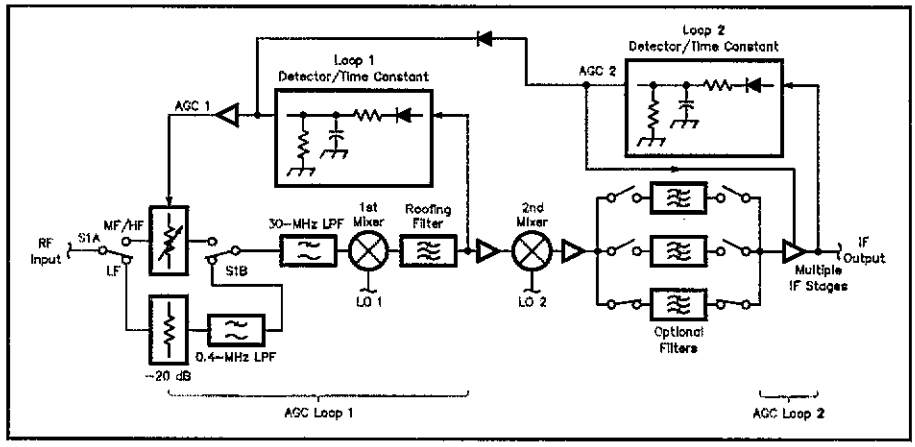

Figure 4—This receiver block diagram includes *two* AGC loops—one driven by first-IF energy that is band-limited by the roofing filter, and another driven by second-IF energy band-limited by the optional second-IF filters. The first loop controls a PIN-diode pi attenuator ahead of the first mixer; the second loop controls second-IF amplifier stages. A microprocessor adjusts the time constants of both loops so that time delays introduced by the filters do not cause AGC oscillation. For clarity, this block diagram omits the input filtering (to the left of RF Input) necessary for a practical system.

attenuator approach, besides its cost, is that an attenuator's noise figure equals its insertion loss. Assuming that such a system's AGC comes from a single AGC detector (usually at the end of the second IF in multiconversion receivers), sophisticated control circuitry is needed to adjust the system's AGC time constant as different IF filters are selected. Otherwise, the varying time delays contributed by different IF filters may cause AGC instability.

Independent First-IF AGC

The correct solution to this problem is an additional AGC loop that operates entirely at the first IF. A monitoring stage samples the second mixer's input level and applies AGC to gently attenuate signals that would otherwise overdrive the second mixer. Although this may limit the maximum signal-to-noise ratio achievable by wanted signals, it also cleans up intermodulation problems that would otherwise occur. Properly implemented and operated in conjunction with good second-IF AGC, independent first-IF AGC like this can largely free us of the receiver-generated intermod products we all too often experience on the air.

Some Comments on Switching Diodes

The receiver sections of amateur MF/HF transceivers generally use diode-switched front-end filtering. The switching diodes used have low junction capacitance and can typically handle medium dc levels (10 to 100 mA). These characteristics are important because we want these diodes to contribute minimal loss when turned on and leak very little RF when turned off.

The two-tone, third-order IMD dynamic-range testing routinely done to amateur transceivers seems to point up no weakness in these switching diodes. In real life, however, a huge number of signals simultaneously appear at a transceiver's antenna connector. Periodically, their voltages all sum in phase, producing, for short durations, enough voltage to change the bias of the diode at the input of the filter in use. This causes intermodulation distortion—generally, second-order IMD. This is ironic for two reasons: First, this diode-generated IMD generates exactly the interference the filters switched by the diodes are supposed to prevent! Second, Amateur Radio equipment reviews have long let second-order front-end IMD go unmeasured because we have long assumed that our radios' front-end filtering reduces this IMD to a nonproblem. Later in this article, I will present measurement results that prove that second-order IMD is a very real problem today.

The best way to avoid switching-diode IMD is to switch the filters with relays instead of diodes, and military and commercial gear generally take this approach. Relays are costly, however. A less expensive

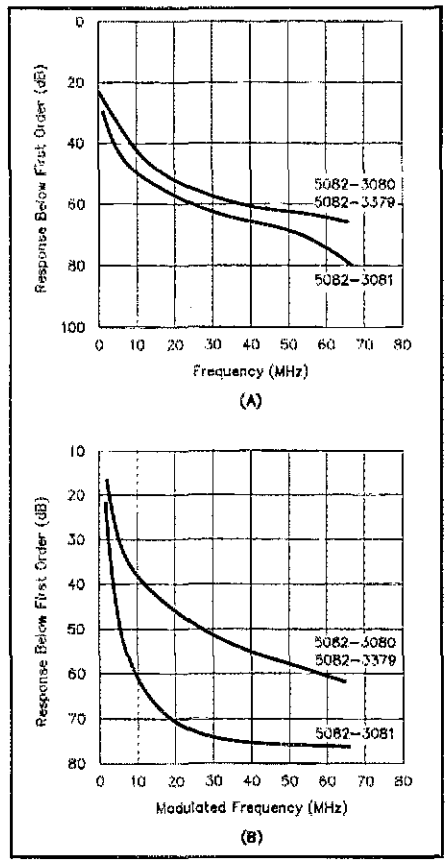

Figure 5—Typical second-order IMD (A) and cross-modulation distortion (B) responses of RF PIN diodes. Cross-modulation distortion, an effect also long untested in most Amateur Radio equipment reviews, is particularly important in these days of superpower shortwave broadcasters operating in and adjacent to Amateur Radio bands. Cross-modulation causes one signal's modulation to appear on other signals passing through the distorting device. (Conditions for A: 10-dB bridged-T attenuator; 40 dBmV output levels; one input frequency fixed at 100 MHz. Conditions for B: 10-dB bridged attenuator; 40 dBmV output levels; unmodulated frequency fixed at 100 MHz; variable frequency 100% modulated by 15-kHz audio.)

work-around that's acceptably good for Amateur Radio equipment is to use diodes—PIN diodes—designed for this application. The two best-known US manufacturers of PIN diodes for this type of low-frequency application are Hewlett-Packard and Alpha Industries. The best diode for the shortwave range is the HP 8052-3081. (A similar Alpha diode with a minority carrier lifetime of 4 µs is also available. The Alpha diode can handle higher power.)

A hot-carrier diode's lowest frequency of operation is determined by the inverse of the lifetime of its minority carriers. For the HP 8052-3081, which has a minority carrier lifetime of 4 µs, the lowest frequency is therefore 250 kHz (1÷0.000004). Figure 5 shows the intermodulation distortion properties of several HP hot-carrier diodes, including the 3081, as a function of frequency and bias.

Notes

[1]This figure assumes that the IMD comes from *equal-level* input signals.

[2]This figure also assumes equal-level input signals.

[3]D. DeMaw and G. Collins, "Modern Receiver Mixers for High Dynamic Range," *QST*, Jan 1981, pp 19-23.

[4]This characterization of blocking differs from what we call *blocking* in ARRL Lab receiver testing for *QST* Product Reviews. We define a receiver's blocking dynamic range as the difference, in decibels, between the signal power that produces a 3-dB signal-plus-noise to noise ratio (in other words, the receiver's *minimum discernible signal* [MDS]) and the power of an out-of-passband signal that reduces the audio output produced by a desired signal (at a level 10 dB below the radio's 1-dB compression point for radios with their AGC turned off, or equal to 20 dB above MDS for radios with AGC that cannot be turned off) by 1 dB. This measurement indirectly reflects the purity of the oscillators involved if they are so noisy that reciprocal mixing raises the receiver noise floor enough to mask the onset of blocking. When this occurs, we characterize that measurement as *noise limited* and denote it as such in the Product Review. —*Ed.*]

[5]Purists considering "S units" in terms of the RST signal-reporting system (in which the lowest S number is 1) may insist that there is no such thing as "S0," but we have not exhausted the communication possibilities afforded by today's real-world radio links by the time we've worked downward to S1 on a 6-dB-per-S-unit basis from the decades-old amateur "standard" of S9 = 50 µV in 50 Ω. Solid communication can often be established and maintained at signal levels too weak to move our S meters.—*Ed.*]

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QST

Coming in Part 2:
Building these concepts into receivers.

You Can Build: A Compact Loop Antenna for 30 through 12 Meters

Are you looking for a low-profile, compact antenna? With a coat of camouflage paint added to it, you could park this one just about anywhere!

By Robert Capon, WA3ULH
322 Burlage Cr
Chapel Hill, NC 27514

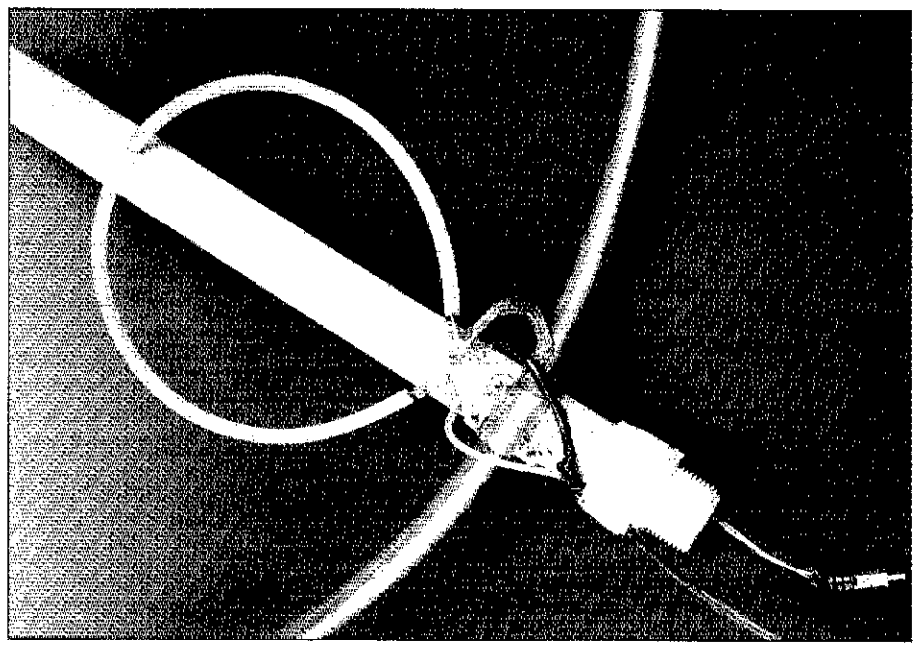


Figure 1—A close-up of the coupling-loop attachment.

I was intrigued by Franz (DL9RBT) Freller's miniature loop antenna.[1] It looked like the perfect portable-antenna solution for my QRP station! I wrote to Franz for information and received a prompt reply. Armed with construction information, I can now tell you how to build a multiband miniature loop antenna that can be set up in less than five minutes. This antenna is compact and performs on a par with a commercial multiband vertical antenna and it's inexpensive—about $35.

A Little Background

This loop is a physically small antenna—only 1/8 of a wavelength in circumference on 20 meters, increasing to 1/4 wavelength on 12 meters. There's extremely low resistance within the loop. It's tuned with a single-section variable capacitor and has a very high Q. As a result, the antenna exhibits a narrow bandwidth on 20 meters (10 to 20 kHz between the 2:1 SWR points), so the capacitor must be adjusted to retune the loop as you move across the band. On the higher-frequency bands, however, the loop has a progressively lower Q and a broader bandwidth (40 to 50 kHz). In fact, the narrow bandwidth and need for frequent retuning on the lower bands is the antenna's only drawback.

The antenna's outer copper-tubing loop (see Figure 1) is inductively coupled to the feed line by means of a small coax loop. This might appear to be a short-circuit because the small loop is attached to the feedline's center conductor and shield. Actually, the small loop is not a short-circuit at all, but a one-turn inductor coupling to the large loop. The ground (braid) side of the small loop is attached to the large loop. This braid connection does not feed the signal to the large loop; it eliminates capacitive coupling between the two loops.

Mounted in the vertical plane, the antenna is directional; the nulls are perpendicular to the loop's axis and the antenna can be mounted quite close to the ground. If the loop is physically horizontal, it exhibits an omnidirectional pattern. In the horizontal plane, the loop should be at least 1/2 wavelength (about 33 feet on 20 meters) above the ground to work effectively. Installed horizontally, the antenna has a low angle of radiation—excellent for working DX.

Antenna efficiency depends on keeping the loop's surface resistance at an absolute minimum. *Don't* use small-diameter wire to connect the capacitor to the loop. Also, make the connections between the capacitor and the loop conductor as short as possible to eliminate unwanted resistance.

The loop develops a large voltage across the capacitor, and a minimum plate spacing of 3 mm is required for a transmitter output of 100 W. Because I used a small, single-section, air-variable capacitor (available from Ten-Tec[2]) the antenna handles a maximum applied power of approximately 7 W. If you use a different variable capacitor, make sure that it has a value of 2 to 100 pF. It's best to use a tuning capacitor equipped with low-resistance wiper contacts. You may be able to find a suitable tuning capacitor in a friend's junkbox, at a hamfest or a surplus parts outlet. You'll also need an enclosure in which you can house the capacitor; I used a plastic box.

Antenna Construction

Table 1 provides a complete parts list for the antenna. For the large copper loop, I bought 8 feet, 3 inches of 7/8-inch-diameter coiled copper plumbing pipe at a local hardware store for $1.09 per foot. The coiled copper pipe is easy to shape into a loop. The copper pipe dents easily, so handle it carefully. Uncoil the pipe and gently work it into a loop a little at a time. You may find it easiest to work the pipe while it's flat on a carpeted floor or work mat.

[1]Notes appear on page 36.

Table 1
Loop Antenna Parts List

Basic Antenna: 8¼-foot length of ⅝-inch-diameter coiled copper tubing; Ten-Tec 2- to 100-pF variable capacitor (Ten-Tec part no. 23227, available from Ten-Tec, 1185 Dolly Parton Pkwy, Sevierville, TN 37862, tel 615-453-7172, fax 615-428-4483); 20-inch length of RG-8 center conductor and dielectric; Radio Shack enclosure (270-231); Radio Shack knob (274-415), 2-inch-long #8 bolts and nuts; electrical eyelets.

Mast: Two 10-foot lengths of 1-inch-diameter PVC plumbing pipe; three T joints; four male thread-on caps; one female thread-on cap; five end-caps.

Motorized Drive Option: Radio Shack SWR Meter (21-524); two Radio Shack momentary DPDT toggle switches (275-637); Radio Shack female panel-mount phono jack (274-346); Radio Shack battery holder (270-382); 1-rpm high-torque dc motor, such as Edmund Scientific K41860 (12 V dc) or K41327 (3 V dc); 2½-inch-diameter hose clamp.

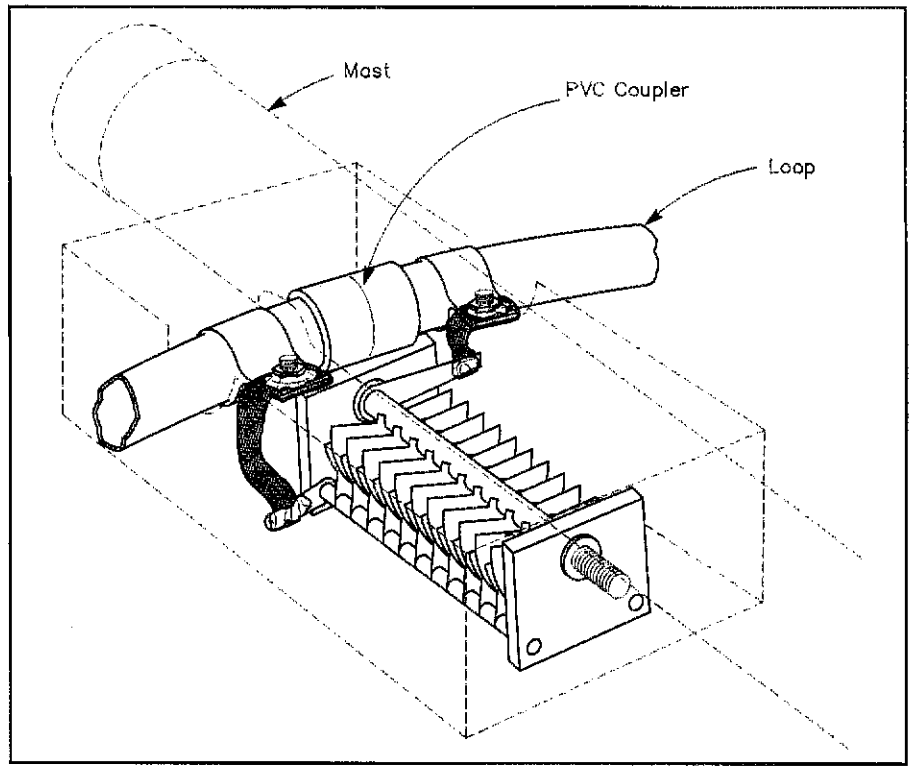


Figure 2—The tuning capacitor is housed in a plastic enclosure that is taped to the mast. Heavy copper braid is used to connect the capacitor rotor and stator sections to the copper-tubing loop.

There are two ways you can mount the tuning capacitor. One way is to use a punch (or nail and hammer) to dent the copper pipe approximately ⅜-inch in from each of the open ends of the loop to provide a drill-bit guide. Drill two ⅛-inch-diameter holes in the pipe. At the connection points, clean the pipe with no. 0000 steel wool and tin the copper loop and capacitor tabs. Bend the capacitor tabs into the small holes drilled into the pipe. Solder the capacitor tabs in place with a 150-W soldering iron or a small soldering torch. Ensure that the loop is adequately heated so that the solder flows into the connection.

A second, and better method (see Figure 2) is to secure the capacitor to the loop by fabricating two short mounting straps, soldering those straps to the ends of the loop, then using copper braid to obtain a low-loss connection to the straps and the tuning capacitor tabs. With this method, use a ½-inch PVC coupler as an end insulator to separate the loop halves.

Cut a 4-foot length of 1-inch OD PVC pipe and cement a threaded male PVC fitting to the bottom using PVC pipe cement (available at most hardware and plumbing supply stores). PVC cuts and drills easily and its joints weld solidly together with the PVC cement. *Be certain to use the cement only in a well-ventilated area!* Read and observe the precautions on the label.

Cut a ½-inch-square notch in the 4-foot pipe approximately 3 inches from the top. Place the loop assembly inside the notch, and fasten the loop to the pipe with the capacitor enclosure as a cover. You'll have to cut a ⅝-inch-diameter hole in the enclosure's end to pass the capacitor's shaft. I strapped the enclosure to the mast with plastic tie wraps. (See Figure 3.)

Fabricate an aluminum bracket to secure the loop's bottom to the PVC pipe. If you use the Radio Shack enclosure, simply cut off a 1-inch strip from either side of the aluminum cover (resulting in a 1-inch sheet metal strap with two holes in the ends), bend the sheet metal over a ½-inch-OD form (such as the handle of a socket wrench), and form ½-inch tabs using pliers. Fasten the loop to the mast with the homemade bracket using a pair of 2-inch #8 bolts.

The small coupling loop is made from a 20-inch length of RG-8 coax center conductor and dielectric. (Save the ground braid for later use.) To facilitate mounting the small loop, I used electrician's eyelets crimped and soldered to the ends.

The coupling loop is fastened to the PVC pipe with a pair of 2-inch-long #8 bolts. Fasten the coax feed line to the same bolts that hold the loop to the mast. Attach the center conductor to one side of the small loop and the shield to the other side. Run a 2-inch length of RG-8 braid from the ground side of the small loop to the metal mounting strap of the large loop.

Put the finishing touches on the antenna by cleaning the entire loop with no. 0000 steel wool and applying two coats of polyurethane varnish. In addition to making the copper shine, this prevents the copper from tarnishing (allowing a build-up of surface resistance) which lowers the loop's radiation efficiency.

A 20- to 40-m loop can be fabricated by using different values: a loop diameter of 1.7 meters and a small coupling loop diameter of 0.34 meter. Such a configuration will have a bandwidth of only 5 kHz on 40 meters, but should exhibit excellent efficiency and a broader bandwidth (20 to 40 kHz) on 20 meters.

Building the Mast

The antenna is so light that you can use almost anything to support it. You could plant it in the ground with a length of aluminum mast, or even hang the antenna with nylon rope for really portable operation.

To support the loop, I modified a design of a PVC base and mast developed by Bruce Auld, NZ5G. This free-standing PVC support structure can be assembled in just a few minutes. The structure has five components: an **H**-shaped base measuring 3 feet on each side, a 4-foot vertical PVC pipe mast, and the 4-foot PVC structure supporting the loop (see Figure 4).

To fabricate each side of the **H** base, cut two 18-inch lengths of PVC pipe and cement one 18-inch section into each end of a PVC **T** connector. Cement PVC end-caps onto the ends of the 18-inch sections. The cross piece of the **H** base is identical to the side pieces, except the ends are finished with male thread-caps instead of end-caps. For the vertical mast, cut a 4-foot length of PVC. Cement a male thread cap to the bottom of the mast (which is threaded to the **H** base), and a female thread cap to the top of the mast (which is threaded to the antenna).

Motorizing the Loop

Franz Freller's photograph in *QST* shows

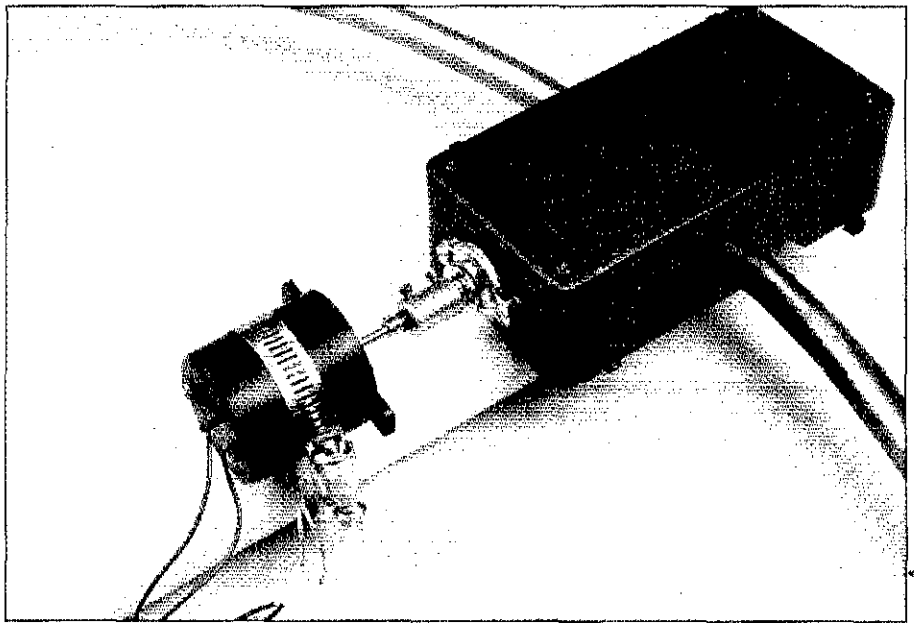


Figure 3—A small dc motor drives the capacitor. In this version, a reduction drive has been added to further decrease the tuning rate (see the sidebar "The Capon Loop and the ARRL Lab"). A shaft coupling links the motor to the capacitor. A 2½-inch-diameter hose clamp fastens the dc motor to the PVC mast. The motor control cable is inside the PVC mast and equipped with a phono plug for quick connection.

a manual lever he used to tune the capacitor. This works fine for many installations, but if you intend to operate the loop remotely, consider building a motor drive for the capacitor.

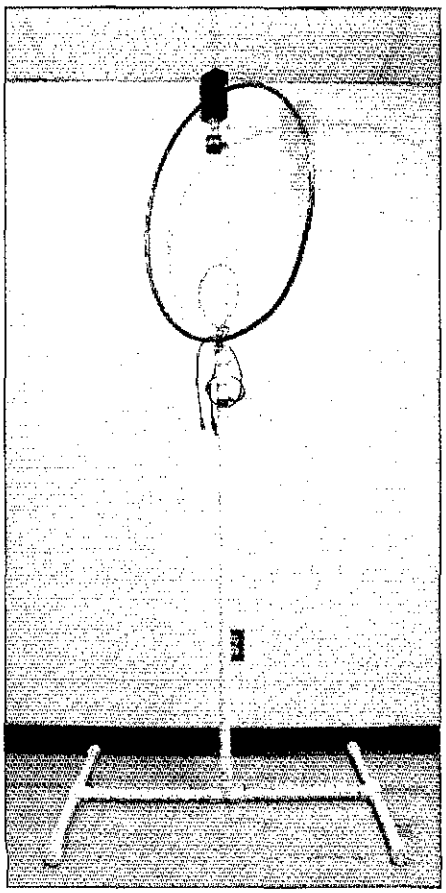


Figure 4—The antenna is supported by an H frame made of PVC pipe.

So I could tune the antenna's capacitor and measure SWR using a single control box, I built a motor-drive controller inside a Radio Shack SWR meter (21-524). I cut two holes in the top of the meter enclosure and installed two momentary contact DPDT toggle switches. I wired the switches (see Figure 5) so that they send positive and negative voltages to the motor drive to turn the motor in either direction.

I found a scrapped high-torque dc motor. The motor turns at about 1 rpm when powered by 2 AA cells. If you can't find the right motor in your scrapbox, Edmund Scientific[2] sells a high-torque 1-rpm dc motor for $22.50. There are two motor models: a 12-V motor (that can be driven by your transceiver's power supply) and a 3-V motor that can be powered by AA cells.

A shaft coupling links the motor to the capacitor. A 2½-inch-diameter hose clamp fastens the dc motor to the PVC mast. I ran the motor control cable inside the PVC mast and put a phono plug on the end for quick connection.

Safety Notes

The loop produces significant RF output, so please follow these precautions. Locate the antenna as far as possible away from people while it's in use and use the minimum power output necessary to maintain communication. Don't touch the antenna or the capacitor when transmitting! You can get an RF burn. For a thorough discussion of RF radiation safety, see Chapter 1 of *The ARRL Antenna Book*, or Chapter 36 of *The ARRL Handbook*.

The Capon Loop and the ARRL Lab

When the loop antenna was brought to the Lab for evaluation, I was excited about testing it because I'd done some antenna modeling of small loops using *ELNEC*.* I'd learned that a small loop at low heights above ground slightly outperforms a half-wave dipole at low angles of radiation (those best for DX). I was intrigued to see how a home-brew version of the popular small loop would work.

We first asked ARRL Laboratory Engineer Zack Lau, KH6CP, to do some testing for us. He set up the antenna in the large open space just south of the Headquarters building. Zack found that with the supplied capacitor, a good SWR could be obtained from 10 to 25 MHz, covering the 30- through 12-meter ham bands. (A capacitor with a lower minimum value of capacitance would allow coverage of the 10-meter band.)

I took the antenna home to give it a try on the air. Because the weather was cold and icy, I set up the antenna in my kitchen, about 20 feet from my shack. It tuned up nicely! I did find that the 1-rpm motor had a bit of overshoot, but it didn't take much practice to tune the antenna to nearly a 1:1 SWR. Although I was using a 9-V transistor battery to power the 12-V motor, the motor had more than enough torque to do the job, even at the lower voltage.

As Rob says, transmitter output powers greater than 7 W were too much for the tuning capacitor employed. But, I'm an avid QRPer, so I throttled the rig back to 5 W and called CQ on 14.060 MHz. Much to my surprise, my first CQ was answered by *two* stations! This antenna played! The band was fading fast, but I received a 559 signal report. A few other contacts proved that the antenna did indeed work. I returned the antenna to Headquarters the next day and bragged a bit about my QRP accomplishments.

Later, we decided to experiment and further decrease the tuning rate, so we added a 6:1 reduction drive salvaged from a dial drive. This made tune-up even smoother.

Reluctantly, I returned the loop to the author. I'd been thinking about a small loop antenna for portable work and HF mobile on my pickup truck. Playing with Rob's loop antenna for a couple of days convinced me: This antenna is for me!—*Ed Hare, KA1CV, ARRL Lab Supervisor*

*Available from Roy Lewallen, W7EL, PO Box 6658, Beaverton, OR 97007.

Operating Results

I set up my antenna indoors vertically on its short PVC mast. When I tuned up the antenna, I found that incoming signals were on par with my full-size multiband vertical antenna that's mounted outside on a 20-foot mast.

The loop has a narrow bandwidth of about 20 kHz on 20 meters between the 2:1 SWR points and a progressively broader bandwidth on the upper bands. As expected, the antenna is quite directional, so I can null out interfering stations by simply rotating the antenna.

I use the antenna with my little MFJ-9020 transceiver, powered by a solar-charged gel cell, running about 3.5 W. My first two contacts using the loop on 20 meters were Z32RC in FYR Macedonia and I8WWV in Italy.

Summary

For amateurs who are restricted from using outdoor antennas, this miniature loop antenna is an excellent alternative. Because it takes up very little space and sets up in minutes, it's great for Field Day and other portable use. The antenna works well on 12 through 30 meters and I'm sure a 20- through 40-meter version could be built.

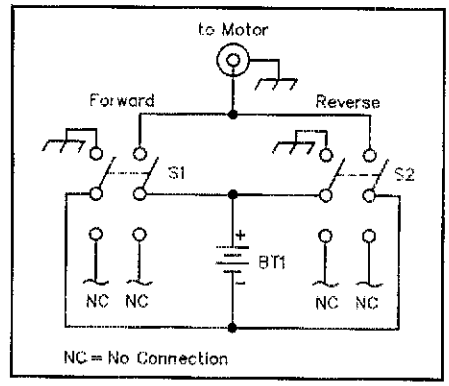


Figure 5—Schematic of the motor drive circuit. A pair of DPDT momentary contact switches supply positive and negative voltages to turn the motor forward and backward.

Acknowledgment

My special thanks to Franz Freller, DL9RBT, for inspiring this project and for providing me with the necessary background information on how to assemble this miniature loop antenna.

Also, thanks to Bill Hutchins, KM4UO, who assisted me with the construction of the antenna.

Notes

[1]F. Freller, DL9RBT, "Up Front," *QST*, Dec 1992, p 11.

[2]Edmund Scientific Co, 101 E Gloucester Pk, Barrington, NJ 08007-1380; order tel 609-547-8880, fax 609-573-6295; customer service tel 609-573-6260.

New Books

SPACE SATELLITE HANDBOOK

By Anthony "Tony" Curtis, K3RXK

Gulf Publishing Company, PO Box 2608, Houston, TX 77252-2608; tel 713-529-4301. Third Edition, 1994, 346 pp; B&W diagrams, illustrations, tables; 8½×11 inches, hardcover. Retail $39.

Reviewed By Steve Ford, WB8IMY
Assistant Technical Editor

The third edition of the *Space Satellite Handbook* is a rare and pleasant discovery. It's one of those few references that won't put you to sleep five minutes after you open the cover. On the contrary, Tony Curtis keeps you going with fascinating tidbits of knowledge and a conversational narrative.

For example, he doesn't simply tell you that there are more than 100,000 manmade pieces of space junk orbiting our planet. To add spice to such potentially dry information, Tony describes what happened when some larger pieces took the big plunge homeward. (Australia seems to be a favorite target for orbital bombardment.) He also discusses how the junk got there in the first place. (Like the screwdriver that got away from a Russian cosmonaut a few years ago.)

The *Space Satellite Handbook* makes the job of understanding satellites easier by separating them into groups with corresponding chapters: communication, search-and-rescue, weather, earth-observing, navigation, military science, manned and extraterrestrial. Amateur Radio satellites are found in the communication-satellite chapter. Tony devotes 22 pages to past, present and future ham satellites. Because this book is intended for a less technical audience, you won't find great detail about power systems, transponders, ground-station requirements and so forth. Instead, he focuses on brief biographies of each bird. The information in this section is accurate, except where he speaks of a few current satellites in the future tense—as though they weren't in orbit yet. The information concerning Phase 3D is out of date because of recent design changes. These errors are understandable when you consider the rapid progress the Amateur Radio satellite program has enjoyed during the past several years. Keeping up with the ever-changing world of ham satellites is any author's nightmare.

As you read each chapter, you can't help but pause and say, "Hey, I didn't know that!" Did you know that the Russians plan to orbit a replacement for the *Mir* space station in 1997? I didn't until I read the manned-satellite chapter. Until I browsed through the Satellite Scorecard on page 82, I was unaware that Luxembourg has three payloads in orbit (launched by other nations). You've probably heard of the NAVSTAR global positioning satellites (GPS), but do you know how much they've revolutionized the world of mapmaking? A sidebar on page 101 tells the story of how GPS has caused cartographers to revise maps they once thought were highly accurate. In one example, the position of a flagpole on a topographical map of Honolulu had to be moved 1480 feet to the southeast!

It's unfortunate that Tony's attention to NAVSTAR, the current DoD satellite navigation system, caused him to shortchange the earlier, but excellent, NAVSAT system, which he addresses mainly at the individual satellite level, rather than at the system operational level. Even though it was the very first satellite navigation system, NAVSAT was so good that it remained in operational use by DoD for 30 years, it was used over a similar period by the US Coast and Geodetic Survey and others throughout the world for precision cartography, and it continues to serve commercial and recreational users to the present day. NAVSAT surveys determined mapping errors such as the misplacement by cartographers of the Australian subcontinent by a few hundred meters. Depending on the receiving system used and the time duration over which observations are made, NAVSAT can determine position to accuracies of a few centimeters, which is quite a contrast to Tony's quote of best accuracy of 4.9 feet. [NAVSAT was conceived, developed, and managed for the US Navy by the Applied Physics Laboratory of The Johns Hopkins University, which is very near Tony's home.—*K3KMO*]

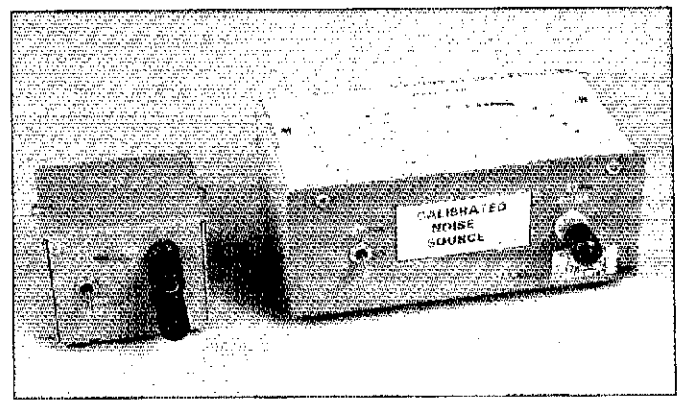
More than 140 pages are set aside for a master list of all satellites—those presently in orbit and those that have met their fate in the atmosphere. Each satellite is cataloged by the year it was launched, its international designation, its name, its country of origin and its launch date. In most cases, Tony includes basic information about each bird's orbit (period, inclination, apogee altitude and perigee altitude). If a satellite is in orbit now (or ever was in orbit), you'll find it in this list.

Tony Curtis has done a stellar job (forgive the pun) with the *Space Satellite Handbook*. This is a must-have reference for anyone with an interest in space technology. It makes a great coffee table or bedside book, and I suspect it would be invaluable for high school and college students. The most serious flaw I could find was the lack of photography. The history of satellites is full of exciting photos and I'm sure a few would add to the atmosphere of the book. Even so, Tony's tight writing style fills the gaps. Your imagination can do the rest.

A Calibrated Noise Source for Amateur Radio

Calibrated and stable noise sources are expensive —but not this one! Here's a reliable unit *you can build* at a quite reasonable cost.

By William E. Sabin, WØIYH
1400 Harold Dr, SE
Cedar Rapids, IA 52403



WØIYH's calibrated noise sources. The smaller 1 MHz to 2.5 GHz unit is to the left of the 0.5 to 500 MHz noise source.

Most hams know about the noise sources included in RF bridges that are used to measure impedances and adjust antenna tuners. A somewhat different device—an *accurately calibrated and stable* noise source—is also useful. If you combine a broadband RF noise source of known power output and known output impedance with a true-RMS voltmeter, you have an excellent instrument for making interesting and revealing measurements on a variety of circuits hams commonly use. (Later on, I'll identify some examples.) The true-RMS voltmeter can be an RF voltmeter, a spectrum analyzer, or an AF voltmeter[1] at the output of a linear receiver.

Calibrated noise generators and noise-figure meters are available at medium to *astronomical* prices. Here, I'll describe a *low-cost* approach you can use with reasonable confidence for many amateur applications where accuracy to tenths of a decibel is not needed, but where precision (repeatability) and comparative measurements are much more important. PC boards are available for this project.[2]

Semiconductor Noise Diodes

Any Zener[3] diode can be used as a source of noise. If, however, the source is to be calibrated and used for reliable measurements, avalanche diodes specially designed for this purpose are preferable by far. A good noise diode generates its noise through a carefully controlled *bulk avalanche*[4] mechanism, which exists *throughout* the PN junction, not merely at the junction surfaces where unstable and unreliable surface effects due to local breakdown and impurity effects predominate. A true noise diode has a very low *flicker noise* (1/f) effect and tends to create a uniform level of truly *Gaussian noise*[5] over a wide band. In order to maximize its bandwidth, the diode also has very low junction capacitance and lead inductance.

For this project, I used the NOISE/COM NC302L diode. It's in a glass, axial-leaded DO-35 package and rated for use from 10 Hz to 3 GHz, if appropriate construction methods are followed. Prior to sale, the diodes are factory-aged for 168 hours and are well stabilized. NOISE/COM[6] has kindly agreed to make these diodes available to amateur experimenters for the special price of $10 each, as compared to the usual low-quantity price of about $25.

Noise-Source Design

The noise source presents two kinds of available output power. One is the thermal noise (–174 dBm/Hz at room temperature) when the diode is turned off; call this N_{OFF}. The other is the sum of this same thermal noise and an "excess" noise, N_E, which is created by the diode when turned on; call this N_{ON} (equivalent to $N_{OFF} + N_E$). For accurate measurements, the output impedance of the test apparatus must be the same whether it is on or off, so that the device under test (DUT) always sees the same generator impedance. In Amateur Radio work, this impedance is usually 50 Ω, resistive. The circuit design must guarantee this condition.

For maximum frequency coverage, a PC-board layout and coax connector suitable for use at microwaves are needed. For lower-frequency usage, a less-stringent approach can be employed. Two noise sources are presented here. One is for the 0.5 to 500 MHz region and uses conventional components that many amateurs already have. The other is for the 1 MHz to 2.5 GHz range; it uses chip components and an SMA connector.

Circuit Diagram and Construction

Figures 1A and 1B are the simple schematics of the two noise sources. In series with the diode is a 46.4-Ω resistor, which, when combined with the dynamic resistance of the diode in the avalanche noise-generator mode (about 4 Ω), totals about 50 Ω. When the applied voltage polarity is reversed, the diode is forward conducting and its dynamic resistance is still about 4 Ω, but the avalanche noise is now turned off. As a result, the noise-source output impedance is always about 50 Ω. The 5-dB pad reduces the effect of any small impedance differences, so that the output impedance is nearly constant from the *on* to the *off* condition and the SWR is less than 2:1.

We must consider the noise situation of the noise diode when it is forward conducting. The resistance of the forward-biased PN junction is a *dynamic* resistance. This dynamic resistance is *not* a source of thermal noise, since it is not an actual physical resistance, such as in a resistor or lossy network. However, the 0.6-V forward drop across the PN junction does produce a shot-noise effect. The mathematics of this shot noise shows that the noise power associated with this effect is only about 50% of the thermal noise power that would be available from a physical resistor having the same value as the dynamic resistance. Therefore, the forward-biased junction does *not* add excess noise to the system.[7] There is a 1/f noise effect associated with this shot noise in the NC302L diode, but its corner frequency is at about 100 kHz and of no importance at higher frequencies. Also, the small amount of bulk resistance contributes a little thermal noise.

In order to maximize the unit's flatness and frequency response bandwidth, noise-source construction methods should aim for

[1]Notes appear on page 40.

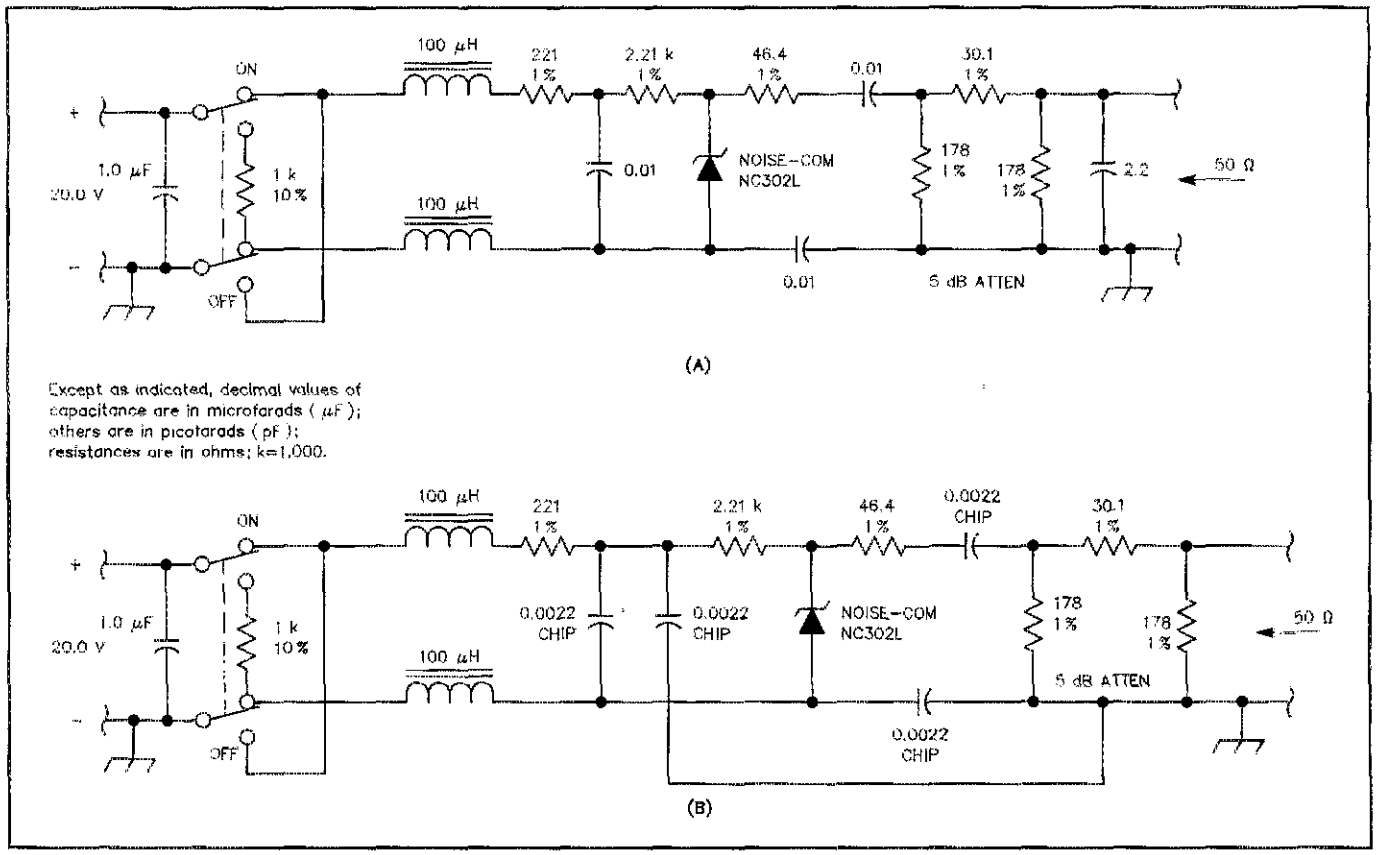


Figure 1—Schematics of the two noise sources. At A, the 0.5 to 500 MHz unit. Resistors are 1/8-W, 1%-tolerance metal-film units. The 1 MHz to 2.5 GHz unit at B uses 1% tolerance, 0.1-W chip resistors and chip capacitors.

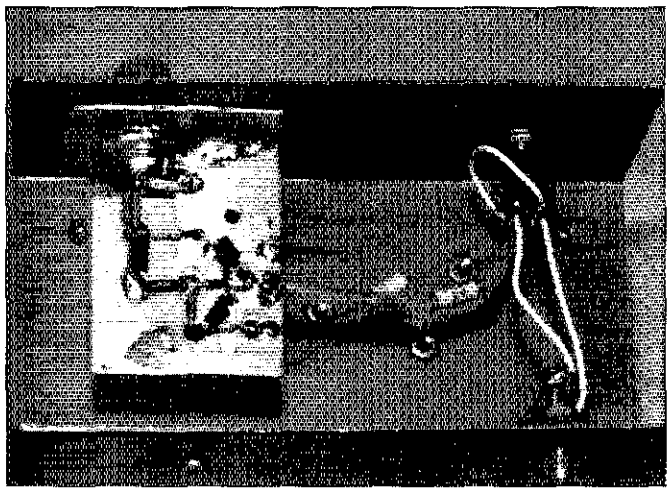


Figure 2—An inside view of the 0.5 to 500 MHz noise source.

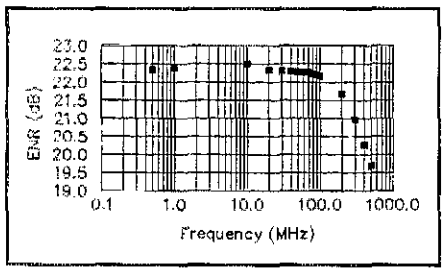


Figure 3—Sample calibration chart of excess noise ratio (ENR) versus frequency for the 0.5 to 500 MHz noise source.

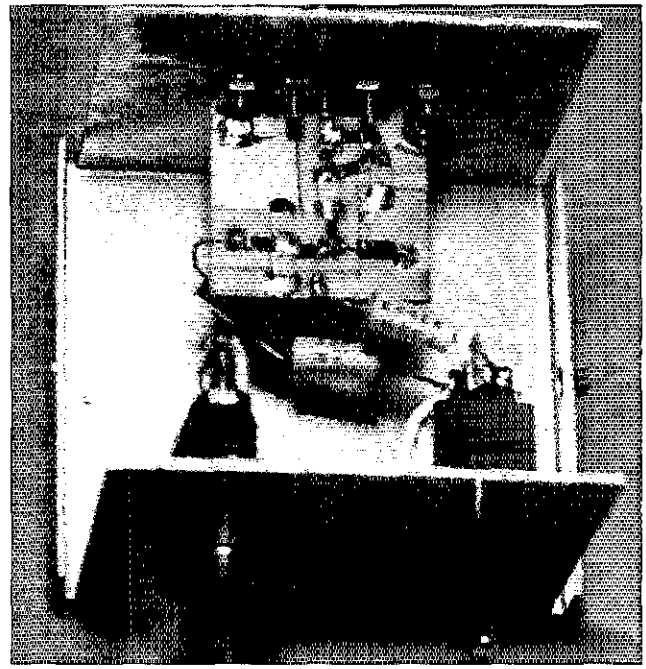


Figure 4—View of the inside of the 1 MHz to 2.5 GHz noise source.

RF circuit lead lengths as close to zero as possible, and minimum inductance in the ground path and the coupling capacitors. The power-supply voltage must be clean, well bypassed and set accurately. Figure 2 shows my 0.5 to 500 MHz unit. This construction method satisfies quite well the electrical requirements I wanted for this model. At 500 MHz, the return loss with respect to 50 Ω at the output jack decreased to 10 dB and I didn't try to extend the calibration beyond that frequency. A calibration chart (Figure 3) is attached to the unit's top for easy reference. Figure 4 shows the

Frequency (MHz)	0.5 to 500 MHz Unit		1.0 to 2500 MHz Unit	
	ENR (dB)	SWR	NR (dB)	SWR
0.5	22.33	1.03		
1	22.38	1.03	21.38	1.03
10	22.45	1.04	21.46	1.03
20	22.35	1.06		
30	22.32	1.06		
40	22.32	1.09		
50	22.30	1.11		
60	22.29	1.12		
70	22.25	1.15		
80	22.22	1.17		
90	22.20	1.20		
100	22.15	1.23	21.80	1.07
200	21.65	1.42		
300	20.96	1.62		
400	20.25	1.70		
500	19.60	1.90	20.71	1.44
1000			20.12	1.86
1500			20.00	2.06
2000			20.70	2.14
2500			21.51	1.88

Figure 5—NOISE/COM calibration for both of my noise sources. The data is, of course, not universal; it varies from unit to unit.

inside of the 1 MHz to 2.5 GHz noise source.

Calibrating the Noise Source

If the construction is solid, the calibration should last for a long time. There are two ways to calibrate the noise source. *If the unit has been carefully constructed and its correct operation verified,* NOISE/COM will calibrate home-built units over the desired frequency range for $25 plus return shipping charges. Note that one factory-calibrated unit can be used as a reference for many home-calibrated units. Figure 5 shows the NOISE/COM calibration data for both models of *my* noise sources, including SWR data. The noise data is strictly valid only at room temperature, so it's necessary to avoid extreme temperature environments.

The second calibration method requires a signal generator with known output levels at the various desired calibration frequencies. One approach is to build a tunable weak-signal oscillator[8] that can be compared to some accessible high-quality signal generator, using a sensitive receiver as a detector. The level of the signal source in dBm is needed.

Access to a multistage attenuator[9] is also desirable. If you build the attenuator, use the nearest 1% values of metal-film resistors so that systematic errors are minimized. A total attenuation of 25 dB in 0.1-dB steps is desirable. Attenuator construction must be appropriate for use at the intended frequency range. In some cases, a high-frequency correction chart may be needed.

With the calibrated signal source and the attenuator feeding your receiver in an SSB or CW mode, use the techniques discussed in the referent of Note 1 to determine the excess noise (N_E) of the noise source and the noise bandwidth (B_N) of the receiver.

Excess Noise Ratio

A few words about excess noise ratio (ENR) are needed. It is defined as the ratio of excess noise to thermal noise. That is,

$$ENR = \frac{N_{ON} - N_{OFF}}{N_{OFF}} = \frac{N_E}{N_{OFF}} \qquad \text{(Eq 1)}$$

When the noise source is turned on, its output is $N_{OFF} + N_E$. The ratio of N_{ON} to N_{OFF} is then

$$\frac{N_{ON}}{N_{OFF}} = \frac{N_{OFF} + N_E}{N_{OFF}} = 1 + \frac{N_E}{N_{OFF}}$$

$$= 1 + ENR \qquad \text{(Eq 2)}$$

Therefore, ENR is a measure of how much the noise increases, and the noise generator can be calibrated in terms of its ENR.

Normalizing ENR to a 1-Hz bandwidth and converting to decibels, this is

$$ENR\ (dB) = 174\ (dBm/Hz) + \frac{N_E\ (dBm)}{B_N\ (Hz)} \qquad \text{(Eq 3)}$$

Prepare a calibration chart and attach it to the top of the unit (see Figure 3). If you decide to have the unit factory calibrated, first perform the calibration procedure so you're fairly sure everything is working properly. Remember, a factory calibrated unit can be used as a reference for other home calibrated units, once you've worked out the calibration-transfer procedure according to your lab capabilities. This requires some careful thinking and proper techniques. If you have any doubts, a NOISE/COM calibration is the best choice.

Noise-Figure Measurement

The thermal noise power available from the attenuator remains constant for any value of attenuator setting. But the excess noise, and therefore the ENR (in dB) due to the noise diode, is equal to the calibration point of the source minus the setting (in dB) of the attenuator.

The noise-figure measurement of a device under test (DUT) uses the Y method and the setup in Figure 6. If the DUT has a noise-generator input and a true-RMS noise-measuring instrument at the output, then the total output noise (including the contribution of the measuring instrument) with the noise generator turned off is

$$N_{OFF(TOT)} = kTB_N F_{TOT} G_{DUT} G_{NMI} \qquad \text{(Eq 4)}$$

where kTB_N is thermal noise, G_{DUT} is the gain of the DUT, G_{NMI} is the gain of the noise-measuring instrument and F_{TOT} the noise factor of the combination of the DUT and the noise-measuring instrument. When the noise generator is turned on, the output noise is

$$N_{ON(TOT)} = kTB_N F_{TOT} G_{DUT} G_{NMI} + (ENR)kTB_N G_{DUT} G_{NMI} \qquad \text{(Eq 5)}$$

where the last term is the contribution of excess noise by the noise generator. Note that none of these values is in dB or dBm.

If we divide Eq 5 by Eq 4 and say that the ratio

$$N_{ON(TOT)} \div N_{OFF(TOT)} = Y,$$

then

$$\frac{N_{ON(TOT)}}{N_{OFF(TOT)}} = Y = \frac{F_{TOT} + ENR}{F_{TOT}}$$

$$= 1 + \frac{ENR}{F_{TOT}} \qquad \text{(Eq 6)}$$

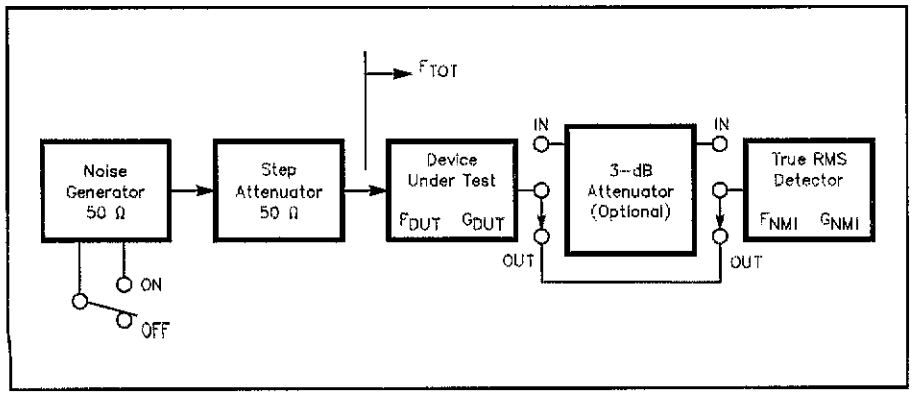


Figure 6—Setup for measuring the noise figure of a device under test (DUT).

Note that kTB_N, G_{DUT} and G_{NMI} disappear, so that these quantities need not be known to measure noise factor. If we solve Eq 6 for F_{TOT}, we get the noise factor

$$F_{TOT} = \frac{ENR}{Y - 1} \qquad \text{(Eq 7)}$$

If the noise output doubles (increases by 3 dB) when we turn on the noise source, then Y = 2, and the noise factor is numerically equal to the excess noise ratio (ENR). If the attenuator steps are not fine enough, or if the attenuator is not reliable over the entire frequency range, use Eq 7 to get a better answer. (It's much simpler to use a good fine-step attenuator.) The value of F_{TOT} is that of the DUT in cascade with the noise-measuring instrument. To find F_{DUT}, we must know the noise factor F_{NMI} of the noise-measuring instrument and G_{DUT} and then use the Friis formula, unless G_{DUT} is very large (as it would be if the DUT were a high-gain receiver [see Note 1]).

$$F_{DUT} = F_{TOT} - \frac{F_{NMI}}{G_{DUT}} \qquad \text{(Eq 8)}$$

The validity of Eq 8 (if we need to use it) requires that the noise bandwidth of the noise-measuring instrument be less than the noise bandwidth of the DUT (see the referent of Note 1). Verify this before proceeding.

There's another advantage to using the power-doubling method. If the 3-dB attenuator of Figure 6 is used to maintain a constant noise level into the following stages and the RMS meter, this means that the noise factor, using the calibration scale and the input attenuator (without using Eq 7), is

$$F_{DUT} = ENR + \frac{1}{G_{DUT}} \qquad \text{(Eq 9)}$$

If G_{DUT} is large, then the last term can be neglected. If G_{DUT} is small, we need to know its value. However, we do not need to know the noise factor F_{NMI} of the circuitry after the DUT, as we did in the previous discussion.

The 3-dB attenuator method also removes all restrictions regarding the type of noise-measuring instrument, since the meter reading is now used only as a reference point. This last statement applies only when two noise (or two signal generator) inputs are being compared.

Frequency Response Measurements

The noise generator, in conjunction with a spectrum analyzer, is an excellent tool for measuring the frequency response of a DUT, if the noise source is much stronger than the internal noise of the DUT and that of the spectrum analyzer. Many spectrum analyzers are not equipped with tracking generators, which can be quite expensive for an amateur's budget.

The spectrum analyzer needs to be calibrated for a noise input, if accurate amplitude measurements are needed, because it responds differently to noise signals than to sine-wave signals. The envelope detection of noise, combined with the logarithmic amplification of the spectrum analyzer, creates an error of about 2.5 dB for a noise signal (the noise is that much greater than the instrument indicates). Also, the noise bandwidth of the IF filter is different from its resolution bandwidth. Some modern spectrum analyzers have internal DSP algorithms that make the corrections so that external noise sources and also carrier-to-noise ratios, normalized to some noise bandwidth like 1.0 Hz, can be measured with fair accuracy if the input noise is a few decibels above thermal. One example is my Tektronix Model 2712. If only relative response readings are needed, then these corrections are not needed.

Also, the noise source itself can be used to establish an accurate reference level (in dBm) on the screen. An accurate, absolute measurement with the DUT in place will then be this reference level (in dBm), plus the increment in decibels produced by the DUT.

The noise-generator output can be viewed as a collection of sine waves separated by, say, 1 Hz. Each separated frequency "bin" has its own Gaussian amplitude and random phase with respect to all the others. So the DUT is simultaneously looking at a collection, or "ensemble," of input signals. As the spectrum analyzer frequency sweeps, it looks simultaneously at all of the DUT frequencies that fall within the spectrum analyzer's IF noise bandwidth. The spectrum display is thus the "convolution" of the IF filter frequency response and the DUT frequency response. If the DUT is a narrow filter, a very narrow resolution and a slow sweep are needed in the spectrum analyzer. In addition, the analyzer's video, or post-detection, filter has a narrow bandwidth and also requires some settling time to get an accurate reading. So, some experience and judgment are required to use a spectrum analyzer this way.

Using Your Station Receiver

Your station receiver can also be used as a spectrum analyzer. Place a variable attenuator between the DUT and the receiver. As you tune your receiver, in a narrow CW mode, adjust the attenuator for a constant reference level receiver output. The attenuator values are inversely related to the frequency response.

A calibrated noise source with an adjustable attenuator that can be easily switched into a receiver antenna jack is an excellent tool for measuring antenna noise level or incoming weak signal level (in dBm), or for establishing correct receiver operation.

The noise source can also be combined with a locally generated data-mode waveform of a known dBm value to get an approximate check on modem performance or to make adjustments that might assure correct operation of the system. The rigorous evaluation of system performance requires special equipment and techniques that may be unavailable at most amateur stations. Or, you could evaluate the intelligibility improvement of your SSB transmitter's speech processor in a noise background.

Summary

The calibrated, flat-spectrum noise generator described in this article is quite a useful instrument for amateur experimenters. Its simplicity and low cost make it especially attractive. Getting a good calibration is the main challenge, but once it is achieved, the calibration lasts a long time—if the right diode is used. The ENR of the units described here is in the range of 20 dB. You may want to use a high-quality, external, 10-dB attenuator barrel to get into the range of 10-dB ENR. If you send the unit to NOISE/COM, send the attenuator also and ask that it be included in the calibration. That attenuator then "belongs" to your noise source and should be so tagged. If the attenuator is of high quality, the output SWR will also be improved. Ask for calibrations with and without the attenuator, if you like. NOISE/COM suggests periodic recalibration, at your discretion.

Acknowledgments

I appreciate the review and suggestions, and also the collaboration with respect to diode purchase and calibration service, of Gary Simonyan and Bent Hessen-Schmidt at NOISE/COM.

Notes

[1] W. Sabin, "Measuring SSB/CW Receiver Sensitivity," *QST*, Oct 1992, pp 30-34. See also Technical Correspondence, *QST*, Apr 1993, pp 73-75.

[2] PC boards are available from FAR Circuits, 18N640 Field Ct, Dundee, IL 60118-9269; price, $3.50 plus $1.50 shipping. A PC-board template package is available free from the ARRL. Address your request for the SABIN NOISE SOURCE TEMPLATE to: Technical Department Secretary, ARRL, 225 Main St, Newington, CT 06111. Please enclose a business-size SASE.

[3] The term *Zener diode* is commonly used to denote a diode that takes advantage of avalanche effect, even though the Zener effect and the avalanche effect are not exactly the same thing at the device-physics level.

[4] The term *bulk avalanche* refers to the avalanche multiplication effect in a PN junction. A carrier (electron or hole) with sufficient energy collides with atoms and causes more carriers to be knocked loose. This effect "avalanches" and it occurs throughout the volume of the PN junction. This mechanism is responsible for the high-quality noise generation in a true noise diode.

[5] *Gaussian noise* refers to the instantaneous values that the noise voltage has. These values conform to the Gaussian probability density function of statistics.

[6] NOISE/COM Co, East 49 Midland Ave, Paramus, NJ 07652. Contact Gary Simonyan at 201-261-8797.

[7] Motchenbacher and Fitchen, *Low Noise Electronic Design*, (New York: Wiley & Sons, 1973), p 22.

[8] W. Hayward and D. DeMaw, *Solid State Design for the Radio Amateur*, (Newington: ARRL, 1986).

[9] *The ARRL Handbook for Radio Amateurs*, (Newington: ARRL, 1994), pp 25-37 to 25-39.

Amateur Use of Telescoping Masts

Do you need an inexpensive skyhook for your antenna? Here's one candidate you may have overlooked.

By R. P. Haviland, W4MB
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Daytona Beach, FL 32119

One of the many pieces of equipment designed for the TV industry is the telescoping mast used to support TV antennas. In some areas more than about 20 miles from a TV transmitter (and not served by a cable TV company), these masts are used frequently.

TV telescoping masts aren't commonly used by hams. Observation and inquiry show two reasons for this: (1) a lack of knowledge of the capabilities and the limitations imposed by telescoping-mast design; (2) having had (or heard of) a bad experience with such a mast. The latter seem to stem totally from mishandling during installation, leading to mast and antenna damage and—occasionally—injuries to people. The mishandling is directly related to a lack of knowledge regarding proper installation techniques.

Mast Design Limitations

It's important to know the limitations imposed by telescoping TV mast design. One major TV mast manufacturer's flier emphasizes this by stating "Telescoping masts are not recommended for commercial or ham installations" in the specification list. The "not recommended" ignores the fact that many amateur antennas are *smaller* than some TV antennas used in rural areas and that the mast alone can be used as a vertical antenna.

None of the ads, fliers or instructions packed with a telescoping mast provide adequate information about the capabilities and limitations of its design. The most I've seen is a short note to the effect that the mast should not be used with antennas having a wind load area of more than 2 square feet. In TV antenna ads, you're told the number of elements a particular antenna has, but not necessarily its wind load area or its weight. In most amateur antenna ads, this vital information is given. Telescoping-mast fliers and instructions also omit correct installation procedures and safety procedures. About the only precaution I've seen mentioned is to "stay away from power lines."

Here, I'll explore the capabilities of telescoping masts for amateur use. I'll provide data to allow you to determine correct use in your application, up to the limit of mast capability. Proper installation and use are also covered.

Telescoping-Mast Design Principles

A telescoping TV mast is much more than a few pieces of steel tubing. It includes a number of design features to make use simple and safe. These feature areas are shown in Figure 1, starting at the top of a mast section and working toward the bottom.

There's size reduction in the top section to bring its ID to a size slightly greater than the next smaller section, which is also the next higher section when the mast is extended. Partly, this is for strength, to distribute the load from the upper section. It's also an antirattle feature, to limit noise caused by wind moving the mast.

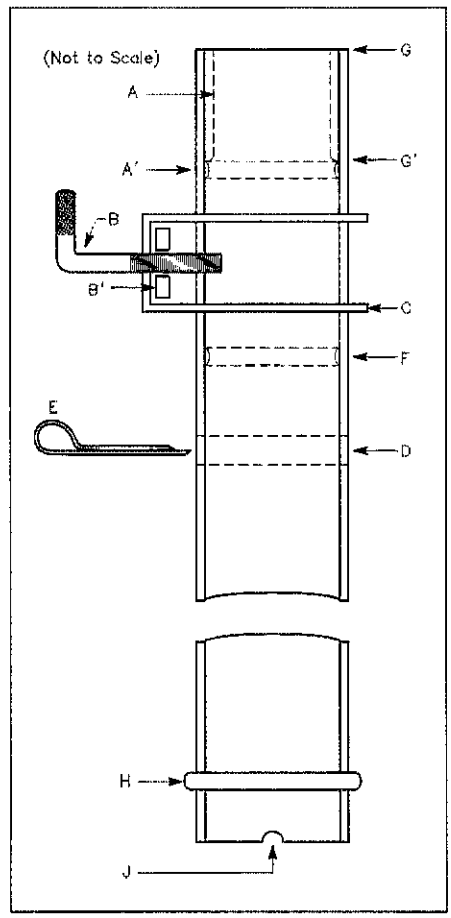


Figure 1—Major features of a single section of a typical TV telescoping mast section. See text for explanation of elements A through J.

In some designs, the top 4 to 6 inches of a section is roll-swaged to the smaller diameter as at A. In others, the swage may extend only 1/4 to 3/8 inch, as shown in Figure 1 at A'. In these, the swage is typically 1 to 2 inches below the top of the section.

Just below the swaged area are two holes in the section. The top one (B) is typically 1/4 inch in diameter, and penetrates only *one side* of the tubing. This hole is for a clamping screw. The screw's primary use is to hold the smaller, inner-mast section in place while a new grip on this section is taken during mast erection. Secondly, the screw keeps the two sections tightly together to prevent wind noise. This screw is *not intended* to be the permanent—and only—mechanism to prevent slippage and mast collapse (more on that later).

The clamping screw (B) has some type of a support fixture. One style uses a simple strap, with a floating square nut for the mating screw. The nut is held in place by metal tabs. A second type (C) uses a flat, U-shaped metal sheet, with a hole on each of the U-shaped sides just larger than the tubing diameter. There's a captive nut (B') at the bottom of the U. Either type may have a small, internally threaded stud not shown here. This stud is used to mount an insulated standoff for carrying twin lead or coax, holding it away from the mast to reduce signal loss and wind-induced slapping noise.

The second, lower hole (D) is typically 5/16 inch in diameter, and penetrates the tube completely, along the diameter. This hole accepts a large cotter pin (E), which is the support for the next-smaller mast section. (The best designs equip the cotter pin with a short chain to prevent the pin from being lost.) This pin is intended to carry *all of the weight above it:* tubing sections, rotator, antenna and guys. It's a safety feature: With overload, the pin should shear and the mast should safely telescope downward. As we'll see, this is the weak point in the design.

In designs I've seen, there's an additional, smaller-diameter swaging (F) between the two holes. The contact of this and the upper swage create a force couple, which transfers bending forces from the smaller section to the larger. It's also part of the antirattle design. Additionally, it's a safety

feature (working with the next feature to be described) to prevent sliding the small section completely out of the larger one while raising the mast.

Rings are employed for attaching guy wires. Some designs make the hole diameter in a ring just greater than the diameter of the next-smaller mast section. The rings are used at the very top of a section, at G. Another design makes the hole in the ring just larger than the topmost swage outside diameter. This slides over the section, and rests on the shoulder of the swage, at G'. Another design makes the ring hole larger than the tubing. This ring is kept from sliding down the mast by a weld bead around the mast at A'. The ring located at G is the least desirable since the ring tends to jam if the mast is telescoped downward. The ring size varies with the section diameter.

There are two types of guy rings. One is a simple, flat plate, typically 1/8 inch thick. The other is thinner, with a lipped inner hole, and with the outer edge roll-crimped. It's claimed that the rolled edge eliminates the need for a guy thimble to keep the guy from chafing through. Prudence indicates the use of thimbles, which are *not* supplied with any masts I've seen.

These guy rings have holes for six guy wires, spaced as shown in Figure 2. They allow use of three sets of guys (commonly); four sets are rarely used.

Just above the bottom of the mast section, at H in Figure 1, is a weld ring. The size of this weld ring is controlled so that its outside diameter is just smaller than the inside diameter of the next-larger section. This acts with the swage of A or A' to take the bending moment when extended. It also prevents the inner tube from extending past the swage at F, preventing overextension.

At J is a pair of notches in the tube bottom. These are half circles, 5/16 or 3/8 inch across. They're intended to receive the cotter pin and prevent the mast section from rotating. The notches also distribute the shear load presented by the weight of the upper parts of the mast system.

After the sections are finished—with all holes punched or drilled and all welds made—they are hot-dipped galvanized. (Or at least, they should be!) I've seen one mast of unknown manufacture that was zinc-plated rather than hot-dip galvanized. I've been told paint-dipped masts exist. Such treatments are *not recommended*, as rust makes for a short mast life.

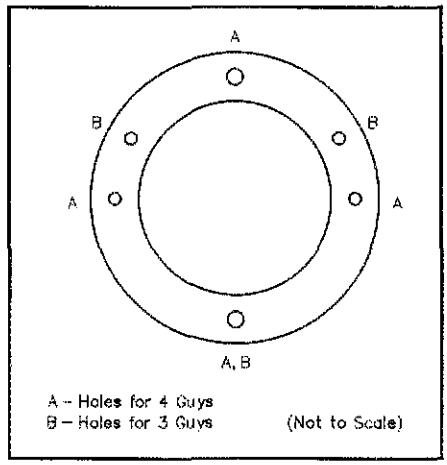


Figure 2—Top view of the guy ring plate found at the top of each section of a telescoping mast. The hole arrangement allows use of three or four sets of guys.

Mast Specifications

Telescoping masts are manufactured in three weights. The light-duty mast is formed from 18-gauge steel, which has a nominal

Glossary of Terms Used in the Tables

ALLOW—allowable load.
AREA—Section area exposed to wind.
A WND LD—allowable wind load.
BOLT LD—maximum shear load on the bolt.
COTR LD—maximum shear load on the cotter pin.
DIAM—outside diameter of a section.
GUY LEN—guy length.
GUYS—length of three guys.
GUY COMP—compressive load on a mast due to guy tension.
GUY LD—guy load.
GUY STR—guy strength.
H WND LD—horizontal wind load.
HGT—overall height.
LAT AREA—cross section of tubing.
LEN—length.
LEN 3 GUYS—length of three guys.
LEN 4 GUYS—length of four guys.
LIMT LD—section load at failure limit.
MAX AREA—maximum area of antenna and rotator.
MAST WND—mast wind load.
MAX V LD—maximum vertical load on section.
NOM WT—nominal weight of a section.
PANEL—a section of mast.
RAD GYR—radius of gyration of section.
SAFE LD—maximum safe load (with a safety factor of 4).
STAT LD—static load.
THICK—thickness of the section wall.
TRY—a trial value.
V WND LD—vertical wind load.
WIND—wind load on projected area.
WND LD—dynamic wind load.
WT—weight.
WT MAST—weight of the mast.
WT GUYS—weight of the guys.

Table 1
Telescoping Masts

Quantity	Unit of Measure	Section 1	2	3	4	5
LEN	ft	10	10	10	10	10
HGT	ft	10	19	28	37	46
PANEL	ft	9	8	8	8	9
THICK	in.	0.05	0.05	0.05	0.05	0.05
DIAM.	in.	2.25	2.00	1.75	1.50	1.25
AREA	$in.^2$	0.35	0.31	0.27	0.23	0.19
GUY LEN	ft	25.08	29.83	36.24	43.57	51.43
LEN 3 GUYS						558.43
LEN 4 GUYS						744.57
LAT AREA	ft^2	1.88	1.67	1.46	1.25	1.04
NOM WT	lb	15	13	12	10	8
WIND	lb	37.50	33.30	29.20	25.00	20.80
RAD GYR	in.	0.98	0.87	0.76	0.66	0.55
MAX V LD	lb	4070.26	3659.60	2903.26	2176.73	1281.30
With Cotter Pins						
COTR LD	lb	745.14	745.14	745.14	745.14	745.14
LIMT LD	lb	745.14	732.14	720.14	710.14	702.14
SAFE LD	lb	186.28	183.03	180.03	177.53	175.53
With Stainless-Steel Bolts						
BOLT LD	lb	2943.75	2943.75	2903.26	2176.73	1281.30
LIMT LD	lb	2943.75	2930.75	2891.26	2166.73	1273.30
SAFE LD	lb	735.94	732.69	722.82	541.68	318.32

Characteristics of typical mast sections. At the top of the table are the dimensions and weights of the five sections of a typical 50-foot mast. Derived quantities of wind area, section radius of gyration and section strength considered as a column are shown. The bottom parts show the shear strength and safe vertical load on the section for two types of retaining pins.

thickness of 0.049 inch. The heavy-duty mast is 16 gauge, with a nominal thickness of 0.063 inch. There is also an intermediate-weight mast, which uses 16-gauge steel for the top section, and 18-gauge for all other sections. This reduces the weight and cost of the complete assembly; it does not reduce the carrying capacity of a complete "as supplied" mast appreciably, but it does reduce the safety factor.

Because it seems likely that most amateur installations need the best possible mast, only the tallest, heavy-duty type is considered here.

Section specifications from the catalog of one large manufacturer are shown in Table 1. (See the "Glossary of Terms" for an explanation of the abbreviations used.) This 5-section design is often called a "50-foot" mast, but has a maximum height of 46 feet. One foot of height is lost in the overlap between each two sections. The table gives the overall height, the section length exposed to wind, and the panel length, the distance where there is no added strength from overlap with higher or lower sections. The weight of each section and its radius of gyration is shown, as well as the projected area and the wind loading for a 20 lb/ft^2 wind. This corresponds to a wind speed of 70.7 mph. This is selected as adequate for short-term use, such as a Field Day installation. The wind loading should be increased for permanent installations. Acceptable design values are:

SE Florida, Cape Hatteras	50 lb/ft^2
SE USA coasts, some other areas	40 lb/ft^2
Rest of the contiguous states	30 lb/ft^2

Load capability data shown later is based on the 20 lb/ft^2 value.

A Standard Installation

The telescoping mast is designed to have a set of guy wires reaching from the ground to the top of each mast section. There are, of course, many mast heights, arrangements of these guys, as well as many ways of mounting antennas on the mast, and many antenna sizes. To reduce the analysis to reasonable size, a standard antenna mast installation is assumed.

We'll use a five-section mast with guys extending from the top of each section to a common point, as shown in Figure 3. Assume the common point to be located one-half of the total mast height from the base of the mast. All antenna and rotator weight is assumed to be located at the top of the mast: There are no intermediate antennas.

The standard guys are seven-strand galvanized wire common in TV installations. These guys are specified to have a tensional breaking strength of 910 lb and weigh 31.8 lb per 1000 feet. However, guy strength was found to be one of the limiting factors, so other material was also tried, as described later. Guys were assumed to be nonelastic: not changing length under load. I also assumed a negligible pre-load on the guys. Very closely, this corresponds to the precept that the guys should look tight and feel loose.

The mast is assumed to be as described in Figure 3, and to be in new condition. Lacking other information, common material strength values are used.

Basis for Analysis

The foregoing assumptions allow analysis of each mast section as if it is totally independent of the others. The basic force diagram for the top section is shown in Figure 4. The horizontal force to the left is the wind load on the antenna and rotator and on the mast section. At the right is the slanting guy tension under load. This load is resolved into horizontal and vertical components.

Additional vertical loads on the mast are the weight of the antenna and rotator, and the weight of the mast section. The wind load on the mast is resolved into two components, one-half at the upper-guy attachment point, the rest being at the next guy, and not affecting this section. The wind load on the guy is neglected. The horizontal component of guy tension is equal to the sum of the wind loads at the upper guy. The vertical component then appears as a compressive load on the mast, adding to the weight of antenna, rotator and mast section, and guy. The relation between these components are:

Compression/Wind load = Guy height + Guy base. For the top section and the installation assumed, the compression is just twice the total wind load. Guy tension = SCORE (Compression × Compression +

Table 2
Telescoping Mast 2

Quantity	*Unit of Measure*	*Weight, Antenna and Rotator, lb* 10	20	30	40	50	100
WT MAST	lb	9	9	9	9	9	9
WT GUYS	lb	0.5	0.5	0.5	0.5	0.5	0.5
STAT LD	lb	19.5	29.5	39.5	49.5	59.5	109.5
MAST WND	lb	5.2	5.2	5.2	5.2	5.2	5.2
1/8-inch Steel Guy and Cotter Pin							
ALLOW	lb	175.5	175.5	175.5	175.5	175.5	175.5
GUY COMP	lb	156.0	146.0	136.0	126.0	116.0	66.0
TRY GUY	lb	174.4	163.2	152.1	140.9	129.7	73.8
GUY STR	lb	227.5	227.5	227.5	227.5	227.5	227.5
GUY LD	lb	175.5	163.2	152.1	140.9	129.7	73.8
V WND LD	lb	157.0	146.0	136.0	126.0	116.0	66.0
H WND LD	lb	78.5	73.0	68.0	63.0	58.0	33.0
A WND LD	lb	73.3	67.8	62.8	57.8	52.8	27.8
MAX AREA	ft^2	3.7	3.4	3.1	2.9	2.6	1.4
3/16-inch Dacron Line and Bolt							
ALLOW	lb	318.3	318.3	318.3	318.3	318.3	318.3
GUY COMP	lb	298.8	288.8	278.8	268.8	258.8	208.8
TRY GUY	lb	334.1	322.9	311.7	300.5	289.3	233.4
GUY STR	lb	687.5	687.5	687.5	687.5	687.5	687.5
GUY LD	lb	334.1	322.9	311.7	300.5	289.3	233.4
V WND LD	lb	298.8	288.8	278.8	268.8	258.8	208.8
H WND LD	lb	149.4	144.4	139.4	134.4	129.4	104.4
A WND LD	lb	144.2	139.2	134.2	129.2	124.2	99.2
MAX AREA	ft^2	7.2	7.0	6.7	6.5	6.2	5.0

Load and wind area spreadsheet calculation of allowable antenna area for various antenna plus rotator weights. The top part of the table shows the dead weights and mast wind loads. The lower parts combine these vectorially to obtain the allowable wind force and the antenna area, for the two types of support pins used. Note the large difference in antenna weight in the last two columns.

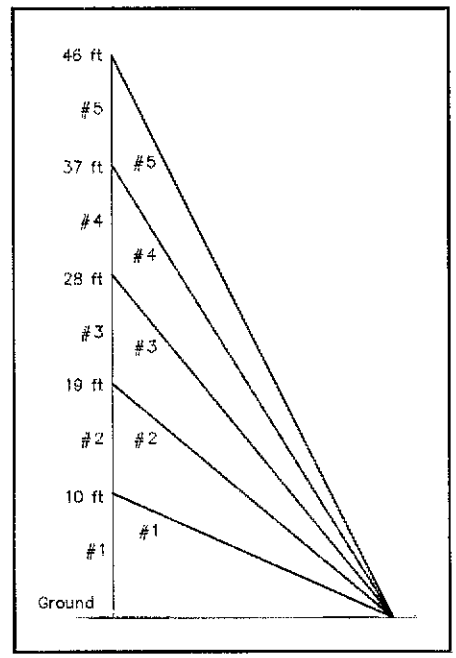


Figure 3—Assumed mast and guy installation. See text for assumption as to guy location.

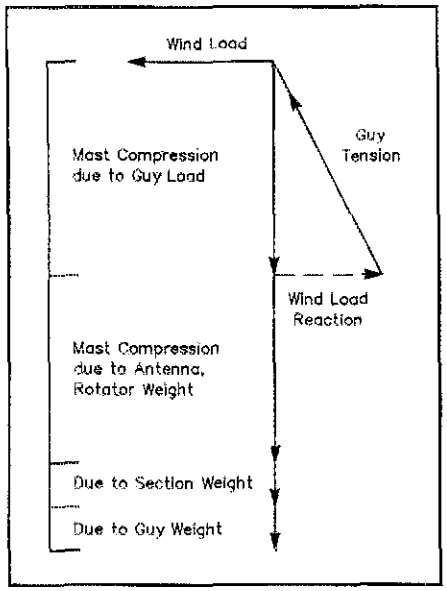


Figure 4—Load vector diagram of top mast section. Lateral wind load is opposed by horizontal component of guy tension. Its vertical component plus dead weights form the compressive load on the mast section. See text for relations.

Wind load × Wind load). For the top section, with the dimensions assumed, the guy tension is 1.118 times the total wind load.

We also need some strength values. The mast section is acting as a column under compression. Since the length/diameter ratio is 9 × 12 ÷ 1.25, or 86.4, the column is a short column. The compression strength is:

Max load = 17000 − 0.485 × length × length ÷ (RadG × RadG) for typical steels. Length is the length of the panel or part of the mast that has no overlap from another section. RadG is the radius of gyration of the section about its long axis. For the thin-wall tubing of these masts:

$$RadG = (OD - thickness) \div 2 \qquad (Eq\ 1)$$

where OD is the outer diameter of the section.

The other relation we need is the shear strength of the cotter pin. This is:

$$Max\ pin\ load = 15000 \times Pin\ area \qquad (Eq\ 2)$$

For a $^3/_{16}$-inch diameter cotter pin, the maximum load is 745 lb (there are two bearing points on the cotter pin, each in single shear).

The allowable working load is equal to the maximum load divided by the safety factor desired. The required safety factor is partly a matter of laws of strength loss due to deterioration, the fact that the largest load encountered grows with time, and engineering judgment. For simple structures where safety is not a direct concern, a safety factor of 4 is often used.

Allowable Section Loads

The relations just given were easily transferred to a spreadsheet for calculation (see Table 1). The last row of the top part is the maximum allowable vertical load on the section, considered as a column in compression.

The second part of this calculation sheet is for safe vertical load with cotter pins. The top row is the allowable shear load on a $^3/_{16}$-inch-diameter cotter pin. Just below this is the limit load, in all these cases that of the cotter pin. The safe compression load with a cotter pin is shown next. Note that any pin must support the weight of the sections above it.

Because the cotter pin is so limiting, I calculated the maximum shear load of a $^1/_4$-inch stainless-steel bolt as shown in the bottom three lines of the table. This assumes 30,000 lb/in^2 as the bolt strength, so be certain the bolts are *stainless steel*. This allows a load increase factor of about 4. The limit load now is the compressive strength of the top two sections, then the bolt shear strength for the lower ones.

The analysis method assumes that the wind load on the mast itself is transferred to the points of guy attachment. Under conditions of very high winds—or if an intermediate antenna is installed on the mast—bending loads may be appreciable. Analysis of the affected mast section can be made using standard pinned-and-bending relations.

Allowable Antenna Weight and Area

From Table 1, the safe total load on the mast is established by the top section: 175 lb if cotter pins are used and 318 lb with stainless-steel bolts. This safe load must be apportioned into the static and dynamic load. The static load is that due to the weight of antenna, rotator, fittings and guys. The dynamic load is the changeable part, here due only to wind load. This is a way of saying that the allowable area of the antenna goes down as the installed weight goes up.

The easy way to do the apportionment is to assume a static load, then calculate the wind load that uses up the rest of the safe load allowance, using the equations presented earlier. This is easily done by a new spreadsheet, as shown in Table 2. Here, the columns are the values that result from the assumed antenna plus rotator weight, as listed at the top of the numerical column. The top section adds the weight of the mast section and guy, giving the total static load. For convenience, the mast wind load is also tabulated here.

The next group is for the standard installation. The limit strength of the top section is given first (cotter-pin shear). This minus the static load is the allowable compression due to wind. This is converted to a trial guy load, and compared to the guy strength. The smaller is taken as the guy load. This is resolved into the vertical (compression) and horizontal (wind) components. Half the total wind load on the mast section is subtracted to give the allowable antenna wind load, which is then converted to allowable antenna plus rotator wind area.

Table 3
Sample Antenna Types, Weights and Wind Load Areas

Antenna Type	*Weight (lb)*	*Area (ft^2)*
24 el, 2 m	4.5	2.3
3 el, 10 m	9.9	2.0
3 el, 10 m	18.0	3.1
2x24 el, 2 m	21.5	4.8
6 el, 6 m	26.0	4.8
3 el, tribander	27.0	4.4
3 el, 20 m	30.0	5.5
2 el, 40 m	44.0	6.4
4 el, 20 m	55.0	8.1

For small, light, antenna/rotator combinations, the guy strength dominates the dynamic load, limiting the allowable area to 3.7 ft^2 At 50 lb of dead weight, the allowable wind area decreases to 1.4 ft^2.

Remember that the assumed wind load is only 20 lb/ft^2, two-thirds the recommended permanent installation value for most of the country. It is easy to see why these masts are limited to small antennas for long-term use.

The lower part of Table 2 examines the result of using a stainless-steel bolt, and using a guy with a breaking strength of 2150 lb. This is the value for $^3/_{16}$-inch Dacron line. The strength of $^1/_4$-inch-diameter, seven-strand wire rope with a hemp core is essentially the same. With these changes, the mast can now be used for heavier antennas of greater wind area. The capacity of the standard condition has been doubled, or nearly so.

Several points are important if this extra capacity is used. The safety factor of the entire system has been reduced from normal use factors; in particular, the mast may collapse by guy failure or bending, rather than telescoping together. Additionally, the erection becomes more difficult as size and weight of antenna increase. Extra care is needed.

To get an idea of the range of usefulness of these telescoping masts, we need to look at antenna catalogs. Table 3 presents some figures from several well-known manufacturers. To these should be added the rotator weight: 5 to 10 lb for a small unit.

For temporary use, the small antennas for 10 meters and higher bands are nicely within limits of the "out of the box" mast. But even a lightweight tribander on a beefed-up telescoping mast is pushing the safety limit. You can probably get a full-sized 20-meter Yagi, or a loaded 40-meter Yagi up for a Field Day installation, but you're likely to lose the mast and antenna if a thunderstorm comes up. For permanent installations, a lightweight 10-meter beam should have extra guy and pin strength. Smaller antennas for the higher bands are okay with the standard mast. Be careful: If you must use a large antenna, use a larger mast.

The TV mast itself can be used as a ver-

tical antenna with no additions. Add a set of three to six wires parallel to the mast, and up to a foot or so from it, to form a cage for low loss and improved bandwidth. A bottom insulator of fiberglass cloth and resin can be used, or the cage wires can be fed as a folded dipole. A 3, 6, or even 10-foot capacity-hat is within the design capability of these masts. The usual rules about good grounds apply.

A simple installation for Field Day use replaces the top guys with a pair of 40- and 80-meter dipoles, with end cord added to keep the antenna ends as far above ground as the site permits. With a lightweight tribander at the top, scores will depend more on operators than on installation limits.

Telescoping-Mast Installation

The telescoping mast is designed to be extended in only one way. *The mast must be vertical and the lower section properly guyed before extending the upper sections.* The bad reputation of the telescoping mast is almost completely due to attempts to ignore this simple rule. If you extend the sections, mount the antenna and then attempt to raise the assembly from a horizontal position to the vertical, you'll bend the mast. You may also damage the antenna and injure someone. In fact, the mast may bend if you try to raise it to the vertical while extended, just from its own weight—even if there's nothing mounted on the mast.

The recommended safe procedure is:

• Get a firm footing. For a typical Field Day installation on dirt, this means using a steel plate, with a spike on the bottom to penetrate the earth, and a pin on the top to keep the mast from slipping sideways. Base and tripod mounts for other surfaces are available.

• Mount the collapsed mast, plumb it to the vertical, and guy it with the bottom section permanent guys. A little pre-tension on these guys is a good idea.

• Tie one or two stepladders to the mast, for further work.

• Mount the rotator and antenna, and attach cables and the guys for the upper sections. Be sure that all fastenings are properly made and that the cables and guys won't tangle.

• If the antenna is small and light and there is no wind, an experienced person can get the antenna to a height of 30 feet. For greater heights, or with wind present, two to seven people are needed. Four handle the guys, two on ladders push up the sections and one person handles the clamping screws and the cotter pin or bolt. The guy handlers should not place strain on the guys, but should be prepared to keep the mast vertical. Practicing with the mast only, with no antenna in place, is a good idea.

• Starting with the top section, push it up a foot or two and tighten the clamp screw just enough to keep the section from slipping when released. Take another grip, and raise again, repeating until the stop is reached. Slip the cotter pin or bolt in place. Carefully lower the section until it rests on the pin or bolt. Turn the section until the slots engage. Then, tighten the clamp screw sufficiently to prevent rattling (wear a pair of good leather gloves). Don't use pliers—the screw will dent and deform the inner tube enough so that it will be impossible to lower the mast later.

• Repeat for the next lower section, and so on. If the mast starts to leave the vertical, or the wind picks up, stop, tie the guys temporarily and get help.

• Don't strain, and don't take chances. Even a few pounds falling from 10 or 20 feet can be deadly.

In principle, taking down a mast is easy: Just reverse the erection steps. If the mast is badly rusted, or the sections have been deformed by bending or by excessive clamping, however, this can be a chore—even impossible. If a little work doesn't get the antenna down to ladder height, consider bringing in a crane or ladder truck.

Some Precautions to Take

Always check local building codes when considering the installation of a large antenna or high tower or mast structure. Much trouble and expense can be avoided by staying within imposed limits.

If you're going to use these telescoping masts above their rated TV antenna size and load limits, I recommend running a load analysis with the weights and dimensions involved. When doing this, include such factors as the distance from the top of the mast to the antenna mounting point, and the weight and wind area of the rotator. I recommend you *measure* the size and thickness of the mast sections. Errors in filling orders have occurred.

Remember: Safety First!

Bob Haviland was first licensed as W9CAK in 1931. He obtained his BSEE degree at Missouri School of Mines in 1939, and his Professional Engineering license in New York.

Bob was project engineer for the first radio transmission from beyond the ionosphere, in 1949, at White Sands, New Mexico, and for the first missile launching from Cape Canaveral, in 1951. He developed ablation (the use of material which goes from solid to gas state) for space-vehicle reentry protection, and initiated programs for recovery of equipment and data from space.

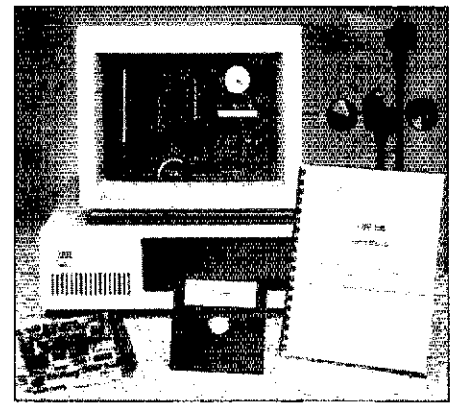
Bob's worked extensively on communication and broadcast satellite concepts, and played a founding role in commercial satellite communication. Between 1959 and 1972, Bob was a member of US delegations to the ITU and CCIR. He served as Chairman, subcommittee for 27 to 1215 MHz, FCC WARC Advisory Committee for Amateur Radio, 1976.

Bob is a Fellow of the Institute of Electrical and Electronic Engineers, the American Astronautical Society and the British Interplanetary Society. He holds eight US patents, and is author of many articles and 14 books, including The Quad Antenna, *CQ Publishing, 1993.*

New Products

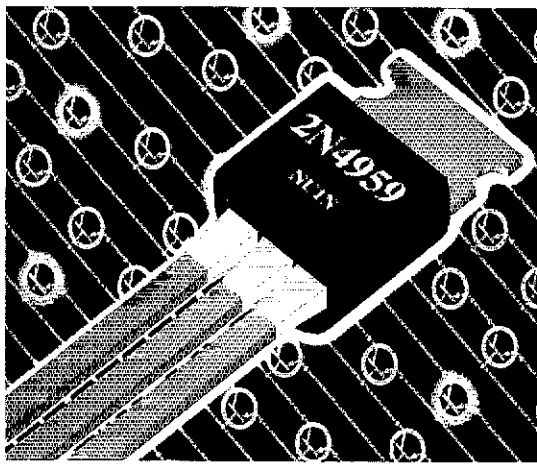
WEATHER AND DATA MONITOR INSTRUMENTS

◊ Weather observers, repeater control ops, packet operators and other hams interested in experimentation can check and record atmospheric conditions or other environmental factors remotely by using a PC to operate a remote Environmental Monitoring System. The ENV-100 directly connects to standard 4-20 mA or 0-1 V sensors for data-acquisition applications. It accepts as many as 200 modules linked to one PC serial port. The ENV-100 is a plug-in board for IBM-compatible personal computers and can be easily customized from the keyboard, with no external power supply or other interface device. The onboard clock time-stamps data for later evaluation. It provides a standard RS-232 (EIA-232)/485 multidrop sensor-to-computer interface; programmable setpoints; uses a complete ASCII command set; supports up to six analog-to-digital channels per module; holds 16k of nonvolatile memory for data logging and independent control (32k with $49 upgrade); and comes in a compact, weatherproof case for harsh environments. The ENV-100 can operate alarms, relays and controls via TTL outputs. A four-wire cable delivers power and communications. It operates on 7-30 V dc at 10 mA. An interface kit with *SYS50* software to graphically display, store and manipulate data on a PC, an ac power pack and 60 feet of cable is available for $59.



Remote modules gather data to log information on temperature, humidity, solar radiation, rainfall and barometric pressure (ENV-50-HUM); wind direction and velocity, rainfall and temperature (ENV-50-WDT); and electrical signals of 0-10 V, 0-1 V, 0-2.5 V, 0-100 mV, -5 to +5 V, 0-100 mA and 4-20 mA (ENV-50-VOL). Retail prices: ENV-50-WDT $395, ENV-50-HUM $395, ENV-50-VOL $379, rain gauge with 60 feet of cable $85. Don Preston, SensorMetrics Inc, PO Box 1049, Lakeville, MA 02347; tel 508-946-4904.

Under the Hood V: *Solid State Devices*



In this, the fifth installment in the Under the Hood series, we take a practical look at the diodes, transistors, integrated circuits, and other solid-state devices that make modern, compact, feature-laden communications gear possible.

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In our quest for a practical understanding of what lies under the hood of our feature-laden, microprocessor-controlled trans-ceivers, we've examined the basic passive components—resistors, capacitors, and inductors—in terms of their form, function, and application to radio. Although passive components are essential to any modern communications circuitry, it is the evolution of solid-state technology that rapidly redefined both amateur and commercial radio.

Semiconductors have come a long way since the "cat's-whisker" galena crystal detectors in use over half a century ago. Affordable, ultra-compact, battery operated, lightweight, and rugged communications units would be impossible without semiconductor diodes, transistors, ICs, and other solid-state components. Solid-state components offer a number of advantages when compared to vacuum tubes, switches, relays, and other mechanical assemblies that they replace. For example, solid-state components are generally:

1. Smaller, allowing more compact circuit designs.

2. More efficient. Transistors, for example, do not require the added energy to power the heater elements essential to the operation of vacuum tubes;

3. Cooler running. With no filaments to heat, solid-state components run cooler, resulting in longer component life;

4. Safer to work with. Although there are exceptions, most solid-state components are operated at relatively low voltages, commonly no more than 24 V.

5. More reliable. Although all components have a finite life span, most solid-state components outlive their vacuum tube or mechanical equivalents.

6. Less expensive. Single-IC receiver systems can be purchased for less than the price of a generic vacuum tube.

It's often difficult to appreciate the wide variety of solid-state components and assemblies available today. Perhaps more confusing, a given component may be available in a variety of packages. For example, a given transistor design may be leaded or surface-mount, bolt-on or solder-mount, encapsulated in an epoxy or metallic housing. Identification of small surface-mount components is especially difficult. With a little patience, a digital multimeter, and a good magnifying glass, however, most of the simpler surface-mount components can be identified.

Although we can't hope to cover the universe of solid-state components here, we can take a broad look at the most prominent stars, namely diodes, transistors, and ICs. Below is a brief introduction to some basic solid-state concepts, followed by an overview of diodes, transistors, and ICs.

Solid-State Concepts

Whatever the external appearance or intended function of solid-state components, they all share a common characteristic—their operation depends on some semiconductor material. Semiconductors are so named because they have a conductivity somewhere between that of insulators and conductors. Semiconductor conductivity and operating characteristics are purposely modified by adding substances or "impurities," such as phosphorous or boron, through a process known as doping, to otherwise pure semiconductor materials. Doping affects the relative abundance or absence of electrons or holes in a semiconductor, which in turn defines the electrical properties of the material.

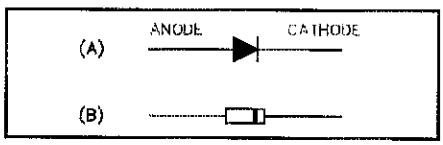

Figure 1—The simplest semiconductor device is the diode. At A, the schematic symbol for a diode; at B, the drawing of a typical diode package shows the band used to indicate the *cathode* terminal.

Some Useful Generalizations

Most solid-state components are based on the same semiconductor materials, allowing a few useful generalizations to be made as to their operating characteristics. Compared to their vacuum tube and mechanical equivalents, solid-state components are relatively fragile in terms of withstanding even brief periods of high voltages and temperatures, but relatively resistant to shock, vibration, and humidity. Whereas a vacuum tube or mechanical relay might recover completely from a voltage spike, an unprotected transistor or IC would likely be destroyed when exposed to a simple electrostatic discharge (which may be induced by careless handling!). Thus, although an IC might survive the mechanical stress of being dropped onto your shop floor, it might be destroyed by the electrostatic discharge generated as you pick it up! High temperatures and solid-state devices are simply not compatible. For this reason, high-power devices are normally attached to the chassis or other large heat-sink.

Solid-State Components

Diodes

Semiconductor diodes, the simplest and one of the most common solid-state devices, are used as signal and power switches, power supply gates, voltage references, capacitors, clippers and clamps, frequency multipliers, and as rectifiers in ac-to-dc power supplies (see Figure 1).

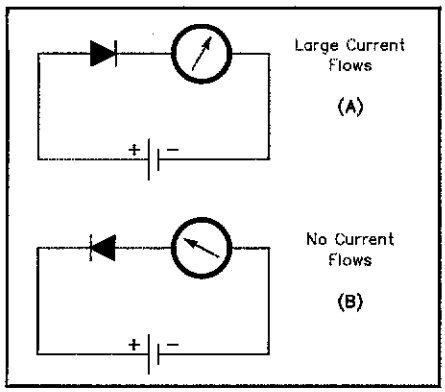

Figure 2—The basic characteristic of a diode is that it allows current flow in only one direction. At A, a positive voltage is applied to the anode, and a negative voltage to the cathode. The meter indicates a large current flow. At B, the diode is reversed, so the voltage on the anode is negative and the voltage on the cathode is positive. While a slight *leakage current* flows, it is too small to be seen with the meter.

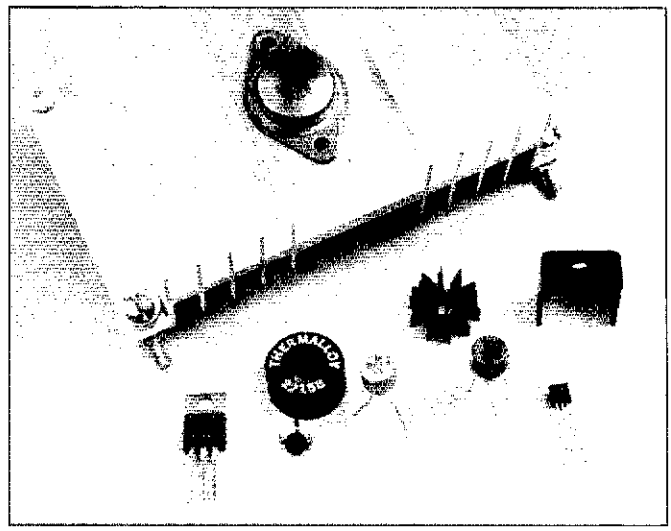

Figure 3—Transistors are built into a variety of metal and plastic packages. The actual transistor junction will be destroyed by excessive heat. Heat sinks are sometimes used to conduct away the excess heat. Heat sink size is determined by how much heat is generated by the transistor.

Diodes are used in electronics because they offer a greater resistance to the flow of current in one direction than in the opposite direction (this feature also makes diode troubleshooting relatively easy with the aid of a sensitive ohmmeter). See Figure 2.

Diodes are commonly classified by power and voltage handling capabilities, reverse leakage current and other factors, depending on the intended application. For example, a relevant rating for silicon power diodes to be used in power supply circuits is the *peak inverse voltage*—the maximum reverse voltage that can be applied before the avalanche point is reached; as well as the diode's current-handling capabilities.

Diodes can be packaged in a variety of materials, including epoxy, metal and glass. Silicon junction diodes have cornered the power diode market, mainly because of their wide temperature and voltage operating range, high power ratings, and small size.

Germanium diodes have a greater reverse leakage current than silicon diodes, but smaller forward voltage drop. If you're replacing a defective diode, use a diode with the same basic construction and rating. Germanium signal diodes don't generally fare well as replacements for high-power silicon junction diodes, and vice versa.

High-speed switching diodes have a typical reverse recovery time (the time required for the diode to return to a normal state after being switched from a reversed bias condition) of about 2 nanoseconds, compared to about 30 microseconds for a general purpose silicon power diode. Schottky-barrier or hot-carrier diodes have a low forward voltage drop, good frequency response, and low noise, and make ideal detectors. Zener diodes provide relatively stable reference voltages. Voltage-variable capacitors or Varicaps, are used in variable-frequency oscillator circuits. PIN diodes (made by defusing *P* and *N* material onto an almost *I*ntrinsically pure silicon layer) are used in RF switching, phase-shifter, and attenuator applications. Impatt, Trapatt, and Gunn diodes have applications at microwave frequencies, where they are used to generate RF directly from dc.

Perhaps the most intriguing class of diodes is light-emitting diodes or LEDs, which produce light when the P-N junction is forward biased. Compared to conventional filament lighting, LEDs are less expensive, have a greater life span, are more efficient, cooler in operation, more rugged, water resistant, and flameproof.

Photodiodes, in some respects the inverse of LEDs, convert photons or light into electric current.

Transistors

Stepping up in complexity from the 2-terminal diode is the transistor, a 3-terminal device that provides current amplification (Figure 3). Transistors have applications ranging from AF and RF amplifiers and oscillators to frequency converters, mixers, and high-speed switches. Like diodes, transistors are generally classified in terms of their internal construction, which in turn greatly influences their electrical characteristics.

The oldest, and perhaps best-known transistor designs are the bipolar NPN and PNP transistors, with their familiar emitter, base, and collector leads (Figure 4). The bipolar transistor and its successors have been largely responsible for the slow demise of the vacuum tube, at least for small-signal applications.

New designs and manufacturing techniques have produced transistors with less noise, greater power-handling capability, higher voltage ratings, higher gain, and other enhanced operating characteristics. A notable departure from the bipolar design is the field-effect transistor or FET. Unlike bipolar transistors, which operate on current flow, FETs work like vacuum tubes, in that the current flow in the output elements (from the source to the drain) is controlled by the voltage applied to one or more control elements (the gates). Like vacuum tubes, FETs provide both high input impedance, good dynamic range, and good noise characteristics. FETs are commonly used in preamplifier circuits at both audio and radio frequencies.

The two basic types of FETs differ mainly in whether the controlling gate electrode(s) is insulated from the source and drain elements. The gate in the junction FET or JFET is not insulated, whereas the gate in a metal oxide semiconductor FET or MOSFET has a layer of metal oxide between the gate(s) and the source and drain elements. Power FETs, known as vertical FETs, MOSPOWER FETs, and VMOS FETs, are available for RF amplifier applications, with moderate power output ratings through VHF.

To the average amateur, the most important transistor electrical characteristics are power handling capability (small signal versus power), operating frequency range (AF versus RF), and current amplification factor. Power transistors differ from small-signal designs mainly in internal construction and packaging. Most power designs are intended to be bolted onto a chassis or other heat sink, while most small-signal types are meant to be mounted in air. Transistors intended for small-signal applications typically generate less noise than those intended for power applications.

Most transistors will work at audio frequencies, but all transistors have some cutoff frequency where they can no longer provide amplification. Modern transistors are available with cutoff frequencies well into the UHF range and above.

Troubleshooting a suspected transistor is a bit more involved than checking a junction diode with an ohmmeter. Although an ohmmeter can verify absence or presence of gross opens and shorts, it's difficult to assess other parameters without more advanced test equipment. Fortunately, many

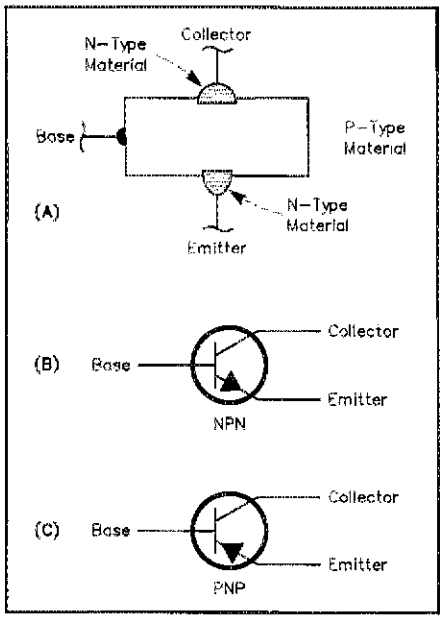

Figure 4—A junction transistor is made by *doping* N-type material onto P-type material (A). At B, the schematic diagram for an NPN transistor; at C, the schematic diagram for a PNP transistor.

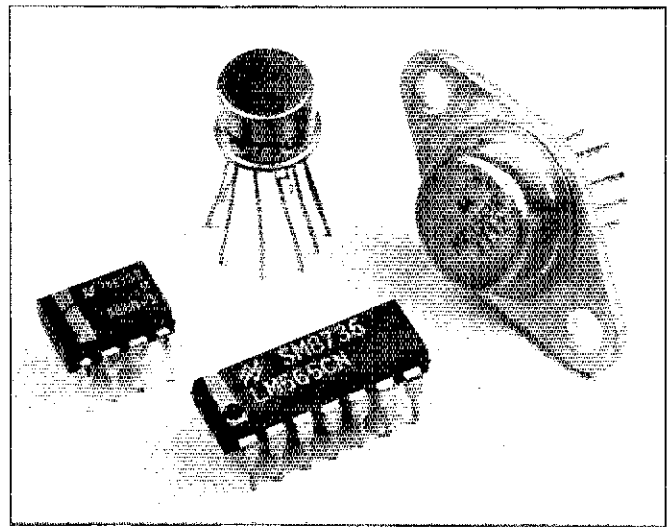

Figure 5—Like transistors, integrated circuits are built into a variety of packages, some of which are shown here. The two "bugs" in the foreground are *dual-inline package* or *DIP* ICs. Most digital ICs are supplied in some form of DIP, while analog ICs may be commonly found in any of the packages shown.

modern hand-held digital multimeters offer transistor-gain-test function.

If you look through any good electronics parts catalog, you'll find transistors listed in terms of their construction, suggested applications, operating current and voltage, minimum gain (hfe), and package type. For example, a typical listing might read: "NPN Power AF, 120 V, 250 mA, hfe 40, TO-39" for an NPN transistor designed for audio-frequency power applications, with maximum ratings of 120 V and 250 mA, a minimum hfe of 40, and in a TO-39 package (see the *ARRL Handbook* for examples of transistor packaging). If you're replacing a defective junction transistor, you'll be mainly concerned with the NPN or PNP classification, operating voltage and current, hfe, and package type, typically in that order. You may be able to use a transistor with a somewhat lower hfe or different package type (within physical limits, of course), but NPN and PNP transistors can't be interchanged. Similarly, a bipolar transistor can't be directly substituted for a MOSFET.

Integrated Circuits

Compared to the relatively limited world of diodes and transistors, ICs can be thought of as a catch-all for all solid-state components (see Figure 5). ICs often contain hundreds or thousands of diodes, transistors, and passive components in intricate circuits designed to perform functions ranging from simple digital logic switching, phase-locked-loop frequency control and direct digital synthesis to microprocessor control. ICs are relatively inexpensive, plentiful, and extremely functional, given their size. By reducing component count, both engineering time and equipment production cost are often reduced. In addition, because of the manufacturing process, it's generally easier to obtain better transistor matching within ICs than with discrete components.

Despite the extremely wide range of possible functions, ICs are generally classified as either digital, analog, or mixed. Digital ICs deal with input and output signals that are either on or off, as in the digital logic circuitry used in your PC. In contrast, analog or linear ICs work with time-varying signals, such as audio and some forms of video. Mixed ICs, a hot area in IC design circles, combine both digital and analog functions on a single chip. Analog-to-digital and digital-to-analog converter ICs are often implemented in a single, mixed-IC design.

Perhaps the most notable contribution of solid-state components to communications has been inexpensive digital ICs, especially microprocessors. Plug-in boards populated with digital ICs can transform any PC into a multi-mode communications package capable of handling everything from packet and SSTV to satellite tracking. Similarly, many contemporary transceivers rely on digital circuitry to manage RF switching, frequency synthesis, and most often used frequencies.

Families of ICs have similar characteristics, as defined by their common construction.[1] Examples of digital IC families include: TTL (transistor-transistor logic) and CMOS (complementary metal oxide semiconductor). Digital logic families vary considerably in input/output potentials, speed, and power consumption. For example, CMOS designs are used where power consumption must be minimized. More importantly, most families cannot be connected directly to other families because of differences in input and output levels. The one exception is the CMOS family, which can interface directly with most other digital IC families. In addition to the differences between digital IC families, there is also considerable variation in the characteristics of ICs within a family. Despite variations in characteristics though, all TTL ICs adhere to the same input and output level standards.

Unlike digital ICs, analog or linear ICs are designed to operate on a variety of signal input and output levels. Examples of analog ICs include the popular *operational amplifiers*, which are high-gain, dc-coupled amplifiers. Analog ICs are often designed to replace a number of discrete components, from those required to create an entire receiver, multimeter, or RF source, to video amplifiers and voltage regulators.

ICs are usually identified by their unique packaging. Compared to other devices, however, IC packaging provides little insight into the function of an IC. It's almost impossible to determine the nature of a particular IC without referring to the alphanumeric labels on the component package.

Unfortunately for most amateurs, the move toward increased use of ICs has made troubleshooting all but the simplest analog or digital ICs a formidable task. If you're lucky enough to be working with plug-in ICs, then try substitution—just like in the old vacuum-tube days. In many cases, repair requires shipping the entire transceiver back to the manufacturer. Even so, most of us would argue that the added functionality is well worth the troubleshooting hassles—especially given the functionality we have come to expect from our equipment. It would simply be impossible, were it not for modern solid-state devices.

[1] G. Tharalson, "Which Logic Family Is Best For You?" *Electronic Products*, 31(16): 53-7, 1989.

For Additional Reading

R. Schetgen, ed, *The ARRL Handbook for Radio Amateurs* (Newington: ARRL, 1994), Ch. 4 "Solid-State Basics."

L. Wolfgang, *Understanding Basic Electronics* (Newington: ARRL, 1992).

New Books

AMATEUR RADIO ENCYCLOPEDIA

By Stan Gibilisco, W1GV, Editor-in-Chief

First Edition, 1994, ISBN: 0-8036-4096-7, TAB Books, Division of McGraw-Hill Inc, Blue Ridge Summit, PA 17294-0850, Paperbound, 8½×11 inches, 608 pp. B&W illus. $29.95

Reviewed by Larry Wolfgang, WR1B
ARRL Senior Assistant Technical Editor

Since its announcement a few months ago, the Amateur Radio Encyclopedia has generated quite a lot of interest. Even the most seasoned hams seem drawn to clear, concise explanations of the many technical aspects of our hobby. The *Amateur Radio Encyclopedia* appears to contain a wealth of such "information on virtually every aspect of ham and hobby radio," as it says on the back cover of the book.

Author/editor Stan Gibilisco, W1GV, of Miami Beach, Florida, is an electronics engineer and a science and technical writer, according to the author's information on the back cover. In "About the author" inside the back cover, we learn that Gibilisco is a mathematician, and that "between 1977 and 1982, Stan served as Assistant Technical Editor for *QST* magazine ... and vice president of engineering for International Electronic Systems, Inc...To date, Stan has authored and coauthored more than 20 books." Impressive credentials, to be sure. (Stan's employment here was from mid-1978 until mid-1979, as an assistant technical editor for about half that time.)

The Table of Contents lists the first and last entry for each letter of the alphabet. It also lists four appendices and an index.

Let's take a peek inside this encyclopedia. There's a lot of information here, but the articles all seem rather short. Few of them are longer than three paragraphs and many are shorter. My initial impression was that the information in many of the entries is too brief, often leaving out details important to the understanding of a topic.

Seeking another opinion, I checked with another ARRL Headquarters Staffer. Without further comment, I asked Jim Kearman, KR1S, to take a brief look through the book and give me his reactions. Dave Sumner, K1ZZ, had looked at the book before I received it and had offered a brief comment as well. Both said they had looked up one of their favorite Amateur Radio topics, and found no entry. The fact that both had independently tried to read about Beverage antennas surprised me, but so did the fact that the book contained no entry on that topic! A quick check of the index turned up an entry for Beverage antennas, but that only led me to the "Antenna" entry, which lists articles about many specific antenna types. Apparently the "Beverage Antenna" article didn't make the final cut. Too bad, because this entry would be more valuable to most hams than one about the "Alexanderson Antenna." This antenna apparently hasn't been used much above the standard AM broadcast band. An article about Beverage antennas would probably also be of more interest than an entry about the "Czochralski Method," which describes a technique for growing semiconductor crystals.

I was also surprised to discover that a mathematician had made a common error in defining the decibel. According to the *Encyclopedia*, the "*decibel* is a means of measuring relative levels of current, voltage or power." Equations for calculating decibels with voltage, current and power are then given. The decibel is a means of comparing only *power* levels. You can use the voltage or current comparisons only if you're certain both voltages or currents are based on the same circuit impedance. The only mention of an impedance or resistance in the decibel entry is in relation to using a reference power of 1 mW, to obtain a comparison in dBm. Here we're told the load must be a pure 600-Ω resistor. Power ratios, however, are independent of source and load impedances!

Again seeking another opinion about the *Amateur Radio Encyclopedia*, I contacted ARRL Technical Advisor and *QST* World Above 50 MHz column editor Emil Pocock, W3EP. Emil commented that related information is fragmented and often repeated in several articles. In addition, material that seems to be repeated doesn't always agree. For example, in the entry about the F Layer, we read that "the F layer can occasionally return signals at frequencies as high as about 80 to 100 MHz." Under "Very High Frequencies (30 MHz to 300 MHz)" in the "Propagation Characteristics" article, we read that, "F-layer propagation is rarely observed, although it can occur at times of sunspot maxima at frequencies as high as about 70 MHz." (Emil notes that during sunspot Cycle 19, F-layer propagation was observed to exceed 70 MHz only.)

Emil also noted that information in the articles is often misleading or contrary to standard textbook accounts. In the "Moonbounce" entry, which describes amateur communication using this mode, we read that Earth-Moon-Earth (EME) contacts were first made on the HF bands at 21 and 28 MHz. The *ARRL Handbook* states that the first amateur two-way EME communication took place in July 1960 at 1296 MHz.

The index seems competent, and brings together information scattered throughout the book. Emil commented that you wouldn't find all propagation-related information under the index headings for "Propagation" or "Propagation characteristics," however. Perhaps subheadings under such index items would be helpful.

There are many incorrect and misleading explanations in the book. For example, in the discussion about capacitive reactance we're told that the choice of the positive direction for inductive reactance and the negative direction for capacitive reactance is "purely arbitrary, having been chosen by engineers for convenience." Actually, it's simple to understand this convention. It's a direct consequence of the mathematics involved. In a circuit with an inductor and a resistor in series, the voltage *leads* the current, and thus has a *positive* phase angle. In a series circuit with a capacitor and a resistor, the voltage *lags* the current, and thus has a *negative* phase angle. If the opposite convention were selected, the mathematics wouldn't work!

In the "Chebyshev Filter" article, the filter-response graph shows ripple in the stopband response, but ripple is actually only present in the Chebyshev passband response. In addition, the text refers to the skirt selectivity as "extremely steep," and while the selectivity is steeper than for a Butterworth filter, it is not as steep as that for an elliptical filter. There is no description of an elliptic filter response in the *Amateur Radio Encyclopedia*, so readers won't learn of the relative merits of these three filter responses.

The decibel definition error is continued in the discussion of filter cutoff frequency. We read that the cutoff frequency is that "at which the signal output voltage is 6 dB below the level in the passband." Actually, the cutoff frequency is specified as the point where the signal *power* is 3-dB below the level in the passband. This is also known as the half-power point. The voltage level here is 0.707 times the voltage in the passband (–3 dB). This same error is repeated several places in the various filter articles.

This book doesn't live up to the expectations of an encyclopedia. It might be better named an *Amateur Radio Dictionary*, because of the brevity of many entries. I wouldn't expect to find complete information about a topic in a dictionary, so a different title might ease some of my disappointment. Still, I'd expect the information I did find in the book to be accurate. There are far better books for less than the $30 price tag on this book. I recommend that you spend the money on a copy of the *ARRL Handbook*, or renew your League membership for another year! QST

Portable S5

A vacation in Slovenia yields big pileups, warm friendships and deeper understanding of ham life in an emerging free country.

By Sharon Machlis Gartenberg, KC1YR
31 Joseph Rd
Framingham, MA 01701

You don't have to travel to a rock in the South China Sea—100 pounds of radio gear and anti-dysentery drugs in your luggage—to be one of the hottest DX signals on the band. In my case, I just hopped on a Swissair jet and went to visit a friend. That's because my friend happens to be Boris Tušek, S51XE, in the new nation of Slovenia (see "Hamming on the Sunny Side of the Alps," by David Sumner, K1ZZ, in the November 1993 *QST*). Although Slovenia has been a DXCC country for more than two years and a lot of Slovenes are active on the bands, many hams are still missing S5 in their QSL card collections. I made more than 900 QSOs, was invited to two DX nets and heard from hams who claimed they'd waited hours to make contact with me. All in just three days on the air!

"Thanks for the new one," I heard over and over again during my stint on the other side of a pileup. I didn't know it then, but my reason for visiting Slovenia began with a QSO in December 1990, with Boris, then-YU3XE. Our chat lasted about 15 minutes and wasn't atypical—a basic talk about name, age, equipment and hobbies. But somehow in the next three years, amidst QSOs and letter writing and the tragic war in Bosnia—during which Boris has selflessly spent hours on the radio to get news from my friends in Sarajevo—we became close friends. Before I knew how it happened, my wish to visit him "someday" turned into a definite decision for my husband, Lee, KA1USL, and me to spend our 1993 summer vacation operating Portable S5. What a handy way to plan a DXpedition! With Boris arranging for operating permission and graciously offering us the use of his radio club's spectacular contest station—not to mention the second floor of his home for two weeks—all we had to do was show up.

We arrived in nearby Klagenfurt, Austria (it's possible to fly into the Slovenia's capital, Ljubljana, but it's cheaper to go to Austria). Boris drove us for an afternoon through picture-postcard Alpine scenery to Cerkno (population 2200). Impatient to begin work on the air, my thoughts were diverted when we stopped at his parents' farm nestled halfway up a mountain. The view of the valley and surrounding mountains was breathtaking. "Just let me sit here for a week and look at this," I pleaded. Instead, we set off for the Cerkno radio club's contest spot, Črni Vrh (Black Peak). Driving up the winding, not-always-paved mountain road, I was especially grateful for our native host!

Lessons Learned from the Other Side

Like anyone who has worked DX from the States, I've listened to lots of big pileups. No matter how many people are screaming their call signs, I can always easily hear a few letters in the crowd. I found out it's a lot different when all the beams around the world are pointing at *you*. Now I know why DX stations work by call area, a practice I found annoying when I was the one chasing DX. In Slovenia, it was impossible to pick out call signs in the cacophony.

Who got through the pileups? I'd often hear one letter from a ham, but not a second; I vowed that when competing in future pileups, I'll shout my whole call with gusto! I noted that "tail ending"—waiting for the pileup to die down and then dropping in one's call sign—was often effective. And maybe it's just my imagination, but I think I heard a greater percentage of those who included my name—"W1 Alfa Bravo, Sharon!" instead of just "W1 Alfa Bravo!" Perhaps it has something to do with the brain's conditioning to respond to one's own name, which predates even the quest for DX.

After sorting through hundreds of QSL cards sent direct, I have a better idea of what hams can do to make it easier and more pleasant for DX stations to answer their cards. Here are some tips:

• Include return postage and a self-addressed envelope (SASE). I never mind if I have a chat with someone at home and then they send their card without postage. However, I'm a little irked at the people who heard my huge pileup from S5, but didn't stop to think about simple economics. Working more than a station a minute, how could I afford it if everyone wanted a direct card without sending postage? With a mixture of Stateside and DX QSOs, that would cost more than $30 an hour! I don't expect fellow hams to help pay my QSL card printing costs (although the few who added a green stamp for that purpose were deeply appreciated), but it's unreasonable to expect a DX station to assume the full burden for postage. An SASE is a big timesaver when there are hundreds of cards to answer direct.

• Put as much information as possible on the outside of the

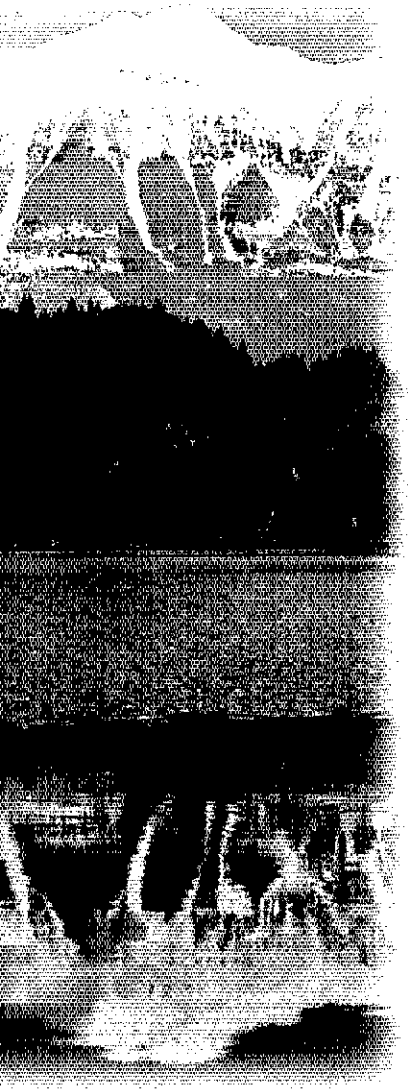

PHOTO BY MARJAN SMERKE

There's more to do in Slovenia than work DX pileups. Bled is one of the country's most popular tourist destinations for its beautiful lake and stunning mountain scenery.

Contest Station with a View

I was floored when we arrived at the peak. The location was perfect—atop a mountain in the woods, with each vista more stunning than the last. Looking one way was Triglav, Slovenia's tallest mountain; another way was Cerkno in the valley below. It was late afternoon and the last thing I wanted to do was waste the chance to view my first sunset over the Alps. Until I saw the station.

Built from scratch by 10 active hams, the Črni Vrh contest location is a cabin with a loft upstairs that sleeps four. There are three towers, the tallest at 30 meters, supporting antennas that include a 5-element beam for 20 meters, 3-element beam for 40, and 2-element cubical quad for the newer HF bands. As it turned out, the only one I used was the monobander for 20 because the pileups were so persistent. I didn't have much chance to change bands.

The cabin and antennas are shared. Technically, members bring their own radio gear, although they often loan that back and forth. They decide each year who gets to work which contests from the site, divvying up the major DX weekends. Because of the time and expense that went into buying, building and equipping the site, other hams who want to become regular users are asked to pay a fee of 600 German marks. That's about $350 in US bucks, or approximately the average monthly take-home salary in Slovenia. During our visit, however, we were told to think of the site as "ours."

The Lady is DX

This was not my first exotic prefix—the year before, I operated UC1A/KC1YR—nor was it the first time I was a guest op at a station with a 100-foot tower and monoband Yagi. But the combination of the S5 prefix, outstanding setup and 1300-meter mountain generated the largest, most persistent pileups I'd ever experienced. During each session on the air, I held a frequency for hours. Even more amazing, I only had to call CQ once a night, for maybe 20 or 30 seconds, when we first fired up Boris' commercial ham transceiver and the club's home-brew amplifier. That would be it—once someone found me, I had company for the duration. The pileups got so huge that sometimes, even when broken down by call area, they were a wall of noise. My QSO rate was cut considerably when it would take me two or three "QRZ again, please?" requests to pick out some letters. A nice "problem" to have!

Being an American operating from the unusual location added to my attraction on the bands. Some thought I was in the middle of the war in ex-Yugoslavia; I had to keep explaining that Slovenia had just 10 days of fighting in 1991 before splitting with Belgrade and has been at peace since then. Also generating interest was what my husband calls the "YL factor." Even local Cerkno hams, who have plenty of experience with pileups of their own, were a little surprised at the crowds I garnered.

"Unfair advantage," several of them chided with a smile.

"You guys need more YLs on the air in this country," I replied. Anyway, it didn't seem particularly fair to me that they could put a 4300-foot mountain under their towers! YL DXCC hunters were especially happy to hear me, because the country has few women working regularly on HF.

"When are you going to be on the air again?" asked one American operator in Germany, ready to telephone friends back home with the news. When I told him I wasn't sure, maybe only one more day, he said, "Well, they can read it and weep."

On my first day on the air, I worked almost 250 stations in a little more than three hours, including chats with Cerkno hams who got on 20 meters to say hello and welcome us to town. My other nights on the air were similar. In contrast, my KC1YR log in Massachusetts often takes more than a month to fill a page. I worked hundreds of stations in the States, including Alaska and Hawaii, and

envelope. I waited more than a month for my S5 QSL cards to be printed and didn't want a huge pile of cards to sort through at once. So I checked them against my log as they came in and wrote my necessary information on the envelope to speed things along when my cards arrived. The information on the outside of the envelope made it a breeze to check and sort cards.

• ***Make sure your call sign is on the side of your card with QSO information.*** I found it annoying when I was checking my log and looked at date and time on a QSL card, only to have to search for the call sign on the card.

• ***Get the date and time right.*** This may sound painfully obvious, but it's surprising how many people who want a DX card get the date or time wrong. After you've spent 30 minutes waiting to bust through a pileup, take an extra 60 seconds and make *sure* you've got the correct UTC date and time. If the DX station's log is computerized, this isn't a problem anymore because it's easy to search for a call sign. But my S5 log isn't, and with a stack of cards to answer, a QSL card that's wrong even by an hour or a day means flipping through a lot of pages to check. Such cards go to the "wait until everything else is answered" pile.

Another tip from my friend Martin, who operated FW/G4DZC in *CQ* WW '92: Include the exact frequency you worked the station on, not just "14 MHz." That can help the DX station locate when you worked, if the date or time are accidentally off.

• ***If the QSO is a new country or something else you need for an award, make a note on the card.*** After the fun and excitement of a DXpedition—not to mention a wonderful vacation away from life's usual chores—sitting down to write out a stack of cards is a comparative drudge. Seeing comments like "Thanks so much for the new one!" or "You sure had a big pileup! I'm glad I got through" makes the QSLing seem appreciated. And it brings back wonderful memories of what it was like to be one of the world's most popular hams—if only for three nights.—*KC1YR*

The Native Tongue

Want to surprise a Slovenian ham? Living in a nation of just two million people, Slovenes almost never get to make a DX contact in their mother tongue. In your next S5 QSO, try a few words in Slovene:

*Me ve**SEli***	Nice to meet you
*Pet de**VET***	59
HVA**la za **ZVE**zo	Thanks for the QSO
*Lep poz**DRAV***	Best wishes
***SREC**no* (pronounced ***SRECH**no*)	Good luck

PHOTO BY THE AUTHOR

The Črni Vrh (Black Peak) contest station near Cerkno, Slovenia.

PHOTO BY LEE GARTENBERG KA1USL

The author visits the castle at Bled with Boris, S51XE.

much of Europe and a bit of Asia. We talked to many of our friends back home.

Hams in the Public Interest

I got a chance to hear first-hand about the outstanding service hams are performing in the former Yugoslavia, passing messages in and out of war-ravaged Bosnia-Herzegovina. I doubt there's ever been such a need for sustained emergency and Health-and-Welfare ham traffic in the history of Amateur Radio. Normal mail and phone service to the republic was cut more than a year and a half ago; for many Bosnians trapped in the siege and for their loved ones outside, hams have provided the only way to communicate with family and friends.

Bosnian hams in Sarajevo and elsewhere conduct this traffic handling under unimaginably brutal conditions. Somehow they stay on the air, despite incessant artillery bombardments (antennas can't be placed too high or they'll catch the attention of Serbian gunners in the surrounding hills), equipment breakdowns (with the obvious problem of how to get parts) and constant cutoffs of electricity. They're true heroes.

We listened on 40 meters for a while, with Boris translating the discussions about friends and family being okay, and how to get some documents out of Sarajevo (for many who fled the war and "ethnic cleansing," things like diplomas and professional certificates are vital if they hope to find work in their temporary homes). One lengthy QSO discussed what a visiting priest would be taking in to help beleaguered inhabitants.

With hundreds of thousands of Bosnian refugees now elsewhere in Europe, hams inside Bosnia are exceedingly popular; when they can be on the air, many take lists of hams waiting with traffic. Boris has waited hours trying to get a message in on behalf of a Bosnian abroad. I was lucky. As a visiting American with traffic to pass to fellow hams, Sarajevans on the air were sympathetic to Boris' requests; our wait was relatively short. Twice, T9 hams telephoned my friends, allowing us to talk briefly. It wasn't the visit to Sarajevo I had dreamed would be possible, but it was better than nothing at all.

Local Operating

My friends wished me a good trip, Lee and I got a taste of local VHF while portable S5, and we found 2-meter operation in an Alpine country an interesting change from the flatlands back home. As one Slovene ham told us: "Here, it's less important to know repeater frequencies than to know the mountains."

The Slovenes make the most of their terrain, perching repeaters atop many of their highest peaks. One day, we drove to the well-known cathedral at Sveta Gora (Sacred Mountain). It was up a winding road, with numerous wooden crosses along the way, where the faithful can stop and pray. Atop the mountain, Boris pointed to a nearby digipeater. It was respectfully out of the typical tourist's view—and certainly handy for bouncing packets to Italy. The hams in Cerkno use 2-meter simplex to chat amongst themselves. We could usually find Danilo, S59WA; Damijan, S59AB; Branko, S51HB; or other local hams after returning home from a long day of sightseeing, to chat about our tourist activities.

The hospitality we enjoyed during our stay was tremendous. Shortly after we arrived, many hams in town got on 2 meters to make sure we felt welcome at their radio club and in the community. Many of them made the drive up the mountain to keep us company while operating at Črni Vrh. Mirko Rejc, S52RD, even dragged his computer up to Črni Vrh and left it there for several days so we could use packet during our stay; he provided invaluable help in sending messages to my friends in Sarajevo.

A Home Away from Home

The local radio club, led by president Miran Vončina, S59VM, threw us a party at a nearby country inn—a great evening of good food (including local specialties like goat meat), good wine (Slovenia produces excellent vintages) and warm, friendly conversation. We brought back two beautiful

books about Slovenia and a lot of wonderful memories. We were even interviewed by the local radio station. I've never felt more welcome and at home in a place so far away.

We fit in more than radio during our two-week stay, enjoying many tourist attractions on the "Sunny Side of the Alps." We stopped at the beautiful lake in Bled, with its island church and stunning, cliff-hugging medieval castle; the cave where Dante Alighieri hid out from Italian authorities and wrote "The Inferno"; a waterfall near the town of Bohinj; and local wine producers in the countryside bordering Italy. Although poor timing made us miss a tour of caves famous for their geological beauty and we skipped the world-renowned stallions of Lipica, we did catch a handmade-lace festival in nearby Idrija, and international wine and flower shows in Ljubljana.

Time to Go Home and Get in the Contest

My only DX disappointment, aside from not hitting DXCC (I spent too much time beaming Stateside), was missing the 1000-QSO mark. We had planned another late night on the air for our last night in the country, this time at the contest station of Tone, S52CD, and Darko, S54DL. I was hoping to finally try my hand on 80 meters with their 2-element delta loop atop another nearby peak. However, a thunder and hail storm cut short my quest for 1k.

Our journey back to Austria was typical of the entire trip. We left on a Saturday morning, before the beginning of the European HF DX contest. Because our rental car started exhibiting hesitation the night before we left, we were concerned if it would be okay for the 2½-hour trip back to Klagenfurt. Boris' friend Damijan, S59AB, and YL Ingrid graciously agreed to follow us in their car—departure time was 5 AM. They stayed with us at the airport until our plane departed (late) before heading home, where Damijan was to embark on an all-night contest effort.

We felt guilty for tiring him out before the contest, so we promised to find him from home and give him some points. True to our word, after more than 12 hours' travel, I found S59AB, worked 10 stations before him and passed him the special "QTC" points from those previous contacts. Shortly before collapsing in bed, I went through our stack of mail and found more than 80 QSL cards already waiting for S5/KC1YR!

The full impact of just how sought-after I had been on the bands didn't really hit until a month after we were home. A ham from North Carolina telephoned, asking for my QSL card. I explained that my special photo cards were still at the printer and he politely urged me to consider writing out his card on a postcard or anything else that was handy. Because the Spratly cards are coming out, he told me, he only needed one more card to have confirmed every DXCC country: Mine. I'm pretty sure that will never happen in Framingham. QST

New Books

CQ 1994 AMATEUR RADIO ALMANAC

Edited By Doug Grant, K1DG

CQ Communications Inc, 76 N Broadway, Hicksville, NY 11801; tel 516-681-2926. First edition, 1993. 486 pp, illustrated with B&W photographs, diagrams and maps, and 7 pp of color photographs. 8×5½ inches. Retail price $19.95. ISBN 0-943016-06-1.

Reviewed By Brian Battles WS1O
QST *Features Editor*

The ARRL holds what may appear to be a near monopoly on Amateur Radio information. That makes sense, because your League has been around for eight decades, and it must be capable of serving you and your fellow Members in almost any way necessary—now and into the future. Not everything is conveniently accessible on paper or as computer data, though. Here at HQ we have an incredible resource that can instantly provide details and data on an unimaginable range of Amateur Radio-related subjects: Facts about FCC rules, operating issues, spectrum management, DXpeditions, contests, identities of well-known hams, countries, awards, trivia and almost anything you can think of. This "secret weapon" is code-named K1ZZ. Few staff members recall any time when the ARRL's Executive Vice President was stumped by a question.

Most hams aren't fortunate enough to have such an impressive memory and knowledge of facts, and you can't have Dave standing by whenever you have a question on a fact relating to ham radio. For most amateurs, owning a copy of the CQ *Amateur Radio Almanac* could be the next best thing. Editor Doug Grant, K1DG, a ham of considerable experience and accomplishments, has prepared an extensive reference work packed with data that can come in handy for any ham. After an interesting opening chapter that provides a condensed, informative history of Amateur Radio, the complete text of FCC Part 97 is reproduced (although recent changes in Novice VHF privileges didn't make it into this edition), and there are records, tables, tips, addresses, awards and listings that cover almost every type of Amateur Radio category. There's plenty of the fascinating trivia hams love to eat up, too, such as WWV and NIST information, mini-profiles of well-known amateurs, postal rates and regulations, and so on.

Almost everything in this book is available from other sources, such as *QST*, *CQ*, ARRL publications and free handouts, and other books, electronic bulletin boards and so forth. The value of the *Almanac* is that so much is contained in one place, with a handy index, and it can save time when you need to look something up. It's also an incurable browser's paradise. Novices and Technicians who haven't explored much beyond local FM repeaters will find that flipping through the *Almanac* exposes them to a wider scope of Amateur Radio, and it may spark their interest in using new bands and modes, or in upgrading to gain HF privileges. The book is well-balanced in its coverage of material that relates to above- and below-30 MHz topics. For HFers, there are geographical data and world maps, DXing, contesting, QSLing, propagation and contest statistical tables. For VHF/UHF/microwave operators there's packet, satellites, EME, VHF/UHF/microwave records, contest info and *more*.

Most of the material in the *Almanac* is of interest to any active amateur. There's a wealth of helpful information on license census stats, FCC rules and addresses, frequencies and bandplans, events, hamfests, publications and reference tables. There are sections that cover radio manufacturers and dealers, IARU societies, key foreign phrases, computers, the Internet and other publications. A weak spot in any almanac that carries volatile information is that much of it may be outdated shortly after the book reaches print. For example, the list of ARRL officials is certain to have inaccuracies because of changes in the ranks of committee members; Division and Section leaders are included, although this information is available in up-to-date form on page 8 in every issue of *QST*; the complete Novice and Technician written license exam question pools is included, although these change every few years; top contest scores and other achievements may be superseded at any time; and the Silent Keys list will obviously be subject to continuous update. Naturally, there will almost certainly be an updated *Almanac* each year, and you'd need to pick up a new each year if you need the latest information.

I read through the book three or four times, and didn't happen to notice any significant errors, omissions or typos. (Perhaps Dave would have spotted a few slip-ups, but then, *he* doesn't need this book!) [I learned a *lot* just by skimming the book!!!—*K1ZZ*]

You could view this book as the next closest thing to a 24-hour direct hotline to Dave Sumner. If you're a "data hound" who's fascinated by Amateur Radio facts or if you'd just like an practical reference work to add to your ham library, I'd say that the CQ *Amateur Radio Almanac is* worth your 20 bucks. It's a commendable first-time effort for Doug and *CQ*. QST

An Overview of Amateur Call Signs —Past and Present

There's some history behind that call sign of yours—check it out!

By Phil Sager, WB4FDT and Rick Palm, K1CE
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N4MM, KH6IJ, K3LVA, WS1O, N1EER, KB1AFX! The United States has a wide variety of amateur call signs. Have you ever wondered how this came about? The history of US call signs goes back 80 years, and their story is more complicated than most amateurs realize. Before we start on our call sign journey, let's make sure we understand the road signs:

The *prefix* refers to the character(s) before the number in a call sign. For example, WB4FDT has a *two-letter* prefix, *WB*.

The *suffix* refers to the character(s) after the number. WB4FDT has a *three-letter* suffix, *FDT*.

A *one-by-two* call sign has one letter in the prefix and two letters in the suffix, such as W3UT. Similarly, a *one-by-three* call sign has one letter in the prefix and three letters in the suffix, such as K4BAI. An example of a two-by-two call sign would be KJ4KB; a two-by-three call, WB4FDT.

Preferred Call Signs

One-by-two call signs, such as W8IO or K4VX, are considered to be *preferred call signs*, because of the implied status of the holder as an "old-timer" in ham radio. But in pursuing the idea of preferred call signs further, we run into an anomaly: One-by-three call signs that begin with either W or K are also generally thought of as preferred call signs, but one-by-threes that begin with N are *not*, because they have come to indicate the newer generation of hams. (Sure, this is illogical; but when you examine such areas of implied status in any field, you will typically run across such departures from logic!) Call signs with two characters in the prefix, such as WB4FDT, are also considered as being nonpreferred by many hams.

When co-author Phil Sager worked for the FCC in the old Amateur and Citizen's Division in the early 1970s, the Division's biggest headache was amateur call signs. In fact, there was an in-house joke to the effect that *no* amateur was satisfied with his or her call sign: Hams with WA and WB calls wanted W or K one-by-three call signs. Hams who had one-by-three calls wanted one-by-two calls signs. Hams who had one-by-two calls wanted their suffix to be their *initials*! Some amateurs wanted the call sign of a deceased friend or relative. At times it seemed as if every licensed ham was on the FCC's phone trying to get a new call sign!

The situation is somewhat amusing to the disinterested bystander, but for the hams involved, it is very serious business, indeed. It's often difficult for nonhams or newer hams to understand the importance an amateur attaches to his call sign. Call signs are *at least* as important as names, and most amateurs want a short one that is easy for others to remember. Or one that reflects their initials or name. Or one that has a good sound (on phone) or good rhythm (on CW), or *both*.

There is one interesting aspect to the preferred call sign game that is generally overlooked: It often appears that the FCC regards amateurs as somewhat silly for wanting call signs of their individual preference. There have been many periods during the FCC's tenure that the Commission has not been willing to structure call sign assignments to meet the ham community's wish for preferred call signs. Yet, throughout most of the history of commercial broadcast stations, the FCC has cooperated fully with the commercial interests in assigning call signs of their choice, and in enabling one broadcast group to "purchase" a preferred call sign from another station (by the license holder turning the call sign back in to the FCC and being assigned a new call sign, while the call sign turned in is reissued to the station that wanted it. Why? So that, by a stretch of both the phonic rendition of the call sign and the audience's imagination, the radio station can be called "Kiss Radio" or "Light Radio," or some such.

In the beginning...

Prior to 1912, there were no call signs assigned by the authorities, simply because there was no licensing of radio stations in the United States. Pioneer amateurs made up their own calls, sometimes using their initials. The ARRL's founder, Hiram Percy Maxim, used the initials SNY for his call sign in 1911.[1] Since the range of the average spark station at that time was usually only a few miles, no further identification was needed, and there were few cases of confusion caused by two or more stations picking the same identifier letters.

With the passage of the Radio Act of 1912, amateurs were required to be licensed and were assigned government-issued call signs. All call signs were issued by the Department of Commerce, which divided the US into nine call sign districts. All amateur call signs consisted of a number followed by two letters, such as 1WH.

The concept of preferred call signs, incidentally, began in the early days of Amateur Radio, as shown by the following story, which Stew Perry, W1BB, used to tell on himself (Stew, now a Silent Key, was a pioneer of 160 meter DXing, a fine operator, and a true gentleman.)

Amateur Radio was shut down for the duration of World War I. The strong identity of hams with their call signs was not recognized by the Department of Commerce, which simply cancelled all amateur licenses for the war, so that hams lost the call signs that had been issued to them a few years earlier. After the war, the Department announced that amateurs would be relicensed, but with new call signs, rather than their previously held call signs. Hams wanted to be assigned call signs at the head of the alphabet, so as to show their early origin in the hobby.

When the Department of Commerce announced that it would begin issuing call signs to amateurs on a certain day, young Stew showed up at the Boston office in the early morning hours, thinking that he would be first in line and, when the office opened, he would be given the call sign 1AA. To his chagrin, over 20 amateurs—all obviously having the same idea—were already in line when he got there, so that Stew was assigned 1BB!

The two-letter suffix call signs quickly ran out, and a third letter was added; 1ANA, for example. Many two-letter suffixed call signs were reissued as they became available, and they were often available upon request. As late as 1927, new amateurs in some call areas were given reissued one-by-two call signs.

Call Signs That Were Reserved or Withheld

When call signs began to be issued by the government, the suffixes that began with X, Y, and Z were reserved for "special classes of stations," such as "experimental stations for the development of radio communications [the X block], technical and training school stations [the Y block], and special land stations[the Z block]." For example, 1ZM was licensed to Hiram Percy Maxim as a "Private (limited commercial and special)

[1]Notes appear on page 59.

Special Land Radio Station." The ARRL's co-founder, Clarence D. Tuska, was similarly licensed as 1ZT.

The calls with X, Y, and Z as the first letter of their suffix continued to be blocked from being issued to hams for many years. For example, when experiments began with television broadcasting in 1927, a typical station call sign for experimental television broadcasting was W2XCO, licensed to *Radio Corporation of America*, in New York, as shown in the 1929 call directory. Later, these blocks of call signs were released for assignment to amateurs, which opened up quite a few new preferred call signs. Z-suffixed call signs weren't regularized until 1925 when they appeared in the *Call Book*. Y-suffixed call signs continued to be issued to school stations (W1YK, for example, was issued to Worcester Polytechnic Institute), but were later assigned to individual hams in the 1930s. X-suffixed call signs didn't show for regular amateur use until Extras could request specific one-by-two call signs in 1977, and later when the current call sign assignment system was enacted. There is still one exclusion with respect to X-suffixes: Two-by-three X-suffixed call signs are reserved for experimental stations, and are therefore not issued to amateurs.

There was another group of call signs that were not issued in the early days—those that could be construed by some as being vulgarisms or obscenities. That was a more prudish age, to be sure, and it's amusing to consider some of the call signs that were withheld for such a reason. Eventually, this rule was relaxed and moderated, so that now we can all enjoy W2SEX on Field Day. There are, however, some call signs that have never been issued; you may conduct your own research in your copy of the *Call Book Magazine* to determine what those call signs might be.

Time Marches On...

But, to get back to the chronology of our story, the state of the radio art moved forward, amateurs began experimenting with short-wave frequencies, and international QSOs became more commonplace. Canadian, European and South American amateurs were using the same system of call signs that US hams were using, and it was impossible to identify the country a ham was in by hearing his call sign. To avoid confusion, many amateurs, in about 1923, began using, on an unofficial basis, what they called *international intermediates*, and a one-letter prefix to indicate the country.

In this country, amateurs used *u* (which was rendered in lower case, not the usual capital letter, because it was unofficial) to indicate the United States. Furthermore, they would transmit the call sign on the air with a space between the unofficial prefix and the official call sign—for example, u 6OI—but would write it on QSL cards as u6OI, without the space. A later modification to this unofficial system, in 1927, added another letter to indicate the continent (with *n* being used for North America), so that the call sign would then be sent as nu 6OI. Canadian amateurs used nc, for North America, Canada. There were more details to this unofficial system that seem confusing today, but the hams of the day were being inventive in dealing with an operating problem, and their conventions served them well at the time.[2]

Where Our Present Prefixes Come From

By the late 1920s, it was obvious that some official system of international call sign prefixes had to be used. The Washington Conference of 1927 assigned prefixes to each country. The United States was assigned the prefixes *K*, *N* and *W* (for commercial, military, and amateur call signs).[3] *N* was used by the Navy (you will recall that radio in this country had its beginnings with the Navy and with amateurs, and the Navy continued to be a strong user of radio), and *K* and *W* were used by the civilian services. At the suggestion of the ARRL, the Department of Commerce decided that radio amateurs within the continental US should use the prefix *W*. Thus, 1AW became W1AW. Amateurs in US territories or possessions would use the prefix *K* (K7ADY was an early ham in Alaska, and K6BT was a radio pioneer in Hawaii). These prefixes went into effect in 1928.[4]

The *A* prefix block was unassigned in 1927.[5] The *AA* to *AL* prefix block was later assigned to the US (but not specifically to amateurs) at the Atlantic City conference of 1947.[6] In 1975, the FCC reassigned call sign prefixes in the *AA* to *AL* block and the *N* block to amateurs. Amateur-style calls in these blocks had previously been used by the Department of Defense for MARS stations; however, the MARS calls had later taken a different form, and the Department of Defense had no objection to the FCC's reassigning these blocks to amateurs.[7] The AA to AL prefix block was not used, however, until 1977.

Call Areas

Nine call areas, numbered *1* through *9*, had been originally created in 1912 (Figure 1). They were similar to today's call areas in many ways, but there were some major exceptions. The largest call area, the ninth, contained all of the states in the present tenth (WØ) call area. Four states—New York, New Jersey, Pennsylvania and Michigan—were split between two different call areas. Western New York and western Pennsylvania were part of the eighth call area, while eastern New York was in the second call area and eastern Pennsylvania was in the third call area. Michigan was split between the eighth (southern Michigan) and ninth (northern Michigan) call areas and southern New Jersey was part of the third call area, while northern New Jersey was in the second call area.

Some states were in different call areas than they are today. Virginia was part of the third call area, while Kentucky was part of the ninth. Nevada, Utah and Arizona were part of the sixth call area.[8] Alabama was part of the fifth call area until 1928, when it was moved to the fourth call area.[9]

Tenth Call Area Added

Shortly after the newly formed Federal Communications Commission took over amateur licensing, as a result of the changes indicated by the Communications Act of 1934, it was apparent that the continued growth of Amateur Radio made the existing system of call areas obsolete. Even before WW II, "the bottom of the barrel had been reached in the ninth call area and the FCC found it necessary to resurrect and reassign old call signs that had been vacated by former owners only a few years before."[10]

During WW II, the ARRL undertook the study of the future needs of amateur call sign availability, since it was apparent that changes needed to be made, and ARRL felt these changes could best be initiated before amateurs were reactivated after the war. Suggestions from the membership regarding calls were solicited.[11] Proposals for remapped call areas were finalized in time for the May 1945 meeting of the ARRL Board of Directors.

At that meeting, the ARRL Board recom-

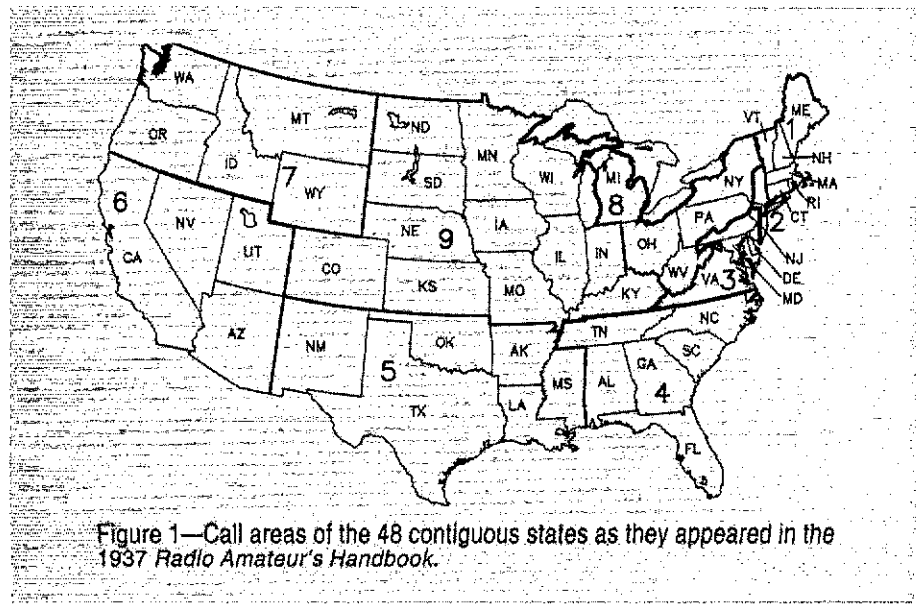


Figure 1—Call areas of the 48 contiguous states as they appeared in the 1937 *Radio Amateur's Handbook*.

mended that splitting of states into two call areas be eliminated and that some states be shifted to different call areas so that each area would contain approximately the same number of amateurs. Also, the Board recommended to the FCC the establishment of the tenth call area.[12]

By the end of the year, the FCC agreed to accept the Board's recommendations, and the call areas that we still use today came into being.[13]

Amateurs who were switched to new call areas had their call signs changed to the new call area when they next renewed their licenses. In many instances, amateurs were able to obtain a "counterpart" call sign, changing only the number. For example, W9BAZ became W4BAZ.[14]

At the same time, all US possessions and territories were assigned their own two-letter special prefixes, beginning as before with a K. For example, KG6AA was a call sign from Guam, and KV4AA was a station in the US Virgin Islands. The number in these DX call signs was chosen to be in general alignment with extensions of the mainland call areas. To return to the examples just given, Guam was "offshore" from California—as were Johnston Island, KJ6; Midway Island, KM6; American Samoa, KS6; Wake Island, KW6; etc—so they had the numeral 6 in their call signs. Similarly, the US Virgin Islands (also Swan Island, KS4, and Puerto Rico, KP4), offshore from Florida, had the numeral 4 in their call signs. The Canal Zone was in the extension of the fifth call area, so that it had KZ5 call signs, and the Territory of Alaska was in the extension of the seventh call area and thus had KL7 call signs.[15]

At the time, this alignment made the call areas roughly equal in amateur population, no one could foresee the huge population increases in California, New York and Florida. Within a decade, the second, fourth and sixth call areas had far larger populations than did the remaining seven.

During and After World War II

When World War II reached the US, Amateur Radio was shut down (on December 7, 1941), as it was in other countries of the world, for the duration of the hostilities. During the war years, the FCC continued to give examinations for and to issue Amateur Radio licenses, but those licenses were operator licenses only, not station licenses, so that no call signs were issued. Issues of *QST* of that era tagged those hams without call signs as LSPH—licensed since Pearl Harbor. Hams who held station licenses and call signs when the war began were allowed to keep their call signs. Renewals of amateur licenses during the war was not required; all station and operator licenses were grandfathered, so as to be renewable at the end of the war.

Immediately after WW II, *K* call signs started appearing at various places around the world, as American servicemen who were hams started getting back on the air. Many of those K call signs, although American call signs, were not issued by the FCC; rather, they were issued by local US military governments. Examples of such call sign prefixes are KT1, in the US Tangier Zone of Morocco, and KG1, for US personnel in Greenland. Another example is the American troops stationed in Japan, who were issued two-by-two call signs with the KA prefix. (The KA prefix had been used prior to WW II in the Phillipines, which at the time was a US Commonwealth.)

Novice Prefixes

The Novice class license was added to the licensing structure on July 1, 1951.[16] The Commission decided to distinguish Novice licensees by assigning them a two-letter prefix, *WN*, such as WN4TYU. These calls became commonly known as *two-by-three* calls, because of their two-letter prefix and three-letter suffix. When a Novice upgraded, the *N* was dropped from the call, so WN4UWA became W4UWA, for example.[17]

The popularity of the new Novice license brought such a large number of new hams into our hobby that, after only a few years, the Commission began to run out of K and W call signs in the populous second and sixth districts. Novices were then assigned *WV* prefixes, which were changed to a *WA* when the Novice upgraded.[18] For example, WV2AYO appeared in the Winter 1958 edition of the *Radio Amateur Call Book Magazine*, but he later upgraded and his call sign was changed to WA2AYO, as shown in the Spring 1961 edition.

Novices in US territories or possessions did not have an N in their prefix. Instead, their two-letter prefix began with a *W* instead of a K. When the Novice upgraded, the W would be replaced by a K; for example, Novice WL7BCH became KL7BCH when he upgraded to General class.[19]

The FCC stopped issuing distinctive Novice prefixes in 1976, citing difficulties in processing applications. After October 1 of that year, permanent call signs were issued to Novices.[20]

During this era, an amateur could have two call signs simultaneously—a Novice and a Technician—because the privileges of the two licenses didn't overlap. He would use his Novice call sign on the Novice band, and his Technician call sign on Technician frequencies.

K Prefixes Appear

The first K call signs in the continental US made their appearance in 1947. In the ninth call area, where the bottom of the barrel was being scraped on W calls, a new series was started, beginning with K9AAA. Hawaiian call signs were changed from K6 to KH6 and Alaskan call signs from K7 to KL7, as they were renewed. Hawaiian and Alaskan amateurs with prewar K6 or K7 calls were advised to seek renewal immediately so as to get a call from the new series to prevent confusion with the new K calls from the contiguous 48 states.[21]

By the mid-1950s, other call areas were running short of call signs as the W prefix calls ran out. Even though the FCC had had several options, including issuing two-by-two calls such as WA1AA, they decided to issue calls beginning with the one-letter prefix K, such as K4BAI, as they had already done in the ninth call area. (Twoletter K prefixes, such as KL7AB, continued to be reserved for US territories and possessions.)[22] Novices were assigned KN prefixes, with the N being dropped when the Novice upgraded.[23]

Operation Deep Freeze

Operation Deep Freeze was an intensive scientific exploration of the Antarctic region in the late 1950s and early 1960s. It started in 1957, which was called the International Geophysical Year. The FCC assigned the block of two-by-three call signs from KC4AAA to KC4AAZ to the National Science Foundation, which, in turn, issued them to their Antarctic stations. Similarly, the FCC assigned the block from KC4USA to KC4USV to the Navy for their stations.

WA, WB and WD Prefixes Appear

By the late 1950s and early 1960s, the FCC had begun to run out of call signs with K prefixes in the most populous call areas, so the first two-by-three call signs with the WA prefix were issued.[24] WA2AAE, for example, showed up in the 1958 *Call Book*. Prefixes beginning with WA were generally issued in most call areas between 1960 and 1968, with the major exception being the small third call area, where WA prefixes didn't appear until the 1964 *Call Book*.

At the same time, the FCC discontinued the practice of issuing "counterpart" call signs for hams who moved across call area boundaries (such as 1950s Oklahoma Section Communications Manager W5RST, who previously held W2RST *and* WØRST), citing workload considerations.[25]

The first call signs with *WB* prefixes were issued in 1962 in the second and sixth call areas, followed by the fourth call area in 1965. Most call signs with the WB prefix had been issued prior to 1972, with the exception of the smaller call areas.

Between 1966 and 1969, the Commission began to run out of WB prefixes in the second, fourth and sixth call areas. The Commission reissued vacant WA and WB prefixes in those call areas in the early to mid 1970s. It became possible for newer hams in those districts to be given a call sign with a WA prefix, when their neighbor down the street, who might have been licensed 10 years previously, had a WB prefix! To most amateurs, these assignments made little difference, although some did complain that the new ham down the street had a "more preferred" call sign than the "old-timers" did!

Beginning about 1976 and ending in 1978, new amateurs in the second, fourth, sixth, eighth, ninth and tenth call areas received *WD* prefixes. These ended in 1978 when the Commission began issuing the now-familiar *KA* prefixes.

Changing Call Signs—Exceptions to the Rules

Generally, the government has issued call signs systematically and sequentially, but

there were some key exceptions. For example, a look at the FCC Rules in 1954 reveals that the Commission allowed a specific unassigned call sign to be reassigned to a previous holder [Sections 12.81(a)(1) and (2)]. Also, an unassigned two-letter call would be assigned to a previous holder of *any* two-letter call [Section 12.81(a)(5), FCC Rules, adopted 1946].[26] These provisions were carried on the books through 1977.

Amateurs who had dropped out of the hobby for a number of years were thus sometimes able to retrieve their old call signs. Some amateurs, long after they had been Novices, requested and were reissued their old Novice call signs. This is why some WN-prefixed two-by-three calls exist today.

From the late 1960s until 1978, the FCC had an informal practice of issuing, on request, a preferred one-by-three call to a person who had once held the Novice call equivalent but had not previously upgraded; for example, issuing K3ABC when the licensee had held KN3ABC.[27]

Until the rule changes of 1978, if an amateur moved into another call area, he or she was required to get a new call reflecting his or her new call area. If an amateur wanted to keep his or her old call, the only way to do so was to continue to license the station location within the original call area. Some amateurs did this by licensing the station location at the home of a friend or relative in the desired call area. This game became moot in 1978, when the FCC decided amateurs could continue to keep their calls if they wished, even when they changed call areas.[28]

Special Calls For Extra Class Licensees: 1968 to 1977

The present Extra Class license has been around since 1952. Other than a special FCC certificate, there was no benefit to obtaining an Extra Class license prior to 1968, when incentive licensing was reinstated. More important to many Extra Class licensees than their increased frequency privileges, however, was the FCC rule change that allowed any Extra Class licensee who had been licensed 25 years or longer to request a one-by-two call sign, such as W4AA.[29]

The prefix was limited to a W or a K. The applicant did not have any choice of what call he or she was to receive. This was the first time since the late 1920s that these two-letter call signs had been regularly issued, and there was a great deal of excitement as some old-timers changed calls they had held for 50 years or more.

In 1977, the FCC modified this rule so as to allow any Extra Class licensee to request a two-letter call sign of his or her choice, and they dropped the 25-year requirement.[30] At the same time, the FCC opened up new prefixes in the block for the Extra Class. For the first time, Extra Class amateurs could receive an *N*-prefixed one-by-two call sign, such as N3AL. They could also request a unique two-by-two call sign beginning with the prefix *AA*, such as AA4AT.[31]

This ambitious program was developed in four stages, giving the first choice of call signs to amateurs who had been licensed as Extra Class prior to incentive licensing. The second and third stages of this program allowed amateurs with progressively shorter longevity as Extra Class to apply. The last stage opened up the program to *all* Extra Class licensees. This program remained in effect until 1978, when the present assignment system was adopted.[32]

Incidentally, it is possible to have a one-by-two "Extra Class format," preferred call and not be Extra Class. There are still a handful of amateurs who received their one-by-two call signs in the 1910s and '20s—the real old-timers in our hobby—and who have kept them to the present day, whether they hold Extra Class licenses or not.

The Present System

The most comprehensive change in the Amateur Radio call sign structure since World War II went into effect in late March 1978. The reason for this change was federal funding. While the workload of the FCC's Gettysburg licensing facility had increased 1000%, budget problems made it impossible for the Commission to hire enough employees for the increased workload.[33]

The first phase started on March 30, 1978.[34] In effect, the previous system was almost entirely thrown out. The most obvious change was the creation of the call sign blocks corresponding to the class of license, which is the present situation. The current system allows an amateur upgrading his license to get a call sign corresponding to his license class, the only exception being that the Technician class and General class licensees share the same call sign group. But there are problems in that some call sign groups are being exhausted (eg, Group C call signs in most call areas).

All provisions for the issuance of specific calls were abolished. All call signs would be assigned in systematic order. Extra Class licensees are systematically assigned a call within their block, although a licensee could request a nonspecific call from another amateur class block. If you move from one call area to another, you are no longer required to get a new call sign. Also, the FCC no longer issues special event calls, or RACES, repeater, military-recreation, and club station licenses. The Commission is, however, continuing to renew and modify existing RACES, military-recreation, and club licenses. Figure 2 shows the current call sign scheme.

An often overlooked change that was made is that the FCC will no longer assign a call sign on the basis of the station location; the new rules assign the call sign based on the *mailing address*.

Also, the prefixes of US territories and possessions were, in most cases, changed. Caribbean possessions were all given KP prefixes, with different *numbers* now identifying the different countries. Puerto Rico kept its old KP4 prefix, but the US Virgin Islands switched from KV4 to KP2. Pacific possessions were all given KH prefixes, with Hawaii keeping its KH6 prefix. Guam amateurs, for example, went from a KG6 to a KH2 prefix. In all instances, licensees with the former prefixes were allowed to keep them if they wished; for example, the perennial KG6DX. Thus, today we find both the old and the new prefixes being used in most US possessions and territories.

Phase II of the call sign program became effective January 1, 1979,[35] reaffirming FCC policies that no specific call sign requests would be honored and also that the FCC would no longer issue secondary station calls. Extra Class licensees were now only allowed to be assigned Group A calls, and could not choose an alternative group. While we're on the subject of Group A calls, did you know that it's *possible* that an Extra Class licensee might someday be assigned a one-by-one call, such as W1A? One-by-one calls, beginning with K, N and W, are in the Extra Class block. However, since there's only 78 such calls per call area (26 × 3), the Commission has so far shied away from issuing them. Those would be the *ultimate* preferred call signs, and if the FCC did issue them, it would take the entire FCC staff to field irate phone calls from the hams

Summary of Government Regulation of Amateur Radio

Before 1912, there was no licensing, no regulations, and no governing body to oversee "wireless" activities. Mandatory licensing began when the US Department of Commerce and Labor, under the authority of the Radio Act of 1912, created the Amateur First Grade and the Amateur Second Grade licenses.

In 1923, the Department of Commerce created the Amateur Extra First Grade license—a license so special that it was printed on pink paper! Only Amateur Extra First Grade licensees thereafter qualified for "special" station licenses, which had distinctive call signs and conveyed CW privileges on wavelengths longer than 200 meters. (Remember that hams had been banished to wavelengths of 200 meters and shorter, so as not to cause interference to commercial and military radio stations. At the time, everyone thought that such short wavelengths would not be very useful for communication. *Ha!*)

The Radio Act of 1927 transferred the power to issue *station* licenses to the Federal Radio Commission (FRC), while preserving the authority of the Commerce Department's Radio Division to issue *operator* licenses. Later, in 1932, the Radio Division and the FRC were merged.

The Federal Communications Commission (FCC) succeeded the FRC when the Communications Act of 1934 became law. The FCC revised the regulations in 1951 to create the license classes and their names as we know them today.

Group A Call Signs

Block no.	Contiguous USA
*1	K#$$
*2	N#$$
*3	W#$$
4-13	AA#$-AK#$
14-36	KA#$-KZ#$
37-59	NA#$-NZ#$
60-82	WA#$-WZ#$
83-92	AA#$$-AK#$$
93	Group B

The following prefixes will not be assigned to stations in the contiguous 48 states: AH WH KH NH NL AL KL WL KP NP WP. Pacific-area stations will be assigned AH#$ KH#$ NH#$ WH#$, then Group B. Alaska-area stations will get WL7$ AL7$ KL7# NL7$, then Group B. Atlantic-area stations will be assigned KP#$ NP#$ WP#$, then Group B.

Group B Call Signs

Block no.	Contiguous USA
1[1]	KA1$$
2-23	KB#$$-KZ#$$
24-46	NA#$$-NZ#$$
47-69	WA#$$-WZ#$$
70	Group C

[1]KA prefixes will be assigned only to persons living in the first call district. Other KAs are assigned to US personnel living in Japan. The following prefixes will not be assigned to stations in the contiguous 48 states. KH KL KP NH NL NP WH WL WP. Pacific-area stations will be assigned calls in the format, AH#$$, Alaska-area stations, AL7$$, and Atlantic-area stations, KP#$$. Once these blocks are used up, assignments will be made from Group C call signs.

Group C Call Signs

Block no.	Contiguous USA
*1	K#$$$
2	N#$$$
*3	W#$$$
4	Group D

Pacific-area stations will be asigned KH#$$ NH#$$ WH#$$, in that order; ALaska-area stations KL7$$ NL7$$ WL7$$; Atlantic-area stations NP#$$ "WP#$$. After these are depleted, Group D will be used.
*Call signs using these prefixes are not currently being issued.

Group D Call Signs

Block no.	Contiguous USA
1-23[1]	KA#$$$-KZ#$$$
24-41	WA#$$$-WZ#$$$

[1]Except KC4AAA-AAF and KC4USA-USZ.
The following call sign formats will not be assigned to stations in the contiguous 48 states: KH#$$$ KL#$$$ KP#$$$ WC#$$$ WH#$$$ WK#$$$ WL#$$$ WM#$$$ WP#$$$ WR#$$$ WT#$$$. Pacific-area stations will be assigned to KH#$$$ WH#$$$; Alaska-area stations will be assigned KL7#$$$ WL7$$$; Atlantic-area stations KP#$$$ WP#$$$.

Figure 2—Current US call sign blocks.

who *didn't* get a one-by-one call sign!

Other Call Sign Types

Special Event Call Signs

Special Event call signs were formerly available to individuals and organizations to help publicize a special event or happening. The rules explicitly allowed for such assignment [97.51(a)(4), FCC Rules, 1976]. N6V, WX3MAS and NQ4ITU are some examples of special event calls that were issued. Even calls such as KC3F, which later became routine Group A call signs, were used. These calls were valid only for the duration of the event—usually only a few days. Some of the most popular special event calls were those issued to honor International Telecommunication Union Week in mid-May. Between 1975 and 1977, more than 120 of those special calls—all having ITU suffixes—were issued to groups and individuals requesting them. The FCC announced a moratorium, effective March 3, 1977, on applications for special events stations, and few, if any, special events calls have been issued since.[36]

During the nation's bicentennial year in 1976, the FCC authorized amateurs to use a special prefix, if they wished. During the bicentennial year, amateurs could, at will, use either their normal prefix or the following sets of special prefixes:

Prefix	Bicentennial prefix
W	AC
K	AD
WA	AA
WB	AB
WD	AE
WN	AK
KH6	AH6
KP4	AJ4
KL7	AL7

There were also various bicentennial prefixes for the other US possessions, and distinctive bicentennial prefixes for the Novice class in some.[37]

Temporary Calls

Before there were interim permits, amateurs had to wait until they had their license "in hand" before they could use their new privileges. Occasionally, someone who had just passed an examination and did not have any call sign had a pressing need to use his license immediately. For example, some individuals were planning to depart right away on a cruise on a small boat, and needed Amateur Radio communication immediately. Between 1976 and 1978 about 100 of these calls were issued. Each began with the prefix WT, such as WT4AAA. These calls were not issued by the FCC in Gettysburg, but by the Amateur and Citizens Division in Washington. These temporary calls expired when the regular license arrived.

Repeater Calls

When repeater stations first began to flourish in the late 1960s, the owner's call sign was used on the repeater. Beginning in 1973, repeater stations were assigned two-by-three call signs with the prefix WR, such as WR4AUJ.[38] In May 1978, the FCC stopped issuing and renewing WR call signs. Amateurs could continue to use their WR calls until they expired, and then the repeater would revert to the owner's call sign. By 1984, all WR repeater calls had expired.[39]

Secondary Station Licenses

Up to March 1977, the FCC would issue a *secondary station* license to an amateur who requested it. An additional station license could be licensed anywhere other than the primary station location. This gave amateurs the opportunity to keep old call signs when they applied for new call signs. They simply licensed one of their call signs to a secondary station location. In 1977, the FCC felt there was no longer any need for secondary station licenses, and they stopped issuing new ones[40] and stopped renewing old ones. Since many amateurs had a preferred call sign licensed to a secondary station, the FCC did allow the licensee the choice of which call sign he would keep when his secondary station license expired.[41]

RACES Stations

For a brief period from 1976 to 1977, RACES (Radio Amateur Civil Emergency Service) stations were assigned *WC* prefixes.[42] This prefix was not available for general amateur use. In early 1977, the FCC erroneously assigned several hundred WC prefixes to amateurs in the tenth call area. The FCC soon corrected their mistake and reissued new WD call signs, but allowed amateurs to use the WC call signs until the replacement license was received.[43]

Club Calls

Club stations have been licensed almost as long as individual stations have been licensed. When the FCC proposed to eliminate club station calls in 1977,[44] there was a storm of complaints. The FCC finally said it would renew and modify existing club station licenses, but would not issue new ones.[45]

Many clubs were previously able to receive preferred one-by-three or even one-by-two calls through the "in memoriam" FCC rule. This rule allowed amateur organizations to request the call sign of a deceased member as a memorial (see, for example, Section 12.81(a)(3), *FCC Rules*, 1957)

Summary

Figure 3 shows a brief history of US call signs drawn on a vertical time line. Some of the most notable changes during the 70 years displayed on the time line are noted.

What's Happening Now

The FCC has recently released a proposal

History of Call Signs At A Glance

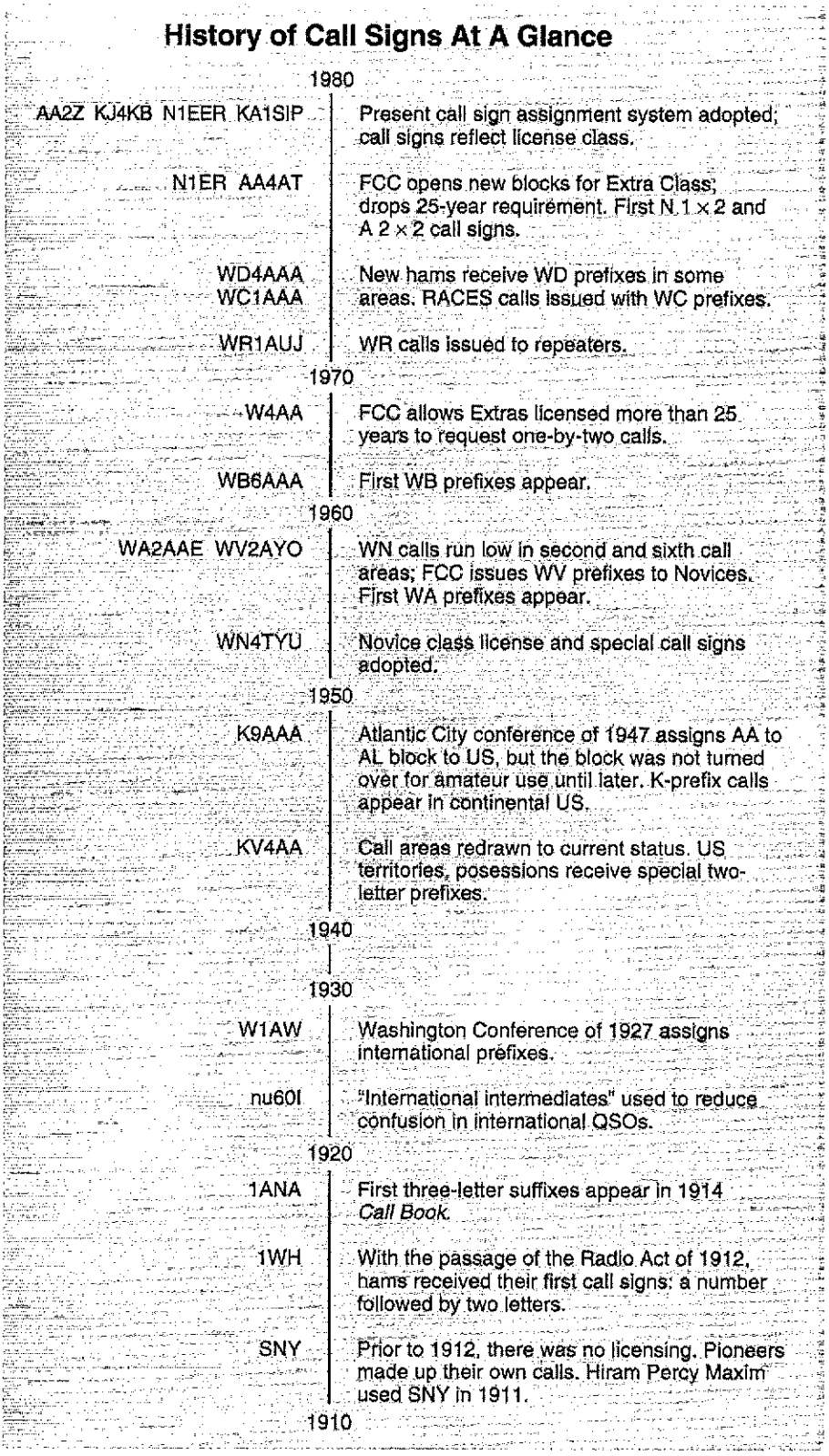


Figure 3—Call sign history at a glance.

to once again revamp the call sign assignment system. The proposal would allow all amateurs to choose their call signs, but for an annual fee. You can have the best call sign money can buy! See February 1994 *QST*, page 84, for details, and get ready for the biggest thing to happen in the call sign arena for years. Preferred call signs, *here we come!*

Notes:

[1]A. Schumacher, *Hiram Percy Maxim*, (Greenville, NH: The Ham Radio Publishing Group, 1970), p 62.

[2]"The International Intermediate," *QST*, Dec 1923, p 19, and "New International Intermediates," *QST*, Dec 1927, p 54; see also "Amateur Calls Changing," *QST*, Aug 1928, p 35, and the sidebar "When Amateur Call Signs Went International," *QST*, Oct 1992, p 41.

[3]Article 14, Sec. 1, *Call Signs, Radiotelegraph Convention and General Regulations*, Washington Conference, 1927.

[4]"Amateur Calls Changing," *QST*, Aug 1928, p 35.

[5]Article 14, Sec. 1, *Call Signals, Radiotelegraph Convention and General Regulations*, Washington Conference, 1927.

[6]Article 19, Sec. II, para. 4, *Allocation of International Series, Final Acts, International Telecommunications and Radio Conferences*, Atlantic City Conference, 1947, International Telecommunuications Union.

[7]"New Call Sign Blocks Made Available," *QST*, May 1975, p 89.

[8]*Amateur Radio Stations of the United States*, (Washington: Government Printing Office, 1913).

[9]*Amateur Radio Stations of the United States*, (Washington: Government Printing Office, 1928).

[10]Service, Charles A., "Postwar Station Calls," *QST*, Jul 1945, p 24.

[11]"Station Calls," *QST*, Feb 1945, pp 7-8.

[12]Service, Charles A., "Postwar Station Calls," *QST*, Jul 1945, p 24; see also Service, Charles A., "More About Postwar Station Calls," *QST*, Sep 1945, p 20.

[13]"New Call Areas," *QST*, Dec 1945, pp 31-32.

[14]Ibid.

[15]Ibid; see also "Noncontinental Prefixes," *QST*, Apr 1946, p 43.

[16]*Radio Amateur's License Manual*, ARRL, 27th ed., 1951, p 13.

[17]"Novice Call Signs," *QST*, Jul 1951, p 25; see also "FCC Announces New System for Future Call Signs," *QST*, May 1958, p 72.

[18]"FCC Announces New System for Future Call Signs," *QST*, May 1958, p 72.

[19]"Novice Call Signs," *QST*, Jul 1951, p 25.

[20]"League Lines," *QST*, Oct 1976, p 10.

[21]"K Calls," *QST*, Feb 1947, p 36.

[22]"New Call Areas," *QST*, Dec 1945, p 32; see also "Call Signs," *QST*, Oct 1956, p 49.

[23]"Novice Call Signs," *QST*, Jul 1951, p 25; see also "FCC Announces New System for Future Call Signs," *QST*, May 1958, p 72.

[24]"FCC Announces New System for Future Call Signs," *QST*, May 1958, p 72.

[25]Ibid.

[26]"Two-Letter Calls," *QST*, Oct 1946, p 27.

[27]"All Special Calls—Doomed?" *QST*, May 1977, p 60; see also *FCC News Release*, March 16, 1977.

[28]"Call Me Anything, But Don't Call Me 'Good Buddy'," *QST*, May 1978, p 49.

[29]"Incentive Licensing Adopted by FCC," *QST*, Oct 1967, p 78.

[30]"Extra Class Call Signs," *QST*, Jun 1976, p 55.

[31]"New Call Sign Blocks Made Available," *QST*, May 1975, p 89.

[32]"Extra Class Call Signs," *QST*, Jun 1976, p 55.

[33]"All Special Calls—Doomed?" *QST*, May 1977, p 58-60.

[34]"Call Me Anything, But Don't Call Me 'Good Buddy'," *QST*, May 1978, p 49.

[35]"Phase II of the Call-Sign Assignment System," *QST*, Jan 1979, p 62.

[36]"League Lines," *QST*, Apr 1977, p 11.

[37]"Centennial Call Signs," *QST*, May 1975, p 89.

[38]"New Repeater Rules!" *QST*, Oct 1972, p 102.

[39]"WR Call Signs Will Go, " *QST*, May 1978, p 47.

[40]"League Lines," *QST*, Apr 1977, p 10.

[41]"Call Me Anything, But Don't Call Me 'Good Buddy'," *QST*, May 1978, p 49.

[42]"RACES Rules Reregulated," *QST*, Apr 1976, p 49.

[43]"WC Calls In Error," *QST*, May 1977, p 64.

[44]"All Special Calls—Doomed?" *QST*, May 1977, p 58-60.

[45]"Club Calls—Those That Have them Can Keep Them," *QST*, May 1980, p 54.

QST

Correspondence

Conducted By Kirk Kleinschmidt, NTØZ
Assistant Managing Editor

THE SECRET OF OUR SUCCESS

◊ Despite *QST*'s comments to the contrary, our first-place, record-breaking, 1993 UHF Contest win happened because of a dedicated team of operators and rovers. Our rover teams traveled to 23 grids; they were able to give out the extra QSOs and the extra grids necessary for our win. The quality of the main station operators and equipment allowed us to work those rovers and gave us our big score.—*Dave Hallidy, KD5RO, Wayland, New York*

USE IT OR LOSE IT

◊ Frank, WA6JBV, has a valid point in his March letter: There are those of us who aggressively pursue contest points, rare DX and so on beyond established fraternal bounds. It should be pointed out, however, that the organizations that sponsor weekend contests, awards programs and other activities are doing Amateur Radio a great service by helping us hang onto and expand our frequency allocations. The cardinal rule is still "Use it or lose it."

Without such incentives to turn on the rig, much less spend 30 to 40 hours at a crack on the air, our allocated spectrum space would be threatened. Just listen to 10 meters in the daytime, the foreign broadcast stations on the 40-meter band at night, much of 75/80 meters and all of 160 meters, day or night.

Activity sponsors are not in a position to police our behavior. The most they can do is to try to persuade us to act responsibly. And for the most part, they have.

My first CW contest (this February) was nothing like the bedlam WA6JBV described: There were a number of unimpeded QSOs in progress at the top of the CW subbands. Because WA6JBV specified the third weekend in November and made reference to 11 meters, perhaps he should have limited his comments to phone operators....—*Phil Jacobsen, KM6FW, San Diego, California*

◊ As an avid contesting enthusiast, it's of particular interest to me to know how we come across to those who don't share our enthusiasm.

I'm amazed at how two people can perceive the same events so differently. Frank, WA6JBV, says that last year's Phone Sweepstakes weekend "was a catastrophe." When I listened to the radio that weekend, what I heard were hundreds of my fellow hams engaging in friendly sport, having many more QSOs than you usually find in a single weekend, testing their stations, perfecting their traffic-handling techniques and their emergency preparedness, and generally having a good time. To me it sounded like our spectrum was being well used in exactly the manner in which it was intended.

Frank implied that the number of large, national contests is increasing. This is not the case. Over the last 15 years, the ARRL has cut its domestic contest schedule by 240 hours per year. *73* magazine cut its contest schedule by about 100 hours.

All this is to say that there are two sides to every coin. I think excessive emotionalism can only cloud the issues we need to face to clear up this problem. We all know there is strong sentiment against contesters. If you share that mindset, consider the following: There is no contest that uses all available HF spectrum at any given time. Large, nationwide [US] contests total 348 hours every year. That leaves 8412 hours for ragchewing, skeds, nets and other on-air activities. From this perspective, it would be easy for contesters to make a case for not getting their fair share.—*Mark Beckwith, WA6OTU, Sierra Madre, California, Chairman, ARRL Contest Advisory Committee*

FLYING HIGH ON 6 METERS

◊ Regarding the 6-meter radio-control frequencies listed on page 63 of March 1994 *QST*: The reference ignores the time-honored RC frequencies of 53.1, 53.2, 53.3...53.8 MHz. Many "RC hams" use 53-MHz frequencies because they are mostly interference-free (barring an occasional repeater) and can be used with relatively wideband RC equipment. I have used 53.3 MHz since the 1950s, and I plan to use it for the indefinite future.

The 50.8-MHz RC frequencies have well-known problems: (1) The equipment needed for these frequencies is expensive because of the required narrow channelization and (2) They are in a very active part of the band.

The 6-meter band plan is just that: a plan. Further, the plan is little known except for 6-meter enthusiasts. FCC regulations make the band open to most types of modulation and all types of amateur activities.

These days, the upper end of the band is little-used in most parts of the country. RC activity on 6 meters can help our lowest VHF band lose its reputation of being the "forgotten band."—*George Wilson, W1OLP, Marstons Mills, Massachusetts*

A TRIP TO THE OLD NEIGHBORHOOD...

◊ In February Correspondence, W9LNQ says he "was pleasantly surprised to receive [an ARRL] Elmer Certificate" and notes that it was the first such recognition he had been presented with in more than 50 years of hamming. Perhaps the reason is that the ARRL Elmer Certificate is a pretty well-kept secret!

Had I known of the award, I would certainly have nominated my Elmer, W7EH, a long time ago. I first met him in the way that many 10-year-olds first meet hams: One Sunday morning I rode my bicycle to his house and knocked on the door. Leon Faber opened the door, introduced himself and invited me inside.

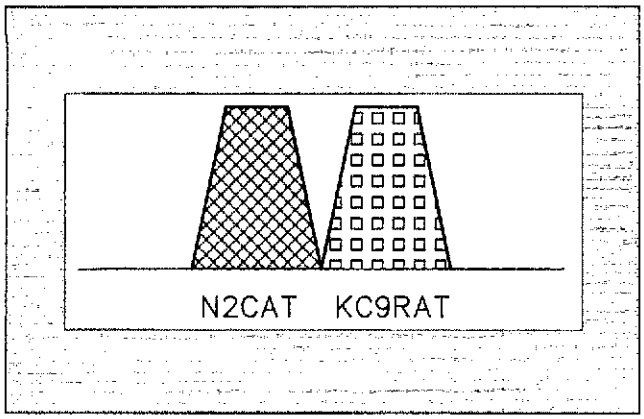
Mr Faber was a friendly looking man in his late 60s, retired, and quite active. He let me see his radio gear his radio equipment and showed me how to use the receiver. He then made a few contacts, and I watched in awe as he talked to people from across the country, turning knobs and every now and then reaching for the antenna rotator. Finally, he offered me his seat and went into the kitchen to finish his breakfast, which I had apparently interrupted.

This gradually became a regular ritual. Every Sunday morning before my parents arose, I would pedal over to Mr Faber's house, presenting myself there at 7:30 or so to listen on his receiver while he had breakfast. (This alone is worth some kind of recognition!)

After he finished breakfast, I would accompany him on his chores—looking after the tropical birds in his aviary, working on some project in his workshop, finding and feeding the desert tortoises he kept in his backyard—and he would talk to me about radio, and began to teach me what I needed to know to get my own license.

With Mr Faber's help, I eventually became licensed as WA7QZL. I continued my occasional visits to Mr Faber's house until we moved away from the neighborhood, almost 25 years ago. Eventually, I moved to California, where I stayed until last year.

Returning to Arizona, I couldn't resist driving past the old neighborhood. The antenna is still there, as are the boat and the aviary. The Land Rover has been replaced with a Land Cruiser. I wonder how many more hams he's helped in the last quarter-century?—*Bruce Toback, KN6MN, Mesa, Arizona* QST



NEW HAM COMPANION

Strange as it may seem, you're looking at a tool that will help you get the most out of your HF transceiver. Find a pair of scissors and turn to page 66.

This Month in *New Ham Companion*

Make Your Mobile More Portable

Picture yourself fumbling beneath the dashboard of your car as you try to remove your transceiver. You've found the dc power connector, but where is the external speaker plug? It sure would make life simpler if you could bring all these wires together at one easy-to-use connector. There *is* a solution to the problem and its magic letters are "XLR."

Steve Mendelsohn, WA2DHF

Conquering the Code

Mastering Morse is easier if you have a few tricks up your sleeve!

Gail Bellamy, AA8MY

Interference in Reverse

When you think of interference and Amateur Radio, images of angry neighbors or spouses come to mind. But what happens when *you're* on the receiving end? Here is the saga of an amateur bedeviled by a local signal that just won't go away.

Tom Freedom, W3HVE

But How Do I Use It?

Bells and whistles—that's what most hams call those knobs that decorate their HF transceivers. Some are superb tools—if you know how to use them. Learning about these devices can be fun. All you need is the plastic lid from a coffee can (no kidding!).

Paul M. Danzer, N1II

A PC Shopper's Guide

When you're ready to take the plunge and buy an IBM PC or compatible computer for your station, make sure you get the most bang for your buck. This handy guide will tell you how.

Steve Ford, WB8IMY, and Kirk Kleinschmidt, NTØZ

The Doctor is IN

The Doctor discusses water and antennas, an anemic HF amplifier, the mysterious FM capture effect, high SWR on a 6-meter beam and more!

Elsewhere in this issue

In addition to New Ham Companion, there are other articles in this issue that you might find interesting. Here's a quick rundown:

❑ If competitive ham radio sounds like your cup of tea, this issue is loaded with tips. Sweepstakes, (after Field Day, probably the best US contest for beginners) is a good place to get started, so check out Chip Margelli, K7JA's, **An Enchanted Sweepstakes** (warm-weather contest fun), and John Reisenauer, NL7TB's **Yukon DXing With a Flair** (cold-weather contest fun).

❑ In **Under the Hood V**, Brian Bergeron, NU1N, discusses the basics of solid-state components. Don't miss this primer—especially if you can't tell a germanium transistor from a metric Crescent wrench....

Making Your Mobile More Portable

Why fumble with separate speaker and power leads when one connector will do it all?

By Steve Mendelsohn, WA2DHF
318 New Milford Ave
Dumont, NJ 07628

In many urban areas, it's standard practice to remove your mobile transceiver from your car after you park it. On the streets of New York City, removing your rig is mandatory. Either you take it, or someone takes it for you!

Speed of installation and removal is important when you're forced to do this day after day. My magnetic-mount antenna can be slipped off and stored in the trunk in seconds. My transceiver, however, is another matter. Like most modern radios, it has individual plugs for dc power and an external speaker. These plugs aren't easy to get to—especially when you have the rig mounted in a compact car. The plugs are also not especially durable. It doesn't take much force to break or deform them.

I solved this annoying problem by leaving the original speaker and power plugs on the radio and passing their wires through a *single*, easy-to-use connector. The connector of choice has been a favorite among broadcasters and audiophiles for years: the Amphenol *XLR*.

The XLR is a steel-reinforced, keyed connector with as few as three, or as many as eight, pins. Its current rating is 15 A, more than enough for mobile radios. It snaps together easily and has a holding pin that requires thumb pressure to release the male connector from the female. (You can even connect and disconnect an XLR without being able to see it. Touch alone will guide you.) The XLR is extremely durable. I've seen heavy trucks roll over these connectors without inflicting as much as a scratch!

You can use an XLR to make the connections for positive dc power, an external speaker "high" lead and a common speaker/power ground. I picked up my XLRs for less than $2 at a hamfest. (You can also buy XLR connectors at Radio Shack.) For an additional dollar, I purchased a quick-connect PL-259 antenna connector. Purists will quibble with the use of quick-connect RF plugs, but I'll accept an impedance mismatch and a slight amount of RF loss as the price of convenience.

Installation

Let's install the radio side first (see Figure 1). Start by cutting the existing dc power leads and tinning them with solder. The fuse connector should go on the radio side of the connection. Unscrew the rear shroud of the XLR (and the tiny front screw) and slide the wafer containing the pins forward. Place the rear shroud on the tinned power leads, sliding the body of the connector onto the wires and leaving the tinned leads projecting through the front of the connector.

Next, slide any additional wiring (for

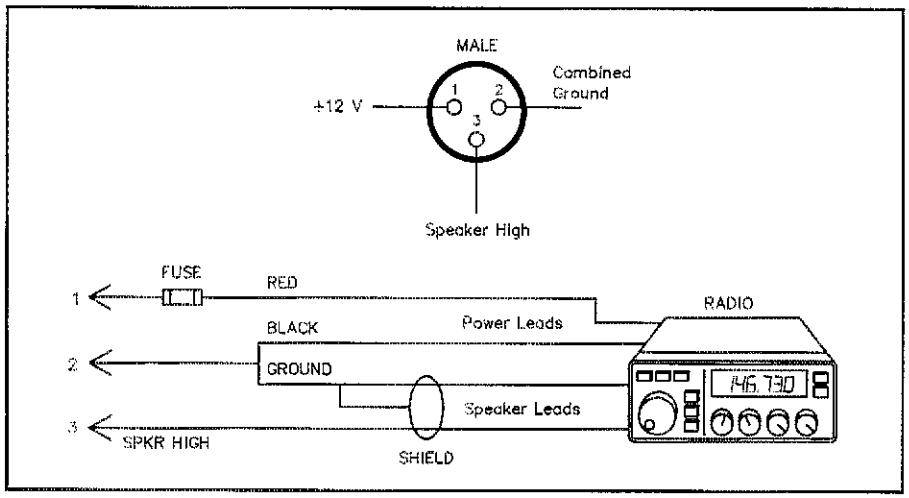


Figure 1—The radio side of the XLR connection. Note that the fuse is on this side of the plug. One of the speaker wires is attached to the negative dc power lead to form a common ground.

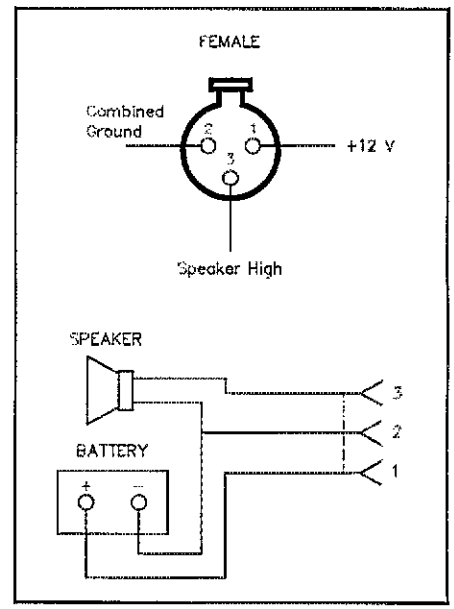


Figure 2—The automobile side. From here it's a simple matter to route the wires to your external speaker and battery.

KIRK KLEINSCHMIDT, NT9Z

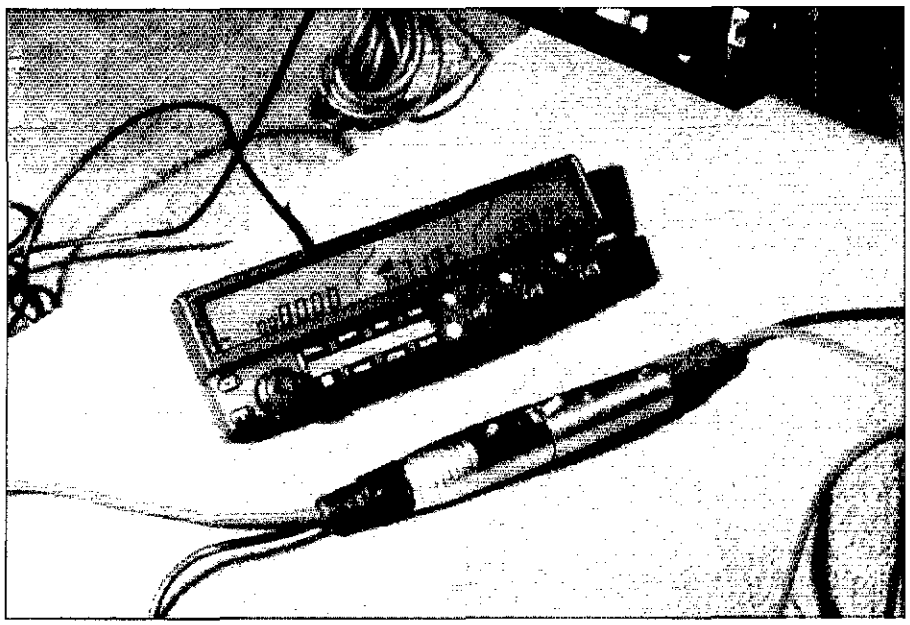


Figure 3—This XLR connector makes a rugged splice for the positive dc power and ground leads from my VHF/UHF transceiver (that's its control head just above the connector). You can also use the third XLR pin to pass the "high" wire from your external speaker. Notice the tab at the junction of the two connectors. Simply press this tab and the XLRs separate easily!

the external speaker, in this case) through the rear shell and body of the connector. Solder one of the speaker wires to the *negative* dc power lead. Make absolutely certain that you've correctly identified the negative power lead! Now solder the positive dc power lead to pin 1. Solder the combined speaker/power ground to pin 2 and the remaining speaker wire to pin 3.

Finally, push the pins back into the body of the connector and reinstall the screw. The plastic wafer is keyed, so it's impossible to reinstall the wafer in the wrong position. Slide the rear shroud onto the connector body and screw it in tightly. This will compress the plastic insert in the shroud's shell and provide a strain relief.

Now it's time to install the automobile side of the connector (see Figure 2). Use the same steps you performed on the radio side. Pay careful attention to the pin numbers when you're soldering the power, ground and speaker leads. Remember that they're *reversed* on the opposite connector! For safety sake, use a VOM (volt-ohmmeter) set on the resistance mode and make sure that the wires are connected properly through the XLR.

That's all there is to it! Snap the connectors together and press the little tab to pull them apart (see Figure 3). When it's time to take your radio out of the car, all you have to do is pull off the RF connector and unsnap the XLR. The total time is measured in seconds! QST

Radio Tips: Traffic Handling is for Everyone

Whether you're an old-timer with an Extra Class license or a new Technician, the exciting world of traffic handling has a place for you. If you're tired of making casual contacts or chasing DX, why not check in to a traffic net? This is Amateur Radio public service and emergency training at its finest. Traffic nets carry free radiogram messages all over the country (internationally, too) on behalf of hams and nonham third parties.

The first time you tune in a traffic net, you might be puzzled by the strange transmissions you hear. If you're interested in checking in, don't be intimidated by the abbreviations or "shorthand," or afraid you won't be able to follow proper procedures. It isn't that mysterious and there are even slow-speed CW nets for folks who haven't gotten past 10 wpm with Morse code.

Listen First

There are traffic nets on almost all HF hams bands, using Morse code (CW) and phone (voice). Many local nets meet on VHF and UHF (generally on FM repeaters). These nets usually last less than a half-hour or so. *The ARRL Net Directory* makes them easy to find and it's available from League Headquarters (see the publications catalog elsewhere in this issue).

After listening a few times, you'll begin to make sense of the net procedures. The purpose of most traffic nets is to pass messages through the ARRL National Traffic System (NTS).

A net is run by a Net Control Station (NCS), who is responsible for checking everyone in, keeping track of who's on frequency, who has traffic to send and who's willing to receive messages. When someone volunteers to take traffic, the NCS generally instructs the sending and receiving stations to move to a nearby frequency to pass the traffic.

Checking In

When you find the net, set your radio directly on the NCS's frequency before attempting to check in. The NCS has to handle dozens of stations and doesn't need the hassle of trying to copy somebody who's off frequency!

Suppose the NCS is me, NTØZ, and you're WA1YUA. Here's how checking into the 10-meter Imaginary Traffic Net (on phone) would sound (it's abbreviated somewhat because of space restrictions!):

NCS: "Calling ITN ITN, this is NTØZ, net control."

You: "WA1YUA."

NCS: "WA1YUA, go ahead."

You: "This is WA1YUA, good evening, [I have] no traffic."

NCS: "WA1YUA, good evening, please stand by. Other stations wishing to check in, please do so now."

Now You're In—What's Next?

You're now checked into the net. Be prepared for the NCS to ask you for your name and location. He may do it as soon as you check in, when he checks you out or right after he closes the net. He'll also introduce himself then, and invite you to continue checking into the net.

The Net Control will continue to check in stations and will be sending stations off to other frequencies to pass traffic. After a while, you'll hear the NCS begin dismissing participants. First, he'll call you.

NCS: "WA1YUA?" (He might send just the last three letters of your call sign.)

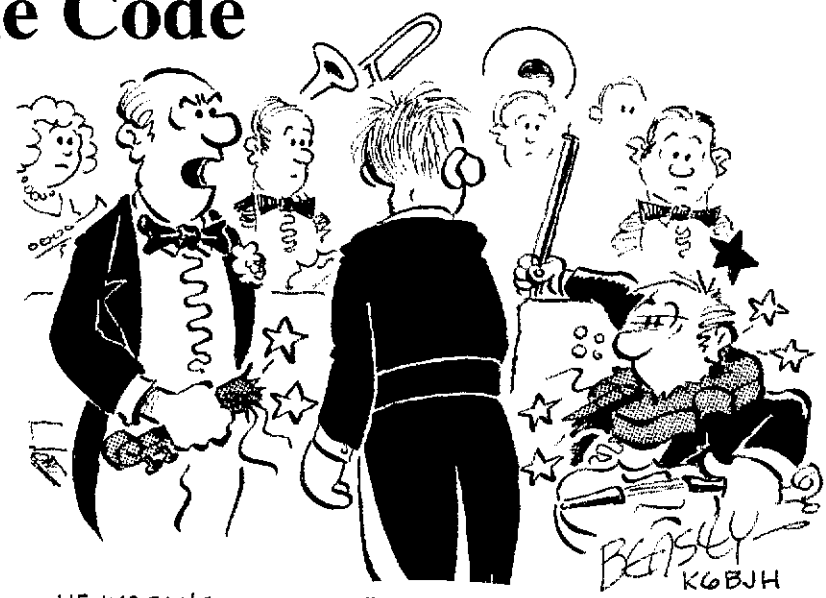
You: "YUA." (Just send something brief that indicates your presence.)

NCS: "Thanks for checking in; hope to see you again here soon. I have no traffic for you and you're excused from the net. 73 and good evening."

You: "Thanks, see you later, 73 from WA1YUA."—*NTØZ*

Conquering the Code

By Gail Bellamy, AA8MY



HE WASN'T PLAYING "FLIGHT OF THE BUMBLE BEE," HE WAS SENDING MORSE CODE, AND IT SAID I WAS OFF-KEY!

For many new hams, Morse code is the monster under the bed. It looms large, like the mythological many-headed Hydra that grew two heads every time one was cut off. Consider the quest for license upgrading: Once you conquer five words per minute, you've got to battle the 13-wpm test. If you lick *that* one, look for its 20-wpm big brother to rear its head. Sure, thousands of hams have successfully met the challenge and are reaping the rewards of expanded operating privileges, but they're them and we're us.

Well, not exactly. Last year I was one of us—and now I'm one of *them*. What's more, if I can do it, you can, too. I have no technical background; in fact, I earn my living writing about food, wine and restaurants. Prior to winter 1993, whenever anyone spoke of hams, I thought of the Honeybaked store. I'd never seen a ham radio.

When my husband said he wanted an Amateur Radio license, however, I thought it might be fun for us to study together. The result? I got my Novice call sign in May 1993, and by August both of us had passed our Extra Class written and 20-wpm code tests.

When we began traveling the code road—listening to the ARRL tapes, "Your Introduction to Morse Code"—I often had to give myself pep talks. If Anne Sullivan could find a way to teach deaf and blind Helen Keller to read and write, I could certainly find a way to conquer the code.

It doesn't take a miracle worker to figure out that there's no single correct technique for learning code. If you're unsuccessful with one method, try something else. The current books, tapes and software seem sufficient for most of the motivated folks interested in upgrading their licenses. But what about those of us who go the route of tape listening and code practice twice a day, yet still find ourselves unable to copy code at 5 wpm, or unable to crack the 10-wpm barrier?

My advice is to investigate alternative learning methods. Call upon other skills you may have acquired. Morse code involves learning new symbols and sounds for letters, but it may not be a task completely unrelated to other things you've mastered. For instance, here are a few transferable skills:

❑ ***Stenography experience.*** My stenographic experience gave me the idea of transcribing code practice runs in narrow columns (about 4 inches wide), similar to the ruled columns in steno notebooks, or the single-column reporter's notebooks. Reducing hand motion often helps increase writing speed. Shorthand uses symbols to represent words, letters and phrases. While most people talk at a rate of 140 words per minute, stenographers can take dictation while actually writing at a rate of only 80 wpm, thanks to these symbols. Court reporters have it tougher: they're required to record spoken information (using a machine) at a rate of up to 200 wpm.

❑ ***Reading music.*** Learning to play a musical instrument bears similarities to learning Morse code. Both endeavors require adjusting to a new system of annotation (learning how to read musical notes, or learning a system of dots and dashes). Also, both tasks require learning a specific sound represented by each notation—be it a note on the musical scale, or the rhythm of a particular code character.

If you've ever played in a musical ensemble, you know that when the music is moving along at a good clip—particularly during those speed-demon showpieces such as Rimsky-Korsakov's "Flight of the Bumblebee"—if you stop to think about playing a particular note, you're lost. Meanwhile, your fellow musicians will have galloped three measures ahead. In such cases, you need to skip a few notes to catch up. Same with the code—if you miss a letter during practice or a test, simply let it go and wait for the next character.

❑ ***Playing in a rhythm band.*** Speaking of tempo and rhythm, my fourth-grade spelling teacher also taught music. To demonstrate the concept of syllables, she tapped out word rhythms on the blackboard with her conductor's baton. To transfer this analogy to the code, an accented syllable would be represented by a dash, an unaccented one by a dot. Perhaps you've heard that the code character "V" (· · · –) duplicates the rhythm of the four opening notes of Beethoven's Fifth Symphony. Similarly, the slant bar prosign (DN) sounds like the "shave and a hair cut" beat that kids have been using as a secret code knock for generations.

❑ ***Using mnemonic devices.*** If you're not familiar with the phrase, it refers to using tricks to help yourself remember things. For instance, as you progress with your studies in Amateur Radio theory, you may use the mnemonic phrase "ELI the ICEman" to help you remember that voltage leads current through an inductor, and that current leads voltage through a capacitor. In other words, **E**=voltage, **L**=inductive circuit, **I**=current (**ELI**) and **I**=current, **C**=capacitive circuit, **E**=voltage (**ICE**man).

I didn't realize it at the time, but my spelling teacher provided me with a mnemonic device for learning Morse code. I had great difficulty distinguishing an "a" from an "n" until I used mnemonics based on word rhythms. For example, the word "around" begins with "a" and it also has the same stress that the "a" code character does—one unaccented syllable (a dit) followed by an accented one (a dah).

Like this: a-ROUND = dit-dah. Get it?

Here are other examples:

N: Nancy (– ·) NAN-cy

L: Luxuriant (· – · ·) Lux-UR-i-ant

F: Federation (· · – ·) Fed-er-A-tion

Remember—it's the rhythm that counts!

Gail Bellamy, AA8MY, holds an Extra Class license and is a Volunteer Examiner. She's senior editor of a national restaurant trade magazine, and also does restaurant writing for travel guides, newspapers and a European journal. Her poetry has appeared in nearly 50 publications—including Rolling Stone *and* Cosmopolitan. *She is listed in the* Directory of American Poets and Fiction Writers. QST

Interference in Reverse

By Tom Freedom, W3HVE
1507 Woodcrest Circle
Harrisburg, PA 17112

It started one afternoon in 1991. While I was chatting with some friends on 75 meters, a strong, warbling signal appeared on the frequency. The rest of the group couldn't hear it, so I knew the source had to be local. I signed off and started my investigation. The signal wasn't just on our roundtable frequency, it was also 148 kHz above and below. Tuning around with my general-coverage receiver, I found the signal at 148-kHz intervals from 1600 kHz to about 21 MHz. Perhaps I was hearing *harmonics*, multiples of a fundamental frequency. I suspected that the fundamental was in the AM broadcast band, but strong broadcast signals reduced the gain of my receiver and I was unable to find it. To my dismay I discovered that the harmonics were present around the clock.

I endured the interference for several weeks until I decided to track it down. With my mobile transceiver and a 19-inch whip antenna, I could hear the 75-meter signal faintly at my house. Cruising the neighborhood, I turned onto a nearby street and the S meter indicated an S8 signal level. I knew I was close.

I passed the first two homes. No change. As I passed the third home, I hit pay dirt. The S meter pinned!

The suspect house was familiar. It belonged to a foreign dentist who had recently moved to the United States. When I rang his doorbell, I started a series of events that would not be resolved until mid 1993.

The First Meeting

"Sir," I said, "I'm a ham radio operator. For several weeks a loud radio signal has interfered with my communications. It is present 24 hours a day and seems to come from your house. Perhaps you have some device that's out of adjustment? If you'd permit me to come in with my equipment, I can check it."

I couldn't fault him for refusing me. His response, in broken English, told me that this wasn't going to be easy. "No," he said, "not my house. Maybe you hear from telephone wires, or TV cable. Not my house, not my house!" I thanked him and left my name, address and telephone number.

Interference from the cable TV system was a remote possibility. I called the cable plant and an engineer arrived at my house within 20 minutes. He listened to the signal on my equipment. In his opinion, it wasn't typical of cable TV leakage. To make sure, he called the plant and asked them to temporarily shut down the loop that fed our area. The signal remained. They were clean.

With cable interference eliminated, the dentist's house was the most likely source. I could imagine his confusion and I felt sorry for him. He probably didn't know that the FCC even existed, or that there were laws in our country governing emissions from unlicensed devices. I decided to give it one more try.

The Second Meeting...and the FCC

Armed with the FCC Rules and Regulations, Part 15, Sections 15.5 (B) and 15.5 (C), I visited the dentist again. I explained that some household devices use radio signals to do their jobs, but such signals must stay within the devices and not cause trouble elsewhere. Again, he went through the "Not my house" routine and ended with, "No more talk. You go now, and not come back."

I was reluctant to bring in the FCC, but my enjoyment of Amateur Radio was being seriously compromised. The signal remained strong and too many of my conversations were being clobbered. My call to the Langhorne, Pennsylvania, FCC field office was answered by one of their engineers. I explained the problem and added that my neighbor would not cooperate. He responded with, "He will after he gets our letter." Sure enough, I soon received a copy of a letter dated November 27, 1991, under Case File No. PA-92-336. The letter contained the usual direction to cooperate and gave the man 30 days to respond.

Three days later I had access. My receiver led me to the man's basement. There it was—a three-zone intrusion alarm, its red lights blinking in perfect cadence with the warbling signal. Tapping on the panel caused the signal to disappear. I readjusted my receiver and found it again a few kilohertz removed. Apparently, a free-running oscillator was part of the circuitry. I suggested that he contact the installer for a corrective fix and I offered to assist. I also offered to help him compose his reply letter to the FCC after the corrections were made.

The Wait

I waited 30 days, then another 30 days. No word from the dentist. No word from the FCC. And no end to the interference! My letter of inquiry to the FCC went unanswered. Repeated phone calls were always intercepted by a secretary with a stereotypical "I'll pull your file and call it to the attention of the engineer." This state of affairs persisted throughout 1992.

Was I frustrated? Yes. But faint of heart? No. There was only one avenue remaining: my local Congressman. I called his office and spoke to a young aide. The aide wasn't familiar with Amateur Radio, but he was eager and obliging. He agreed to call the FCC on my behalf. As it turned out, he made several calls. On one occasion he was told that FCC priority on subjects relating to ham radio were close to zero due to underfunding and understaffing.

Even so, Congressional clout may be what finally prevailed. On April 2, 1993, a second FCC letter was sent to the dentist. This time it gave him 15 days to respond.

On May 2, 1993, the interference ceased. The dentist either pulled the plug on his alarm system, or the alarm company finally fixed it. Either way, I was happy. The FCC sent me a letter dated July 8, 1993, in which they deplored the expense and inconvenience—*to the dentist!* As an afterthought they also thanked me for being patient.

Epilog

The regulations against RFI (radio-frequency interference) are there to protect everyone, but getting enforcement is like having a root canal. I got the feeling that the dentist and the FCC had hoped the problem would disappear if they dragged their feet long enough. It didn't—and neither did I! Diplomacy and a level-headed attitude are your best tools when dealing with a situation like this. If they fail, however, a good measure of dogged persistence never hurts.

In a post-mortem discussion with the Congressman's aide, we debated whether I should call the dentist and thank him. Relying on the wisdom of two old adages, we decided against it: "Let sleeping dogs lie," and "A wise man knows what to say, and when not to say it."

Tom Freedom is retired from Amp Inc where he was the manager of the testing lab. He is a member of the ARRL Old Old Timer's Club, the Harrisburg Amateur Radio Club, the Central Pennsylvania Repeater Association and the Harrisburg Organ Society. Tom enjoys playing music and building his own Amateur Radio equipment.

Interference isn't always the ham's fault.
Sometimes we're the victims!

But How Do I Use It?

Understanding receiver controls isn't as hard as it seems. All it takes is a little creative fun!

By Paul M. Danzer, N1II
2 Dawn Road
Norwalk, CT 06851

I read the manual three times.
I can turn "IT" on, off, and adjust "IT."
But I still don't know how to use "IT."

How many times have you heard that or said it yourself? Today's transceivers come with features that are often referred to as "bells and whistles." These features are available because many hams have asked the manufacturers to include them.

Often these bells and whistles add to the ease or enjoyment of a conversation. Sometimes they make the difference between having a successful contact or none at all. But just as often they are confusing, and even a bit tricky in the hands of less experienced amateurs.

Selectivity and Tuning

One of the most important features of any radio is its ability to tune in the station you want and reject all the others. It's not surprising that many of the most confusing bells and whistles affect tuning and selectivity. We'll clear away some of this confusion in a way that may surprise you. All you need is a pair of scissors and some plastic!

Basic Definitions

Before we start cutting, let's talk about signals and take a look at how they appear to our receivers. In Figure 1 the horizontal line represents *frequency*. A single sideband (SSB) signal is shown as Signal A, tuned to a (suppressed carrier) frequency of 28.310 MHz, which is in the 10-meter phone band. Notice its width. We are going to claim, for the purposes of this explanation, that it's approximately 3 units—in this case, 3 kHz (3000 Hz) wide.

A CW signal is shown as Signal B. It is 0.2 kHz, or 200 Hz wide. Keep the differences between SSB and CW signal bandwidths in mind as you keep reading. Whenever you look at the width of a signal shown in one of the drawings, you should be able to guess whether it's an SSB or CW transmission.

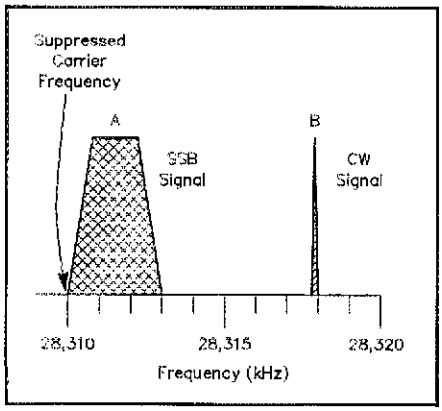


Figure 1—The typical bandwidths of SSB and CW signals. Notice how much spectrum each occupies.

Let's Do a Little Scissor Work!

We're going to build a plastic model of a receiver—at least the part of the receiver that selects which signal you're looking for. All you need is the plastic top from a one-pound coffee can. (Any similar plastic top will do if you can see through it.)

As shown in Figure 2, cut the top in half and then cut a ¾-inch-wide rectangular notch in the bottom (along the flat edge) of one of the halves. Cut ⅜-inch-wide notch in the other half. The wide notch represents your receiver when it's in the SSB mode. The smaller notch represents the receiver in the CW mode. From now on we're going to call these pieces of plastic our "receivers."

Tune the Receivers

Position the SSB receiver (the half-circle with the wide cutout) with its flat edge on the horizontal line in Figure 3A. As you slide the receiver along this line you are "tuning" it. When a signal falls within the bandwidth (when you can see it clearly in the cutout), you can "hear" it. If the signal doesn't appear in the notch, it's outside the bandwidth of the receiver. In other words, it has been filtered out.

Slide the receiver so that W1ABC is centered in the SSB bandwidth. You can see that KA1XYZ is outside the bandwidth. Therefore, you can hear W1ABC without any interference (QRM) from KA1XYZ.

Next center N2CAT in the SSB bandwidth. Notice that KC9RAT is very close to N2CAT. If you want to keep N2CAT centered for clearest reception, a little of KC9RAT will be heard. This means you have a little QRM to contend with!

Finally, slide your receiver along so that K9DOG is centered. A second signal, K9BOW, is so close (it partly overlaps) that you're going to have a great deal of difficulty listening to K9DOG. K9BOW is going to provide a great deal of QRM.

How about Changing Filters?

If you tune back to N2CAT, the obvious question is "Why can't I use my CW filter on SSB? It is narrower, and would get rid of a lot of QRM."

To see the answer, place the narrow-

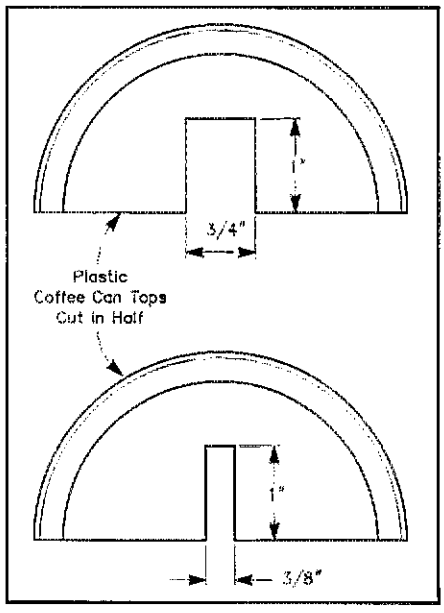


Figure 2—Make your "receivers" from a clear plastic coffee can lid. Cut the lid in half, then cut a notch in each half according to the dimensions shown.

band CW receiver so that it's centered on N2CAT. Now KC9RAT is completely excluded, but so is a lot of N2CAT. The width of the signal in the horizontal line represents information. Cut off part of the signal and you lose information. This means you will hear a very distorted signal. You've excluded so much information you won't be able to understand a thing N2CAT is saying.

If you do have a narrower SSB filter for your receiver it will allow you to cut out part of the interference from KC9RAT—at the sacrifice of good fidelity. Some receivers are equipped with *variable band-pass tuning*, or VBT, which is designed to allow a variable bandwidth. You can use it to narrow the band-pass window while allowing most of the desired signal to come through.

Does narrowing the bandwidth always help? The answer is obviously no. If you try this on the K9DOG/K9BOW case, the signals are just too close, overlap too much, and nothing will really help—short of moving to another frequency.

CW—We Can Get Much Narrower

In Figure 3B we have N6CW very close to W8RF. They are both on CW. If you place the receiver model such that the SSB filter is centered on N6CW, it's apparent that W8RF will also be heard. Switch receivers and center the CW receiver on N6CW. Just like magic, W8RF disappears.

If you're operating CW why not leave the receiver in the CW bandwidth mode all the time rather than in the wider SSB mode? The answer is ease of tuning. Try sliding the SSB receiver along the horizontal line in Figure 3B, but do it with your pinky. Now try sliding the CW receiver in the same manner. You have to be much more careful with the CW receiver, don't you? It's pretty easy to overshoot N6CW with the narrower receiver. For that reason, many hams have gotten into the habit of using the wider bandwidth for initial tuning, then switching to a narrower bandwidth when they find the signal they want.

RIT—The Second Tuning Control

If your rig has a control labeled

RECEIVER INCREMENTAL TUNING (RIT) or **CLARIFIER**, give it a try. You'll quickly learn that all it does is change the receiver frequency. So why do you have a second tuning control? You'll discover the answer by centering the CW receiver on W5AM in Figure 3B. You're getting quite a bit of

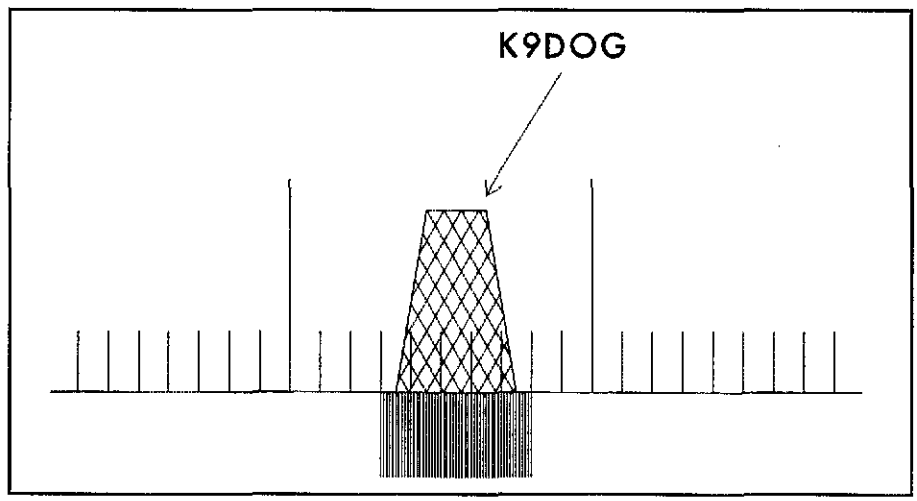


Figure 4—A tuning rate example (see text).

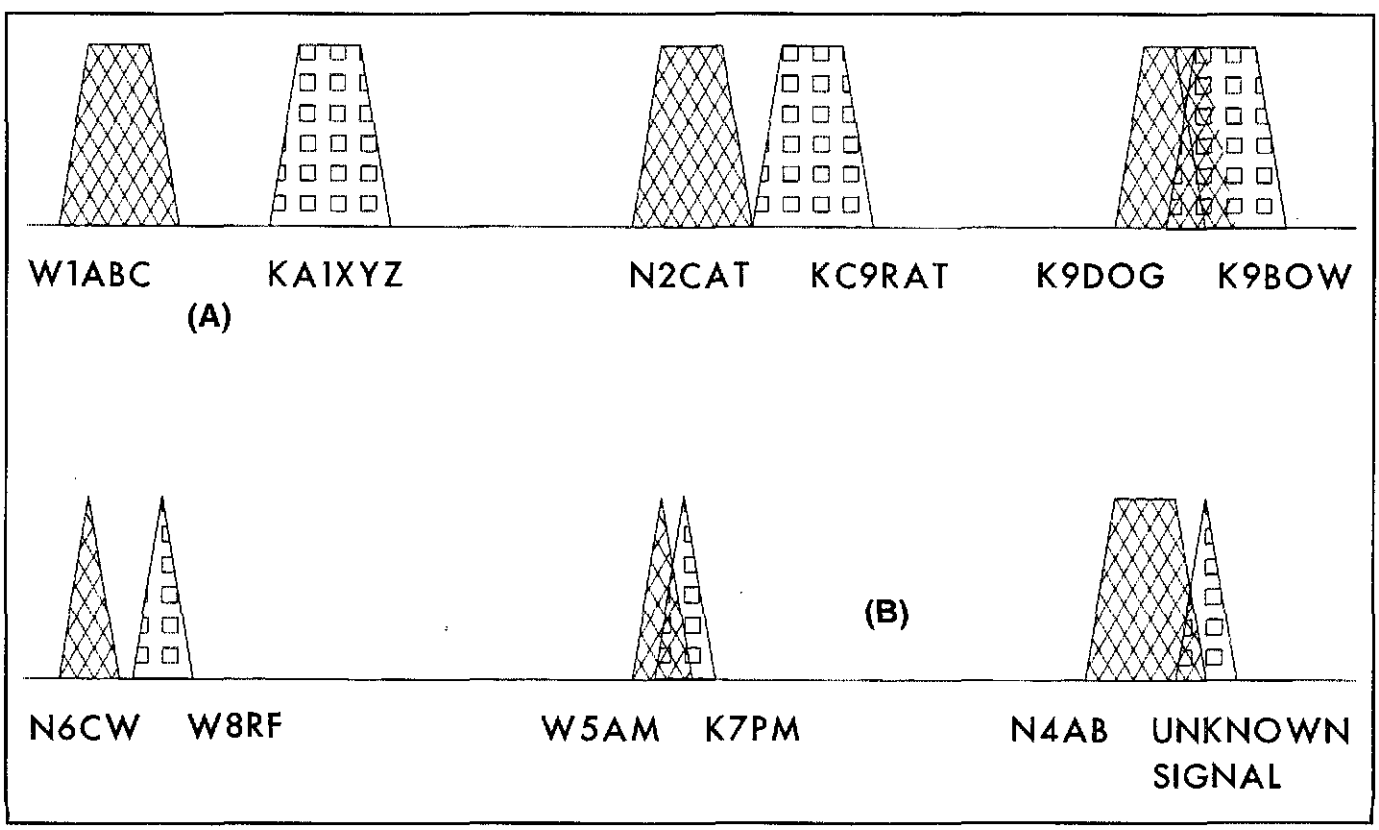


Figure 3—Examples of various signals to use with your "receivers" (see text). Photocopy the page if you have difficulty getting it to lie flat.

interference from K7PM, right? If you slide the receiver to the left (tune down) much of K7PM's signal disappears. When you changed your receive frequency, however, you also changed your transmit frequency. When W5AM stops sending and turns it over to you, your signal will be way off his receive frequency.

Here is where the RIT comes in handy. Hold a pencil over the center of W5AM. The pencil represents your transmit frequency. Turn on the RIT by moving your receiver to the left (tune down), but hold the pencil point stationary. You can now tune out most of K7PM. Because you didn't move your transmit frequency (the pencil point) W5AM doesn't have any problem hearing you.

One More Control—The Notch

Let's go back to Figure 3B and take a look at W5AM and K7PM. These two CW stations are very close together. If you put your CW receiver over them, centered on W5AM, you will still hear K7PM. Now lay a pencil at right angles to the horizontal line in Figure 3B. If you turn on the notch (in this case, the pencil), and move the pencil (tune the notch frequency) so that it's over K7PM, you've blanked out much of the interference from K7PM. This is what a variable frequency notch filter does for you.

Occasionally you'll hear a commercial CW station or some other transmitter in the middle of the SSB band. This is illustrated by N4AB in Figure 3B. The unknown signal is right next to it. After turning on the notch filter (placing the pencil across the SSB receiver bandwidth), the notch filter can be tuned (the pencil slid) until the interfering CW signal or carrier is blanked out. In this case you will not be able to receive N4AB as well as you did without the interference or the notch filter, but it's better than losing him completely. The notch filter takes out the interference (the pencil covers the unwanted signal), but it also takes out some of the information in the signal transmitted by N4AB.

Tuning Rates

As long as we are talking about tuning the receiver, let's look at Figure 4. Many modern receivers are equipped with selectable tuning rates. This allows you to tune quickly or slowly across the band.

The tall vertical lines represent 10 kHz, the smaller lines 1 kHz and the fine lines (beneath K9DOG's signal) 100 Hz. If you want to tune from one end of the band to the other quickly, you can choose the 10-kHz tuning rate. Take the SSB receiver and tune it (slide the plastic half disk) across the line in Figure 4. Remember you're moving at a 10-kHz rate. For illustrative purposes, let's assume this means that you can stop only when the left edge of the receiver bandwidth is on one of the large vertical lines. If you tune at this rate, you're actually jumping the received frequency from a 10-kHz line to a 10-kHz line. With this tuning rate you cross the band quickly, but it's easy to miss stations. If you try to tune in K9DOG you'll find you cannot. At this tuning rate you will miss him almost completely!

Suppose you pick the 1-kHz tuning rate, corresponding to the medium-height lines. Now you tune across the band more slowly. Slide the receiver with the left edge of the bandwidth stopping at each 1-kHz line. You will be able to receive K9DOG, but with the limitation of 1-kHz tuning you won't be able to center him in the bandwidth.

Finally, imagine tuning at the 100-Hz rate. Now you tune even more slowly, but you can center each signal to within 100 Hz. The illustration is not precise enough to show a 10-Hz rate, but you can see from the examples that you would be doing some fine tuning indeed!

Bells and Whistles—Each Has a Use

Many of the manuals supplied with today's radios tell you how to use the various features. Even so, the writers often assume that you understand the concepts behind the functions. As you're getting started, it helps to have a picture in your mind, a physical model of what is going on deep inside your radio. If the coffee-can receiver helps you better understand your transceiver, why not share the idea with another new ham—or with your club! QST

Radio Tips: Join the QRP Craze

QRP is a term hams use to describe low-power operating. How low? Well, most hams run about 100 W of output power on the HF bands; that's about 20 times as much as the commonly accepted definition of QRP power levels—5 W output. (QRP evolved from the CW procedural sign meaning "I am reducing power," and QRP?, "shall I reduce power?") It doesn't stop there, however. For some dedicated QRPers, QRP means running 1 W, 500 mW, 10 mW, or even 1 mW of output.

Nobody can make QSOs running such meager power. Right? Wrong! Thousands of hams around the world enjoy the excitement and challenge of running low power. You can too.

The spirit of QRP operating is about working fellow hams while running just enough power to get through. Your 1-W signal will hardly dominate the band, but with the right conditions, you can easily work all 50 states and a lot of DX.

Finding a rig for QRP work is pretty easy. There are a few QRP-only rigs available on the used market, such as the Heath HW-9, a 5-W CW rig that covers the bottom end of nine HF bands. Earlier versions of this rig are the HW-8 (five bands) and the HW-7 (four bands; not recommended). The classic QRP rig, now out of production, is the Argonaut, manufactured by Ten-Tec. Its three generations, the 505, 509 and 515, cover five HF bands, putting out about 5 W, CW and SSB.

If you don't want to invest in a dedicated QRP rig, it's relatively easy to reduce the power output of most modern solid-state rigs. The drive control can usually be used to reduce the RF output to within acceptable QRP limits. Your rig's instruction manual will probably have more information.

As for antennas, the high-power credo holds true—use the best antenna you can. You don't have to get carried away to make plenty of QRP contacts, however. If you don't have a beam antenna, a dipole or loop will do just fine. Whatever the antenna, make sure it's in good shape electrically, and use good quality feed line. Many serious QRPers use open-wire line because of its low-loss characteristics.

Several clubs exist to serve the interests of QRPers. One of the most prominent is the QRP Amateur Radio Club International (QRP ARCI). For information about QRP ARCI, contact Mike Kilgore, KG5F, 2046 Ash Hill Rd, Carrollton, TX 75007. Please include a self-addressed, stamped envelope with two units of First-Class postage.

Awards are popular among QRP clubs and QRPers. QRP ARCI issues QRP versions of many popular awards, and several exclusive awards such as the 1000-mile-per-watt award.

Contests are also popular among low-power enthusiasts. About a dozen QRP-only contests are held throughout the year, and many mainstream contests such as Sweepstakes, ARRL International DX, CQ Worldwide, and others have QRP classifications.—*NT0Z*

A PC Shopper's Guide

NEW HAM COMPANION

By Steve Ford, WB8IMY
Assistant Technical Editor

and

Kirk Kleinschmidt, NTØZ
Assistant Managing Editor
Photos by Kirk Kleinschmidt, NTØZ

It's no mystery that most Amateur Radio operators own computers. Many hams consider computers to be as indispensable as their radios. Of course, you don't need a computer to enjoy Amateur Radio, but it sure adds an extra dimension to the hobby!

There are certain areas of Amateur Radio where computers are especially popular. In no particular order, they are:

❑ *Satellites*: Orbit predictions, digital communication, telemetry decoding, automatic antenna or transceiver control.

❑ *Packet Radio*: Digital communication over terrestrial networks using terminal node controllers (TNCs).

❑ *Contesting*: Specialized logging programs, CW or voice keying, automatic transceiver control.

❑ *Recordkeeping*: Logging, awards, tracking, QSLing.

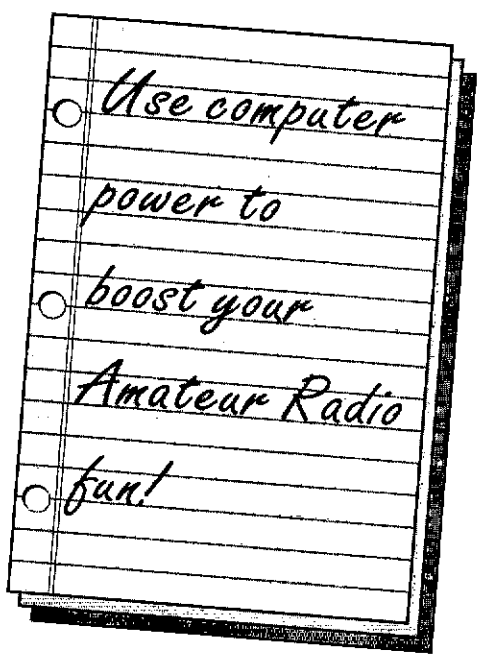
❑ *RTTY, AMTOR, PacTOR, G-TOR, CLOVER*: Digital communication on the HF bands.

❑ *Image*: Slow-scan television (SSTV) and facsimile (fax).

Computers find other uses such as propagation forecasting, antenna modeling, circuit design, digital signal processing (DSP) research and much more. And we can't forget the most important application of all—games! (Even a dedicated ham has to spare a few moments to save the Earth from a dire alien threat, refight the battle of Gettysburg or whatever.)

There are many hams who would like to add PCs to their stations, but they're a bit anxious about spending their money. This is understandable. There are some fine computer systems out there...and there are some dogs, too. The good systems will give you enjoyment and satisfaction for years to come. The dogs will have you reaching for a sledgehammer within two days.

Confusion is the enemy of the computer shopper. Buying a computer usually isn't as easy as walking into a store and walking out with a couple of boxes. There are many features and options to consider. Some retailers will "mix and match" items for you, creating a computer system that is customized to fit your needs. But which features are important—and which ones are just expensive frills? This is a substantial investment and you want to make sure you get the most value for your money.



As the Master Po says in the original *Kung Fu* television series, "If you must choose, Grasshopper, choose wisely!"

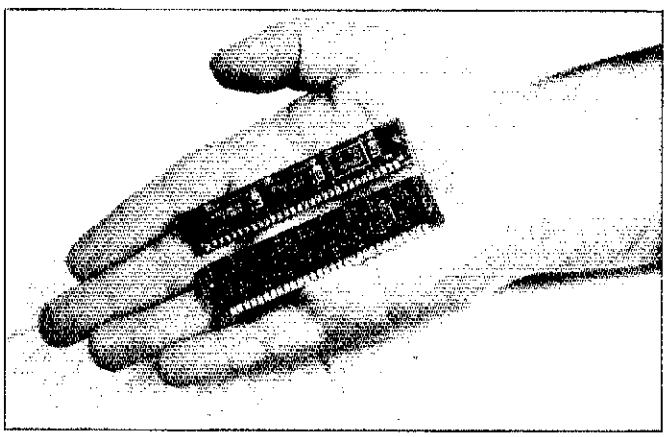
Q: I notice that most hams use IBM PC or compatible computers. Why?

A: PCs are the Amateur Radio standard. That's because there is more ham software and hardware available for these types of computers than all other types put together. This is not to say that Apple Macintoshes, NeXTs, Suns and other computers aren't fine machines. The problem is finding software that you can use for Amateur Radio applications.

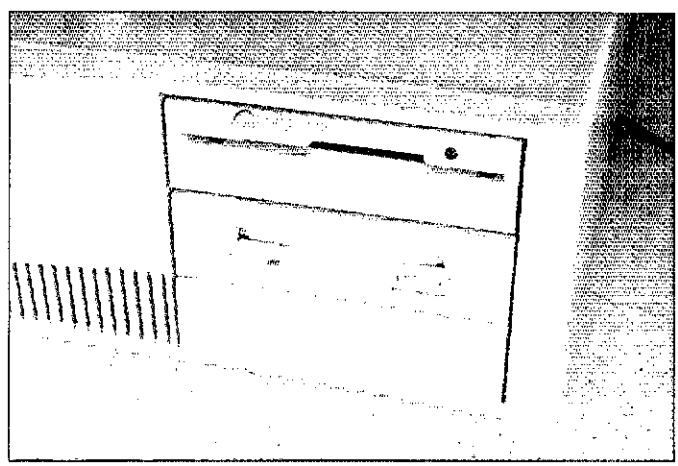
Q: I'm confused by the numbering system PCs use. What's the difference, for example, between a 386/40 and a 486/33?

A: The primary difference is speed and "computing power." A 386 computer is based on the 80386 microprocessor. The 486 is driven by an 80486 chip. The 386 design is older and less powerful.

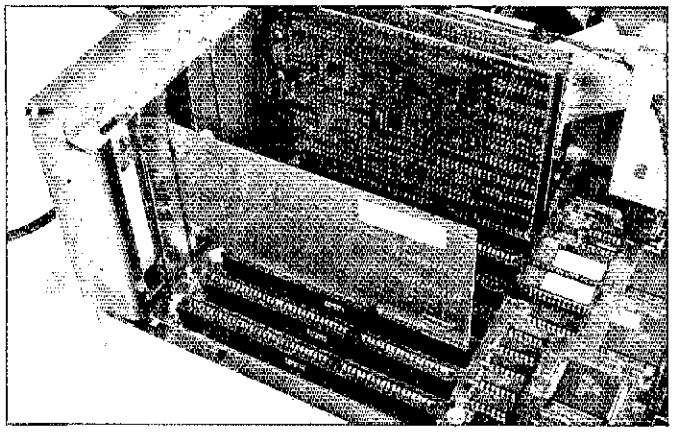
The number to the right of the "/" indicates the clock speed (in MHz) of the computer's microprocessor. The clock is the heartbeat of the computer. The faster the clock, the faster the microprocessor works. This is not the only factor that influences the performance of the computer, however.



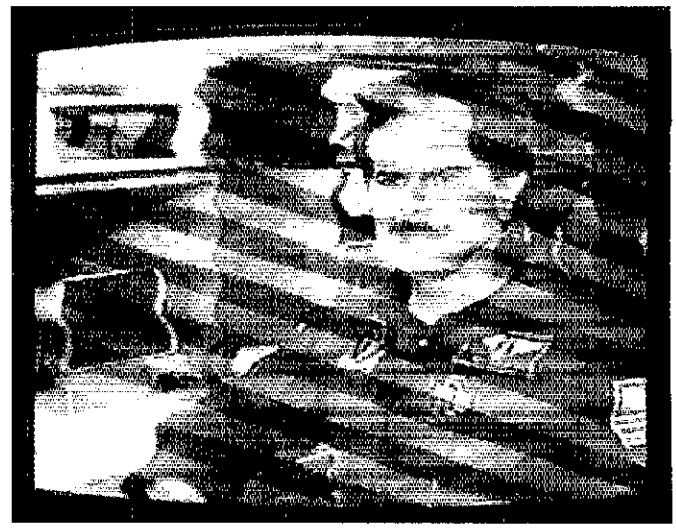
You can add memory to your PC by installing single in-line memory modules (SIMMs) like these. Older PCs require memory-expansion cards to accommodate more SIMMs. New PCs feature SIMM sockets on the motherboard itself.



The most popular disk drives these days are the 3½-inch variety (bottom slot). If you can spend a little extra, a 5¼-inch drive (top slot) is a good investment, just in case!



Sound cards, video cards and other accessories plug into expansion slots on the PC motherboard. Use gentle pressure when installing or removing a circuit card. Always make sure the computer is *off*!



If you transmit near a computer monitor, you can expect to see some video disruption. If you see this much distortion, however, look for another monitor!

Q: I guess that means I should buy a 386/40 computer rather than a 486/33, right?

A: Not necessarily. Although the clock speed of the 386 computer is higher (40 MHz), the newer 486-based machine is much more efficient at handling data. So, a 486/33 is about 60% faster than a 386/40—despite the slower clock!

Q: Because the 386/40 is cheaper, doesn't that make it the better buy?

A: The answer depends on your plans for the future. If you intend to use your computer mostly for Amateur Radio applications, games and some household software, the 386/40 is probably a good deal. On the other hand, if you expect to keep up with new software—which demands more and more computing horsepower—choose the 486. The 486-based computers offer you the ability to upgrade fairly easily. For example, you may want to replace a 33-MHz microprocessor with a more powerful 66-MHz chip. A 486 machine makes this easy to do. Many 486 computers also provide a so-called "overdrive" socket that allows you to add the new Pentium (next-generation) microprocessor.

Q: But Pentium microprocessors are expensive. Do I need one now?

A: No. There is very little software on the market now that takes full advantage of the Pentium's power. Wait a few years, however, and you'll see plenty of amazing programs that will run only on Pentium-based computers. That's why it sometimes pays to keep your options open.

Q: Let's talk memory. I've seen some computers advertised as having 8 MBytes of total memory while others come with only 1 or 2 MBytes. Should I get the computer with the most memory?

A: Generally speaking, yes. For most applications, 4 MBytes (sometimes expressed as "4 meg") of memory is sufficient. One or 2 MBytes is probably okay for most Amateur Radio software. Most computers provide the option to expand your memory. You can start with 2 MBytes and add more later.

The type of memory your computer uses has a big influence on its performance. Some older PCs place extended memory on cards that plug into *expansion slots*. All new units have their memory on the motherboard itself. If given a choice, take the motherboard memory. Your microprocessor can access motherboard memory *much* faster than memory on the expansion bus. The faster the microprocessor can communicate with your memory chips, the better your computer's performance.

Q: Which type of monitor do I need? It looks like I have a choice between VGA and Super VGA.

A: A VGA monitor will be fine for just about anything you want to do. Make sure to get a VGA monitor with a *.28 dot pitch*. These monitors are only a bit more expensive, but you'll enjoy the smooth, high-resolution images. You don't need a Super VGA monitor unless you plan on doing CAD work or desktop publishing with a 17-inch or larger monitor.

Q: When it comes to video, is the monitor all I have to worry about?

A: If you run software that uses animation or complicated graphics (games, some satellite-tracking programs, MicroSoft *Windows*, etc.), you want your video data handling to be as fast as possible. The video display circuitry inside the computer is responsible for getting the video data from the computer to the monitor. Some computers have dedicated video display circuits on the motherboard. The majority, however, use specialized video display cards that mount in one of the expansion slots. These cards contain their own microprocessors and memory.

For most Amateur Radio applications, a standard VGA card is adequate. Whatever the system provides will probably do the job well enough. However, if you want to run high-resolution games or other graphic-intense software, you'll need a high-speed card. There are plenty to choose from. See your computer retailer.

Q: The hard drive is easy. I want the largest drive I can afford, right?

A: That's right. You can (almost) never have too much hard-disk space. You'll store all of your programs and other files on your hard disk, so you want the most capacity you can afford. Like memory, hard-disk capacity is measured in MBytes. Just a few years ago, a 100-MByte hard disk was considered to be a monster. Now 340 MBytes seems to be the standard. If your bank account can tolerate the strain, you can even buy *gigabyte*-sized drives!

Q: I know I want a 3½-inch floppy disk drive. Do I need a 5¼-inch drive, too?

A: The PC world is making a rapid transition to 3½-inch disks. Even so, you may still need 5¼-inch capability from time to time. If you can get a 5¼-inch drive inexpensively, go for it.

Q: What about a CD-ROM drive?

A: Compact-Disc Read-Only Memory (CD-ROM) is becoming very popular. One CD can hold 650 MBytes of data—much more than a typical hard disk. If you check the advertising pages of *QST*, you'll see several Amateur Radio CDs for sale. Some of these ham CDs contain mountainous collections of programs ranging from antenna modeling to CW training. Several manufacturers have also managed to squeeze the names and addresses of almost every amateur in the world onto a CD! Unlike a hard disk, you can own a number of CDs and swap them in and out of the drive as necessary.

The downside of CD-ROM is access time. CD-ROM drives are much slower than hard disks. And you can't write data to CDs, so you can't use them to store programs that you get from other sources.

A CD-ROM is not yet a necessity for an Amateur Radio computer system. It falls into the "nice to have" category, though, and you'll probably want a system you can add a CD-ROM drive to later.

Q: What about other goodies like sound cards?

A: Sound cards are showing up in many Amateur Radio computer systems. Their original purpose was to provide realistic sound for games. Although this is still their primary application, hams are finding other ways to put sound cards to good use.

Sound cards are capable of taking audio signals and converting them to digital data. They also work in reverse, taking data and converting it to audio. It wasn't long before clever hams realized that sound cards could be used as interfaces between computers and transceivers.

Thanks to these creative programmers, we can now use sound cards to save our vocal cords during phone contests. Rather than wearing yourself out calling "CQ contest," you can record your CQ message in advance and let your sound card play it for you. Some contest programs use the sound card to provide the contest exchange as well. You type in the call sign and the sound card "speaks" for you! ("NTØZ, you're 59 in Colorado. QSL?")

Sound cards are also being used to send and receive SSTV images and RTTY data. There's no reason why a sound card couldn't be programmed to decode and transmit other digital modes such as packet, AMTOR and PacTOR. It's just a matter of taking audio from the radio and processing it with the appropriate software. You can expect to see more interesting software for sound cards in the future.

The *de facto* sound card standard is the Creative Labs *SoundBlaster*. The name *SoundBlaster* has become almost generic among computer users. If you want to add a sound card to your system, we recommend one of the 16-bit *SoundBlaster* cards such as the *SoundBlaster* 16 Basic. Other good sound cards include the Reveal *FX16* and the Pro Audio *Spectrum*.

Q: Is a printer essential for my ham station?

A: It all depends on how you plan to use your system. If you intend to do a lot of word processing chores, a printer is a must. For packet radio, satellite activity, HF digital communication and so on, a printer is optional.

If you buy a printer, you don't necessarily need to spend great sums of money. For example, laser printers produce beautiful documents, but you'll shell out close to $1000 for a quality unit. For casual use, a less expensive printer is more than adequate. In fact, you can find dot-matrix and bubble-jet printers that create surprisingly good copy.

Your PC Shopping List

Here's a guide you can use to help you pick the best PC system for your applications. Keep it handy when you're searching through ads in magazines, catalogs or newspapers. Take a copy with you when you visit your local computer retailers.

Essential Features

- ❑ VGA monitor (.28 dot pitch)
- ❑ At least 2 MBytes of extended memory *on the motherboard* (4 or 8 MBytes preferred)
- ❑ 200-MByte hard disk
- ❑ 3½-inch disk drive
- ❑ Two serial ports. At least one parallel port.
- ❑ 25-MHz minimum clock speed

Options

- ❑ Sound card (*SoundBlaster* or compatible)
- ❑ High-speed video card
- ❑ CD-ROM drive
- ❑ 8 MBytes of memory *on the motherboard*
- ❑ MicroSoft *Windows* 3.1 software
- ❑ Mouse
- ❑ 5¼-inch disk drive
- ❑ Printer

The RF Test

When you evaluate a computer in person, take along a small AM or shortwave radio. Ask the salesperson to switch on the system while you hold the radio a few feet away. Make a mental note of the amount of noise you hear, including any odd beeps and burps. Remember that this computer is going to be about the same distance—if not closer—to your radios. All computers generate signals, but you want to choose the machine that is the most "RF quiet." Consider the RF output (or lack thereof) as an important feature of any system.

If you own a 2-meter or 70-cm H-T, take it along, too. Listen for interference on various frequencies. This is especially important if you intend to use your computer for packet radio or satellite activities. Try transmitting with the H-T antenna close to the computer. The image on the monitor may jump or jitter, but the movement shouldn't be severe. If the monitor displays wacky video, or if the computer itself goes haywire, cross this system off your list!

QST

Radio Tips: What's DSP?

DSP stands for *digital signal processing*. It's an abbreviation that's popping up frequently these days. I can guarantee that you'll be hearing *much* more about DSP in the future!

In the ham world, we encounter DSP most often in *audio filters*. We use audio filters to help reduce the effects of noise and interference on received signals. Audio filters have been around for decades. Most use networks of capacitors and resistors to reject certain audio frequencies while passing others. The goal is to block the signals we *don't* want so that we can hear the signal we *want*. Traditional audio filters do a good job, but hams are never satisfied. We're always pushing the envelope for better performance. That's where DSP comes in.

DSP takes a completely new approach to filtering. The received signals are first "sampled" at high speeds. Sampling is a bit like taking many quick snapshots of an object in motion. When you place the photos on a strip of film and run them through a projector, you see a continuous moving image. With DSP, we use analog-to-digital (A/D) converters to sample the audio signal several thousand times every second. Each sample becomes a piece of digital data, reflecting a particular characteristic of the signal at a precise moment in time.

Once a signal is converted to data, you can do all sorts of wonderful things. Putting it very simply, a program in the filter's microprocessor sorts through the data and changes or deletes any information that appears to belong to a portion of the signal that we want to reject.

For example, let's say that your DSP filter is programmed to look for those annoying tones caused by other hams tuning up their radios near your operating frequency. Whenever it finds the type of data pattern that represents a continuous tone, the program deletes that data. When the data is converted back into audio, the tones are gone! (Have someone demonstrate this for you with a DSP filter. It's a remarkable thing to hear.)

Amateur Radio applications of DSP are limited primarily by the sampling speed of A/D converters. That's why audio filtering is a popular use for DSP. The frequencies of audio signals are well within the sampling capability of current DSP technology. The state of the art always advances and you can be sure that affordable DSP hardware capable of functioning at RF frequencies is on the horizon. When these devices arrive, we'll be able to process signals at the RF stages of receivers and transmitters. In the not too distant future, your radio may use digital signal processing from the moment the signal arrives at the antenna input! Transceiver design as we know it today would virtually cease to exist. Instead, an elaborate program would sample the signals and process them to retrieve exactly what you want—and *only* what you want.—*WB8IMY*

The Doctor is IN

Q Ed Graham, N0MZR, asks, "I'm using a trap vertical antenna with buried radials. It works fine in dry weather, but the SWR increases whenever it rains. What could cause this?"

A A common problem with any antenna is that water may be seeping into the connection between your coaxial cable and antenna. Examine the connection carefully for signs of water and seal it with several layers of electrical tape and Coax-Seal, Scotchgard, plumber's putty, or some other sealant.

Another possibility is that moisture is getting into the traps. Most traps have drainage holes to allow condensation to escape. The drainage holes must be pointed the right way (down) and that they're clear. Check your traps carefully for cracks and holes in the seals. If you see anything suspicious, seal it with a silicone caulking compound that's rated for outdoor use. (But don't seal the drainage holes!) Caution: Antenna traps are carefully assembled and tested at the factory. Don't attempt to disassemble the traps without checking with the antenna manufacturer first—you may inadvertently change their electrical characteristics.

Q Jon Buck, KB3APX, asks, "Whenever ice accumulates on my wire dipole antenna, the SWR shoots up nearly four-fold. I receive poor signal reports, too. What causes this phenomenon? Is it common to all outdoor antennas?"

A When ice coats an antenna, it changes the antenna's *dielectric constant*. The effect is similar to placing a thick layer of insulation on your antenna. When the dielectric constant changes, the resonant frequency changes, too. By the same token, a shift in the resonant frequency causes a shift in the *impedance* value at the feedpoint. You see the end result as a higher SWR. Electrically speaking, it's as though your antenna had suddenly changed its length!

Depending on the type (and length) of feed line you're using, a high SWR can cause a substantial loss in the line. That might explain the poor signal reports you received. The higher SWR also may cause your transceiver's protection circuitry to automatically reduce its RF output.

Q B. Meyer, K2PMA, asks, "Can you explain the FM 'capture effect'?"

A Sure. The *capture effect* is what happens in FM reception when the strongest signal on a channel totally suppresses all the other signals on the channel. You've probably heard this while receiving FM stations on your car radio: Stations abruptly pop in and out instead of smoothly blending with each other, as cochannel AM broadcasters do when they fade in and out at night.

The capture effect occurs as a result of an FM receiving system's ability to suppress AM interference sources like static, ignition noise and alternator whine. Once an FM signal has "captured" an FM receiver's *limiter* circuitry (the circuitry that does away with AM noises), the receiver tends to respond to weaker FM signals as though they are AM noise and entirely suppresses them.

Q What's the difference between the Amateur Radio Emergency Service (ARES) and the Radio Amateur Civil Emergency Service (RACES)?

A The Amateur Radio Emergency Service (ARES) consists of amateurs who have registered with the ARRL. (ARES is the emergency communications arm of the League.) All hams are eligible to be members of ARES—whether they're League members or not. The primary function of ARES is to handle emergency messages, including those between government emergency-management officials.

The Radio Amateur Civil Emergency Service (RACES) is similar to ARES in some respects, but it is managed by the US government. RACES is sponsored by the Federal Emergency Management Agency (FEMA). Like ARES, RACES is made up of volunteer ham operators. Its mission is more narrowly focused, however. RACES stations are limited to providing government-to-government communication for state and local civil defense organizations and emergency preparedness agencies. Any ham can become a RACES operator, but he must be officially enrolled in a Civil Defense organization.

To register with ARES, complete ARRL Form FSD-98 and send it to your local Emergency Coordinator. If you don't know who your Emergency Coordinator is, or if you need the form, contact your Section Manager or Section Emergency Coordinator. You'll find names and addresses of Section Managers on page 8 of any *QST*. To register with RACES, you must contact your local Civil Defense office.

Q I just bought a used Heathkit SB-200 linear amplifier. The RF output level seems to be okay, but I notice that the high voltage appears to be dropping. When I first used it, the front-panel meter indicated 1800 V. Now it's less. Are the tubes going bad?

A Your tubes are probably not the problem. Instead, I'd check your power supply. A leaky diode or a bad resistor can cause your high voltage to drop.

Use a volt-ohm-meter (VOM) to check each diode and resistor in the power supply—with the amplifier off and unplugged! You may have to remove each diode or resistor from the circuit to get an accurate measurement. Use the resistance function of the meter to measure the resistor values directly. Leave the meter in the resistance mode when you check the diodes. Measure the resistance of the diodes in one direction, then reverse the VOM leads and measure again. You should see a high (virtually infinite) resistance in one direction and a much lower resistance in the opposite direction.

The metering circuit may also be suspect. The SB-200 uses a series of 4.7-MΩ resistors in a voltage divider arrangement for the meter. If any of these resistors have changed their resistance values significantly, you'll get an inaccurate reading on your meter.

Q Thomas Robinson, KD4CAN, asks, "I have a 5-element beam antenna that I use for SSB and CW at the low end of the 6-meter band. I'd like to try the 6-meter FM repeaters, but my SWR at those frequencies climbs to 4:1. If I do manage to hit a repeater, my signal is weak. What's the solution? Should I buy an antenna tuner or an amplifier?"

A Because the 6-meter band spans 4 MHz of spectrum, some antenna designs will not cover the entire band with a low SWR. Also, your beam is probably mounted in the horizontally polarized position for your CW and SSB work. Most 6-meter FM repeaters, however, use *vertically* polarized antennas. Mismatched polarization can result in a substantial reduction in signal strength between stations.

There's a good chance that the 4:1 SWR in the repeater portion of the band is causing a fair amount of loss in your feed line. Combine that loss with the polarization mismatch and your signal may indeed be weak at the repeaters.

An antenna tuner won't solve your problem. It will provide a low SWR at your transceiver, but the SWR will still be high at the antenna. Using an amplifier under high-SWR conditions isn't a good idea, either. You could damage your feed line or the amplifier itself.

To get the best of both worlds (SSB and FM), you may need to invest in a separate antenna for the high end of the band. Because you're using repeaters, it doesn't need to be large. An omnidirectional antenna such as a ground plane may be adequate. If you have sufficient space on your mast, a small beam (mounted for vertical polarization) would be even better.

DO YOU HAVE A QUESTION OR A PROBLEM? ASK THE DOCTOR! SEND YOUR QUESTIONS (NO TELEPHONE CALLS, PLEASE) TO: "THE DOCTOR," ARRL, 225 MAIN ST, NEWINGTON, CT 06111.

1993 THE YEAR IN REVIEW

The year 1993 saw an unprecedented sequence of natural catastrophes tear across the nation. Amateur Radio rose to the occasion, turning each crisis into another opportunity for public service. The first such "opportunity" came when the so-called "Blizzard of '93" locked the eastern US in snow and ice. Hams helped emergency and law enforcement officials cope. A few months later, disaster moved westward when summer floods swept through the river valleys of the Midwest. Hams responded again. And in October, misfortune turned west as fires raged through southern California. Yes, hams were there to help.

In spite of claims that the use of new consumer devices like cellular telephones are now standard in emergency situations, Amateur Radio operators demonstrated that there is no substitute for basic communication skill, technical know-how and effective field organization.

Even as Amateur Radio continued to prove itself an important national resource, ARRL continued to provide an effective voice with the FCC; international treaty-making organizations such as ITU, CITEL and CEPT; Congress and the public.

However, we can't rest on last year's achievements. Amateur Radio has been among the most stable hobbies, enjoying slow, steady growth and wide public acceptance. As we approach the new millennium, however, new technology appears at an exponential rate, creating new demands on spectrum and requiring new knowledge on the part of those who use it. Social and demographic changes increasingly fragment the once-unified community of hams. A population already overburdened with other concerns also becomes less "neighborly" when it comes to RFI problems or antenna complaints directed at hams.

To remain strong, the ARRL must remain responsive. In 1992, we commissioned a membership survey to help us examine your concerns. We asked, and you spoke up. In 1993, the ARRL staff relied on the survey results to help with program changes that will benefit all Members.

As we move into 1994, the Board of Directors that you elected is considering policy level issues raised by the study. You, as a Member, are the key element in this process, so it's important that you continue to let us know where we've strayed and where we're on the mark. Working together, we can ensure that the ARRL remains an effective force in Amateur Radio, not just into the next year, but into the next millennium.—*David Sumner, K1ZZ, Executive Vice President*

The key to success in the last exciting decade of the century is the ARRL's ability to continue to "listen" carefully

ARRL MEMBERSHIP: BACKBONE OF AMATEUR RADIO

Watching Amateur Radio Grow

The ARRL is a primary force in the continued healthy growth and development of Amateur Radio in the US. During 1993, the number of individual Amateur Radio licenses on record with the FCC increased about 7%, from 587,657 in 1992 to 631,598 by year-end 1993. Not surprisingly, the Technician-class license continued to lead the way, with an increase of about 35,000 licenses. The growth of Amateur Radio can't help but play a positive role in the development of ARRL membership. By year-end 1993, League membership was the highest ever.

An Effective Field Structure

The ARRL operates through a highly effective field structure of elected and appointed volunteers who administer important programs. The structure draws its strength from the 69 elected Section Managers and their staff of key field appointments. A highlight for 1993 was the first New Section Manager Training and Motivational Workshop, which participants report was very effective. The workshop not only introduced new Section Managers to the ARRL's organizational structure and functions, it provided an understanding of the Section Manager's role in the organization and Amateur Radio at large.

Not to be overlooked are the efforts of an additional network of volunteer activists that includes Volunteer Counsels, Public Information Officers, Technical Specialists, Technical Advisors, Local Government Liaisons, Official Relay Stations, Official Observers, Official Emergency Stations, Official Bulletin Stations, Net Managers, Local and District Emergency Coordinators, Assistant Section Managers, ARRL NTS Officials and Volunteer Consulting Engineers. These volunteers deserve the thanks of the entire membership for their efforts in 1993.

Coping During a Year of Havoc

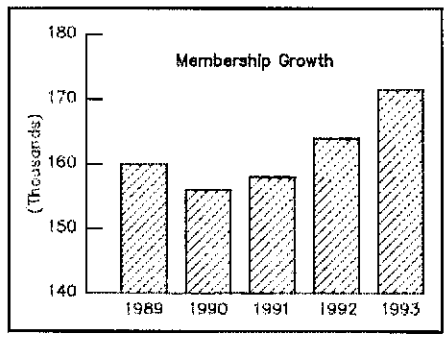
The Blizzard of '93 raged across the eastern US from Florida to Maine. Hundreds of ARES and RACES volunteers provided emergency communication activity. Just a few months later—ironically, as Field Day activities were set to begin—disaster hit the Midwest. Hams mobilized as rising flood waters destroyed roads, businesses and homes. The volunteers stayed on duty throughout the summer until flood waters receded, logging thousands of hours. Once again, hams proved there's no substitute for their tremendous effort and dedication in the name of public service.

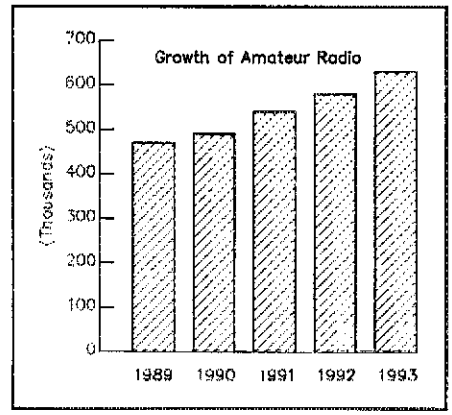
Strengthening Our Ability to Listen

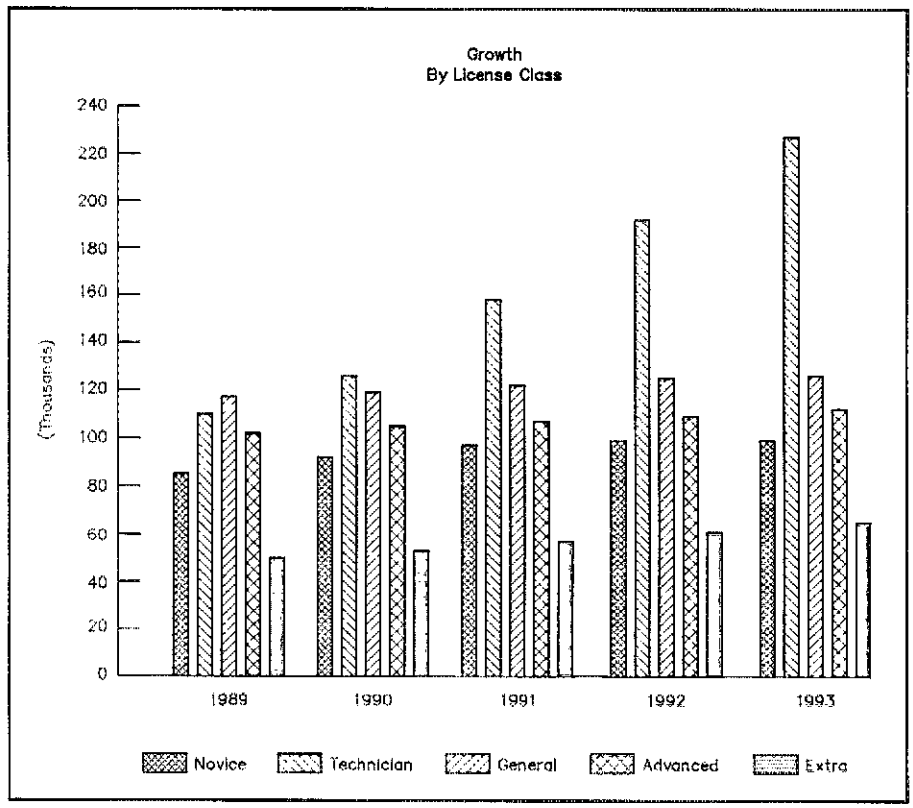
Much of the ARRL's ability to respond to membership is based on its continual examination and upgrade of our communications ability. In previous years, our MCI electronic mail and telefax capability provided direct electronic links and the ARRL BBS, described in June 1993 *QST*, was upgraded substantially. In 1993, our Internet connection went from part-time to full-time connection, and we increased the speed of the modem. These improvements brought us closer to the Amateur Radio community and we continue to look for ways to apply new technology to "the art of listening."

Table 1
Current Field Appointments

Affiliated Club Coordinators	62
Bulletin Managers	52
Official Observer Coordinators	56
Public Information Coordinators	44
Section Emergency Coordinators	64
State Government Liaison	49
Section Traffic Managers	66
Technical Coordinators	58







REPRESENTING HAMS IN WASHINGTON AND AROUND THE WORLD

Patrolling the "Capitol Beat"

Recognizing that we're one among many interest groups vying for attention on Capitol Hill, the ARRL's approach is to work for incremental changes in the laws affecting Amateur Radio by talking directly with Congress and the Congressional staff. This year, with the help of Congressman Mike Kreidler of Washington and Senator Charles Robb of Virginia, we introduced legislation urging the FCC to give hams wider latitude in experimental radio activities (H. J. Res 199/ S. J. Res 90). We introduced a bill with the help of Congressman Slattery of Kansas that would limit the liability of hams participating in Volunteer Examiner activities and the Amateur Auxiliary to the FCC Field Operations Bureau. In what may be one of the most notable, if most unheralded, successes in ARRL legislative history, we managed some "behind-the-scenes" persuasion that removed a proposal from the administration's Omnibus Budget Reconciliation Act that would have imposed a substantial fee on all Amateur Radio license transactions.

The Pulse of the Regulatory Agencies

During 1993 we were actively filing comments on several important FCC Notices of Proposed Rule Making. In one of the more important decisions, the FCC agreed with our contention that Amateur Radio activities for public service deserved wider latitude. As a result, more lenient rules were adopted with respect to 97.113, which should be of service to groups involved with the public-safety aspects of marathons and other mass-participation events. At our urging, the FCC issued an order preempting local prohibitions of ham transceivers that could incidentally receive public-service frequencies. We filed comments on the FCC's docket covering control operator responsibility for messages forwarded through repeaters and other message forwarding systems, and stated our opposition to a proposed "instant" Amateur Radio license that would have allowed those passing an exam to go on the air immediately.

We participated with the National Telecommunications and Information Administration (NTIA) on that body's efforts to comply with the spectrum-reallocation provisions of the Omnibus Budget Reconciliation Act of 1993, and presented a paper on amateur packet radio to the Federal Emergency Management Agency (FEMA).

International "Alphabet Soup"

As part of our responsibility to Amateur Radio, the ARRL participates in US preparations for the ITU's "Voluntary Group of Experts" charged with rewriting the International Radio Regulations, and other study groups. The ARRL continues to participate in preparations for future World Radiocommunications Conferences through our International Amateur Radio Union (IARU) affiliation. In addition, we participated in CITEL meetings to discuss the creation of an International Amateur Radio Permit in the Americas, and in discussions with CEPT to work toward a common license agreement with European countries.

Headlining Ham Radio

In its second year of operation, the ARRL's publicity effort focused on bringing Amateur Radio into the national spotlight through extensive news media coverage. We "placed" stories in national news media, including NBC, CBS, ABC and CNN and, in addition to acting as a resource in breaking news stories, we created and packaged a variety of feature stories such as the "Santa Ham" story in regional media in December.

Responding to requests from the membership, the ARRL produced two television public service announcements (PSAs) based on the theme "You Never Know Who You'll Meet on Amateur Radio."

QSO/Media, the ARRL's grassroots public relations newsletter, continued to be an important part of our public relations effort. The publication gives PIOs, PICs and others interested in promoting Amateur Radio advice, tips and publicity materials they can use with local news media around the US.

YOUR BEST SOURCE OF INFORMATION ON AMATEUR RADIO

Periodicals Cover All the Bases

Amateur Radio's flagship publication, *QST*, came under new leadership in 1993 when Al Brogdon, K3KMO, joined the staff as managing editor. *QST* continues to provide the most up-to-date information on Amateur Radio. The "New Ham Companion" section, introduced in early 1993, received high praise for its value to beginners and for experienced hams who want to learn the basics about new techniques.

QEX is now 32 pages per issue and plans are being finalized to upgrade the mailing to Second Class to improve service.

The *ARRL Letter* entered its 11th year, continuing to provide Amateur Radio news to Members and editors of Affiliated Club newsletters, encouraging editors to reprint items from the *Letter* in their publications.

Books You Need on Subjects You Like

The book team completed a successful year working on new books and revised editions to keep hams on the leading edge of technology. New titles in progress included the long-awaited companion volume to the *UHF Microwave Experimenters Manual*, Volume 4 of *The Antenna Compendium* and a new book about packet radio. A revised edition of the *ARRL Antenna Book* was begun in 1993.

Workshops on New Technologies

Digital signal processing (DSP) is one of the fastest-growing areas of interest in Amateur Radio. For the second year in a row, the ARRL sponsored two all-day DSP workshops in Tucson, Arizona, and Ventura, California, in 1993. The workshops were a success, and continuing education units (CEU) were given to those attending. Look for more technical workshops covering a variety of topics in 1994. The new *Technician Class Exam Course*, produced in conjunction with King Schools, is a success. Customer feedback has been very positive.

Answering Your Regulatory Questions

The Regulatory Information Branch continues to act as a valuable resource for Members seeking answers to questions on topics like antenna ordinances, rules interpretation and reciprocal agreements with other nations. A revision of the FCC rules in 1993 brought an end to much of the confusion surrounding the "business communication" rules, relaxing restrictions on activities that had been prohibited previously.

Offering Technical Help Fast

In 1993, the Lab made major improvements to its Technical Information Service with better information packages designed to answer the most common technical questions. Each year, the Lab answers technical questions by phone, letters and e-mail.

RFI Work Continues

In 1993, the ARRL continued to address radio frequency interference (RFI) issues with participation in the Society of Automotive Engineers and an ANSI committee working to develop immunity standards for consumer electronics equipment. ARRL staff members wrote an article on cable TV interference for *Communications Technology*, to help cable companies understand their responsibilities regarding RFI.

Testing for the Amateur Community

The ARRL continued to upgrade its testing capabilities in 1993 with the purchase of a new Hewlett-Packard spectrum analyzer that has a frequency range of 30 Hz to 26.5 GHz. The superior range and ease of the new analyzer allowed the Lab staff to perform measurements that weren't possible with our old analyzer.

HAVING FUN AND STRETCHING YOUR OPERATING SKILLS

Contests and Awards

ARRL contests, awards and other competitive activities hone operating skill and provide hours of enjoyment for Members. Among the most popular activities is the DX Century Club (DXCC) program. This year, six new countries joined the DXCC country list: Slovenia, Croatia, Bosnia-Herzegovina, the former Yugoslav Republic of Macedonia, the Czech Republic and the Slovak Republic. The total new DXCCs for 1993 were 4124. In the "Top of Honor Roll" category there were 677 new awards for Mixed, 332 for Phone and 72 for CW. Joining the Honor Roll: 479 Mixed, 358 Phone and 135 CW.

Table 2
Awards, 1993

Worked All States Applications Processed at HQ	551
Worked All States Certificates	872
Worked All States Endorsements	438
5-Band Worked All States	34
Friendship Awards	117
Code Proficiency Certificates	129
Code Proficiency Endorsements	124
VUCC Certificates	150
VUCC Endorsements	155
Rag Chewers' Club	527
Extra Class Certificates	105
Old-Timers Club	104
A-1 Operator Awards	32

In late 1993, the ARRL Awards Committee approved the addition of a RTTY Honor Roll to the DXCC program. The frustrating backlog of DXCC applications reported in 1992 was virtually eliminated in 1993, thanks to a new computerized system for processing. By year end, turnaround time on applications was well within acceptable limits. Reaction to the new ARRL Friendship Award was favorable. The award began November 1.

Field Day and Other Events

ARRL contests and events continued to challenge the imagination and operating skill of Members. Field Day participation continued to top 30,000, making it the single largest ARRL-sponsored event. Other events that continued to draw strong Member interest included the June VHF QSO party, the International DX Contest and the November Sweepstakes.

Table 3
New DXCC Awards, 1993

Mixed	1092
Phone	1004
CW	539
6 Meters	37
10 Meters	574
40 Meters	270
80 Meters	205
160 Meters	28
Satellite	48
RTTY	97

MANAGING AMATEUR RADIO'S GROWTH

Responding to New Prospects

One year after the creation of the ARRL's toll-free telephone number (800-32-NEWHAM), the service continues to exceed our expectations. By year-end, our Educational Activities Department was answering an average of 1182 calls a month from new prospects and new hams. This service provides a direct link between prospective hams who want to explore a new interest in Amateur Radio and League experts who can provide the information to get them started in the right direction.

Nurturing Young Hams

The number of young hams getting involved with Amateur Radio continued to increase. Year-end figures showed 28,000 licensed operators across the country were under the age of 21, more than double the number in 1990 before the codeless Technician-class license was introduced in February of 1991.

The *S*huttle *A*mateur *R*adio *EX*periment (SAREX) celebrated another year of bringing Amateur Radio into the classroom in an innovative way, with four highly publicized missions during 1993. Highlights included a talk between orbiting STS-57 astronauts and President Clinton, and a record 600 QSL cards received for the popular STS-58 mission.

The ARRL's tent was a popular spot at the 1993 Boy Scout National Jamboree. More than 186 Scouts signed up for activities, worked on the Radio Merit Badge and passed a license exam during the 10-day event. In 1993, for the first time, the ARRL sponsored a booth at the Girl Scout Council National Convention and produced a Girl Scout brochure highlighting the fun of Amateur Radio.

Streamlining the Examination Process

The ARRL's Volunteer Examiner Coordinator (VEC) program is the nation's largest VEC operation, overseeing 5666 exams in 1993. The ARRL VE ranks continued to grow, with the number of accredited VEs in our data base reaching more than 31,000 by the end of 1993, an increase of 10,000 over 1992.

A new General-class question pool was completed in 1993, set for release July 1, 1994. Staff members from the VEC, our Technical Department and the Educational Activities Department participated in the revision process. Suggestions were submitted to the National VEC Conference Question Pool Committee. The ARRL is one of three members of the national committee that revises each license class question pool every four years. Thanks to efforts undertaken in 1993, the VEC Department is prepared to be brought on-line as soon as the FCC implements electronic filing of Form 610 license applications, probably late in 1994.

Building a "Foundation" for Amateur Radio

1993 was a year to celebrate, as the ARRL Foundation turned 20 years old. The Foundation added two new scholarships, bringing the program total to 17 single- and multiple-award scholarships (ranging from $500 to $5000). Programs benefiting from the Foundation's General Fund Grants Program included upgrades to the Johnson Space Center ARC's SAREX hardware project, and support for an impressive Amateur Radio historical exhibit at the Harold Warp Pioneer Museum in Minden, Nebraska. Contributor support, especially many heartfelt memorial donations to honor Silent Keys, has allowed for continued growth to funds that will directly benefit many hams in 1994 and beyond.

Prudent Management of Your Dues Dollars

Thanks to the other revenue-generating activities of the organization, such as book sales and advertising, the ARRL keeps membership dues at an affordable level. In 1993, book sale revenues were approximately equal to the level achieved in 1992. Advertising revenues totaled $3.2 million, an increase of 4.3% over the year earlier. The largest single category of revenues, membership dues, increased to $4.2 million in 1993 as membership surpassed the 170,000 mark for the first time in the history of the association. Total revenues were offset by expenses equaling $11.6 million, a 3% increase over 1992. QST

KPMG Peat Marwick

Certified Public Accountants

CityPlace II
Hartford, CT 06103-4103

Independent Auditors' Report

To the Board of Directors of
The American Radio Relay League, Incorporated:

We have audited the accompanying balance sheets of The American Radio Relay League, Incorporated as of December 31, 1993 and 1992, and the related statements of revenues, expenses and changes in fund balances, and cash flows for the years then ended. These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of The American Radio Relay League, Incorporated as of December 31, 1993 and 1992, and the results of its operations and its cash flows for the years then ended in conformity with generally accepted accounting principles.

Our audits were made for the purpose of forming an opinion on the basic financial statements taken as a whole. The supplementary information included in Schedule 1 is presented for purposes of additional analysis and is not a required part of the basic financial statements. Such information has been subjected to the auditing procedures applied in the audits of the basic financial statements, and, in our opinion, is fairly presented in all material respects in relation to the basic financial statements taken as a whole.

KPMG Peat Marwick

March 18, 1994

Member Firm of
Klynveld Peat Marwick Goerdeler

THE AMERICAN RADIO RELAY
LEAGUE, INCORPORATED

Balance Sheets

December 31, 1993 and 1992

Assets	1993	1992
Current assets:		
Cash and cash equivalents	$ 630,938	706,502
Restricted cash (note 10)	192,863	-
Accounts receivable (less allowance for doubtful accounts of $18,587 and $21,066 in 1993 and 1992, respectively)	339,891	613,283
Insurance policy receivable (note 9)	155,560	-
Accrued interest receivable	28,104	43,426
Inventories (note 2)	666,990	610,252
Prepaid expenses	123,015	124,619
Due from life member assets	561,847	213,801
Federal and state income tax receivable	-	85,764
Total current assets	2,298,306	2,407,647
Life membership assets:		
Investments (note 3)	5,483,837	4,833,720
Due to current operations	(761,847)	(213,801)
Accrued interest receivable	47,750	47,732
	4,769,740	4,667,651
Regular membership investments (note 3)	3,025,691	2,870,203
Land, buildings and equipment, net of accumulated depreciation (note 4)	1,132,417	1,320,851
	$ 12,226,154	10,966,372

Liabilities and Fund Balance		
Current liabilities:		
Accounts payable	$ 348,540	315,304
Other accrued liabilities	108,058	104,085
Current portion of deferred membership dues - life members (note 6)	388,001	389,318
Current portion of deferred membership dues - term members	1,861,273	1,775,360
Current portion of pension liability (note 5)	173,878	144,730
Funds held for others (note 10)	192,863	-
Total current liabilities	3,073,111	2,728,275
Deferred membership dues - noncurrent portion:		
Life members (note 6)	4,481,740	4,287,333
Term members	340,356	359,336
	4,822,096	4,646,669
Contributions restricted by donors (note 8)	140,774	131,212
Long-term portion of pension liability (note 5)	896,871	593,087
	1,037,645	724,299
Total liabilities	8,932,854	8,091,203
Fund balances:		
Unrestricted		
Undesignated	2,819,280	2,556,304
Designated (note 7):		
Defense of Amateur Radio Frequencies	165,304	164,489
Amateur Radio Artifacts	104,376	104,376
Building	50,000	50,000
Total unrestricted fund balance	319,680	318,865
	3,138,960	2,875,169
Endowment (note 9)	154,340	-
Total fund balance	3,293,300	2,875,169
	$ 12,226,154	10,966,372

See accompanying notes to financial statements

THE AMERICAN RADIO RELAY
LEAGUE, INCORPORATED

Statements of Revenues, Expenses and Changes in Fund Balances

For the years ended December 31, 1993 and 1992

	1993	1992
Unrestricted:		
Membership dues:		
Term members	$ 3,798,573	3,636,494
Life members (note 6)	385,618	380,490
Total membership dues	4,184,191	4,016,984
Publications sales, net of sales returns, allowances, and discounts of $84,398 and $66,635 in 1993 and 1992, respectively	3,734,991	3,777,277
Advertising revenue	3,228,541	3,096,620
Investment income	231,151	188,679
Membership supplies sales	31,085	36,163
Examination fees	267,544	241,622
WARC income	-	63,232
Overseas QSL service income	49,692	61,606
DXCC service revenue	174,880	128,512
Other	29,509	34,627
Total revenues	11,951,584	11,645,322
Expenses:		
Publication costs and forwarding expenses	3,951,608	3,845,497
Salaries and benefits	4,624,092	4,409,949
Office supplies and expenses	427,894	432,193
Administrative expenses - other expenses authorized by the Board of Directors	431,420	423,581
Occupancy costs	411,159	381,634
Depreciation and maintenance	358,319	405,911
Postage	427,327	388,687
Legal and professional fees	282,734	287,351
Travel	184,605	252,310
Advertising	77,487	48,493
Awards and plaques	69,920	38,482
Other expenses	806,362	349,091
Total expenses	11,602,927	11,263,179
Excess of revenues over expenses before income taxes	348,657	382,143
Income tax on unrelated business income	84,866	121,000
Excess of revenues over expenses	263,791	261,143
Fund balance beginning of year	2,875,169	2,614,026
Fund balance end of year	$ 3,138,960	2,875,169
Endowment:		
Endowment contribution income	$ 154,340	-
Fund balance beginning of year	-	-
Fund balance end of year	$ 154,340	-

See accompanying notes to financial statements.

THE AMERICAN RADIO RELAY
LEAGUE, INCORPORATED

Statements of Cash Flows

December 31, 1993 and 1992

	1993	1992
Cash and cash equivalents were provided by (used for):		
Operating activities:		
Excess of unrestricted revenues over expenses	$ 263,791	261,143
Endowment contribution income	154,340	-
Items not (requiring) providing cash:		
Net gain on sale of investments	(47,446)	(17,099)
Depreciation	304,158	325,871
(Increase) decrease in receivables	(121,286)	232,802
Increase in insurance policy receivable	(155,560)	-
Increase (decrease) in prepaid expenses	1,626	(26,790)
Decrease (increase) in income tax receivable	85,764	(85,764)
(Increase) decrease in inventories	(35,838)	76,809
Increase (decrease) in accounts payable and other accrued liabilities	36,731	(226,684)
Increase in deferred membership dues:		
Life members	102,090	192,324
Term members	167,431	118,002
Increase (decrease) in contributions restricted by donors	9,562	(54,874)
Increase in pension liability	332,974	218,495
	1,098,437	1,014,235
Financing activities:		
Note payments	-	(107,927)
	-	(107,927)
Investing activities:		
Net purchases of life membership investments	(650,157)	(836,933)
Change in other life membership assets	548,068	644,609
Change in due from/to life membership assets	(548,046)	(620,031)
Net purchases of regular membership investments	(408,042)	(921,623)
Purchase of buildings and equipment	(115,724)	(280,461)
	(1,173,901)	(2,014,439)
Decrease in cash and cash equivalents	(75,564)	(1,108,131)
Cash and cash equivalents, beginning of year	706,502	1,814,633
Cash and cash equivalents, end of year	$ 630,938	706,502
Cash paid during the years for:		
Interest	$ -	2,781
Income taxes (refund received) paid - net	(898)	267,633

See accompanying notes to financial statements.

(1) Organization and Significant Accounting Policies

The American Radio Relay League, Incorporated (the "League") is a not-for-profit organization formed to promote interest in amateur radio communication, experimentation and the advancement of the radio art, further the public welfare and foster education in the field of electronic communication. The League also publishes documents, books, magazines and pamphlets necessary or incidental to its purpose.

The following is a summary of significant accounting policies consistently followed in the preparation of the League's financial statements.

Term Membership Dues

Revenue from term membership dues is recognized to the extent of acquisition costs when memberships are received. The remaining portion is recognized in revenues on the straight-line basis ratably over the applicable membership period.

Deferred Life Membership Dues and Interest

The by-laws of the League provide for a paid-up life membership in the League for twenty-five times the term membership annual dues rate. Life membership dues are invested in assets segregated from regular membership investments. Dues are deferred and recognized as income over the estimated life expectancy of the respective life members (approximately 36 years). Interest earned on these segregated life member investments is deferred and recognized in an amount which is representative of the estimated cost (reduced by dues recognized) to the League of providing services to the life members.

Due to/from Current Operations - Due from/to Life Member Assets

The League occasionally pools Life Membership investments and Regular Membership investments when cash flow and investment considerations warrant. Interest is not charged on these short-term transfers.

Contributions

The League recognizes unrestricted donations as income based on the fair market value of the item at the date of donation. Restricted donations are deferred and recognized as income as expenditures are made consistent with the specific donor restriction.

Endowment Fund

Endowment funds are those funds received from donors with the stipulation that the principal is to be maintained inviolate and in perpetuity and invested for the purpose of producing present and future income. The income earned on the funds may be expended by the League if the endowment income is unrestricted or expended in accordance with the gift instrument if restricted.

Cash and Cash Equivalents

Cash equivalents are stated at cost plus accrued interest, which approximates market value. For the purpose of the statements of cash flows, the League considers all short-term highly liquid investments not designated as life member assets to be cash equivalents.

Income Tax

The League is exempt from federal income taxes under Section 501(c)(3) of the Internal Revenue Code. However, the League is subject to any federal and state income tax due as a result of unrelated business income arising primarily from advertising revenues in the QST magazine.

Investments

Marketable equity securities are carried at cost net of any valuation allowance to reduce the marketable equity securities to the lower of cost or market value on an investment pool basis. The League intends to hold fixed income securities until maturity and, as a result, does not provide for a reduction in the carrying value of the investment portfolio for any excess of book value over the estimated market value unless such difference represents an other than temporary decline in value. The fair value of investments is based on quoted market prices.

Inventories

Inventories are carried at the lower of cost or market, cost being determined using the first-in, first-out method.

Land, Buildings and Equipment

Land, buildings and equipment are recorded at cost. Depreciation is provided over the estimated useful lives of the respective assets on a straight-line basis. Buildings are depreciated over a 40-year life. Furniture, equipment, and building improvements are depreciated over their estimated useful lives ranging from 3 to 15 years.

Pension Plan

The League has a noncontributory group annuity retirement plan which covers all full-time employees. The assets of the plan are primarily invested in a group annuity contract with CIGNA which executes investment transactions and pays all benefits.

The League does not provide postretirement benefits other than through its pension plan.

Accounting for Contributions Received

In June 1993, the Financial Accounting Standards Board issued Statement of Financial Accounting Standards No. 116, "Accounting for Contributions Received and Contributions Made." ("SFAS No. 116"). This Standard will generally require that contributions received, including unconditional promises to give, be recognized as revenues in the period received at their fair values. The effective date of SFAS No. 116 is for fiscal years beginning after December 15, 1994 with earlier application encouraged. The League has not yet determined the effect, if any, SFAS No. 116 will have on its financial statements.

Financial Statement Format

In June 1993, the Financial Accounting Standards Board issued Statement of Financial Accounting Standards No. 117, "Financial Statements of Not-For-Profit Organizations." ("SFAS No. 117"). This Standard will require that the League reformat its financial statements into three classes of net assets - permanently restricted, temporarily restricted, and unrestricted. Certain items will need to be disclosed under these three categories and in total. The effective date of SFAS No. 117 is for fiscal years beginning after December 15, 1994, with earlier application encouraged.

Reclassifications

Certain 1992 amounts in the financial statements have been reclassified to conform to the presentation used for 1993.

(2) Inventories

Inventories are composed of the following:

	December 31, 1993	December 31, 1992
Booklets	$ 503,170	500,587
ARRL Handbook	100,594	86,857
Membership supplies	27,161	31,015
Now You're Talking!	46,971	26,154
	677,896	644,613
Allowance for slow moving inventory	(11,806)	(14,461)
	$ 666,090	630,152

(3) Investments

Investments restricted to life memberships are composed of the following:

	December 31, 1993 Cost	1993 Market	1992 Cost	1992 Market
Fixed maturities:				
Corporate bonds	$ 2,747,391	2,778,902	2,367,077	2,385,546
U.S. Government and Government agency	797,704	816,376	599,531	619,862
	3,545,095	3,595,278	2,966,608	3,005,408
Equity securities:				
Common stocks	1,738,782	2,065,974	1,661,308	1,958,829
Preferred stocks	200,000	211,280	205,764	195,250
	1,938,782	2,277,254	1,867,112	2,154,079
Total life membership investment securities	$ 5,483,877	5,872,532	4,833,720	5,159,487

Regular membership investments are composed of the following:

	December 31, 1993 Cost	1993 Market	1992 Cost	1992 Market
Fixed maturities:				
Corporate bonds	$ 1,957,558	1,993,643	1,915,827	1,966,846
Equity securities:				
Common stocks	968,133	1,105,759	654,376	724,216
Preferred stocks	100,000	100,750		
	1,068,133	1,206,509	654,376	724,216
Total regular membership investment securities	$ 3,025,691	3,200,152	2,570,203	2,691,062

(4) Land, Buildings and Equipment

Land, buildings and equipment and related accumulated depreciation are composed of the following:

	December 31, 1993	1992
Land and buildings	$ 1,094,693	1,094,693
Furniture, equipment and building improvements	2,749,393	2,612,345
	3,844,086	3,707,038
Accumulated depreciation	(2,711,669)	(2,406,187)
	$ 1,132,417	1,300,851

(5) Pension Plan

The League has a noncontributory group annuity retirement plan which covers all full-time employees. The League's funding policy is to contribute annually the amount necessary to meet the minimum funding standards established by the Employee Retirement Income Security Act. This contribution is based on a method which recognizes estimated future salary levels and service.

The League has adopted the projected unit credit actuarial cost method for financial statement reporting. The following table sets forth the plan's funded status and amounts recognized in the League's balance sheets at December 31, 1993 and 1992:

	1993	1992
Actuarial present value of benefit obligations:		
Vested	$ 1,593,363	1,611,517
Nonvested	75,493	67,661
Accumulated benefit obligation	$ 1,668,856	1,679,178
Projected benefit obligation	2,813,731	2,446,980
Plan assets at fair value	2,065,244	1,759,770
Projected benefit obligation in excess of plan assets	748,487	1,687,210
Unrecognized net (gain) loss	479,747	(780,259)
Unrecognized net obligation	(157,483)	(169,174)
Net pension liability	$ 1,070,751	737,777

The net pension expense for the years ended December 31, 1993 and 1992 included the following components:

	1993	1992
Service cost-benefits earned during the period	$ 386,963	294,561
Interest cost on projected benefit obligation	220,710	177,885
Actual return on plan assets	(199,363)	(176,222)
Net amortization and deferral of actuarial gains (losses)	34,432	(8,095)
Net periodic pension cost	$ 442,742	288,129

included in net periodic pension cost for 1993 and 1992 is the amortization of a benefit related to the adoption of Financial Accounting Standard No.87, "Employers' Accounting for Pensions", which occurred in 1988.

As of December 31, 1993, the League has changed the assumptions used in calculating the pension liability to reflect current rates. The average discount rates used in determining projected benefit obligation for net periodic pension cost and related pension obligations as of December 31, 1993 and 1992 were 7.00% and 8.00%, respectively. The projected rate of increase in compensation levels was 5.50% and 9.00%, and the long-term rate of return on assets was 5.00% and 6.50% at December 31, 1993 and 1992, respectively.

(6) Deferred Life Membership Dues and Investment Income

The following is a summary of deferred life membership dues and investment income activity:

	December 31,	
	1993	1992
Beginning balance	$ 4,667,651	4,475,227
Additions:		
Membership dues received	193,418	85,231
Investment income deferred	384,290	487,583
	483,708	572,814
Deductions:		
Net transfer to revenue:		
Membership dues	145,476	142,597
Investment income recognized	240,142	238,093
	385,618	380,690
Ending balance	$ 4,769,741	4,667,651

(7) Designated Fund Balances

The League's Board of Directors designated funds for the purpose of acquiring, restoring and preserving amateur radio related artifacts, defending the use of radio frequencies by amateur radio operators and for future maintenance on the League's administrative building.

Following is a summary of activity relating to the designated fund balances:

	Defense of amateur radio frequencies	Amateur radio artifacts	Building
Balance December 31, 1991	$ 164,489	102,280	-
Additional designations	-	2,479	50,000
Expenditures	-	(583)	-
Balance December 31, 1992	164,489	104,176	50,000
Additional designations	815	-	-
Expenditures	-	-	-
Balance December 31, 1993	$ 165,304	104,176	50,000

(8) Contributions Restricted by Donors

The League receives contributions from donors which are restricted for specific purposes as specified by the donors. These restricted contributions are administered by designated officials of the League in accordance with the directions of the donors. Unused contributions aggregated $140,774 and $131,212 at December 31, 1993 and 1992, respectively. Following is a summary of activity relating to these contributions.

	H P Maxim Award	Colorado Convention Fund	Project Goodwill	Exceptional Merit	Legal Research and Resource Fund
Balance December 31, 1991	$ 27,542	8,352	17,579	10,000	55,505
Contributions	-	-	-	-	-
Investment income earned	2,327	287	-	-	-
Expenditures	-	-	-	-	-
Balance December 31, 1992	29,869	8,639	17,579	10,000	55,505
Contributions	-	-	-	-	8,383
Investment income earned	1,945	221	-	-	-
Expenditures	(1,099)	-	(83)	-	(1,025)
Balance December 31, 1993	$ 30,715	8,860	17,496	10,000	62,863

	(WARC) Frequency Defense Fund	Stan Technology	Rinaldo Technology	ARRL Sales Fund	Colvin Award	Total contributions restricted by donors
Balance December 31, 1991	$ 56,141	1,931	1,000	8,036	-	186,086
Contributions	63,232	-	-	-	-	63,232
Investment income earned	-	-	-	-	-	2,614
Expenditures	(119,373)	-	-	(1,347)	-	(139,720)
Balance December 31, 1992	-	1,931	1,000	6,689	-	131,212
Contributions	-	-	-	-	-	8,383
Investment income earned	-	-	-	-	1,220	3,386
Expenditures	-	-	-	-	-	(2,207)
Balance December 31, 1993	$ -	1,931	1,000	6,689	1,220	140,774

(9) Endowment Fund Balance

In 1993, the League became entitled, as beneficiaries, to proceeds from a life insurance policy on one of its members. This endowment specifies that the principal is to be maintained in a fund and invested for the purpose of producing future income. The income from this endowment will be expended to reward deserving radio amateurs.

(10) Funds Held for Others

In 1993, the League collected $192,864 in contributions from its members in support of AMSAT's Phase 3D Project. This project involves the construction and launch of a satellite which will provide worldwide communication for radio amateurs. These funds are expected to be remitted to AMSAT in 1994.

Schedule 1

THE AMERICAN RADIO RELAY
LEAGUE, INCORPORATED

Administrative Expenses - Other Expenses
Authorized by the Board of Directors

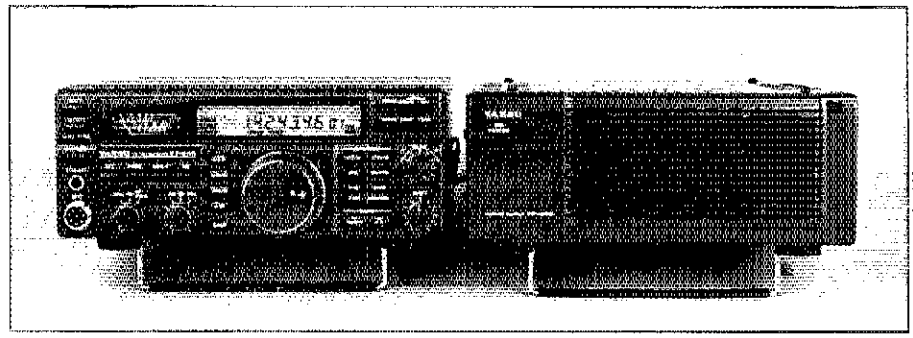
For the years ended December 31, 1993 and 1992

	1993	1992
Division Directors expenses:		
Atlantic	$ 12,280	10,926
Central	5,795	7,568
Dakota	3,258	5,197
Delta	13,032	6,178
Great Lakes	8,706	8,501
Hudson	6,326	10,020
Midwest	8,888	5,395
New England	9,691	10,085
Northwestern	10,164	15,067
Pacific	11,489	11,661
Roanoke	8,143	9,831
Rocky Mountain	6,016	6,430
Southeastern	11,501	10,867
Southwestern	13,477	14,496
West Gulf	3,309	7,323
	134,075	147,545
Section level expenses	99,958	92,037
Board of Directors meetings	89,364	74,208
Executive committee	11,246	12,616
President's expenses	14,801	17,297
Officers' expenses	18,699	21,976
SAREX	3,290	10,502
Digital Communication committee	6,642	9,320
VHF repeater committee	-	6,998
Volunteer resources	7,714	5,717
Ad hoc amateur auxiliary	3,296	5,085
Long range planning committee	7,259	4,939
Administration and finance	3,515	4,732
National traffic system	1,344	3,572
Membership services	2,646	3,449
Ad hoc elections committee	1,957	2,667
Future Systems committee	2,532	2,654
QSL manager expense	2,865	2,517
Ad hoc spectrum management	5,241	-
Ad hoc National Convention Committee	2,485	1,973
Industry Advisory Council	2,112	-
RFI task force	942	2,039
Other committees	4,437	3,038
	297,345	286,036
Total administrative expenses	$ 431,420	423,581

Conducted by Mark Wilson, AA2Z
Editor, *QST*

Yaesu FT-840 MF/HF Transceiver

Reviewed by Steve Ford, WB8IMY



A new HF radio is a major purchase for most hams. So, the less "major" we can make it, the better. Cutting cost almost always means accepting compromises, but a good design keeps those compromises to a minimum. Yaesu joins the fray with the FT-840, a new entry-level radio with a good selection of features and good radio performance. The FT-840 is a 100-W output (adjustable) AM/CW/SSB (and, optionally, FM) transceiver that covers all ham bands from 160 through 10 meters and has a general-coverage receiver. It offers dual VFOs, 100 memory channels and elaborate scanning features as well.

One of the first things you notice about the FT-840 is its size. Weighing in at only 10 pounds, the 840 is packaged in an enclosure that's barely 4 inches high. Of course you have to add a power supply, but we're still talking about a very compact station. This makes the 840 a good choice for a lightweight traveling companion.

Controls, Displays and Other Goodies

The FT-840 provides enough front-panel control options to enhance operational flexibility, yet it avoids things that I'd consider gratuitous "bells and whistles." It's functional and easy to use, and it gets the job done.

The lightly weighted main tuning knob feels smooth and solid. You can follow some simple instructions in the manual to adjust the drag and make it feel just right for you. The SSB/CW tuning rate is normally a comfortable 10 kHz per knob revolution, but you can easily change it to 5 kHz with a switch accessible through the bottom panel. The slow tuning rate is better for CW operation with the narrow filter.

The easy-to-read front-panel LCD is your window to what's going on with the radio. It displays the operating frequency to 10 Hz (you can turn off the last digit) and shows a host of important operating parameters, including the current VFO or memory selection, mode of operation, IF filter selection, tuning rate, and so on. The analog meter displays signal strength on receive and power output or ALC on transmit.

All of the frequency controls are conveniently grouped to the right of the main tuning knob. From here you can easily switch between ham-band and general-coverage-receive operation, change bands (**UP/DOWN**), control the VFO and memory functions, and activate the **FAST** tuning rate for large frequency excursions. Each band has two independent VFOs (**A/B**) that store frequency, mode, filter selection, and so on. The FT-840 also offers 100 tunable memory channels that store frequency, mode, filter selection, RIT settings and split-frequency status. Actually, each memory channel stores *two* frequencies and all the related settings, and you toggle between them with the **A/B** button. (The manual calls these the "front half" and "rear half" of the memory channel.) According to the manual, "you can do nearly anything with the two halves of a memory that you can do with the A/B VFOs, except for a few differences in tuning steps, scanning...and special-purpose memories." You can use the **MEM** button to step through the memories manually, or press the **SCAN** button to step through them automatically. When the memory mode is inactive, the **SCAN** switch allows you to scan through the FT-840's complete frequency range.

The 840 also offers a **CLAR**ifier (RIT) and an IF **SHIFT** control. Both are handy tools when you're operating in crowded bands. RIT range is adjustable to ±2.5 or ±1.25 kHz, a nice touch. Other receiving aids include a switchable AGC ("normal" and "fast" but no "off"), an effective noise blanker and a 12-dB attenuator. The all-mode squelch is a useful addition, especially if you have the FM option and you want to scan through the 10-meter repeater subband.

If you're using a manual antenna tuner (as I was during this review), **MOX** is a button you'll reach for often. It allows you to manually activate the transmitter for quick antenna system tune-ups. If the SWR is high, the FT-840's protection circuitry decreases output power to about 5 W. This is still enough RF to get a usable reading on most antenna-tuner meters. Of course, output increases as you tweak your antenna tuner closer to the match point.

The FT-840 is compatible with the Yaesu FC-10 and FC-800 automatic antenna tuners. There's a separate DIN jack on the rear panel for each of these tuners. The front-panel **START** switch activates the tuner and *Wait* appears on the display while the tuner finds the best match (this happens within 30 seconds, according to the manual). We didn't test either tuner for this review.

The vertical row of buttons to the left of the main tuning knob is dedicated to selecting the various operating modes. You have your choice of SSB (press once for USB, again for LSB), CW (wide or narrow), AM (wide or narrow) and FM (optional). A speech processor is available for SSB or AM.

Yaesu offers two optional crystal filters for the FT-840: a 500-Hz CW filter and a 6-kHz AM filter. If you plan to do much shortwave broadcast listening, get the AM filter. Without it, you have to listen to AM with the standard 2.4-kHz SSB filter, which doesn't offer much fidelity for music. CW enthusiasts will probably want the narrow CW filter. I was grateful to have it when I was roaming through the low end of 40 meters at night. ARRL Lab Engineer Mike Gruber, WA1SVF, reports that it takes less than 10 minutes to install the CW filter. Just remove the cabinet top and press the filter into its connector socket on the board. You don't have to change jumpers or cut any wires. This is a dramatic improvement to filter installation in the last Yaesu MF/HF transceiver we reviewed (see the FT-890 review in September 1992 *QST*). *Good job!*

The FT-840's speaker is located in the

The Bottom Line

Yaesu's newest entry-level MF/HF transceiver offers more features and performance than we would have expected in a "starter" radio just a few years ago. Its compact size and light weight make it a good choice for portable and mobile operation, too.

Table 1

Yaesu FT-840 MF/HF Transceiver, serial no. 3I010272

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Transmitter: 160- through 10-meter amateur bands. Receiver: 100 kHz to 30 MHz.	As specified. Transmitter range: 1.8-2, 3.5-4, 7-7.5, 10-10.5, 14-14.5, 18-18.5, 21-21.5, 24.5-25, 28-30 MHz.
Modes of operation: CW, LSB, USB, AM, FM (optional).	As specified. FM not tested.
Power requirement: 13.5-V dc, ±10%; 1.2 A on receive, 20 A on transmit.	At 13.8-V dc: 1.2 A on receive (no signal); 15.7 A max on transmit.
Receiver	*Receiver Dynamic Testing*
SSB/CW receiver sensitivity (2.4 kHz bandwidth, 10 dB S/N): 0.5 to 1.8 MHz, <1 μV (–107 dBm); 1.8 to 30 MHz, <0.25 μV (–119 dBm).	Minimum discernible signal (noise floor) with 500-Hz IF filter: 1.0 MHz –133 dBm 3.5 MHz –137 dBm 14 MHz –138 dBm
AM (10 dB S/N, 6-kHz filter): 0.5 to 1.8 MHz, <8 μV; 1.8 to 30 MHz, <1 μV.	10 dB S+N/N (signal 30% modulated with a 1-kHz tone, 2.4-kHz filter): 1.0 MHz 1.0 μV 3.8 MHz 0.6 μV
Blocking dynamic range: Not specified.	Blocking dynamic range with 500-Hz IF filter:* 1.0 MHz 106 dB 3.5 MHz 108 dB 14 MHz 113 dB
Two-tone, third-order IMD dynamic range: Not specified.	Two-tone, third-order IMD dynamic range with 500-Hz IF filter:* 1.0 MHz 88 dB 3.5 MHz 90 dB 14 MHz 90 dB
Third-order input intercept: Not specified.	1.0 MHz –0.9 dBm 3.5 MHz –1.9 dBm 14 MHz –1.7 dBm
S-meter sensitivity: Not specified.	S9 signal at 14 MHz: 28 μV.
CW/SSB squelch sensitivity: <2 μV.	0.5 μV.
Receiver audio output: >1.5 W into 4 Ω with <10% THD.	2.4 W at 10% THD into 4 Ω.
IF/audio response: Not specified.	At 6 dB: CW-N, 446-1018 Hz (572 Hz); CW-W, 250-1320 Hz (1070 Hz); USB, 255-2656 Hz (2401 Hz); LSB, 165-2422 Hz (2257 Hz); AM-N, 84-2100 Hz (2016 Hz).
Image rejection (1.8 to 30 MHz): 70 dB or better.	105 dB.
Transmitter	*Transmitter Dynamic Testing*
Power output: SSB, CW, FM, adjustable up to 100 W; AM, 25 W carrier.	Maximum power output typically 105 W, minimum power typically 3 W; varies slightly from band to band.
Spurious-signal and harmonic suppression: >40 dB spurious radiation; >50 dB harmonic radiation; 45 dB harmonic radiation (10, 18 MHz).	As specified. Worst case, 50 dB at 18 MHz. Meets FCC specifications for equipment in its power output class and frequency range.
Third-order intermodulation distortion products: 25 dB at 100 W PEP output at 14.2 MHz.	See Figure 1.
CW keying characteristics: Not specified.	See Figure 2.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 32 ms.
Composite transmitted noise: Not specified	See Figure 3.
Size (height, width, depth): 3.75×9.5×9.75 inches; weight, 10 lb.	

*Dynamic-range measurements were made at the ARRL Lab standard signal spacing of 20 kHz. Blocking dynamic range measurements were noise limited at the values shown. AGC could not be defeated.

top of the radio. Despite its small size, there is more than enough audio for all but the noisiest environments. When the background noise becomes too much, you can always plug in an external speaker or resort to the front-panel headphone jack.

The rear-panel layout is straightforward. A fixed-level audio output is available for digital operating with multimode TNCs, but there is no corresponding audio *input* jack. This means that you must route the audio from your TNC to the front-panel microphone jack. The FT-840 has no FSK provision.

There are access holes for screwdriver-adjust trimmers to set the CW keying delay, CW sidetone level and speech-processing compression level. Having the sidetone control on the rear panel is fine. Once I set my sidetone level, I rarely change it. And a set-and-forget speech processing control is fine as long as you don't change microphones often. The CW keying delay is another matter, though. Most CW operators like to adjust the delay for changes in sending speed and operating style (short delay for contesting or DXing, longer delay for ragchewing).

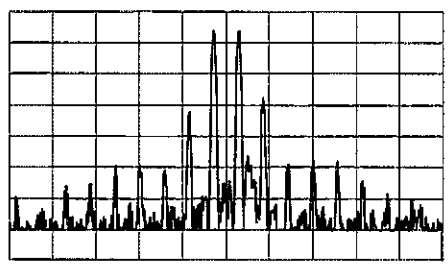
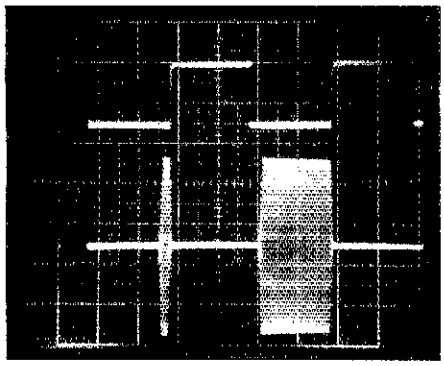


Figure 1—Worst-case spectral display of the Yaesu FT-840 transmitter during two-tone intermodulation distortion (IMD) testing. Worst-case third-order product is approximately 28 dB below PEP output, and the fifth-order product is approximately 49 dB down. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The transceiver was being operated at 100 W PEP output at 14 MHz.

Other rear-panel jacks are standard fare: external ALC (for use with a linear amplifier), remote PTT, external speaker, auxiliary dc output and so on. TR control for a linear amplifier is available from the 8-pin **BAND DATA** jack. Maximum ratings are 1.5 A and 150 V dc, which should be sufficient to switch just about any modern amplifier. I would have preferred the convenience of a separate phono jack for



(A)

(B)

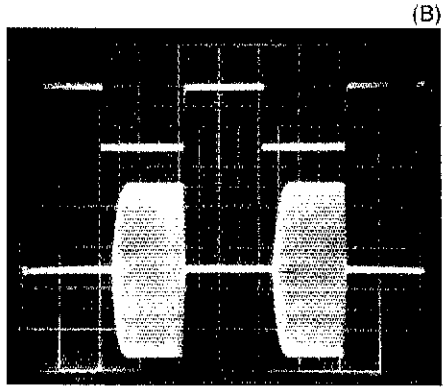


Figure 2—CW-keying waveform for the Yaesu FT-840 in the semi-break-in mode. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output at 14 MHz. The photo at A shows noticeable shortening of the first transmitted character during semi-break-in operation; the photo at B shows the CW waveform with the radio locked in transmit.

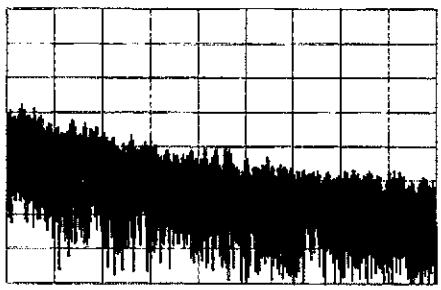


Figure 3—Spectral display of the Yaesu FT-840 transmitter output during composite-noise testing. Power output is 100 W at 3.5 MHz. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The log reference level (the top horizontal line on the scale) represents –60 dBc/Hz and the baseline is –140 dBc/Hz. The carrier, off the left edge of the photograph, is not shown. This plot shows composite transmitted noise 2 to 20 kHz from the carrier.

amplifier switching, though.

The **CAT**—Computer Aided Transceiver—jack permits computer control of many of the FT-840's functions. Many transceiver-control, logging and contesting software packages understand how to communicate with Yaesu's CAT interface, and to use the computer-controlled features you'll need an optional TTL to RS-232-C level converter such as the Yaesu FIF-232.

The FT-840 manual provides plenty of information for those who want to write their own control software. All of the CAT control commands are described along with their corresponding decimal and hexadecimal operating codes. The manual even offers examples of BASIC code to implement various functions. Yaesu does *not* offer software for the FT-840.

We used the FT-840 with Yaesu's matching FP-800 power supply. During this review I used the FP-800 power supply, but I also operated briefly from my own 30-A home-brew unit. Any 20-A (continuous) 13.8-V dc supply should do the job as long as it provides good filtering and regulation.

So, How does it Work?

One of the first things we look for in a new radio is receiver performance. Did Yaesu leave out receiver performance in designing a radio for this price class? At one time, less money meant less receiver performance—low dynamic range, wide filters, noisy synthesizers—that rendered the radios unusable with strong nearby signals and in crowded band conditions. ARRL Lab testing (Table 1) shows that Yaesu considered receiver performance a priority in the FT-840. It is sensitive and offers very acceptable dynamic range. We do have one nit to pick, though: Copy in the FT-840 manual and FT-840 advertising refers to the radio's receiver RF amplifier, but the 840 doesn't have one. This is good engineering—leaving out an RF gain stage you don't really need leads to better strong-signal performance, and the FT-840 is plenty sensitive without it—but inaccurate reporting.

In previous reviews of Yaesu's FRG-100 and FT-747GX, we complained about heavy-handed high-end-audio rolloff, which resulted in muffled-sounding audio on SSB and AM. As the IF/audio response numbers in Table 1 show, however, the FT-840's audio-amplifier chain includes thoughtful, *appropriate* audio rolloff. The audio circuitry in the 840 preserves its solid receive sound on CW and SSB while usefully minimizing high-frequency AF and IF hiss, as well as minimizing the high-pitched audio that results from IF-filter blow-by. The 840's circuitry reduces the radio's high-end IF/AF response less in SSB than in CW wide—even though the same IF filter is used in both cases. (A switchable bypass capacitor in the 840's first audio amplifier/filter makes the difference.) Higher-priced MF/HF transceivers from a number of manufacturers include mode/filter linked AF filtering, but we applaud Yaesu's inclusion of this feature in a *low*-end radio.

The FT-840's stock 2.4-kHz IF filter provides quite good SSB and "wide CW" selectivity. The review transceiver included the optional 500-Hz CW filter. This filter pair, operating in conjunction with the FT-840's IF shift and mode/filter-linked AF filtering, does a good job of sorting out signals in crowded bands and presenting you with audio that's noticeably free of audio/IF hiss. I could hear some high-pitched filter blow-by when tuning adjacent to very strong signals with the 500-Hz filter switched in, but the AF rolloff keeps this effect very much under control.

One selectivity no-no that really compromises the FT-840's usefulness for data communication is its inability to let you use the narrow-CW filter in SSB mode—a trait shared by the higher-priced FT-890, but not by the FRG-100 receiver. There is a workaround. The FT-840 allows you to set its CW offset (discussed later), and it allows you to switch between the upper or lower sideband for CW reception. Through some control acrobatics you can use the narrow filters in the data modes. (It's necessary to operate split, transmit in SSB and receive in CW, and set your offset, CW "sideband" and **IF SHIFT** *just so*.)

To Yaesu's credit, the manual devotes nearly two manual pages to the dance steps necessary to do this, but it seems like some of the effort that went into the control programming for the elaborate memory and scanning features might have been better spent on developing a simple way to make the narrow filters available for data operation. We simply *must* be able to use our radios' "CW" filters in SSB mode, at BFO-to-IF offsets appropriate for data modes!

SSB is the first mode I tried after getting the FT-840 home. Everyone reported that my audio sounded crisp and clean. I'm loath to use speech processing, but I gave it shot one evening on 17 meters. The band was fading fast and I had just started a conversation with a fellow in Arizona. When he commented that my signal strength was slipping, I switched in the processor. To my surprise he said that it made an audible difference. According to him, I immediately jumped from difficult copy to "adequate" copy. A notable omission is the lack of a VOX for SSB operation. I think that VOX should be standard on any MF/HF transceiver.

CW operating was a breeze—despite the fact that I had to set the keying delay and leave it. (There was no way I was going to fiddle around behind the rig every time I was unhappy with the timing.) Previous *QST* Product Reviews have called for adjustable CW offset on all MF/HF transceiv-

ers, and the FT-840 includes it. The CW pitch/receiving offset/sidetone pitch are easily changed from the front panel (400 to 1000 Hz in 100-Hz steps, 700-Hz default). This is a welcome feature.

My AM air time was brief, but educational. The dedicated AMers thought the FT-840's audio lacked "authority." It was perfectly clear and understandable, but it wasn't the booming, full-bodied sound that many AM enthusiasts demand. The FT-840's AM characteristics are more than adequate for those few times I venture onto the AM frequencies.

I didn't test the FT-840's FM option, but it has a couple of features worth mentioning: built-in CTCSS encoding and programming for the standard repeater frequency offset. Many 10-meter FM repeaters use CTCSS to prevent distant stations on the same frequency from inadvertently keying up the machines. If you can't transmit the proper subaudible tone, you won't be able to use the repeater.

On the digital modes (RTTY, AMTOR and PacTOR), I found that the 80-mV audio level at the rear-panel **AF OUT** jack was not enough to "plug and play" with my Kantronics KAM multimode TNC. Audio requirements vary from TNC to TNC, so your experience may be different.

Once the KAM was up and running, I tried the FT-840 on RTTY. I enjoyed several QSOs—both domestic and international—and received excellent reports. The manual cautions you to reduce the output to about 50 W for extended operation. On a couple of occasions I cranked the output up to 100% and the rig held up nicely. Regardless of the power output, keep an eye on the ALC meter to avoid overdriving the FT-840's mike input on the digital modes. A slight adjustment of the **MIC** knob is all that's needed to keep the transmitter drive at the proper level to keep your signal from unnecessarily interfering with other stations on the band.

ARRL Lab testing indicated that our FT-840's TR turnaround time was overly long—120 ms or so—too long for AMTOR and PacTOR. Consultation with Yaesu netted the response that the radio was defective, so Yaesu shipped us another radio to try while they fixed ours. The replacement radio worked fine (32 ms turnaround), as did the review unit after repair. It turns out that Yaesu made some circuit modifications that weren't included in our early-production unit. If you have early FT-840, are using it on AMTOR, and are having a timing problem, contact Yaesu for a warranty repair.

Summary

Yaesu's FT-840 offers features and performance beyond what I would have expected in a "starter" rig just a few short years ago. Although it's missing a few things like VOX and an easy means of using the narrow filter in the data modes, it's the type of radio you'll enjoy for years before you feel the need to upgrade. And it isn't just a radio to leave at home, either. I suspect we'll see FT-840s cropping up in many mobile applications—and more than a few Field Day operations.

Thanks to Dave Newkirk, WJ1Z, Senior Assistant Technical Editor, for lending his critical ear and providing comments on the FT-840's receive characteristics.

Manufacturer's suggested retail prices: FT-840, $999; YF-112C 500-Hz CW filter, $124; YF-112A 6-kHz AM filter, $124; FC-10 automatic antenna tuner, $379; FC-800 automatic antenna tuner, $499; FP-800 dc power supply, $309; SP-6 speaker/audio filter, $160; FIF-232 CAT System Interface, $109; 747 FM unit, $70; TCXO-4 master reference oscillator, $42. Manufacturer: Yaesu USA, 17210 Edwards Rd, Cerritos, CA 90701, tel 310-404-2700.

S & S Engineering ARK 40 CW QRP Transceiver Kit

Reviewed by Jeff Gold, AC4HF

If you're looking for something different in a QRP transceiver kit, S & S Engineering may have just the product for you. The ARK 40 is a single-band, 40-meter CW transceiver that covers 7 to 7.150 MHz; 20- and 30-meter versions are available, too. It features a superheterodyne receiver and 5-W transmitter. The rig offers full break-in (QSK) keying, a diode-ring mixer and 600-Hz crystal filter. Other standard features include RIT, AGC, a front-panel speaker and a narrow (200-Hz) audio filter.

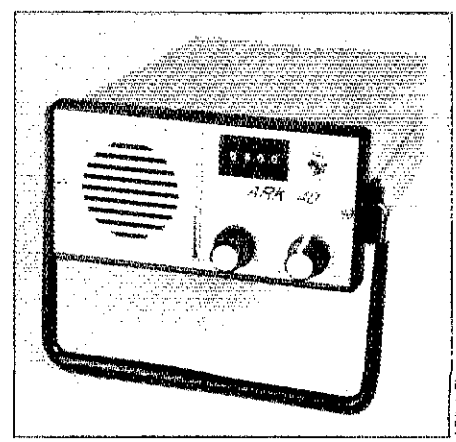
A big difference between the ARK 40 and other low-cost QRP kits is that it uses a frequency synthesizer instead of a conventional VFO. Tuning is accomplished with pushbutton switches. They're like thumbwheel switches, but you push a button to increment or decrement the mechanical 4-digit counter, which resolves frequencies to 100 Hz. Tuning is in 100-Hz steps.

The ARK 40's frequency synthesizer uses two phase-locked loops. The signal from the first, which tunes from 4 to 7 MHz in 2-kHz steps, is divided by 20, giving 100-Hz steps. An image-reject mixer consisting of two 1496s combines the resultant 0.2 to 0.35-MHz signal with energy from an 18.8-MHz crystal oscillator to produce the ARK 40's receiver-LO range of 19 to 19.15 MHz. (The ARK 40's **RIT** control varies this oscillator.) A second PLL, operating as a "cleanup" loop, filters the 19 to 19.15-MHz signal for improved image and spur rejection. Its output drives the ARK 40's receive mixer directly or is converted to 7 MHz by the transmit mixer and a 12-MHz crystal oscillator.

As the test results in Table 2 show, the ARK 40 meets or exceeds its specifications and offers solid receiver and transmitter performance. ARRL Lab Supervisor Ed Hare, KA1CV, even pointed to a couple of areas (blocking dynamic range, for example) where he thought S & S Engineering should revise the performance specifications—*upward*. (He doesn't get to say this very often.) The receiver is plenty sensitive, and the dynamic range is excellent for a receiver in this class. The transmitter effortlessly delivers a clean 5 W. The keying waveform is excellent, with no appreciable shortening of the first transmitted dit.

The Manual

One of the keys to an enjoyable and successful kit-building experience is the manual. Previous kits I've built range from those supplied as basically a bag of parts and a schematic, to Heathkits with manuals that told you in minute, step-by-step detail



KIRK KLEINSCHMIDT, N1NZ

The Bottom Line

Quality components, a thorough manual and good basic radio performance make this kit a good choice for the intermediate or experienced builder.

Table 2

S & S Engineering ARK 40 40-Meter CW Transceiver

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: 7 to 7.15 MHz, 100-Hz tuning steps.	As specified.
Mode of operation: CW.	As specified.
Power requirement: 10 to 13.8-V dc; 0.4 A on receive, 1 A on transmit.	At 13.8-V dc: 0.4 A on receive (no signal); 1 A at 4 W RF output on transmit.
Receiver	*Receiver Dynamic Testing*
CW receiver sensitivity (bandwidth not specified, 10 dB (S+N)/N): 0.3 μV (−117 dBm).	Minimum discernible signal (noise floor) with 600-Hz IF filter: −127 dBm.
Blocking dynamic range: >75 dB at 20-kHz signal spacing.	Blocking dynamic range with 600-Hz IF filter:* 95 dB.
Two-tone, third-order IMD dynamic range: >90 dB at 20-kHz signal spacing.	Two-tone, third-order IMD dynamic range with 600-Hz IF filter:* 94 dB.
Third-order input intercept: >10 dBm.	14.2 dBm
Receiver audio output: 1 W.	0.7 W at 1% THD into 4 Ω.
IF/audio response: Not specified.	At −6 dB: Audio filter off, 696-1304 Hz (608 Hz); audio filter on, 647-880 Hz (233 Hz).
Image rejection: >60 dB.	62 dB.
Transmitter	*Transmitter Dynamic Testing*
Power output: 3 to 4 W typ, 5 W at 13.8 V dc.	Maximum power output, 5.9 W at 13.8 V dc.
Spurious-signal and harmonic suppression: Not specified.	41 dB. Meets FCC specifications for equipment in its power output class and frequency range.
CW keying characteristics: Not specified.	See Figure 4.
Composite transmitted noise: Not specified	See Figure 5.
Size (height, width, depth): 2.75×5.5×8 inches, weight 4 lb.	

*Dynamic-range measurements were made at the ARRL Lab standard signal spacing of 20 kHz. Blocking dynamic range measurements were noise-limited at the values shown. AGC could not be defeated.

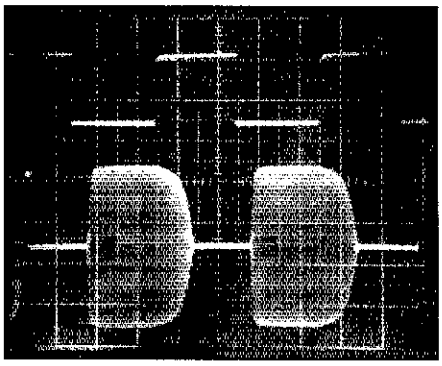


Figure 4—CW-keying waveform for the S & S Engineering ARK 40. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 5 W output at 7 MHz.

how to assemble the rig. The 118-page S & S instruction manual is a work of art. It is professionally written, with excellent production quality, good schematics and clear photos. This is by far the most complete and well done manual I have come across since building my Heath HW-9.

There is a master list of parts that has complete descriptions of each part (including details such as the color code for the resistors). This makes part placement a lot surer. One of the biggest problems builders experience is incorrectly identifying parts and putting them in the wrong place on the board.

The manual offers a second parts list, this one with two checkoff boxes for each part, as an aid during construction. The parts list is in the back of the manual, separate from the assembly instructions. At first I wasn't sure I liked this approach, but found it worked fine as I built the boards. There are separate assembly instructions for each board, and then sections for final assembly and alignment.

The manual was very easy to follow until the final assembly and alignment section. I found it easier to look at the pictures of the assembly and the schematic for this part. I also found the alignment procedures to be somewhat confusing. During initial testing, the ARRL Lab engineers found that I had missed some of the alignment steps and were able to realign it to specifications. S & S said they are revising the manual to make the alignment instructions clearer.

S & S offers a guarantee that the rig will work as specified or you can send it back and they will fix it promptly. If the problem is their fault (bad component, etc), they'll fix it free (you pay postage one way). If you've done something wrong (like put a part in the wrong place), they'll fix it for less than $25. Although I didn't have to test the service, this seems like a very reasonable arrangement to me.

Building the Kit

Most of the ARK 40's components fit on three printed-circuit boards. There are over 1000 solder connections in all, and S & S Engineering clearly states that this is not a beginner's kit. Although this shouldn't be your first kit, I think that someone with a little kit-building experience could tackle this project with help from an experienced builder. There are a lot of parts, but the way the kit is packaged and the quality manual make it easy to assemble.

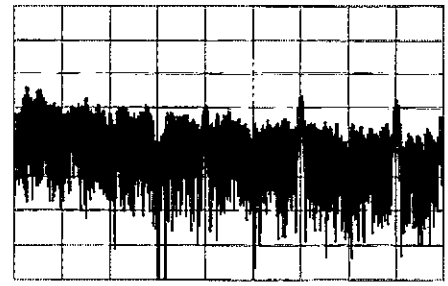


Figure 5—Spectral display of the S & S Engineering ARK 40 transmitter output during composite-noise testing. Power output is 3.6 W at 7 MHz. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The log reference level (the top horizontal line on the scale) represents 60 dBc/Hz and the baseline is 140 dBc/Hz. The carrier, off the left edge of the photograph, is not shown. This plot shows composite transmitted noise 2 to 20 kHz from the carrier.

The boards and their corresponding parts are each packaged separately. If there are a lot of the same value resistors or capacitors, they are put in separate packages. If there is any chance of a part being identified incorrectly, it is in a separate wrap and clearly labeled. The coils are all pre-wound. Some of the capacitors are tiny

surface-mount devices; the kit includes extras in case you goof. (It turned out that I managed to crunch one with a pair of surgical forceps. No problem: I just used a different tool and the spare capacitor.)

My approach to building a kit is to take all the parts out of the box, check them off and separate them. I usually take a big piece of paper, label the components (R1, C34 and so on), and put the leads through the paper. This helps me keep track of everything when I'm soldering the parts on the board. It also alerts me ahead of time if anything is missing so I can call for a replacement. This tedious process is usually my least favorite part of building a kit, and I found that I didn't need to do it with the ARK 40 because the parts were so well packaged. I just took a number of small plastic bins and just dumped each of the packages into each one. There was nothing missing.

The boards are double-sided with plated-through holes. The down side to this type of board is that if you put a part in the wrong place, it is harder to remove it from the boards—so watch what you're doing. Silk-screened component numbers make parts placement much easier. The parts in the kit were also all top-quality. The case is fantastic and should stand up to about any type of use.

I still get real nervous when I first power up a rig, especially one with so many parts. When I flipped the switch on the ARK 40, the power came on and no smoke billowed out. Boy, was I happy!

Testing and alignment requires a multimeter, a receiver with an accurate digital display (or a frequency counter), and an oscilloscope or power meter capable of measuring QRP levels. After you complete each board, you are asked to make some simple resistance checks with an ohmmeter. Most of the alignment procedures are typical of QRP transceivers. There are two coils and a couple of variable capacitors to adjust in the receiver section and two transformers for the transmitter. If you run into problems during alignment, the troubleshooting section should help point you in the right direction to localize the problem. If you need to take advantage of the service, you will find the people at S & S Engineering knowledgeable and helpful.

On the Air

Building the rig is only half the fun. Putting a rig I just have built on the air is always an exciting experience for me. I plugged in the antenna and key and turned on the power. The 40-meter band was not in very good condition. I tuned around a little and heard someone calling CQ. I answered and he came back with a QRZ? This was a good sign as far as I was concerned. I answered back with my call twice and turned it over. Ralph, N3QF, in Washington, DC, came right back. We had a nice 40-minute ragchew. He said my signal had a very nice sound to it. I listened to the ARK 40's keying on my Kenwood TS-850, and it sure sounds sweet.

At first I had serious reservations about the use of push buttons to tune around the band. I found that after a few minutes I didn't mind this method at all. The QSK works as expected, and my only (minor) complaint is that the TR relay sounds a little squeaky. The rig sounds great, is very sensitive, has great full break-in keying, and is extremely rugged. It even acquitted itself well during the ARRL November Sweepstakes, when 40 meters is packed with contest stations. The size is about right for backpacking or portable operation. I am impressed!

I was little surprised when I first saw the $270 price tag; many of the other QRP transceiver kits I'm familiar with are in the $160 to $200 range. As I finished building and testing the rig, though, I came to the conclusion that the quality of the components and manual, combined with the impressive radio performance, make this kit a good value.

Manufacturer's suggested retail price: ARK 40, $270 (20- and 30-meter versions also available); optional keyer kit, $40. Manufacturer: S & S Engineering, 14102 Brown Rd, Smithburg, MD 21783; tel 301-416-0661; fax 301-416-0963.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from dealers. ARRL receives no remuneration from anyone involved with the sale or manufacture of items presented in the Product Review or New Products columns.—*Ed.*]

The ARRL-purchased Product Review equipment listed below is for sale to the highest bidder. Prices quoted are minimum acceptable bids, and are discounted from the purchase prices. All equipment is sold without warranty.

Alinco DJ-580T dual-band H-T with EMS-8 speaker/mike, EDC-36 dc cable and EDH-6 battery case (sold as a package only; see Product Review, March 1994 *QST*). Minimum bid: $316.

Down East Microwave SHF-2400B Mode S downconverter (see Product Review, February 1994 *QST*). Minimum bid: $158.

ICOM IC-707 MF/HF transceiver with FL-52A CW filter (sold as a package only; see Product Review, April 1994 *QST*). Minimum bid: $665.

ICOM IC-W21AT dual-band H-T with HM-75 speaker/mike, CP-13 dc cable and BP-130 battery case (sold as a package only; see Product Review, March 1994 *QST*). Minimum bid: $404.

JPS Communications NF-60 notch filter (see Product Review, February 1994 *QST*). Minimum bid: $105.

Kenwood TH-78A dual-band H-T with SMC-33 speaker/mike, PG-2W dc cable and BT-8 battery case (sold as a package only; see Product Review, March 1994 *QST*). Minimum bid: $364.

SSB Electronic UEK-2000 Mode S downconverter (see Product Review, February 1994 *QST*). Minimum bid: $260.

Standard C558A dual-band H-T with CMP-111 speaker/mike, CAW-150 dc cable and CBT-151 battery case (sold as a package only; see Product Review, March 1994 *QST*). Minimum bid: $422.

Yaesu FT-530 dual-band H-T with MH-29A2B speaker/mike, E-DC-5B dc cable and FBA-12 battery case (sold as a package only; see Product Review, March 1994 *QST*). Minimum bid: $407.

Sealed bids must be submitted by mail and must be postmarked on or before May 27, 1994. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

In your bid, clearly identify the item you are bidding on, using the manufacturer's name and model number, or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by ARRL. Please include a daytime telephone number. The successful bidder will be advised by telephone with a confirmation by mail. No other notifications will be made, and no information will be given to anyone other than successful bidders regarding final price or identity of the successful bidder. If you include a self-addressed, stamped postcard with your bid and you are not the high bidder on that item, we will return the postcard to you when the unit has been shipped to the successful bidder.

Please send bids to Bob Boucher, Product Review Bids, ARRL, 225 Main St, Newington, CT 06111-1494. QST

Hints and Kinks

Conducted By David Newkirk, WJ1Z
Senior Assistant Technical Editor

BEEPER MADNESS

Even though many Amateur Radio repeaters, and communicators on military and commercial circuits, routinely use end-of-transmission beepers, some radio amateurs just about vibrate in their chairs at the thought of them proliferating outside the repeater bands. It's therefore safe to say that hams who find EOT beepers useful and fun will probably enjoy the next three items, and hams that don't won't. To readers who don't want or don't like EOT beepers, or hams who thump Part 97 or invoke some mythical Very Serious Ham edict as supposedly proscribing their use, The Hints and Kinks Poison Control Center suggests four antidotes, the appropriateness of which depends on whether you're reading, operating, or considering writing Hints and Kinks a nastygram. The antidotes: (1) Try a different page; (2) operate the on-off switch; (3) turn the tuning knob; and (4) read FCC Rules §97.3(c)(5), which says, among other things, that "incidental tones for the purpose of selective calling or alerting or to control the level of a demodulated signal may also be considered phone."—*Ed.*

A Power-Miser Beeper

◊ This circuit (Figure 1) draws insignificant current—a few microamperes—from its built-in 9-V battery. Aside from C2, C3 and C9, which should be low-leakage types, none of its components is critical.

The circuit operates as follows: Pushing the mike PTT button pulls the PTT line low (from a dc level that usually rests in the 4 to 15 V range). During standby, this voltage turns on Q2, the output of which, inverted by U2D, dumps the charge on capacitor C1. Releasing the PTT switch applies a positive voltage to differentiator R1C1, and the resulting positive pulse triggers monostable multivibrator U1A. U1A produces a negative-going pulse about 0.5 s long at pin 7. This pulse triggers U1B, which produces a positive-going pulse about 0.25 s long. This pulse does two things: it gates the RC tone oscillator (U2A-U2B) on and turns on MOSFET switch Q1, which holds the PTT line low for the duration of the tone burst. After the tone, the PTT line goes high again. U1A does not operate again during this cycle because it is connected in the nonretriggerable mode.

A two-stage RC low-pass network (R5, C5, R6 and C6) filters U2C's square-wave output into something more like a sine wave. C7 and level-setting resistor R7

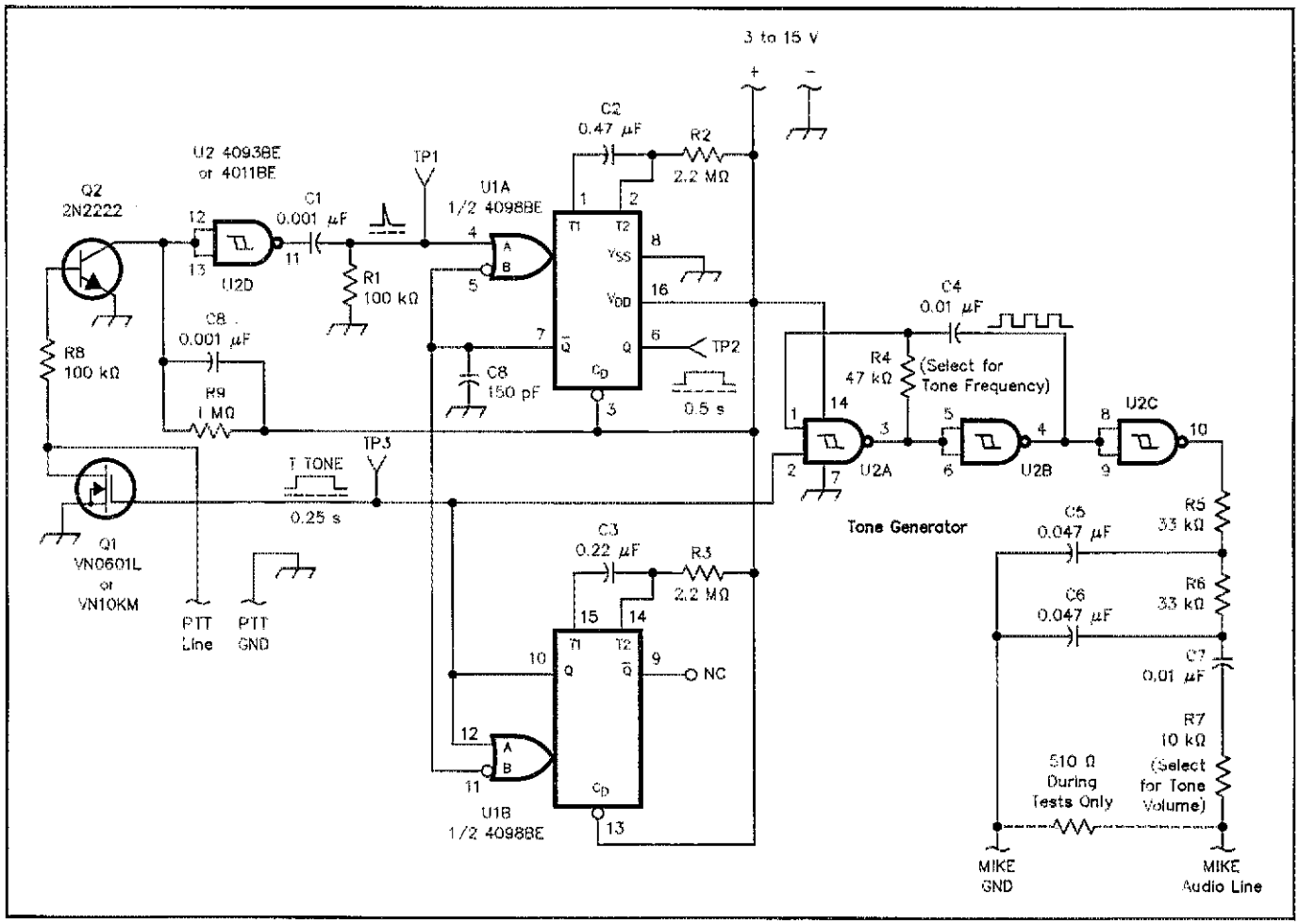


Figure 1—Emerson Hoyt's end-of-transmission beeper consumes very little power. (A 9-V battery should last essentially for the duration of its shelf life even though no power switch is available to turn the circuit off.) All of the circuit's capacitors are low-voltage ceramic types, and all of its resistors are ⅛-W composition or film.

Q1—VN0601L or VN10KM power MOSFET.
Q2—2N2222.

U1—CD4098BE dual monostable multivibrator.

U2—CD4011BE or CD4093BE quad two-input NAND gate.

couple this signal to the mike audio lead. (The R7 value provides a tone level suitable for the Kenwood transceivers TS-940, TS-440 and TM-241 in conjunction with a Kenwood MC-43S 600-Ω dynamic mike.) Note that the beeper ground is common to the PTT ground, and that the mike ground, including the common connections of the low-pass tone-filter network capacitors, *is not connected to the beeper ground.*

Setting the circuit's tone-burst frequency and duration is easy. C4 and R4 determine the tone frequency; start with the values shown and vary R4 to suit. (The circuit operates in the vicinity of 500 Hz as shown.) The tone duration is approximately one-half the product of C3 and R3, or about 0.25 s with the values shown. The retrigger-inhibit pulse should be about twice as long as the tone pulse, and is approximately one-half the product of C2 and R2, or about 0.5 s for the values shown.

I built the circuit in a metal box and connected it to my transceiver via its mike connector's **PTT**, **PTT GND**, **MIC** and **MIC GND** terminals. (See your manual for your radio's pinout.) Use only shielded cable, and connect its shield to the PTT ground at one end only. In my setup, I connect this shield, and the PTT and circuit grounds, to the metal box housing the beeper. —*Emerson Hoyt, WX7E, Beaverton, Oregon*

The Oregon Beeper

◊ During long and sometimes rambling SSB contacts, an end-of-transmission indicator can be helpful. Having a surplus of reed relays, I put together a gadget (Figure 2) that adds a short tone burst to the end of each voice transmission. The circuit connects between my microphone and my transceiver and uses three SPST reed relays and a twin-T RC tone oscillator. It can be powered from any suitable dc source—batteries, or 12 V from the rig or its power supply. A switch (S1, **BEEPER**) allows you turn the beep on and off.

The circuit acts as follows: Pushing the mike PTT button immediately closes relays K1, K2 and K3, grounding the transmitter PTT line through K3B. K2B applies dc to the tone generator, Q1, but Q1 can't oscillate because K1B shorts part of Q1's feedback network to ground. Speaking into the microphone at this point generates a normal voice transmission.

Letting up on the PTT button opens K2 and K3 after a short delay determined by how long C1 takes to discharge through R1, K2A and K3A. (R1 affects the circuit's time constant only slightly; it's there to limit C1's peak charging current.)

Because the diode (D1) prevents C1 from discharging through K1A, K1 opens as soon as the mike PTT switch opens. This unshorts Q1's feedback network, so Q1 oscillates, generating an audio tone.

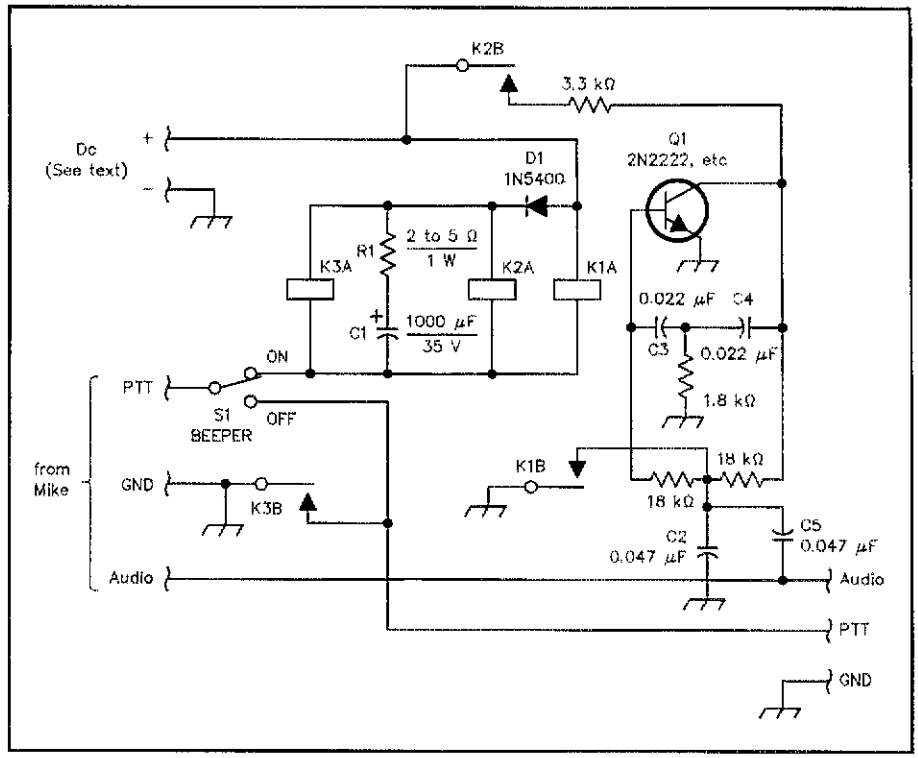


Figure 2—Jan Moller's end-of-transmission beeper uses sequenced reed relays and a bridged-T oscillator. D1 is a 3-A, 50-PIV part; except for R1, the resistors are ½ W.

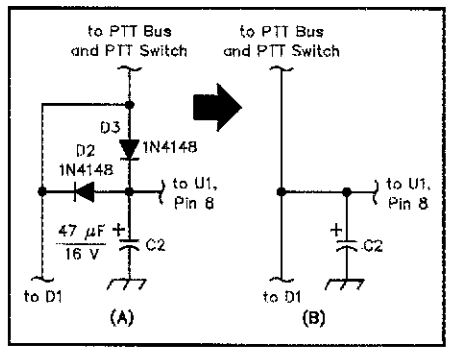


Figure 3—John Reinke reports improved Beep-Over performance after replacing two of its diodes (D2 and D3, shown at A) with a jumper as shown at B. John also says that the original circuit's L1 (0.25 H) and C3 (0.047μF), which form a parallel-tuned circuit that somewhat filters the beeper's output, can be omitted if you're willing to settle for increased total harmonic distortion in the beeper signal.

Because K2 and K3 stay closed for another 50 to 100 ms as C1 discharges, the transmitter transmits the tone for this length of time. On the air, it sounds like a brief *beep.*

The dc supply voltage and C1's value depend on the reed relays you use. I used 5-V relays with a coil resistance of 145 Ω each, and these worked fine at supply voltages of 6.3 and 9. Once you've settled on a supply voltage appropriate for your relays, try different values for C1 to get the beep duration you want.

Any small-signal AF NPN transistor should work at Q1. For optimum operation, C2 should be about twice the capacitance of C3 or C4 (C3=C4), and R5 should be about 1/10 the resistance of R3 or R4 (R3=R4). The values shown in the parts list will produce a tone of around 750 Hz.

RF pickup in my unshielded test prototype caused horrible audio quality. I built my final version into a metal box and used well-shielded cable to connect it to my transceiver.—*Jan Moller, K6FM, Grants Pass, Oregon*

Beep-Over Update

◊ Several letters and calls regarding my Beep-Over (Hints and Kinks, April 1991 *QST*, page 47) prompted me to revisit the design for simplicity and better performance. I'm inclined to believe that diodes D2 and D3 (Figure 3A) are unnecessary and can be replaced by a single jumper as shown in Figure 3B. I've tried it this way and there seem to be fewer problems with false triggering—and the circuit is simpler.—*John Reinke, AB6I, Casselberry, Florida*

MORE "DON'T LOSE THE LITTLE BITS"

◊ If a small part falls on thick carpet and disappears, rubber-band a nylon stocking over the end of your vacuum cleaner's hose. The vacuum will pull the part right up and hold against the nylon mesh for retrieval. —*Jim Roux, W4YA, Tampa, Florida* QST

Technical Correspondence

Conducted By Paul Pagel, N1FB
Associate Technical Editor

HF MOBILING: MAG MOUNTS AND GROUNDING

Al Brogdon, K3KMO, Managing Editor, QST

◊ The article on HF mobiling[1] by Jeff Gold, AC4HF, was an excellent and enthusiastic presentation that will likely get more HF mobile stations on the air. I've operated nothing but HF mobile for the past 14 years, and have found it to be quite rewarding.

There's one experience I'd like to share with *QST* readers with regard to the magnetic mounts that Jeff described. He made the point that he could match the mag-mounted antenna to the rig very well "with no additional grounding." That has been my experience also. But when I first went to a mag mount, I had to solve another problem related to grounding.

During many years of mobile operation, I had tried various methods of multiband antenna coverage without having to stop the car to change resonators or entire whips. The three- or four-resonator tops for the Hustler whip that I had been using eventually led to problems and mechanical failures caused by the large mass at the top of a long mast.

I bought four Lakeview tri-magnet mounts[2] and partially disassembled them, so as to have four identical subassemblies that consisted of a pair of magnets mounted on a short aluminum bar. At my local hardware store, I purchased a 6-foot piece of aluminum stock that was identical to the stock used by Lakeview for their tri-mag mounts. I cut the aluminum to an arbitrary length of 4½ feet and installed five equally spaced whip receptacles along the length of the bar. Then I installed the four magnet-pairs as crosspieces on the bar, one at each end and the other two equally spaced along the length of the bar. It was an antenna mount of perfect length for my Toyota van's roof!

I connected five runs of RG-58 coax from the five receptacles, brought them in the rear hatch of the van, forward to the driver's seat, and connected them to the antenna switch. Now I could band-switch across five bands from the driver's seat!

Placing the individual Ham Sticks in close proximity to one another detuned all of them, so I had to retune them. Nevertheless, I had a low SWR on each band (about 1:1 on 14 MHz and above; on 7 MHz, the SWR is slightly higher). The next morning, I started my commute to work, turned on the rig and found a horrendous level of ignition noise! Because I hadn't changed anything in the mobile station other than the new antenna mount, it was easy to deduce the source of the problem.

That evening, I installed a low-impedance ground strap (1-inch-wide tinned copper braid) from the rear of my mag mount, parallel with the five runs of coax, to the chassis of the van just inside the hatchback. The ignition noise went away. Mobile operators using mag-mounted antennas on HF might try a similar low-impedance ground strap to see it if reduces their vehicle-generated electrical noise.

To second Jeff's comments about the possibilities that are available to mobile operators, I discovered that I can do just about everything mobile that I can from a home station. Once I was on a trip during the ARRL CW DX Test. I found that my Century 22's 20-W output could sustain a QSO rate of about 30 to 33 per hour, even while driving and logging! That 20-watter worked 150 countries before I stopped counting. With the Century 22 on 40 meters, I've worked Australia long-path. I worked Fiji through a pile-up with my new TS-50S (at 50 W), and nabbed Antarctica through a *big* pile-up with my TS-140S while on my Gold Wing motorcycle—both on 40 meters. More hams should get out there on the roads and have some fun, instead of fuming through traffic tie-ups.

TERMINATED FOLDED DIPOLE

John S. (Jack) Belrose, VE2CV, ARRL TA, 17 Tadoussac Dr, Aylmer QC J9J 1G1

◊ The terminated folded dipole (TFD) antenna is a traveling-wave antenna, since the termination (typically a 600-Ω noninductive resistor) reduces reflection from the "end" of the dipole (the center of the conductor opposite the fed conductor in the case of a folded dipole). This reduces the large impedance variation with frequency characteristic of a dipole antenna, but introduces loss. But how much loss is introduced, and what does the pattern of this antenna look like on the bands from 2 through 30 MHz?

The TFD was initially tried for vertical incidence ionospheric sounding,[3] but its use for this application was abandoned in favor of a terminated delta antenna. However, TFD antennas have been used for more than three decades by the military because of their broadband characteristics—a requirement for frequency agile communications systems. G. L. Countryman, W3HH, (then a Commander in the US Navy) introduced a tilted (or sloping) version of the terminated folded dipole to the amateur community in 1949.[4] This antenna, dubbed the T2FD antenna, has recently been revisited by John D. Heys, G3BDQ, in his book on practical wire antennas.[5]

For more than a decade, Barker and Williamson (B&W) has marketed a terminated folded dipole,[6] the B&W Model 370-15 (current version BWDS 1.8-30), so there must be a considerable number of such antennas in use. Over the years (and recently) I've been asked by several colleagues to comment on the performance of such antennas.

I've calculated and measured the gain of a typical TFD antenna (a 90-foot dipole). In Figure 1, I show the theoretical free-space gain versus frequency for such an antenna, calculated by *ELNEC*. Recall that the free-space gain of a half-wave dipole is 2.15 dBi. The calculations are accurate, since the segment taper option with *ELNEC* was used for both ends of all wires making up the TFD antenna (the smallest segment size being 1 inch). In Figure 2, I show the measured near vertical incidence sky wave (NVIS) gain for the B&W Model 370-15 antenna, the closed circles,[7] compared with the gain for a half-wave dipole antenna (theoretical gain according to NEC-3 for a dipole over poor ground); both antennas were horizontal at 30 feet. The solid curve

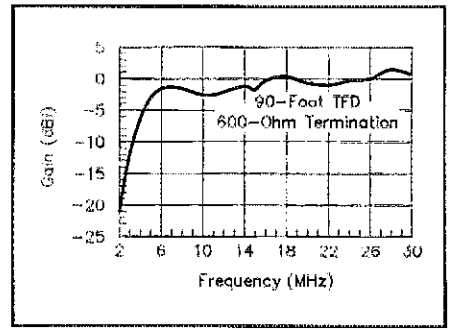


Figure 1—Theoretical gain (in dBi) versus frequency for a 90-foot terminated folded dipole (600-Ω termination) in free space.

[1] J. Gold, "HF Mobiling—Taking it to the Streets," New Ham Companion, *QST*, Dec 1993, pp 67-69.

[2] Lakeview Company, Inc. 3620-9A Whitehall Rd, Anderson, SC 29624, tel 803-226-6990. (See Lakeview's ad in *QST*.)

[3] R. Bailey, "Aperiodic Aerials Used with Vertical Incidence Ionospheric Recorders," *Wireless Engineer*, Vol 28, p 208, 1951.

[4] G. Countryman, "An Experimental All-Band Nondirectional Transmitting Antenna," *QST*, Jun 1949, pp 54-55.

[5] J. Heys, "Practical Wire Antennas: Effective Designs for the Radio Amateur" (Potters Bar, England: RSGB, 1990), pp 46-49.

[6] P. Pagel, "B&W Model 370-15 Antenna," Product Review, *QST*, Mar 1981, pp 50-51.

[7] J. Belrose, G. Royer and L. Petrie, "HF Wire Antennas over Real Ground: Computer Simulation and Measurement," AGARD Lecture Series No. 165, Modern Antenna Design Using Computers and Measurement: Application to Antenna Problems of Military Interest, Sep 1989.

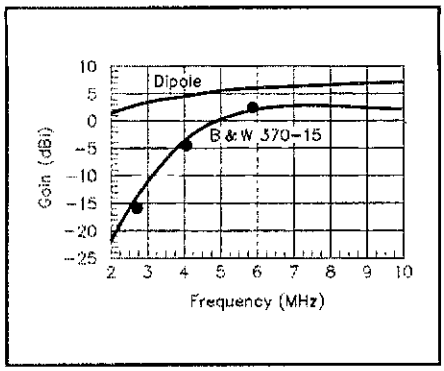


Figure 2—Theoretical gain of a dipole and a 90-foot TFD antenna over poor ground (conductivity of 1 mS/m), and measured NVIS gain (the circles) for the B&W 370-15 antenna. All antennas were installed horizontally at 30 feet.

through the measured data points is the theoretical gain for a 90-foot TFD antenna, referenced to the theoretical gain of the dipole, and is therefore the gain of a TFD over real ground.

The 90-foot TFD has a dipole-like pattern on frequencies less than 12 MHz. At higher frequencies, side lobes develop. The azimuthal pattern at 14 MHz has six major lobes, with a principal lobe still in the broadside direction. The azimuthal pattern for the frequencies between 18 to 24 MHz is an iron cross, with a null in the broadside direction. The pattern becomes multilobed again for the frequencies from 26 to 30 MHz.

I see no reason for the radio amateur to use a terminated folded dipole, particularly when a dipole or multiband dipole antenna with tuned feeders *outperforms* the TFD antenna—providing that balun losses associated with the high SWR on some bands, characteristic of multiband dipole antennas, are not a problem. Balun losses have not been considered here, but they are included in the measured data. While the extreme variation of SWR versus frequency is reduced for the traveling-wave TFD antenna (see Note 6), a 12:1 balun is used for this antenna since its nominal input impedance is 600 Ω.

Note: All correspondence addressed to the Technical Correspondence column should bear the name, call sign and complete address of the sender. Please include a daytime telephone number at which you can be reached if necessary.

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New Products

NO-HANDS HAND-HELD HOLDERS

◊ Carry your hand-held transceiver in a safe, snug and convenient harness. The ECW-050 Belt Harness holds your radio securely on your belt, out of the way for freedom of movement, or can be used on bicycle handlebars. Modeled here by Elizabeth Williams, KB5UBG, the MAW-100 Chest Harness is used by ski patrols, and is designed for hands-free listening without an earphone. It has a padded, zippered pocket for pens, notepads, extra batteries and other items, and an auxiliary microphone attachment. It's suspended with one-inch nylon webbing with side-release buckles for fast adjustment or removal. Both harness are made of weatherproof, padded Cordura for protection from shock and the elements, and they won't deteriorate from exposure to rain, salt spray, snow or perspiration. The ECW-050 retails for $18.95 and the MAW-100 is $29.95. Add $3.50 s/h. Elizabeth and Mark (WB5KKE) Williams, EMARS, PO Box 781204, San Antonio, TX 78278-1204; tel 210-493-7546.

NEON CALL SIGN

◊ Be the first in your neighborhood to have your call sign made into a "call sign." Put your call sign up in lights! These handcrafted works of art are made of real neon tubing and last for years. This addition to your shack's decor has 4-inch-tall letters in your choice of eight vivid colors. Each sign is mounted between two sheets of clear acrylic for durability and has a one-year limited warranty. The basic unit retails for $225, tested and delivered. Personalized signs are available with a bottom accent strip, border or other custom design. Howie Cohen, WA2TVE, Just Neon, 409 James St, Utica, NY 13501; tel 315-724-9150, fax 315-792-9032.

VOX FOR ICOM RIGS

◊ In the April 1994 *QST* Product Review, we noted that the ICOM IC-707 transceiver doesn't provide built-in voice-operated transmit (VOX). ICOM offers the model EX-1514 external VOX unit for any ICOM base or mobile radio without built-in VOX, even FM rigs. Suggested retail price is $67.

We also noted the lack of VOX in the August 1993 *QST* Product Review of the ICOM IC-737 transceiver. ICOM has since released the IC-737A, which includes VOX. Chris Lougee, N7TJM, Manager, Amateur Division, ICOM America Inc, 2380 116th Ave NE, Bellevue, WA 98004; tel 206-450-6088.

Ham-Boater Credits Amateur Radio in Rescue

Two men rescued from a sinking boat in the Gulf of Mexico credit Amateur Radio for saving their lives.

On March 2, Larry Hooker, KB5ZNY, of Thaxton, Mississippi, and his sailing partner, Rhett White, were returning from Honduras on Larry's 45-foot sailing vessel *Off the Hook*, when they ran into an unexpected storm and high seas.

Larry had been in contact with his friend Randall O'Brian, KD5ZH, of West Point, Mississippi, on 80, 40, and 20 meters since raising anchor on February 6. Larry had visited his daughter, Tina Hooker, KB5YNN, a missionary with Global Outreach, on the northeastern coast of Honduras, in an area accessible only by air or sea.

"Tina's US Novice license allowed her to operate from Honduras," Larry said. "I was taking her a rig and other supplies." Larry, who upgraded to General class about six months ago, was looking forward to regular skeds with his daughter.

Larry's friend Randall was his link back to the States. "Larry and I made two radio contacts a day," Randall said, "starting on 75 meters, then on 40 and 20 meters as he got farther out." Larry arrived at his destination on February 17, and after spending time with his daughter, began the return trip on February 26.

All went well until March 1. "Larry reported being in bad weather," Randall said, "and he was using his radar to pick his way around the most severe thunderstorms. He had lowered his sails and was under power. The weather forecast had been wrong."

Things began to to deteriorate on March 2, when Larry reported to Randy that he was in gale-force winds and high seas (20 to 25 ft). "Larry was concerned about having enough fuel to make it back to Mobile, Alabama. We started making contact every two hours for the remainder of the day," Randy said.

At 4 PM Larry reported taking on water and the seas still running 20 to 25 feet. Randall called Coast Guard officials and advised them of Larry's situation, and the Coast Guard started an every-other-hour check on Larry, coming up on Larry and Randall's regular 75-meter frequency, 3862 kHz.

"At about 5 PM Larry reported the situation as bad with no improvement in sight," Randall said. "This was the last contact that anyone had with him the rest of the night."

Randall and other amateurs listening tried all that night to contact *Off the Hook*, as did the Coast Guard. At about 5 AM on March 3, Coast Guard operators in New Orleans called Randy to say that their station at Corpus Christi, Texas, had picked up a call from Larry, but couldn't establish contact with him. They asked O'Brian to try.

Larry Hooker, KB5ZNY (r), and mate Rhett White aboard the ill-fated *Off the Hook*.

"I had a dream that night," Randall said, "that I'd be able to contact Larry again. And at about 5:30 AM I did. He was in an emergency situation, on the verge of sinking. I talked to the Coast Guard officers and they again came on 3862 kHz and contacted Larry."

The Coast Guard dispatched a jet aircraft from New Orleans to drop pumps to *Off the Hook*, which was 250 miles southeast of Mobile. The two exhausted sailors tried to pump the water out of their boat.

A merchant vessel, the *Turn Arrow*, was only 16 miles away and quickly came to help in the rescue. "We amateurs had radio contact with the Coast Guard in New Orleans all day," Randall said, "and got reports from Larry. I was notified by the Coast Guard that the cutter *Cushing* was being dispatched from Mobile and would reach Larry at 4:30 PM."

At 5:15 PM the Coast Guard reported that *Off the Hook* was under tow and that Larry and Rhett were bruised and exhausted, but otherwise okay. *Off the Hook* was towed all night, but sank at 10 AM on March 4. They were unable to keep the water pumped out.

During the operation Larry's wife, Teresa, who is not a ham, listened to the communications. After the two men were picked up, she told the Tupelo *Daily Journal* "Now that I know he's on his way home, I may get a little sleep tonight, but I'm going to leave the ham radio on."

"Larry and his wife came to visit on March 6," Randall said. "Larry told me 'I wouldn't be alive today if it weren't for the efforts of Amateur Radio operators.'"

"The Lord used Amateur Radio operators to save our lives," Larry said.

FCC SAYS PHONE MAKERS COULD REDUCE INTERFERENCE

The FCC has released the results of a telephone interference survey and concluded that because some telephones are "bulletproof," all of them could be.

Thirty-five FCC field offices each picked three random cases of telephone interference on record and then visited the scenes. The transmitting stations included 47 Citizen's Band, 27 amateur, 23 AM broadcast, 10 FM broadcast and one international broadcast station (none was specifically identified).

At the location experiencing interference, the FCC's Field Operations Bureau (FOB) personnel first tested the telephones on site, then tested their own "bulletproof" telephones and several commercially available filters. In all, 241 telephones were tested.

Among the FCC's conclusions was that transmitter power didn't seem to be a significant factor; it said that 10 watts or less caused telephone interference in one-third of the cases.

The FCC said that filters worked only one-third of the time. "Manufacturers can design telephones to be interference free," the Commission said, citing its bulletproof telephones, which were immune from interference "virtually all of the time."

The FCC said that it hopes the survey will encourage affected parties "to productively address and resolve this problem."

The FCC said it receives 25,000 complaints per year from people "unable to use their telephones" because nearby radio stations interfere with them. "Whenever the radio stations are on the air, the telephones pick up their transmissions, which then override any ongoing telephone conversation," the FCC said.

The Survey's Goals

The survey's goals were to pinpoint the following:

- What telephones are affected,
- What type transmitting stations are involved (including power levels),
- Whether commonly available filters are effective in eliminating interference,
- Whether specially designed telephones are effective in eliminating interference.

The report emphasized that because the survey was based on what the FCC called a random sample, "it can't be claimed that identical results would be derived under scientific surveying and testing, nor should the results be construed as FCC endorsement or criticism of any particular manufacturer's product."

At the transmitting station, FOB staff logged the type of station (ie, amateur, Citizen's Band, broadcast, etc), measured its power and got information on antenna height, antenna gain and distance from the complainant.

At the complainant's location, the FOB disconnected all telephones, then plugged them, one at a time, into a single jack, while the station was transmitting. Also tested was the effectiveness of several commercially available telephone filters. Finally, the FOB connected "bulletproof" telephones to the telephone jacks and listened for interference.

The power levels of the transmitting stations varied from 2 watts to half a million watts, with one-third of them running less than 10 watts. Of the 241 telephones tested, 68% received interference. In tests of the AT&T Z100B1 filter on 138 telephones receiving interference, 62% of the telephones continued to receive interference. A number of other filters were tested on 82 telephones receiving interference. As a group, these filters eliminated interference on 29% of the telephones, the FCC said. The FCC tested its "bulletproof" telephones at 52 locations and found them 96% effective.

Conclusions

The FCC said the transmitting stations most likely to cause telephone interference are Citizen's Band, amateur and broadcast stations. Citizen's Band stations accounted for half the telephone-interference cases, while amateur and broadcast stations caused the other half. The power levels used by the transmitting stations did *not* appear to be a significant factor in causing telephone interference, the FCC concluded, based on power levels of 10 watts or less causing a third of the interference.

"Although some telephones did not receive interference, the limited nature of [this survey] would not support the conclusion that [those particular models] would always reject interference," the FCC said. On the other hand, models observed to be susceptible to interference by the FCC can be presumed to be susceptible in other installations. The FCC said that telephone interference filters "can't be relied on to eliminate telephone interference," because in two out of three cases in this survey, they didn't work.

"Manufacturers can design telephones to be interference free," the FCC said. "'Bulletproof' telephones were immune from interference virtually all of the time.

"Considering the 25,000 reports of telephone interference the FCC has received to date," the FCC said, "it's the FOB's experience that, as large as this number is, it probably represents only a fraction of the actual instances in which this interference occurs.

"Given the enormous numbers of instances in which this type of interference is experienced by consumers, it's our hope that this survey, notwithstanding its informality, will serve as a catalyst for affected parties to productively address and resolve this problem. As always, the FOB remains ready to assist in that effort."

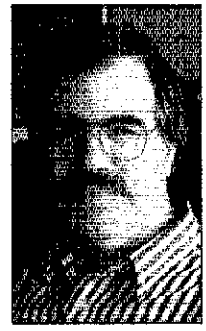
If you'd like a copy of the survey, which includes a list of telephone models checked, send a self-addressed stamped envelope with two units of First-Class postage to the Technical Information Service at ARRL HQ.

1994 DAYTON HAMVENTION NAMES AWARD WINNERS

For the fourth time in the past five years, an ARRL dignitary has been named Dayton HamVention Amateur of the Year. Chosen this year was Perry Williams, W1UED, who retires at the end of April as ARRL Washington Area Coordinator, after 40 years of League service.

Perry joined the Headquarters staff in 1954, and in 1975 took the reins of a new department, Membership Services. In 1980 he became Washington Area Coordinator. Perry was featured in a story about the League's Washington office in April *QST*.

Receiving the Technical Achievement Award is Dick Newell, AK1A, of Bolton, Massachusetts, the author of *PacketCluster*. Dick, 43, began experimenting with what he called a "packet conference board system" in 1986 and sold his first *PacketCluster* software in 1988. More than 600 *PacketClusters* are operating in 34 countries; version 6 is in the works. In December 1990, Dick left his job to devote full time to *PacketCluster*, for 18 months working on the Amateur Radio version. Today, he's part of Harvard Radio, and a commercial version, called *PacketCluster Systems*, is being marketed to public safety agencies.

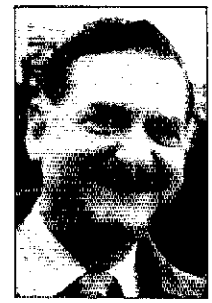


Dick Newell, AK1A.

"In the beginning," Dick said, "I thought if I could sell five *PacketClusters*, I could buy that Alpha amplifier I always wanted. Now it's estimated that 40,000 to 45,000 amateurs regularly use a *PacketCluster*. This has certainly kept me off the streets for the past eight years," Dick said.

A story about him appeared in August 1990 *QST*.

The DARA Special Achievement Award goes to Russ Kroeker, N7HGE, of Kent, Washington, whom the DARA credits with "conceiving, planning, implementing and operating" the Evergreen Intertie, a system of interlinked repeaters stretching from Oregon to British Columbia and east over the Rocky Mountains.



Russ Kroeker, N7HGE.

Russ, 53, has been with the Boeing Co for 20 years and is a manager for electronic product development. He was licensed in 1986, when the Evergreen Intertie was born. "It was the brainchild of Richard Fryer, VE7OG," Russ says, "beginning with a single link between two repeater systems across the border."

At the time, Russ was chairman of the repeater committee of the Boeing Employees Amateur Radio Society (BEARS) and became involved in designing a link controller to expand and improve the system. "Boeing has supported the project over the years," Russ said.

Before joining Boeing, Russ worked in Malawi (then called Nyasaland), designing VHF links between broadcast stations and building radio studios. He was first there while a student at Rutgers University in 1962, as part of Operation Crossroads Africa.

Russ's current involvement in the mature Evergreen Intertie is as a consultant, "helping out when there are political or technical problems, such as siting of repeaters."

A description of the Evergreen Intertie was in June 1991 *QST*.

Previous Dayton Amateurs of the Year include former ARRL President Harry Dannals, W2HD (1993); International Amateur Radio Union President and former ARRL General Manager Dick Baldwin, W1RU (1992); and ARRL Hudson Division Director Steve Mendelsohn, WA2DHF (1990).

The awards will be presented at the Dayton HamVention, April 29 to May 1, 1994.

ARRL AND FCC AGREE TO NEW COOPERATIVE AGREEMENT

The ARRL and the FCC's Field Operations Bureau (FOB) have signed a new agree-

ment concerning the use of amateur volunteers.

The agreement is a revised and expanded version of one entered into in 1984, and spells out the roles of amateurs, as trained and registered Official Observers, and the role of the FOB. The volunteers continue to be known as the ARRL Amateur Auxiliary (AA) to the Field Operations Bureau.

Although the new agreement continues to place initial information gathering at the local level, ie. in conjunction with regional FOB offices, it specifies a more centralized system for presenting information to the FOB in cases where enforcement is requested. This will be done between the office of the Chief, the FOB and the League's Washington office. The new agreement adds an FOB agreement to protect the identities of AA members to the extent allowed by law when the FCC institutes an enforcement proceeding involving information provided by the AA. The FOB agrees to assist the ARRL in the training of volunteers and in publicizing the objectives and accomplishments of the program.

The new agreement became effective February 26, 1994. More on the agreement will appear in June *QST*.

FCC EXTENDS COMMENT PERIOD IN "VANITY" CALL SIGN PLAN

The FCC granted an ARRL request to extend the comment deadline in its "vanity" call sign proposal, in PR Docket 93-305. The comment deadline was extended to April 21, 1994; the reply comment deadline was extended to May 23, 1994.

The Commission's Notice of Proposed Rule Making was released December 29, 1993, with an original comment deadline of March 7, 1994. The League said that more time was needed for response because of the importance of the proposal to amateurs and therefore, the need to ensure fairness in whatever system was adopted.

In granting the League's request, the FCC said "it's desirable that the record be as complete as possible and that it reflect the views of the amateur community."

An ARRL *ad hoc* committee on this proposal was appointed by League President George Wilson, W4OYI, and included Division Directors Steve Mendelsohn, WA2DHF; Frank Butler, W4RH; Tom Comstock, N5TC; John Kanode, N4MM; and Brad Wyatt, K6WR. At press time, this committee had completed its work and had submitted its recommendations to the full Board.

More information on the proposal was in February 1994 *QST* (pages 9 and 84).

FCC OKAYS MORE TIME FOR RF-EXPOSURE PROPOSAL

The FCC has extended the reply comment deadline in its proposal to adopt new standards for exposure to RF radiation. The Notice of Proposed Rule Making, in ET Docket 93-62, would adopt standards already observed by the American National Standards Institute (ANSI) and the Institute of Electrical and Electronic Engineers (IEEE) in 1992, and is opposed by the ARRL.

The League has already told the Commission that the proceeding should be terminated, and cited a number of reasons, among them that it isn't really an NPRM because it doesn't actually propose to change anything, and that it shouldn't even apply to the average amateur installation. The ARRL said that amateurs remotely likely to be affected by new standards are those forced to use indoor antennas because of restrictions against outside installations.

The FCC said it was extending the deadline in response to an industry group, the "Telecommunications Industry Association," which said that more than 1200 pages of comments had been filed with the Commission and that not enough time had been allowed for evaluation of that much material. The FCC said that it recognized "the complexity of the issues raised" by its proposal. The reply comment deadline was extended from February 24, 1994, to April 25, 1994.

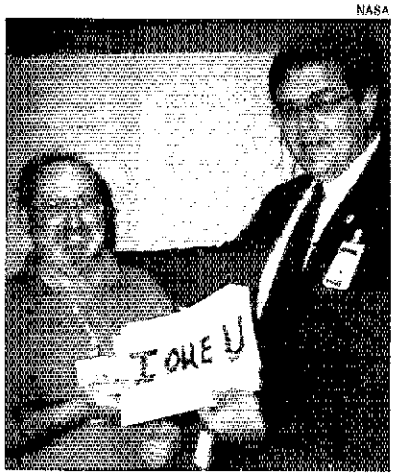
NASA NAMES ASTRONAUT-HAM TO TOP POST IN RUSSIA

Astronaut Ken Cameron, KB5AWP, has been named Director of Operations-Russia and manager of NASA operational activities at Star City and at the Russian control center at Kaliningrad.

He's working with Russian Space Agency engineers and flight controllers on the US-Russia cooperative space program, including supervising NASA astronaut training at Star City, and developing plans and procedures to support joint space shuttle/Russian *Mir* space station flights and space station development. He's expected to command one of the early shuttle-docking missions with *Mir*.

Ken has flown on two Shuttle Amateur Radio EXperiment (SAREX) flights, STS-37 in 1991 and STS-56 in 1993, both "all-ham" shuttles.

NASA



Long Way to a Store

SAREX Working Group member Lou McFadin, W5DID (l), accepts an IOU from shuttle SpaceHab Project Manager Mike Riley. During February's flight of STS-60, Riley's astronauts found themselves short an RS-232 cable to download their experimental data to the ground, so they borrowed one from the shuttle's SAREX ham station.

KATRINA TEN

Running For Charity

Fred Doob, AA8FQ, crosses the finish line after raising more than $2000 for the Childrens Cancer Research Fund while running the Los Angeles Marathon on March 6. Fred made more than 400 contacts on 144 and 440 MHz using a hand-held transceiver provided by ICOM America; ICOM donated $5 to the CCRF for each contact Fred made.

Fred, 47, topped his run last November in the New York City Marathon by 100 contacts and his time was better, too, by 15 minutes. "I average about 3.5 hours in a marathon without radio and about 5 hours when I operate. Listening to the radio takes your mind away from the mental concentration necessary to run 26 miles."

Fred's operation was coordinated by the Baldwin Hills ARC, organized by President Ed Walker, WA6MDJ. Fred's principal net control, Keith Glispie, WA6TFD, "did a great job. But more people should use phonetics; it's hard to hear when you're running," Fred said.

KCOP-TV Channel 13 ran a story about Fred's run for charity the evening of the marathon, with film of him at the finish line and inside the Amateur Radio communications tent. Amateurs provide a medical net and a "start" and a "finish" net. Greg Powell, KD6AIS, helped arrange the television coverage. Fred will be at the Dayton HamVention; look for him at the Solder-It booth.

FCC-ISSUED CALL SIGN UPDATE

The following is a list of the FCC's most recently issued call signs as of March 1:

District	Group "A" Extra Class	Group "B" Advanced	Group "C" Tech/Gen	Group "D" Novice
0	AA0QI	KG0LO	++	KB0LYV
1	AA1IV	KD1TZ	N1RMF	KB1BGS
2	AA2RH	KF2UA	N2YBR	KB2QXD
3	AA3HG	KE3MC	N3RPA	KB3BBC
4	AD4QG	KR4NY	++	KE4KAL
5	AB5TB	KJ5VI	++	KC5FON
6	AC6AP	KN6YT	++	KE6FTE
7	AB7BL	KI7WH	++	KC7BDO
8	AA8OI	KG8HH	++	KB8RSM
9	AA9KI	KF9UM	N9WHC	KB9IXF
Hawaii	++	AH6NF	WH6SV	WH6CRD
Alaska	++	AL7PO	WL7QW	WL7CHL
Virgin Is	WP2G	KP2CC	NP2HG	WP2AHU
Puerto Rico	++	KP4WM	++	WP4MNW

++All call signs in this group have been issued in this area.

FORMER HQ TECH STAFFER VERN CHAMBERS, W1JEQ, SK

Former Headquarters staff member Vern Chambers, W1JEQ, died in January. He was 78 years old and, although he'd left the staff for greener pastures in 1958, he worked for the League for more than 25 years.

According to former ARRL General Manager John Huntoon, W1RW, Vern went to work in the HQ mailroom as a youngster, when he wasn't a licensed amateur. He caught the bug, began helping out in the Lab and eventually became a *QST* technical author and manager of the Lab's Technical Information Service. "Vern always showed a special understanding for problems faced by the average beginner," John said.

JOE HERTZBERG, N3EA, SK

Joe Hertzberg, N3EA, died February 14, 1994, in Silver Spring, Maryland, at age 86. Licensed in 1926, he previously held the call sign K3JH. During WWII he was involved in the development of electronic navigation systems and was decorated by the US and England. After the war he went to work for RCA and in 1956 was named RCA Man of the Year. He ended his career as a corporate vice president of RCA.

In the late 1960s he became active in Amateur Radio again and his station included a full-sized 80-meter cubical quad on a 115-foot Telrex "Big Bertha" rotating pole that was featured in a 1970 *QST* article. He put his station to good use following several natural disasters, including a 1972 earthquake in Nicaragua.

FCC PRIVATE RADIO CHIEF NAMED TO PCS TASK FORCE

FCC Private Radio Bureau Chief Ralph Haller has been named to head a Commission task force on personal communication services (PCS).

The Commission said that the task force would provide "a focal point for the PCS issues currently before" it. The task force would work with all of the FCC's bureaus and offices involved in PCS issues and would be responsible "for assuring consistency between policies and rules for narrowband and wideband PCS."

FCC Chairman Reed Hundt said, "I'm confident that, under the leadership of Ralph Haller, the PCS task force will lead the Commission in the timely development of a comprehensive regulatory framework for PCS."

Other members of the task force include Tom Stanley, Chief Engineer; Robert Pepper, Chief, Office of Plans and Policy; Donald Gips, Deputy Chief, Office of Plans and Policy; and Michael Katz, Chief Economist.

ARRL VOLUNTEERS HELP HEAD OFF NY PLATE FEES

New York state amateurs will soon be able to obtain *distinctive* call sign plates, according to ARRL Public Information Coordinator Stephan Anderman, WA3RKB. The original bill in the New York State Assembly was flawed, in that it would have included a $15 annual surcharge. When ARRL Government Liaison Phil Bradway, KB2HQ, learned of the problem with the bill, he contacted the Tryon ARC of Gloversville, which had been behind the design of the new plates.

The New York Department of Motor Vehicles was alerted to the problem and the bill was withdrawn, removing the threat of increased cost to amateurs. The new plates will carry the same $5 annual surcharge as the old; an initial fee of $18 will pay for the plate, Stephan said.

BACKER VOWS TO SEE REINTRODUCTION OF BILL

The sponsor of an Amateur Radio bill in the Georgia legislature says he plans to see that it's reintroduced in the next session. The bill, HB-1134, which would eliminate the effect of restrictive property covenants on amateurs and is believed to be the first of its kind, was championed by ARRL Georgia Section Manager Jim Altman, N4UCK. The Georgia legislature ended in late March without acting on the proposal.

The good news from Georgia is that, acting on the suggestion of the governor, the legislature rescinded the $25 fee for Amateur Radio vehicle license tags.

SECTION ELECTION NOTICE

To all ARRL Members in Connecticut, Idaho, Minnesota, North Dakota, Ohio, Oklahoma, Southern Florida, Western New York, Puerto Rico and Virgin Island Sections. You're hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 8 of this issue.

To be valid, a petition must contain the signatures of five or more ARRL Full Members residing in the Section concerned. Photocopied signatures aren't acceptable. No petition is valid without at least five signatures on that petition. It's advisable to have a few more than five signatures on each petition.

Petition forms (FSD-129) are available on request from ARRL Headquarters, but aren't required. The following is suggested:

(Place and Date)

Field Services Manager
ARRL
225 Main St
Newington, CT 06111

We, the undersigned Full Members of the...ARRL Section of the...Division, hereby nominate...as candidate for Section Manager for this Section for the next two-year term of office.

(Signature...Call Sign...City...State...ZIP...)

Any candidate for the office of SM must be a resident of the Section, a licensed amateur of Technician class or higher and a Full Member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination.

Petitions must be received at Headquarters on or before 4 PM Eastern Time June 10, 1994. Whenever more than one Member is nominated in a single Section, ballots will be mailed to Full Members of record as of the nominations closing date (June 10, 1994) from Headquarters on or before July 1, 1994.

Returns will be counted August 23, 1994. SMs elected as a result of the above procedure will take office October 1, 1994. If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two-year term beginning October 1, 1994.

If no petitions are received for a Section by the specified closing date, such Section will be resolicited in October 1994 *QST*. An SM elected through the resolicitation will serve a term of 18 months.

Vacancies in any SM office between elections are filled by the Field Services Manager.

You're urged to take the initiative and file a nomination petition immediately.—*Richard Palm, K1CE, Field Services Manager*

Ham Radio Rides the Great Circus Train

By Jim Romelfanger, K9ZZ
412½ Ash St
Baraboo, WI 53913-2501

When the five Ringling Brothers began their small circus in Baraboo, Wisconsin, in 1884, even they probably didn't know that they were on their way to becoming the Greatest Show on Earth, the largest American circus ever to be. Baraboo is still home to their circus heritage, with the world-famous Circus World Museum (CWM), housed in the original winter quarters of the Ringling Brothers Circus. (The Ringlings bought the Barnum and Bailey Circus in 1907, which gives the currently operating circus its full name of the Ringling Brothers, Barnum and Bailey Combined Shows.)

Beginning on July 4, 1963, Milwaukee became host to the spectacular circus parade, authentic in every detail. For the first years of the parade, the museum's growing collection of restored circus wagons was taken from Baraboo to Milwaukee and back by flatbed semitrailer trucks. Then something special happened: The Great Circus Train took on the transportation task. That was when then-Wisconsin Section Emergency Coordinator Bernie Tower (then K9ZPP, now AI6Q) asked me to approach the museum's director about having Amateur Radio on board for communications. I nervously did so and was happy to hear an enthusiastic "Yes!" So it was that in 1965, Don Evenson, K9JYX, became the first radio amateur to operate from the circus train.

In the 1960s, converted tube-type equipment was the only gear available for 2-meter FM. The famed durability of Motorola gear was proven when a can of "barley pop" was accidentally dumped into a Motorola Compa-Station. Don just picked up the radio, poured the beer out and the rig kept working without even a burp.

Doing What Hams Do Best

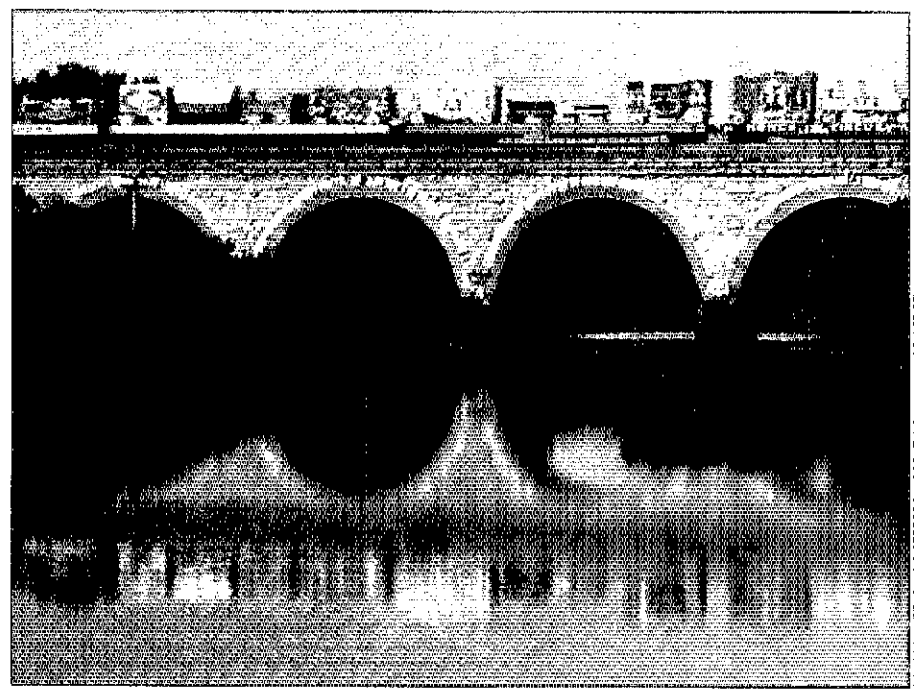
Pulled by two bright, shiny diesel engines, the train is a rocking and rolling, spectacularly colorful advertisement for the CWM and for the parade. Composed of 19 flatcars, two stock cars, five passenger cars and a colorful, special caboose, radio amateurs from Milwaukee County ARES supply communication equipment and staff so that those on the train have means to send news reports and let everyone know when to expect the train to arrive. For news and other business communications, cellular and IMTS telephones are used. For all the rest, ham radio does the job with several wide-area repeaters.

There are huge crowds all along the 164-mile route during the train's two-day journey, mostly in the larger cities. But it's not unusual to see people perched in every imaginable location: atop silos, haystacks, buildings, gravel piles and even on railroad semaphore posts. The cheers from the crowds are clearly audible to the crowd on the train and those cheers are happily returned by riders, including such notables as Wisconsin Governor Tommy Thompson who, for his part of the ride, gets caught up in the excitement and fun just like every other rider aboard this train of trains.

In the early years, installing the antennas was a challenge. Now, with brackets designed years ago with the able help of George Halper, W9SUF, it's easy to put them up. Two sets of brackets are permanently mounted on the passenger coach where the radio gear is located. The eight antennas, four on each side of the car's roof, are installed on bars bolted to the brackets. Finding a ladder to get to the top of the car sometimes takes longer than setting up the antennas; the mounting takes about 10 minutes. SWR checks are run and the job is done. The radio crew is ready for the next two days of traveling through the green Wisconsin countryside, doing what most hams do best: communicating. The communication station is a busy place, so the operators don't see much scenery.

JIM ROMELFANGER, K9ZZ

The quarters are crowded and there's plenty to do for Milwaukee ham radio operators on the Great Circus Train. In the foreground, Bob Goldstein, K9KJT, updates waiting hams on the train's location. Mike Wesolowski, KA9TGN, center, copies a message, while Jack McLeland, W9ATK, just behind Mike, sets up a phone call for a reporter.



COURTESY OF JOANNE PETERSON, GREAT CIRCUS PARADE OFFICE

Colorful isn't even close to a good description of the Great Circus Train, as it crosses a bridge, creating a mirror image in the water below.

Ham Radio as a "Public Circus"

Electricity for the train's lights, PA system, kitchen and other needs is supplied by a large diesel generator in a circus wagon on the first flatcar behind the passenger coaches. Power for the mobile telephones and ham radio gear comes from storage batteries, which are trickle-charged by power from the generator. If the generator stops, the radio show goes on.

Because there's always a possibility of radio and telephone equipment failure, a chase vehicle "tags" the train, using county roads that keep the vehicle as close as possible to the train. The vehicle has a driver who concentrates on doing just that, and a radio operator who keeps in contact with the crew aboard the train. If problems arise, the chase vehicle waits for the train at the next scheduled stop, where adjustments, repairs, or replacements are made. Ron Armstrong, WB9WRW, of Waukesha, did the chase chores until 1992, when his van decided it didn't like chasing anymore and quit on the last leg of the trip. The 1993 chase van was driven by Lloyd Gorsiski, WB9RGO, of Racine, with Kate Kedney, KA9MWT, of Milwaukee, operating the radio equipment.

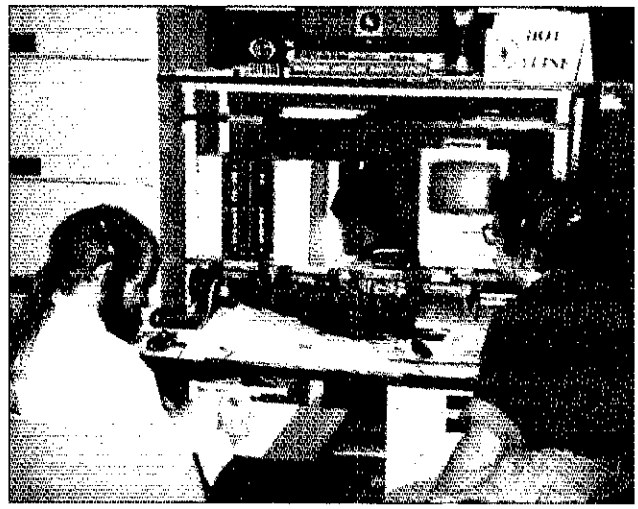
Radio operators on the train in 1993 were Bob Goldstein, K9KJT, of Milwaukee County ARES, with Mike Wesolowski, KA9TGN, and Jack McLeland, W9ATK. Jack could rightly be called "Mr ARES" in the Milwaukee area; he not only works nearly every ARES operation, but maintains the equipment, too. Jack has supported Milwaukee County ARES this way since the 1950s.

The train is always crowded and 1993 brought the biggest passenger load ever. Nonetheless, Bob and the Milwaukee ARES crew hope it will be possible to operate an HF special-event station from the train in 1994. If this comes to pass, watch the ham publications for an announcement.

Then there's the Great Circus Parade itself. *Is ARES involved?* Very much so! *Can they use an extra operator or two (or more)?* You bet! Contact Bob to volunteer for parade communications. (The Milwaukee County EC is John Leekley, WB9SMM, but Bob handles the train and parade communications assignments.) Working communications for the parade is more fun than a barrel of monkeys—or a herd of elephants.

The Circus World Museum is open all year. During the vacation months from mid-May until mid-September, it features a live, first-rate circus in a show under the big top!

Jim Belville of the National Weather Service presents the Public Service Award to Ross Patterson, N4YYH, of Herndon, Virginia, and Jorge Thevenet, KD4DGQ, of Ashburn.



Ross Patterson, N4YYH, and Lisa Thevenet, KD4DGO, of Ashburn, log severe weather reports received by Amateur Radio during the SKYWARN activation following the awards ceremony. Lisa is part of one of many husband-and-wife teams that regularly participate in SKYWARN as a family activity. The initial grant for the SKYWARN Amateur Radio station came from the Foundation for Amateur Radio Inc, a consortium of Washington, DC-area clubs, known for its scholarship program.

United States Department of Commerce

National Oceanic and Atmospheric Administration

Public Service Award

presented to

Jorge Thevenet

in recognition of service

contributing to the Public Safety and Welfare

performed for the National Weather Service

Assistant Administrator
for Weather Services

SKYWARN AWARD PRESENTED

Dr Elbert (Joe) Friday, director of the National Weather Service (NWS), recognized and praised the efforts of the Washington, DC, SKYWARN Amateur Radio Net for its ongoing efforts in providing timely and accurate severe-weather observations to the NWS and specifically for its efforts during the Blizzard of '93. The Department of Commerce/National Oceanic and Atmospheric Administration awards were accepted by Jorge Thevenet, KD4DGQ; Ross Patterson, N4YYH; and Dan Gropper, KC4OCG, on behalf of the SKYWARN Amateur Radio Net. The brief presentation ceremony, presided over by Jim Belville, the meteorologist in charge of the Washington Forecast Office, and Barbara McNaught, the SKYWARN program manager, was cut short by a real SKYWARN activation for severe thunderstorms. QST

Field Organization Reports February 1994

Section Emergency Coordinator Reports

There are 37,400 members accounted for in SEC records. The following Sections reported this month: CT, EPA, EWA, GA, ID, IN, LA, MDC, ME, MI, MN, ND, NFL, NH, NTX, OH, SD, SFL, TN, VA, WMA, WPA and WV.

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	28	856	30.57	0.830	96.4	
CAN	28	690	24.64	0.787	98.8	
PAN*	55	424	7.71	0.450	96.3	
Region Nets						
1RN	56	686	12.25	0.706	99.7	100.0
2RN	56	242	4.32	0.336	96.8	100.0
3RN	28	89	3.17	4.775	96.4	85.7
4RN	56	340	6.07	0.303	79.0	100.0
5RN	56	1017	18.16	0.717	97.0	100.0
6RN	62	368	5.93	0.337	100.0	96.3
7RN	56	302	5.39	0.340	76.4	98.1
8RN	56	371	6.62	0.419	100.0	96.4
9RN						96.4
TEN	56	496	8.86	0.489	78.0	100.0
TWN	56	150	2.67	0.362	91.0	92.7
ECN						96.4
Cycle Three						
Area Net						
EAN	28	256	9.14	0.584	88.7	
Region Nets						
1RN	28	61	2.18	0.291	93.9	92.8
2RN	28	101	3.60	0.333	98.6	85.7
3RN	28	26	0.92	0.170	72.6	85.7
4RN						85.7
8RN						85.7
ECN						96.4
Cycle Four						
Area Nets						
EAN	28	1164	41.57	1.374	97.9	
CAN	28	411	14.68	0.815	100.0	
PAN	28	573	20.46	0.764	100.0	
Region Nets						
1RN	56	327	5.84	0.480	95.9	96.4
2RN	55	210	3.82	0.590	98.0	92.8
3RN	51	161	3.15	0.340	88.1	96.4
4RN	56	801	14.30	0.634	98.0	100.0
5RN	54	372	6.88	0.463	95.0	100.0
6RN	56	240	4.28	0.415	81.0	100.0
7RN	56	398	7.10	0.486	91.4	100.0
8RN	55	305	5.55	0.370	92.0	100.0
9RN	56	353	6.30	0.954	97.0	100.0
TEN	56	304	5.43	0.500	75.0	100.0
TWN	35	148	4.22	0.704		100.0
ECN	38	103	2.71	0.343	78.0	100.0
ARN	28	73	2.60	0.080		

*PAN operates cycles one and two.

ARRL Section Traffic Managers reporting: AL, AR, CO, DE, EMA, ENY, GA, IA, IL, IN, KY, LA, MDC, ME, MI, MN, MS, NC, NFL, NH, NLI, NTX, OH, OK, OR, ORG, RI, SB, SC, SD, SDG, SF, SNJ, SFL, STX, SV, TN, VA, VT, WI, WMA, WNY, WPA, WTX, WV, WWA and WY.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	101	90.18	433	918
TCC Central	62	77.38	408	816
TCC Pacific	97	86.61	588	1019
Summary	260	84.72	1429	2753
Cycle Three				
TCC Eastern	27	96.43	n/a	104
Cycle Four				
TCC Eastern	98	92.45	283	941
TCC Central	58	92.10	200	400
TCC Pacific	98	84.00	489	1012
Summary	254	89.51	972	2353

NTS *APLink* Totals: 10641

TCC ROSTER

TCC Eastern Area Cycle 2: KW1U, Director, N1DHT W1FYR WA1KKP KT1Q W1WCG W2FR KA2GJV N2LTC W2MTA N2XJ N3DRM AA4AT N4GHI WX4H K4MTX N4SS WD8V KA8WNO WB8YDZ VE3AJN VE3GNW VE3GSQ VA3RON.

TCC Eastern Area, Cycle 3: W2FR, Director, N1OTC W1WCG WA1KKP W2FR W3OKN K8TPF KA8WNO.

TCC Eastern Area, Cycle 4: W2FR, Director, K1EIC N1OTC KT1Q KW1U W1CE W1EFW W1NJM W1UD W1WCG WA1KKP N2XJ WB2EAG W2FR W2GKZ W2LWB W2MTA W2RQ N3DRM W3PQ AA4AT K4MTX K4SCL K4WJR K4ZK N4GHI N4SS W4UO WX4H N8ANQ AA8AN K8TPF KA8WNO W8PMJ WD8V VE3AWE VE3FAS

TCC Central Area, Cycle 2: KG5TL, Director, NZ2T W4CKS W5CTZ KG5GE W5JDF N4KKI WB5NKC WB5NKD KG5TL W5QFU K5UPN KD5UY W5YQZ KE5ZV W7CBE WB0WNJ VE5KZ.

TCC Central Area, Cycle 4: K5GM, Director, WB4FDT K5GM W5JDF K5RG N5TC W5TFB K5UPN KB5W W9CBE W9FC K9PUI WA9QCF W0GRW N0SM.

TCC Pacific Area, Cycle 2: ND5T, Director, NZ2T W5JOV ND5T KT6A WB6DOB AB6EU KF7AG W7TGU KA7YYR WA0YNP.

TCC Pacific Area, Cycle 4: W7GB, Director, ND5T W5JOV W6EOT K6LL WF6O W6VZT AB6YR NR7E WA7EES KA7EKL W7EP W7GB W7GHT KB6GZU NN7H W7LG N7MPS W7VSE K9JM KJ0G WT0G K0TER.

Public Service Honor Roll

This listing is available to amateurs whose public-service performance during the month indicated qualifies for 70 or more total points. Please refer to this column in the February 1994 issue of *QST* for point categories.

778 NM1K
697 KB6ECH
502 NZ2T
418 NY1H
368 N2JAW
354 WB5NKC
290 WB5NKD
262 KA2VZX
256 WB2UVB
254 WT0G
248 K0BXF
247 KJ5GE
243 W0OYH
217 NZ0M
205 KB2CDB
204 KG0IW
203 KD4JMA
201 N8ODZ
199 W4AET
197 N2FHJ WB6DOB
195 AA2CX K4SCL
193 KB2KLH
191 KK3F
189 WI2G WA9VND
188 KB2JRT K9DHR N3DRM
184 KA2ZNZ WA4PFK
181 W9YCV N1PGL
180 KA1GWE
179 KM4DY
177 KK1A W1PEX NR2F
175 AB6EU WA1TBY
KL7Q
174 WA1JVV WA8AHV
173 K5UPN
172 KD4GR
171 WA7EES
170 KI5LQ
169 N2DXP
168 N2FET N5IKN K2PBP
166 KD6CCF
164 KE2JX
163 KA4HHE K5DPG
162 W1WCG
161 KT1Q KD4NFY
158 W9CBE W0NBT
157 K4IWW W7VSE
156 WA1FNM K4FQU
155 W3YVQ
154 W5YQZ N4GHI
153 K2UL N8FPN KB5WEE
152 KA2CQY WJ3K
151 WX4J
150 K4BGZ
149 KA9KLZ N7SUB
148 KT6A AD4KA KA0ARP KI5NL
147 NR9K N5NAV AB6YR
145 N2GJ WA4QXT
144 N2EPH N2SXO
WX4H
143 W1EFW
142 KD7ME
141 WA2UKX W2MTA N2PIF
140 WB2FTX W2RRX KA4FZI
139 KA2GJV KB2EPU WA4NDA
138 W7GB WB2VUK N9BDL KW1U WA8HED
137 K2BCL N0MEA WA4EIC WD5GKH KQ4ET AD4BL
136 NX1A KC6ZEC WB4WYG
135 N0JL
134 KF0FI N2XJ N1OTC K4ZK
133 N2LTC KR6K KD1LE KD8HB KA1JXH WA4LXP
132 ND2S WD0GUF N1FLO AA2NX
131 KO4BJ KB2MQP
130 KJ9J WB8SYA N1LKJ WB2ZTE KC4RNF
129 W2FR KG5GE WE2G K2VX KF2KN
128 WM1C WA0TFC WB0LES N7UOF W7WAT KB1AF
127 WB0WNJ W5TFB
126 K2DN AF2K
125 WD4LOO N2ULY N3PDK
124 AA5LT N2JBA N2OPJ N2AKZ AA5LT
122 NR1W K2YAI K2GNZ W7AZU
121 KC3Y WA3UNX N5TFB KB5SFE
120 AA9HN N2OWN K4MTX WA4JDH W4DGH
119 N2GUN N2JOA AA2ED N0CYR W3OKN N1DHT W2QNL AD4IF WA1KKP
118 N2LTK KB0BXE K0ERM KB9ENO N2HTC K6AGD KA7AID WA0SXR W5CTZ
117 KI4YV N2UOE W9UMH KD5UY KA0PDM AB5RO KB5GLV WI3B N4GMU
116 WD4DSS WA2YBM KA9FVX KB7JQM WD4MIS
115 K5CXP WN0Y N2RPI W2PTZ WF6O WB0ZNY
114 KA7YYR N2SAA
W2MTO
113 KB2DQ K4VHF K9KSA N1PNN WA8SSI
112 WB4GGS N1IST AA0QM N5OWO WB4TVY
111 W4BNY N2SOE W0MZI KB5RUG
110 N6FWG N2WFN KA1WCD WA4GLS AA4GL
109 W1ALE KE0AH AG9G KA4UIV W4CKS
108 K7GXZ N4JAQ
106 WB2QIX KI5BV N2SU
105 KC4MWT KB2KOJ WB8JGW AD4CN
104 KD0YL N8FWA N4YYO
103 N5YZM W6VOM
102 N5TTU WA1CSO KD4RZP
101 KI5BV
100 WA5FXQ
99 WA2CUW KJ3E N0WPA WD4EKA KB4WBY W7NWP W4ZBA
98 K4FFM KB4MON KB2GEK
97 N5UQA W2OD KF2ER N5OUJ
96 WB2IJH

The following stations qualified for PSHR during January, but weren't listed in last month's column: K6AGD 120, N6GHG 85.

Brass Pounders League

Call Sign	Orig	Rcvd	Sent	Dlvd	Total
NZ2T	275	1191	2004	59	4029
W3CUL	869	915	1499	81	3364
WB0WNJ	0	339	2181	9	2299
W1WCG	0	945	1120	4	2069
NM1K	659	343	901	5	1908
WB9YPY	0	1070	101	707	1878
WX4H	15	727	714	21	1477
WB5NKC	74	571	617	172	1434
W1FYR	2	654	688	12	1356
W3VR	310	304	516	52	1162
N2JAW	91	462	472	79	1104
N4GHI	3	522	547	13	1085
W9AYK	0	613	113	334	1060
WB5NKD	7	377	419	175	978
K4FQU	11	463	432	8	914
W1PEX	27	264	570	36	897
N2LTC	2	410	422	3	837
K4DOR	188	209	379	18	794
N1OTC	5	375	400	1	781
KT6A	6	353	376	14	749
KA2VZX	8	346	289	76	737
K4SCL	10	337	303	47	697
WB6DOB	6	270	342	73	691
WA9VND	23	312	291	38	664
NY1H	207	107	324	23	661
WA1KKP	0	303	356	1	660
N0BQP	29	364	93	189	675
KJ5GE	60	245	249	64	619
KK3F	15	300	260	40	615
KD6CCF	12	260	277	26	581
KG0AO	28	400	58	91	577
W9IHW	0	297	27	241	565
KA1VEC	15	259	264	16	554
K9DCX	5	335	0	207	547
W7VSE	5	265	254	14	538
W5TFB	0	261	265	2	528
KB4WBY	3	363	158	2	526
KW1U	0	311	201	10	522
K5UPN	27	243	231	8	509
N0DKK	22	282	0	193	501

BPL for 100 or more originations plus deliveries: AB4EA 170, AA7GM 154, N0JUS 151, KD4JMA 149, WD4IIO 128, N1PGL 121, W4AET 112, WT0G, W0LVI 107, KD4NFY 102. The following stations qualified for BPL during December, but weren't listed in the column: N2JAW 2566, AA2CX 1576, K6UYK 1345, N2LTC 1149, KA2GJV 853, WB2IJH 702, W2MTA 629.

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	28	304	349
Bears of Manchester Traffic Net	28	413	369
Carrier Net	24	49	710
Central Gulf Coast Hurricane Net	28	57	2664
Clearing House Net	28	270	—
Empire Slow-Speed Net	28	107	354
Great Lakes Emergency & Traffic Net	28	32	832
Greek Mountain Net	24	22	681
IMRA	24	707	1712
Midwest RTTY Net	28	222	268
Mission Trail Net	28	43	747
NYSPTEN	28	57	435
Southwest Traffic Net	28	284	1509
Vermont Phone Net	4	7	80
20-Meter Interstate SB Net	24	594	298
75-Meter Interstate SB Net	28	140	1228
7290 Net	44	647	3628

N8HSC N9KHD WB8ZJN KB8HJJ
90 KA5YDJ N3LDY N7NEB
89 N2RYT WI3A WB8BGY WB9SHT KA7TTY W4NTI
88 N8JSO KG2D N4KSO
87 N2SSS N2DLN KB2ETO KC5EVI
86 WA8DHB WB4ZNB
85 W1JTH
N2VBM W5RIT KD1DS
84 N1HYF KA1RSY KD4JMV W7PFD
83 N4LST KG7CW AB5JY W5QVT KA3ZCI KE4IJB
80 NY8W KA6TND KD4QXF
79 N2WKT K8ZJU
78 N2VDT W7LBK WD9FLJ
77 WB3LTA NY8V
76 N4NZO
75 W6JCG N1OTL KQ4AG
74 N6GHG KA2ANJ W4QAT W4SME
73 WB2CZW N8MJY AA3CN
72 N1LRT WB6ETY N1OMS
71 KA2JMA KD5GM WB4UHC
70 N6KM NM2M WN3C W0YMB KB5YAM N5KCL KC6YRH KD4ELI N2TQN NB2D

How's DX?

Conducted By Bill Kennamer, K5FUV
DXCC Specialist

Why are These Rocks Called Countries, Anyway?

Have you ever wondered how some rocks and reefs, or even a building or two, are considered "countries"? Sometimes the things hams count as countries stretch one's credulity, yet all of them once qualified under the rules of the ARRL DX Century Club (DXCC) program. To understand what's happened over the years, let's take a look at the chronology of the DXCC Countries List and how it has developed through the years.

In October 1935 *QST*, an article entitled "How to Count Countries Worked; A New DX Scoring System" by Clinton B. DeSoto, W1CBD, described the first country criteria for use by DXers:

"The basic rule is simple and direct:
Each discrete geographical or political entity is considered to be a country."

No list was presented at the time, only the general rule. It was clear from the start that the creators of DXCC intended that more than just politically organized countries would be targets for the DXer's quest.

After the article, differing opinions prevailed about what was a "country" under this definition. This discussion took place while the DX competition was unofficial because there was no list, no award and no rules. Almost two years later, in January 1937, the first Countries List was introduced in *QST*, predating the DXCC Award itself. In September 1937, the DXCC Award was announced and the use of the Countries List was specified. Slight changes were made, but WW II brought an end to the DX game, as stations all over the world shut down for the duration of hostilities.

In February 1947, a new, postwar Countries List was announced. This list reflected changes in the world over the past few years and was created by Herb Becker, W6QD, DX editor of *Radio Magazine* before the war, and of *CQ* afterward. With an advisory group of prominent W6 DXers and the help of G2MI for the RSGB point of view, a list was presented to a five-man ARRL HQ group. After a consensus, the list reached publication again.

An article in March 1950 *QST* gave an insight into how countries were added to the list at that time. A procedure is described for checking with political and geographical authorities, and the procedures of taking votes from those who made the decisions. The concept of geographical separation as a country is mentioned for the first time. Then, as now, it's pointed out that when a country has been added or deleted, there's a good reason for the change.

Standards Put in Print

May 1955 *QST* brought the first publication of real criteria for addition to the Countries List. They were as follows:

1) Does it have political independence?

2) Does it have adequate geographical separation from a parent nation? (This is where the islands, rocks and reefs were covered.)

3) Does it have foreign lands in between?

In April 1960 *QST*, these points are revisited with a definition of what distances are required. For Point 2, 225 miles was the stated distance, but would not apply to islands in a natural island grouping. For Point 3, 75 miles at the closest point was the minimum separation that would allow consideration for addition to the list. Although slightly fine-tuned in later years, these basic criteria served well for years. In 1972, Point 4 was added to the list. This covered the few areas of the world that were unclaimed or unadministered:

4) *Unadministered area:* Any area that is unadministered will not be considered a separate entity.

One of the previously mentioned fine-tunings occurred in July 1963. Although all points were redefined at that time, the most serious change took place in Point 1, which was changed to read:

1) Government/Administration: An area by reason of government or distinctly separate administration constitutes a separate entity.

Although slow to take off, the separate-administration clause gave us many new countries through the early 1970s. An example of this is Kingman Reef, which is too close to Palmyra to meet distance requirements, but is administered by the US Navy and thus qualified under the separate-administration clause. Mt Athos is another separate-administration country, as is Southern Sudan.

After a few years' experience with this rule, and with a view to the potential entities and enclaves out there that might meet the rules if they were proposed, the ARRL DX Advisory Committee (DXAC) announced in November 1976 that no further additions to the Countries List would be made under Point 1, except by reason of government.

Point 5 was added in 1978. Its purpose was to exclude neutral zones and extraterritorial areas. Further clarification in 1986 stated: "The following will not be eligible for consideration as a separate entity from the host country: Embassies, consulates and extraterritorial legal entities of all nature, including, but not limited to, monuments, offices of the United Nations agencies or related organizations, other intergovernmental organizations or diplomatic missions."

The current Country Criteria was published in *QST* in April 1988. It's published in each issue of the *ARRL DXCC Countries List*. To summarize, the current criteria include the following four points:

Point 1, Government. (Remember, this no longer includes separately administered or autonomous areas)

Point 2, Separation by water (includes distance from the mainland and other islands in the group)

Point 3, Separation by another DXCC country

Point 4, Ineligible areas (combines old Points 4 and 5)

Who Decides Which Countries are Added or Deleted?

For a country to be added or deleted, a petition must first be routed to the DXAC, a group of volunteers appointed by the Division Directors, one from each ARRL Division and one representative from Canada. The DXCC Desk at HQ has nothing to do with new country additions or deletions.

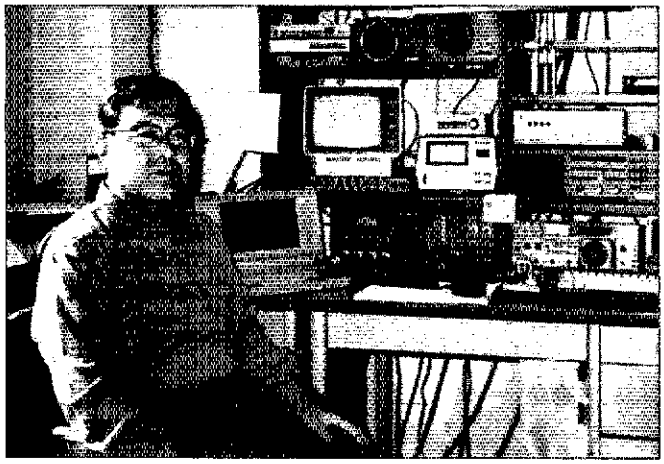
After a period of discussion, the DXAC votes to recommend that a country be added or deleted, or votes that the country doesn't appear to meet criteria. A vote to recommend an addition or deletion then goes to the ARRL HQ Awards Committee, which meets to decide on accepting the recommendation. At the point when an addition or deletion is made, placing it on the Countries List and naming a date for acceptance becomes an administrative matter.

A petitioner should make sure that a possible new one meets the country criteria set forth in the DXCC Rules. When he's sure and has his documentation together, he should obtain a New Country Application Form from the DXCC Desk and proceed with the filing.

This is the short form of how they get to be countries. If students of the DXCC program would like to know how a particular country made it to the list, reference material is available. Let us know and we can cover how some unusual "countries" made it to the list.

Special Austrian Call Signs

The Austrian National Radio Society, OVSV, announces that the Austrian Communication Authority has permitted the use of certain special call signs beginning February 12, 1994. There are 26 call signs, from OExA to OExZ (x = the numerical call area, from 1 to 0). These call signs are for club stations only, for special events and contests. Club stations of the OVSV use OExA, B, C, D, Q, R, S, T, U, V, W, X, Y and Z. The remaining call signs are used by nonmember club stations.



Nao Mashita, JA1HGY, in his fine shack in downtown Tokyo. Nao's worked them all from this location.

Here's popular Larry Erwin, TZ6VV/KBØVV, caught in the shack of Wayne Beck, K5HYB, in Pine Bluff, Arkansas. Larry's a former resident of President Clinton's home state.

ELEMENTARY!

Marty Levin, W6BDN, of Portola Valley, California, writes:

"A number of former-USSR DX entities weren't yet in my log or weren't confirmed. Over time, I worked several and dutifully noted others in my notebook. Studying these entries, I observed that they were usually heard between 0200 and 0400 UTC on Sunday through Thursday evenings (my time). Why not on Friday or Saturday? Why not later or earlier? Why this timetable?

"Hmmm, let's see; that UTC time is 6:00 to 8:00 PM PST. Aha! Depending on exact time zones and local rules, it's about 12 hours later there (they're close to North from my place). So on their time, it's about 6:00 to 8:00 AM on a *weekday* morning.

"*Elementary, Watson!* They're doing what I frequently do; checking the bands for DX before going to work!"

Marty makes an important point. DXers in other countries are pretty ordinary, too. They have jobs and families, and sleep in patterns you'd expect. If you have a particular target area, it makes sense to determine what time work might start there, calculate the local time and figure that maximum activity might be about two to three hours before work starts or two or three hours after the workday ends. For instance, contesters know that activity in Japan is higher on Saturday afternoons through Sunday mornings than at any other time during a contest. This is because many Japanese work on Saturdays (our Friday) and operate on Sunday mornings (our Saturday afternoon).

Another thing that works is knowing the national holidays of the target country. There once was a list published of such holidays, but I can't remember where or when. I'll bet there's a reader who might remember and let us know.

This method works. It's futile to search for a particular country at a time when an operator there is working or sleeping. By plotting your times, your odds of finding someone on from a country you need will greatly increase.

LET US KNOW!

Have you been to an exotic place recently? Write and tell us about it—others would like to hear. Also, if there are any DX topics you'd like to see more about, please let us know.

Russian Prefixes

We've been trying to decipher the changes in the former USSR countries for the past two years. At last the picture is beginning to clear. Here's the lastest cross reference between old and new we've been able to find (see Table 1). The phase-in began last year and continues through this year, so some call signs may not agree yet.

Table 1
Ex-USSR Call Signs

Old Prefix	*New Country*	*New Prefix*
UA	European Russia	RA-RZ, UA-UI
UB	Ukraine	UR-UZ, EM-EO
UC	Belarus	EU-EW
UD	Azerbaijan	4J,4K
UF	Georgia	4L
UG	Armenia	EK
UH	Turkmenistan	EZ
UI	Uzbekistan	UJ-UM
UJ	Tajikistan	EY
UL	Kazakhstan	UN-UQ
UM	Kyrgzstan	EX
UO	Moldova	ER
4J1F	Malyj Vysotskij Island	R1MVA-R1MVZ
4K2	Franz Josef Land	R1FJA-R1FJZ
4K1	Antarctic	R1ANA-R1ANZ

In Russia, old UW prefixes become RU; old UV becomes RX; UZ (club stations) becomes RK; and UN becomes RN.

Although many of these changes have already taken place, enough haven't that the QSL card is the only definitive test of what you may have worked.

UPCOMING DX CONVENTIONS

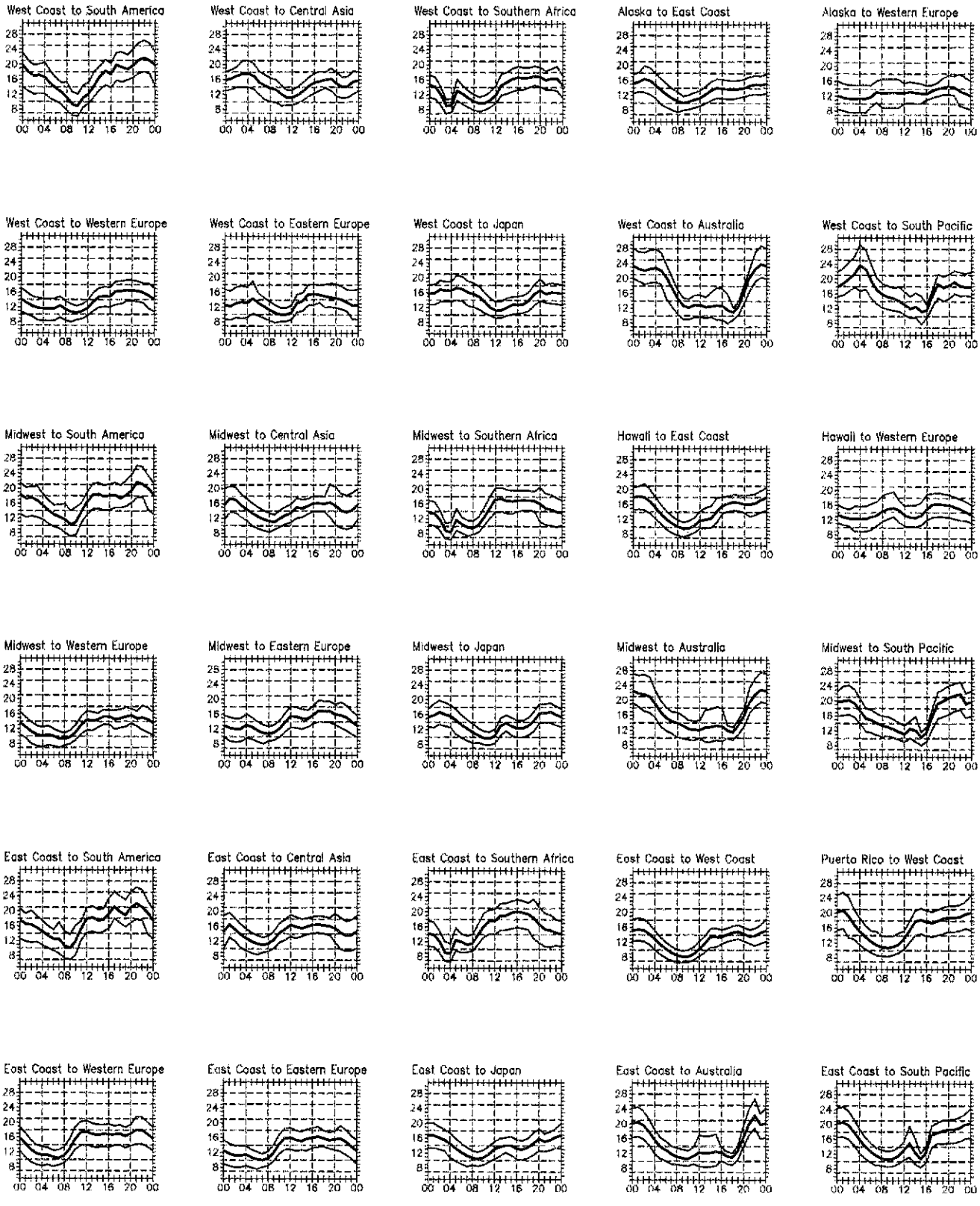
DXers are usually gregarious types, and as such may usually be found at DX conventions. One of the longest running of these is the Northwest DX Convention, which will celebrate its 42nd year in 1994. The convention rotates annually between Oregon, Washington, and British Columbia. This year the party's in Richmond, British Columbia, on the weekend of July 23 and 24. For further information about this event, contact Earl Dery, VE7IN, 16969 20th Avenue, South Surrey, BC V4B 5A8, Canada.

A PLEA TO DX CONTEST STATIONS

Stuart Haimes, N2AUK, writes "Being an avid contester, I am in just as much of a hurry to work a new multiplier as the next guy. I love to get in the fray and fight it out for a new one. The DX contest stations know this and have a great time working the pile-ups. What many of them forget, however, is that they are not the only ones in the contest. They appear to forget that the stations trying to work them would like to make the contact and move along as quickly as possible in search of a new one. The problem here is that many of the DX stations identify only after every few QSOs. Sometimes a DX station works as many as 8 or 10 other stations before giving his or her call sign. Heaven help us if he gets stuck on one contact getting fills due to a poor incoming signal. Not knowing the call sign of the station running the pile-up severely hampers the efforts of hundreds of stations who are standing by intently waiting for the guy to ID so they can check their logs and know whether to wait or move on.

Personally, I have waited for what seems an eternity, begging and uttering vulgar expletives under my breath, for the DX station to say his call sign. Hey guys, we are in this contest too, you know! It seems almost common practice for many of us to just go ahead and work the station and let him say whether or not it is a dupe. Believe it or not this is a great time-saver in the heat of battle. Unfortunately, the DX station now expresses similar utterances under his breath believing we don't know what we are doing and says to his logger "this guy's a lid." Sometimes—but rarely—this fortuitously results in a new multiplier and we feel rewarded.

"Now there are many DX contest stations who play 'by the rules.' I would be remiss in my duty if I did not thank them for identifying after every single contact. Some of these stations that come to mind are P40L, P40V, 6D2X, PJ1B, V31DX, PY0FM, ZF2ND, and many others. So, to the big guns who like to work the masses, while IDing every dozen or so QSOs, take a lesson from these astounding contesters and give us little pistols a break."



When are the bands open? These charts predict average propagation for the period May 16 through June 15, 1994, for high-frequency circuits between the US and various overseas points. One chart showing East Coast to West Coast is also included. On 10% of the days of the period, the highest frequency propagated will be at least as high as the uppermost curve. On 50% of the days it will be at least as high as the middle curve, and on 90% of the days it will be at least as high as the lowest curve. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. See April 1983 *QST*, pp 63-64, for a more detailed explanation. Curves are generated using *IONCAP*. The predictions for this period assume a smoothed 2800-MHz observed solar flux value of 83, which, after adjustment for Earth distance, is equivalent to a sunspot number of 28. QST

DX Century Club Awards

Conducted by Bill Kennamer, K5FUV

The ARRL DXCC is awarded to amateurs who submit written confirmation for contacts with 100 or more countries on the official DXCC Countries List. The totals shown below are exact credits given to DXCC members from January 31, 1994. There were 328 current countries at that time. The DXCC rules and application forms are contained in the *ARRL DXCC Countries List*, which is available for $2.

TOP OF THE HONOR ROLL

Mixed

328

DJ5DA/359
DK1FW/348
HB9AZQ/335
IN3DEI/337
JA2GBO/338
JA6CDA/340
JA9CGW/336
JA0DWY/339
JH1BSR/335
JH1EIZ/332
OK2DB/345
PY2TM/342
SL0ZG/331
UA4RZ/341
VE1AL/341
ZP5JCY/331
NR1R/341
K2UWE/336
NJ2D/331
WB2ABD/334
K3AV/363
W3KH/341
WB4KRH/334
*AD6N/362
K5TSQ/339
K6OZL/350
K6RF/365
W6GMF/366
W6KTE/360
KN8COO/334
K8MNG/336
W8AEL/363
W9IT/352

Phone

328

DK1FW/348
EA4AV/331
EA4DX/331
F5II/353
G4BWP/334
G0CGL/330
I2MQP/338
I2PEI/338
I7IVL/338
IN3DEI/336
JA1MDK/336
JH1BSR/334
OZ3SK/364
PY2TM/337
SL0ZG/331
VE3LDT/331
ZL1AMN/345
ZL3GO/346
ZP5JCY/331
NR1R/341
WA4WTG/346
W6KTE/359
N7RO/348
W8EVZ/358
W8SEY/341
W8ZET/363

CW

328

JA1HGY/332
OH2BN/333
OZ1FRR/334
OZ1LO/338
PY2TM/335
VE3BX/334
K2UWE/333

NEW MEMBERS

Mixed

OU1/JA1BRK/108
F5JUJ/124
G3IAH/249
G0AOL/102
G0NXJ/172
IK2VJF/113
IK4ADE/164
JA2EJB/144
JA2KPW/109
JA3FBT/282
JA5NLN/268
JA6CNH/268
JA9ENB/110
JE1LES/216
JF3IUC/210
JH8CTD/264
JH0HON/110
JI1CZK/186
JQ2BBC/109
JQ2DEJ/108
JR5HXU/138
JR6GHN/105
OE2WJL/331
PT7NN/153
RB3JA/283
SV8ZC/107
TA1AH/209
XE1GSO/119
9A2VC/298
W1AOS/102
W1ECI/262
N2FD1/180
N2PKX/102
WA2OCG/103
*K3BMI/103
NW3K/102
W3DAD/134
AB4ZO/131
AL4FT/101
AD4NQ/102
KC4WMU/108
KG4VG/108
NW4G/244
W4WH/107
*KB5YVT/100
KD6NDX/107
KJ6GQ/261
NZ6T/286
N6JKO/255
KC7HS/251
KD7EY/101
KG7HK/107
N7YQW/104
N7ZZC/106
WS7O/242
AA8DV/124
K8JJC/248
NE8Z/VE/106
WW8H/102
N9BPE/102
*N9DHN/100
KG0GX/109
K0SN/150
K0YR/208
N0CZX/136
WY0V/238

Phone

AH9B/W5/297
DF5DY/105
EA2BP/107
EA5GRM/160
G0REE/108
GM0EGI/101
GW0MOI/163
HL5AP/101
HL5BDD/251
IK1PHC/163
IK2MLX/124
IK2RHH/165
JA1MOH/256
JA2KPW/109
JA6CNH/263
JE1PMQ/110
JH2SON/305
JH5FIL/257
JH8CTD/264
JH8UGL/138
JH0HON/110
JH0JOS/161
JQ2BBC/107
PA3ABH/316
RB3JA/165
SL5ZYB/113
SM7AED/108
SM0GDB/115
VE6EDS/110
VK4EFX/107
ZB2JL/159
9A2VC/144
W1ECI/262
KB2NMV/148
N2FD1/176
N2PKX/102
N2QPX/125
WB2FJY/102
W2HPQ/101
KA3VVQ/128
AD4GC/106
K4IUV/264
*K4TQU/175
*KB4LCR/100
WA4HHJ/301
N6JKO/213
KD7VK/110
N7ZZC/106
WS7O/240
WA8CXV/120
AA9GR/318
*N9DHN/100
N9LTV/104
W9KLS/109
KG0GX/108
KG0IM/155
N0CZX/136
WB0HZL/111
WY0V/209

CW

DL3ECH/102
G3VXJ/270
G0AOL/102
IK2QIT/109
JA1MOH/274
JA3TBT/270
JA4DUD/107
JA8AQ/121
JA9CGW/200
JF3IUC/109
JH1KLA/153
JR5HXU/138
PY1SL/144
RB3JA/246
VE7FJE/276
YU1JU/109
9A2VC/158
AA1V/323
AA2X/315
W3DAD/114
K4IUV/195
KA5MUX/103
W5LJI/121
N6JKQ/190
N6TSI/106
KG7HK/106
W7OM/326
AA8DV/112
KN8COO/111
NU8Z/166
AA9GR/257
KB9GZG/110
K9WYP/112
W9YSX/320
N0EHF/122
WY0V/134

RTTY

DK3EG/102
KL7VZ/100
SL0ZG/108
W2HPQ/107
W5RRK/101
W7AM/104
K8TL/102

Satellite

DK0AK/122
DL6KR/139
JA3THU/104
KA1RYI/127
*WA4EXA/100
KB6A/105
WA0RGV/101

160 Meters

KK4OY/103

80 Meters

DF4PL/171
JA5IU/191
JA8ALB/114
JE2URF/107
JH8JBX/106
JK1SAI/115
JR1MLU/116
VE7FJE/107
K1ST/241
WA1G/117
KC4GKY/102
WA4MME/107
KE5PO/103
K8BN/110
NU8Z/108
W8MHW/105
K0IIR/103
NI0G/134

40 Meters

DF4PL/171
JA1DFQ/102
JA4DUD/103
JA8ALB/114
JE2URF/181
JK1SAI/117
JR1MLU/147
RB3JA/119
VE7FJE/116
AA1V/236
KA1LMR/101
K1ST/287
N1FNN/103
W3HQU/143
KI5GD/115
W7OM/275
K8BN/159
NU8Z/110
AA9GR/105
WO9S/112

10 Meters

DF4PL/283
JH8UGL/128
JH0HON/110
JK1NMJ/139
JK1SAI/144
JP1BJR/217
PA2SWL/104
RB3JA/155
VE7FJE/139
AA1AC/134
KA1LMR/118
K1ST/285
WB1CTO/102
WE1B/105
W1ECI/103
KB2NMV/106
KC2QF/167
N2FDT/155
N2PKX/102
KA3VVQ/128
WA3BZT/165
W3HQU/209
AB4VO/132
AG4Q/106
KN4MN/121
*N4WPG/104
WM4D/108
KI5GD/124
KE6FV/151
KJ6GQ/172
N6IFW/101
N6JKQ/112
N7ZZC/106
WS7O/102
NU8Z/152
AA9GR/234
NG9E/134
WY0V/137

6 Meters

GD3AHV/101
ON4PS/104
VE1ZZ/101
*WA1AYS/101

2 Meters

VE7BQH/101

NEW HONOR ROLL MEMBERS

Mixed

326

OK1RD/331

325

JH2RMU/328

324

K8BN/332
AI0O/330

323

W1EQD/329

321

JA1MOH/335
JA7XBG/325
JE3CHA/325
N1CTD/324
W2MUM/360
WA6CTX/324
W7SLB/323
NC8V/323

320

G3VXJ/323
JA1DFQ/346
JH4JNG/323
N2US/327
NB7N/323
K0IIR/327

319

AH9B/W5/326
OE7XMH/322
WI1S/320
W4XT/326
K6LAE/351
NU8Z/321
N8BIB/322
*W8KZM/325
AA9GR/323
AI9Y/321
KD9CN/322
NF9V/321
WO9S/112

Phone

326

JI2KXK/328
N0CWR/329

324

F2LZ/348
IK1BOD/327

323

JE2LUN/328
W1EQD/329
WD4LJY/327
K8OK/326

322

OZ1LO/342
KE2S/329
NI0G/326

321

DJ5DA/341
EA7LM/324
JA1FHK/335
ON5TW/333
N1CTD/324
WF4G/329
WA6CTX/324
W7SLB/323

320

G3PJK/323
JE1CTA/327
JR1MLU/328

319

CT1AIF/325
I1LNU/326
IK7MCJ/322
JA1AUJ/321
VE7FJE/319
N8BIB/322

CW

327

OK2DB/331

323

KY0A/326

321

JE2URF/324
KE2S/324
K2JF/324

320

PY2RO/323
WU2K/326
NS8T/325

319

IT9AXZ/322
OE6IMD/322
K8CX/326

RTTY

322

I5FLN/329

5BDXCC

K8BN
JH1KLA
K9EC
JR1MLU
K5HYB
W8MHW
W0YVA
KE7UL
W1BYH
WA2UDT
KC2QF
NU8Z
WA1G
S52AB
JA7ZP
HA3OV
LA9HC
VE7FJE
JK1SAI
DF4PL
K4IUV
KM9G
K0IIR
AA9GR
JH8JBX
*W7/DL1UF

17 Meters

ZP5YW
K8BL
K1ST
SM0AJU
K6OJ
G3NKC
KE5PO
JA5IU
KB1HC
K5HYB
JR1MLU

12 Meters

ZP5YW
K8BL
K1ST
K6OJ
G3NKC
KB1HC
K5HYB
JR1MLU

ENDORSEMENTS

Mixed

CT3FT/290
DF3CB/332
DF3UB/317
DF9ZW/274
DJ6NI/346
DJ6TK/350
DJ8FW/343
DJ8WD/248
DK3KD/338
DK5PR/345
DL1BFZ/304
DL1BO/373
DL2KL/320
DL4FV/306
DL6KG/354
DL7CS/353
DL7WL/336
D44BS/345
EA3NA/348
EA6NB/330
EI2GS/319
F2NB/348
F2VX/347
F3PZ/178
F3SG/312
F5II/353
F5NTV/321
F6DZU/336
G2FFO/337
G3AAE/375
G3GIQ/358
G3JJG/301
G3NKC/302
G3TMA/329
G3TXF/341
G3UML/356
G4ADD/332
G4BWP/335
GM3BQA/354
GM3PPE/304
HB9AIB/301
HB9AOF/255
HB9AQW/345
HB9BFS/148
HL5AP/215
I1BWI/334
I2MQP/338
I3EVK/355
I4EAT/338
I5AFC/339
I5FLN/348
I6VYV/331
I8RIZ/338
IK6CGO/326
IK7CJV/328
IK8BQE/323
IK0GPP/345
JA1ADN/364
JA1BK/364
JA1FHK/354
JA1HGY/349
JA1JTR/324
JA1MDK/342
JA1BWE/346
JA1SDV/334
JA1SJV/336
JA1SVP/337
JA2AH/350
JA2JRG/331
JA2MOG/251
JA3DLE/306
JA3KWZ/332
JA3MHA/299
JA4AFT/350
JA4BTD/308
JA4DUD/242
JA4JBZ/331
JA5AQC/335
JA5ELM/336
JA6IU/342
JA6NQT/318
JA6VA/349
JA7AQR/342
JA7ARD/343
JA7BAL/327
JA7FWR/334
JA7HMZ/336
JA7IL/342
JA7OP/332
JA7ZP/336
JA8ADQ/356
JA8ALB/335
JA8DNZ/341
JA8IXM/341
JA9BMP/341
JA0HXV/332
JA0SU/341
JE1CTA/334
JE2LUN/333
JE2URF/331
JF1HOH/338
JF2WXS/284
JH1KLA/208
JH2SON/325
JH2UVL/335
JH3HTD/329
JH7NRE/330
JH8BOE/329
JH8JBX/328
JH8UGL/190
JH0JQS/161
JI1CQA/239
JI2KXK/331
JK1NMJ/186
JK1SAI/310
JM1PTA/141
JN3SAC/281
JP1BJR/325
JP1NWZ/327
JR1ARK/323
JR1BLX/340
JR1CVV/318
JR1FYS/340
JR1MLU/336
JW7FD/147
LA2CF/321
LA5LT/327
LA8XM/330
LA9FFA/312
LA9HC/347
LU4MEE/325
LX2KQ/328
LZ1HA/330
OE5KE/191
OE6IMD/325
OE6MKG/343
OE6RT/353
OH2BN/339
ON4ACG/321
ON5FU/339
ON5TW/338
ON8XA/350
OZ1HX/315
OZ1LO/355
OZ5EV/341
PA2SWL/230
PA3ABH/324
PA3DLM/325
PY2DBU/329
PY5EG/337
SL0ZZI/240
SM3AKX/256
SM4BOI/334
SM5AJX/165
SM5CZY/361
SM5DQC/347
SM6BZE/290
SM6CVX/351
SM6MSG/301
SM7AED/126
SM7BLO/325
SM7FJE/128
SM7PRF/233
SM0AJU/369
SM0GDB/194
SM0NFA/250
SP6BZ/350
S51KL/315
S59DKS/289
T77C/336
T77J/275
UY5XE/311
VE1AL/338
VE1AST/340
VE1BLX/335
VE2AGP/310
VE2FVD/220
VE2GHZ/319
VE3AIA/325
VE3GMT/351
VE3GS/352
VE3HO/339
VE3LDT/337
VE4BJ/340
VE4SN/332
VE4XQ/327
VE7FGU/252
VE7FJE/326
VE7IG/363
VE7PL/336
VK9NL/327
VK9NS/331
VO2GD/324
XE1L/336
XE1ZLW/326
YS1GMV/339
YV3COK/270
ZL1AAS/347
ZL1AMO/352
ZL3GO/360
4X1FQ/364
4X6YY/204
9H5EE/129
AA1AC/306
AA1V/338
AD1V/260
AF1U/331
KA1ED/327
KA1LMR/279
KB1A/191
KB1HY/328
KC1KQ/176
KX1T/281
K1AR/339
K1BW/347
K1DC/273
K1ER/340
K1RAW/344
K1ST/339
K1TKL/229
K1WVX/310
N1FNN/268
WA1EHK/168
WA1FCN/304
WA1G/339
WA1GSO/325
WB1DQC/335
WB1HHF/231
WJ1D/302
WW1N/351
WW1V/253
WZ1R/304
W1AXA/370
W1BYH/309
W1EOA/342
W1HAY/248
W1HOF/332
W1KNT/125
W1NH/342
W1TSP/332
W1WRN/327
W1YN/320
W1YRO/290
AA2X/329
AF2O/331
KB2JGZ/200
KB2NMV/152
KC2QF/330
KD2OD/328
KE2S/334
K2AM/329
K2ARO/330
K2JF/332
K2LFL/301
K2LQ/342
K2MK/226
K2UFM/346
N2DL/343
N2PKP/173
WA2BDP/302
WA2UDT/319
WA2USA/285
WB2AQC/323
WB2RAJ/311
WU2K/329
W2HPQ/255
W2NCG/271
W2TA/342
AD3Z/343
KE3R/310
KN3P/327
KV3J/330
K3BEQ/337
K3GGN/142
NJ3H/324
N3AKD/323
N3HAS/308
N3NCW/196
WA3BZT/166
WA3HUP/352
WA3IIA/277
WA3YVN/320
WB3ABM/330
WB3BDH/164
WR3E/331
WT3P/271
W3AP/350
W3EV/341
W3HCW/334
W3HQU/302
W3XX/342
AA4EL/310
AA4UF/281
AB4KL/147
AB4VO/286
AD4BY/238
AG4Q/274
KB4HBH/226
KB4Q/254
KC4GKY/261
KD4YT/303
KE4YD/327
KF4BU/305
KN4F/331
KN4MN/292
KO4PY/202
KR4M/348
KV4F/337
K4BBH/351
K4HJE/353
K4IBP/337
K4IUV/286
K4NNK/232
K4PVZ/345
K4QMU/163
K4RD/341
K4SB/343
K4XG/349
K4XH/341
N4HOS/132
N4MM/354
N4OM/339
N4PWO/201
N4SLU/251
WA4ETN/329
WA4HHJ/303
WA4IUM/336
WA4LPV/287
WA4MCZ/299
WA4MME/311
WA4QDM/242
WA4QYP/305
WB4CSK/333
WB4PUD/338
WB4QNP/346
WB4RFZ/337
WD4GDZ/312
WF4G/337
WM4D/310
W4AYF/240
W4FLA/350
W4HNK/321
W4JTL/334
W4KA/346
W4MBD/335
W4MPY/332
W4NNH/370
W4RA/318
W4USW/334
W4WJ/338
W4XQ/350
W4YKH/347
AA5BT/320
AB5QS/135
KB5MDD/248
KD5M/322

KE5AX/339
KE5PO/326
KI5GD/321
K5AAD/361
K5BLV/338
K5CSK/338
K5FJ/370
K5GO/339
K5HYB/343
K5JG/344
K5JW/351
K5KLA/342
K5MDW/136
K5PC/329
K5UR/352
K5VNJ/336
K5YY/357
NA5W/333
NF5Z/300
NN5O/322
N5AX/318
N5DDT/320
N5KZZ/212
N5TC/336
WB5IGF/294
WI5A/341
WS5E/332
W5GJ/364
W5LJI/336
W5LLU/327
W5REA/345
W5RJA/317
W5VJW/326
W5YDA/328
AA6GK/252
KB6CLL/328
KC6ESL/189
KD6PY/344
KI6YB/303
KJ6GR/274
K6CJ/193
K6EXO/358
K6GAK/350
K6LU/352
K6MA/361
K6RMM/342
K6RN/365
K6UO/276
K6ZXS/338
NG6W/330
NQ6N/331
NS6C/342
N6AHU/336
N6AHV/334
N6DJM/331
N6DX/363
N6MG/344
WA6F/333
WA6GFE/357
WA6NKQ/203
WA6SDR/334
WA6WZO/339
WJ6O/329
W6AN/344
W6CSI/315
W6EJJ/353
W6EL/363
W6FAH/328
W6JRY/347
W6LQC/348
W6NZX/330
W6PBI/356
W6SHY/309
W6US/344
W6VUN/302
W6WKE/302
W6YO/354
W6ZKM/354
AA7QQ/251
KA7BSD/325
KB7YX/326
KE7UL/330
KI7W/219
K7EG/333
K7EHI/330
K7HPH/141
K7ZR/349
NR7F/320
N7EF/335
N7RO/350
WA7KNK/336
WA7UTM/312
W7AM/345
W7FP/332
W7HR/339
W7OM/354
W7UZA/348
W7ZI/334
AA8FP/201
KA8D/230
KF8VX/198
KT8X/151
K8BL/325
K8CSG/347
K8CX/335
K8LJG/344
K8TL/350
NV8N/325
NY8E/302
N8MC/336
WA8CXU/149
WA8VDC/321
WD8NVA/324
W8BIP/328
W8CBA/333
W8CT/361
W8EVZ/359
W8ILC/355
W8LIQ/329
W8MHW/291
W8RCM/353
W8SEY/358
W8XD/330
W8XM/341
KA9CFD/330
KB9OC/338
KM9G/319
KS9R/333
K9BWQ/344
K9EC/327
K9EHP/237
K9GPN/331
K9SM/360
K9ZXG/334
NG9E/280
N9AB/350
N9ALC/331
WA9CVK/333
WB9JBH/283
WO9S/275
W9AQ/357
W9BB/322
W9LA/350
W9LJR/339
W9LNQ/356
W9MP/326
W9OTE/177
W9TY/336
W9ZWH/339
KAØIQR/310
KB0AUK/321
KB0G/331
KSØZ/332
KYØA/346
KØBUR/354
KØCS/336
KØDN/327
KØGSV/345
KØVZR/329
NEØP/204
NIØG/332
NYØV/335
NØCWR/330
NØDXQ/162
NØEHF/164
NØIWL/315
WØIZV/255
WØKZV/345
WØMHK/312
WØML/284
WØYVA/327

Phone

CT4NH/328
CU2AX/320
CX4HS/331
DF3CB/329
DF3UB/267
DF4PL/331
DJ2YI/371
DJ4ZB/340
DJ6NI/346
DJ9ZB/346
DK2BL/350
DK8IF/204
DL4FV/297
DL6KG/351
DL8RH/311
D44BS/345
EA1IY/343
EA4GZ/319
EA6NB/328
EA7LQ/337
EI2GS/315
F2VX/346
F2YS/W2/338
F3EJ/256
F3SG/288
F5JJM/328
F5NTV/319
F6CQU/330
F6DZU/335
F6FWW/330
F6GEA/330
G3TXF/319
G3UML/356
G4ADD/332
G4PTJ/326
GØOOF/130
GM3BQA/354
GW3CDP/337
HB9AOF/250
HB9AQW/344
HB9AZO/333
HK5DDS/267
I1TBE/343
I2BVG/340
I2IAU/332
I2JSB/331
I2LPA/345
I2YBC/342
I3EVK/353
I3FOM/253
I4EAT/339
I5AFC/339
I5FLN/347
I6VYV/331
I7ETU/328
I7KXG/329
I8IXO/334
I8IYW/321
I8KNT/338
I8RIZ/338
I0UVP/202
IK1AOD/325
IK4ADE/164
IK5GUJ/311
IK7CJV/328
IK8BQE/322
IK8CNT/330
IKØAGU/330
IKØGPP/346
IN3AHS/187
IT9GAI/352
JA1ADN/357
JA1BK/363
JA1JTR/312
JA1RWE/346
JA1SDV/333
JA1SJV/310
JA1SVP/332
JA2AH/349
JA2BL/335
JA2GBO/331
JA2JRG/327
JA3AFR/348
JA3KWZ/315
JA4AFT/349
JA4DUD/227
JA5AQC/333
JA5IU/341
JA6CDA/319
JA6VA/334
JA7AQR/341
JA7ARD/343
JA7BAL/312
JA7FS/337
JA7FWR/330
JA7HMZ/334
JA7IL/342
JA7OP/332
JA7XBG/306
JA7ZP/335
JA8ADQ/352
JA8ALB/335
JA8IXM/340
JA9BMP/341
JA9CGW/335
JAØDWY/338
JE2URF/331
JE3CHA/259
JE7KHL/129
JF1HOH/337
JF2WXS/275
JH2UVL/328
JH3HTD/328
JH7NRE/328
JH8JBX/327
JK1SAI/288
JN3SAC/184
JP1NWZ/317
JR1ARK/308
JR1BLX/338
JR1CVV/254
JR1FYS/337
LA4HF/346
LA5LT/274
LA9FFA/288
LU4MEE/323
LX1WE/238
LX2KQ/327
LZ1HA/327
OE1PPC/227
OE2GKL/345
OE2WJL/329
OE7XMH/320
OK2DB/335
ON5FU/339
ON8XA/349
OZ5EV/341
PA2SWL/230
PA3DLM/324
PAØHVF/331
PT2TF/337
PY5EG/337
SM3AKX/255
SM4BOI/334
SM5CZY/361
SM5DQC/347
SM6CVX/348
SM6MSG/266
SMØAJU/360
SMØNFA/169
SP6BZ/328
SV3AGQ/279
SV8JE/289
UA4RZ/324
UY5XE/284
VE2GHZ/319
VE3BX/347
VE3GMT/351
VE3GS/352
VE3HO/338
VE4BJ/340
VK6LK/348
VK9NL/325
VK9NS/331
XE1L/336
XE1ZLW/326
YS1GMV/338
ZL1AAS/347
ZL1ALE/342
ZL1AMO/331
ZP5FGS/315
ZP5HSB/219
ZS2ACP/140
ZS6AOO/326
4X6YY/204
AA1V/338
AF1U/317
KA1LMR/266
KB1A/159
KC1KQ/176
KX1T/177
K1ER/335
K1RAW/344
K1ST/337
K1TKL/151
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N1FBN/324
N1FNN/210
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WA1EHK/161
WA1G/333
WA1GSO/287
WB1CTO/215
WB1DQC/335
WB1HHF/231
WI1S/206
WJ1D/261
WW1N/347
WW1V/253
WZ1R/267
W1BYH/292
W1KNT/125
W1NM/333
W1TSP/315
W1WRN/327
W1YN/273
AF2O/331
AG2K/280
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KB2QZ/303
KC2Q/318
KC2QF/305
KD2Q/208
K2EWB/337
K2HWE/336
K2UFM/346
N2JJB/298
N2PKP/173
N2US/250
WA2BDP/301
WA2USA/225
WB2ABD/278
WB2AQC/315
WB2RAJ/302
W2INE/190
W2ORA/227
K3BEQ/336
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K3HP/303
NJ3H/324
N3AKD/311
N3CWP/333
N3FAS/296
N3GBM/169
WR3E/328
W3AP/342
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AA4EL/290
AD4BY/236
AG4Q/239
KC4GKY/183
KE4YD/327
KN4BN/325
KN4F/322
KN4MN/291
KO4PY/137
KV4F/334
K4BBF/351
K4HJE/353
K4JLD/324
K4MEZ/345
K4MZU/330
K4SB/336
K4XH/338
N4MM/351
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N4SLU/251
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WA4MCZ/288
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WA4QDM/228
WB4CSK/310
WB4PUD/294
WB4QNP/344
WB4RFZ/337
WD4GDZ/289
WF4V/336
WM4D/286
WT4U/300
W4AYF/240
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KE6FV/268
K6DQ/333
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N6AHV/334
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WA6F/333
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W6SHY/305
W6YO/315
W6ZKM/354
AA7QQ/246
KA7BSD/313
KB7YX/326
KC7HS/248
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KF7SH/329
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K7EHI/330
K7HPH/139
K7TED/308
NB7N/320
NS7J/342
N7EF/333
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WA7UTM/231
WA7YGE/288
W7FP/332
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W7MB/357
W7OM/350
W7UZA/338
KA8D/229
KC8CR/320
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KN8COO/281
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K8LJG/344
K8TL/330
NU8Z/309
WA8VDC/154
WD8NVA/324
W8CBA/333
W8ILC/352
W8LIQ/329
W8MAW/336
W8MHW/169
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KB9OC/337
KD9CN/321
KS9R/333
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K9DXO/345
K9EC/318
K9EHP/232
K9EMG/274
K9GPN/331
K9SM/348
K9ZXG/325
NG9E/269
NO9G/281
WA9CVK/333
WB9JBH/283
WO9S/224
W9BB/277
W9HUW/305
W9LA/350
W9LNQ/341
W9RZW/267
W9ZWH/337
KAØJPM/251
KAØNNF/322
KBØG/325
KSØZ/332
KYØA/341
KØBUR/354
KØDEQ/298
KØGSV/338
KØIIR/267
KØVZR/328
NYØV/221
NØDXQ/161
NØIWL/144
WØFQV/250
WØYMH/345
WØYVA/222

CW

DF2PI/310
DF3CB/328
DF9ZW/214
DJ5DA/320
DK5PR/333
DK6NC/311
DL1ES/318
DL4FCH/133
DL7WL/335
EA6NB/308
F3AT/337
F3SG/239
G2FFO/277
G3NKC/267
G3TXF/328
G4BWP/331
GØGKH/152
GM3PPE/293
GM4REN/203
HB9AKB/228
HL5AP/160
I1BWI/314
I1MUP/183
I1YRL/332
I4EAT/330
I8IYW/161
IK6CGO/309
IK7CJV/187
JA1BK/335
JA1DFQ/280
JA1JTR/298
JA1MDK/335
JA1SDV/290
JA1SJV/305
JA1SVP/320
JA2BL/332
JA2EJI/283
JA2GBO/324
JA2JRG/329
JA3KWZ/312
JA4BTD/278
JA5IU/320
JA5NLN/268
JA6NQT/144
JA6VA/333
JA7FS/332
JA7FWR/318
JA7HMZ/334
JA7IL/326
JA7XBG/269
JA9BMP/313
JAØDWY/328
JE1CTA/331
JE3CHA/275
JF1HOH/327
JF2WXS/222
JG2LGM/270
JH2RMU/318
JH2UVL/310
JH8BOE/141
JH8JBX/304
JH8UGL/158
JI1CQA/229
JI2KXK/274
JK1SAI/263
JM1PTA/139
JN3SAC/273
JP1BJR/325
JR1ARK/293
JR1BLX/315
JR1FYS/335
JR1MLU/313
LA3GI/273
LA5LT/318
LA9FFA/294
ON4ACG/281
ON5TW/297
PA3ABH/298
SLØZG/329
SLØZZI/238
SM5AJX/163
SM5DQC/331
SM6BZE/270
SM6CVX/337
SM6MSG/275
SMØAJU/338
SMØGDB/159
SMØNFA/218
UA4RZ/171
UY5XE/208
VE1BLX/332
VE3HO/332
VE3LDT/326
VK9NL/316
VK9NS/331
ZL1AMO/277
ZL3GQ/332
ZP5JCY/209
AA1AC/174
AF1U/210
K1ER/244
K1ST/332
K1TKL/208
NR1R/335
N1FNN/226
WA1FCN/288
WA1G/308
WA1GSO/223
WB1DQC/204
WE1B/253
WI1S/126
WJ1D/232
WW1N/197
WZ1R/256
W1BYH/272
W1TSP/301
W1YN/286
W1YRO/265
KC2QF/290
K2LFL/297
K2LUQ/137
K2UFM/334
N2US/265
WA2USA/232
WB2ABD/318
WB2AQC/176
WB2RAJ/224
W2HPQ/149
KN3P/262
KV3J/266
K3GGN/142
N3AKD/290
WR3E/329
WT3P/182
W3AP/336
W3EVW/333
AA4EL/291
AB4ZD/131
KC4GKY/222
KE4YD/195
KO4PY/179
KV4F/321
K4JLD/310
K4SB/287
K4XG/328
N4MM/336
N4RUM/286
N4UCJ/189
WA4IUM/329
WA4LPV/249
WB4CSK/328
WF4G/317
W4BFR/334
W4JTL/311
W4MPY/331
W4NGX/163
W4USW/135
W4WJ/335
W4XQ/301
AA5BT/308
AA5TN/224
KB5MDD/204
KD5M/253
KE5OB/253
KE5PO/265
K5GO/232
K5HYB/269
K5KLA/336
K5PC/319
K5TSQ/330
K5UR/337
K5VNJ/243
K5YY/334
NF5Z/295
N5TC/317
WB5IGF/215
W5LVD/323
KJ6GR/243
K6CJ/158
K6DT/335
K6UO/189
K6YT/230
NG6W/321
NQ6N/322
NS6C/333
N6DJM/325
N6DX/288
W6AN/303
W6FAH/296
W6WKE/288
KE7UL/209
K7EHI/260
K7TED/219
K7ZR/334
NR7F/316
NS7J/334
N7EF/333
N7RO/326
WA7UTM/229
W7LR/336
W7MB/329
W7ULC/330
AA8FP/164
K8BL/303
K8BN/269
K8LJG/333
K8MNG/236
K8TL/283
N8MC/328
W8MHW/274
W8SEY/331
W8XM/329
KM9G/294
K9BWQ/333
K9EC/270
K9SM/185
K9ZXG/310
WA9MJT/169
WO9S/211
W9BB/201
W9DH/329
W9IT/329
W9LA/172
W9LNQ/328
W9TY/331
AIØO/322
KØQO/320
KBØAUK/154
KBØG/322
KSØM/316
KØDEQ/310
KØGUG/322
KØIIR/243
KØVZR/317
NEØP/133
NIØG/324
NØIWL/270

RTTY

DF3CB/155
DL7WL/220
G4BWP/180
HB9BFS/140
IK8CNT/174
JA1DFQ/139
JA1HGY/243
JA3DLE/282
JA3KWZ/244
JA8ADQ/319
JH8JBX/213
SM6CVX/292
SMØAJU/300
ZL3GQ/184
ZP5JCY/143
K1ST/175
W1BYH/188
WB2ABD/248
WB2RAJ/190
KN3P/204
WA4MCZ/210
WA4MME/134
KE5PO/241
K5KLA/186
W8SEY/312
WA9CVK/139
W9IT/208
KYØA/173
NØIWL/156
WØML/235

Satellite

OE3JIS/171
VE1BLX/150
KD6PY/209
KR6B/190
KØQQ/133

160 Meters

G4BWP/137
I4EAT/133
IT9ZGY/158
OE5KE/136
OZ1LO/187
SM6CVX/173
SMØAJU/154
ZL3GQ/135
K1ST/152
K1ZM/250
NR1R/172
WB3AVN/155
W3AP/243
N4MM/123
N6DX/151
W9YSX/136
KYØA/155

80 Meters

DF3CB/153
DK1FW/189
G4BWP/261
HB9AZO/115
I4EAT/289
JA1SDV/163
JA2EJI/127
JE1CTA/200
JI2KXK/110
JR1BLX/126
OE6IMD/167
ON4ACG/187
ON5TW/115
OZ1LO/264
SLØZG/168
SM6CVX/290
SMØAJU/294
ZP5FGS/117
ZP5JCY/188
KC1KQ/176
K1DC/151
NR1R/259
WB1DQC/147
WW1N/114
W1NH/322
WA2USA/103
WR3E/165
W3AP/281
AA4EL/111
K4SB/145
K4XG/151
N4MM/215
WF4G/113
KB5CIA/125
K5PC/181
K5TSQ/209
K6DT/164
K6MA/135
N6DX/220
W6ZKM/145
K7EG/211
K7EHI/116
W7SLB/175
W7ZI/176
K8BL/129
K8TL/112
KD9CN/119
K9GPN/110
K9ZXG/120
W9YSX/204
KBØG/213
KYØA/196
KØCS/217

40 Meters

DF3CB/255
DK1FW/192
G4BWP/308
HB9AZO/123
I1BWI/252
I4EAT/322
JA1ADN/245
JA1SDV/215
JA1SJV/245
JA2BL/217
JA2EJI/175
JA7ZP/119
JA8IXM/334
JE1CTA/183
JG2LGM/160
JI2KXK/143
JR1BLX/135
OE6IMD/190
ON4ACG/227
ON5TW/161
OZ1LO/321
SLØZG/227
SM6CVX/328
SM6MSG/136
SMØAJU/331
ZP5FGS/168
ZP5JCY/243
K1TKL/135
NR1R/315
WA1G/152
WB1DQC/119
WW1N/153
WZ1R/209
W1BYH/161
WA2USA/116
WB2AQC/122
WB2RAJ/148
WR3E/231
W3AP/322
AA4EL/211
K4SB/204
N4MM/278
WF4G/188
W4WJ/236
KB5CIA/148
KE5PO/128
K5HYB/165
K5KLA/258
K5PC/263
K5TSQ/219
NF5Z/198
WB5IGF/134
W5LLU/161
K6DT/260
K6MA/237
N6DX/264
W6ZKM/173
KE7UL/119
K7EG/172
K7EHI/127
W7SLB/165
K8BL/186
K8TL/133
W8MHW/200
KD9CN/125
K9EC/150
K9ZXG/237
W9BB/116
W9YSX/223
KBØG/285
KSØM/126
KØIIR/134
KØQQ/201
NØIWL/117

10 Meters

CX4HS/302
DF3CB/316
DF3UB/166
DJ4ZB/311
DK1FW/232
DK3EG/173
F3AT/302
G4BWP/315
HB9AZO/161
I1BWI/186
I4EAT/326
JA1DFQ/199
JA1MDK/258
JA1SDV/285
JA1SJV/274
JA2BL/251
JA3DLE/157
JA7ZP/118
JE1CTA/316
JE2URF/227
JE3CHA/170
JH2UVL/228
JH8JBX/184
JI2KXK/137
JN3SAC/172
JR1BLX/270
JR1MLU/249
OE6IMD/272
ON5TW/244
OZ1LO/330
SLØZG/269
SM6BZE/172
SM6CVX/321
SM6MSG/239
SMØAJU/329
ZP5FGS/240
ZP5JCY/295
KX1T/134
K1RAW/217
K1TKL/135
K1WVX/130
NR1R/325
N1FNN/161
WA1EHK/126
WA1G/237
WB1DQC/254
WW1N/135
WZ1R/191
W1BYH/175
AF2O/257
KB2JGZ/199
KD2OD/129
K2ARO/330
N2PKP/173
WA2USA/162
WB2RAJ/190
W2INE/190
K3BEQ/330
N3GBM/169
WR3E/295
WT3P/194
W3AP/328
AA4UF/131
KR4M/330
K4SB/254
K4XG/239
N4MM/330
N4PWO/201
N4SLU/151
WA4MCZ/169
WA4MME/244
WA4QDM/134
WF4G/284
KB5CIA/225
KD5M/201
KE5PO/268
K5HYB/232
K5PC/273
K5TSQ/250
WB5IGF/133
W5LJI/182
W5LLU/290
KC6ESL/189
K6DT/299
K6MA/261
N6DJM/131
N6DX/280
WA6BYA/250
WA6F/201
W6EJJ/130
W6SHY/214
W6ZKM/275
KE7UL/137
K7EG/182
K7EHI/205
W7SLB/250
KA8D/140
KF8VX/167
K8BN/231
K8LJG/282
K8TL/191
W8CBA/140
W8MHW/178
W8WEJ/183
KD9CN/192
K9EC/236
K9GPN/228
K9ZXG/287
WO9S/202
W9BB/127
W9WHM/324
W9YSX/323
KBØG/275
KØCS/242
KØDEQ/257
KØIIR/177
KØQQ/253
NIØG/286
NØIWL/141
WBØGFV/165

6 Meters

SM7AED/125
SM7FJE/126
9H5EE/129

*Corrections to a previous monthly listing.

DXCC Notes:

During the past year, the DXCC application form has changed substantially. The changes have been made to provide information necessary for proper processing of the application. Older forms in circulation don't ask for all of the information required. The DXCC Award Application MSD-505(194) is the current form, and the proper form to use for all new and endorsement applications, including 5-Band DXCC.

Because of the problems encountered with missing information from older applications, these application forms are no longer acceptable for submission to the DXCC Desk. Beginning August 1, 1994, only MSD-505(194) or later will be accepted. Use of older forms may result in applications being returned without action.

QST

IARU Reps Confer in Miami

Miami's ever-popular Tropical Hamboree gave Amateur Radio representatives from seven countries of North America and the Caribbean a reason to gather on the first weekend of February, and an opportunity to compare notes on matters of mutual interest and concern. This year's was the second such meeting—officially billed as a joint area meeting of IARU Region 2—and it again proved to be a good investment of time for the participants.

Those present included IARU President Richard L. Baldwin, W1RU, and IARU Secretary and ARRL Vice President Larry Price, W4RA. Attending from IARU Region 2 were Vice President Tom Atkins, VE3CDM; Secretary Pedro Seidemann, YV5BPG; Treasurer Steve Dunkerley, VP9IM; Directors Frank Butler, W4RH, and Guillermo Nunez, XE1NJ; and Assistant Area Director Noel Danawa, 9Y4NED. Also present were representatives from the IARU member-societies of Canada, Mexico, Bermuda, the Dominican Republic, and the United States. Among the topics discussed were:

International Amateur Radio Permit. An IARU effort is under way in CITEL, the telecommunications arm of the Organization of American States, to create a mechanism for Amateur Radio operators that would be similar to the International Driving Permit (IDP). The IDP enables a driver having a license from his home country to operate a motor vehicle in other countries without the need for additional paperwork in each one. Such a system for radio amateurs would reduce the burden on national administrations, and would be a great convenience for international travelers.

CITEL Restructuring. Until now, CITEL was simply a conference that met occasionally so the member states could discuss and coordinate telecommunications policy. A new constitution will elevate CITEL to the status of a permanent commission within the OAS. IARU Region 2 has long been an invited participant in CITEL meetings, and it is expected that this relationship will continue. However, CITEL's expanded role may well require a higher level of IARU activity.

ITU Restructuring. President Baldwin called the attention of the group to the modernization of the International Telecommunication Union (ITU) and the need for a larger group of experts qualified to represent the IARU at ITU conferences and meetings. In general, the accelerating rate of telecommunications development in the world requires a greater expenditure of time and money on behalf of IARU in order to keep pace.

Region 2 Finances. IARU Region 2 is funded by dues paid by its member-societies, calculated on the basis of $0.07 per licensed radio amateur in their respective countries (and *not* on the basis of the number of members in a member-society). Region 2 maintains separate funds for the Defense of Amateur Radio and for the Promotion of Amateur Radio, setting aside 5% of its income for each fund. (The ARRL pays Region 2 dues of about $44,000 per year, which represents the majority of Region 2's income. Needless to say, everyone who works on behalf of Region 2, as for IARU itself, is a volunteer; the budget only covers such expenses as postage, printing, telecommunications, travel, etc.)

Region 2 News. Fred Laun, K3ZO, devotes many hours to the editing of this bilingual (English and Spanish) publication, which attracts many compliments. Three issues are scheduled for 1994.

IARU Monitoring System. Mark Allen, WJ7X, has had to resign from the position of Region 2 IARU Monitoring System Coordinator in order to accept a career advancement opportunity. Mark's contributions to the smooth functioning of what is sometimes called the "Intruder Watch" were noted with appreciation. A search is under way for a successor.

Region 2 Conference. Arrangements were reviewed for the next conference of IARU Region 2, to be hosted by the Radio Amateurs of Canada in Niagara Falls, Ontario, September 24 through 30, 1995. The organizers have selected a site that offers a variety of hotel accommodations to fit the varying tastes and budgets of the conferees.

QSL Bureaus. In some countries, there are multiple QSL bureaus soliciting cards from overseas amateurs. This creates great confusion and increases the risk that cards will not be delivered to their intended recipients. Various ways of reducing this problem were discussed.

Thanks to Steve Dunkerley, VP9IM, for supplying the minutes on which this report is based.

AMATEURS IN INDIA JOIN FORCES

A historic joint meeting of members of the Amateur Radio Society of India (ARSI) and the Federation of Amateurs and Radio Societies of India (FARSI) was held in Bombay on July 4, 1993. Building on the spirit of cooperation between the two organizations that has taken hold recently, after two decades of separate existence, the meeting reached agreement on principles to guide a merger of the two into a single entity, the Amateur Radio Society of India, this being the name of the older society and the one that is recognized by the IARU.

FARSI is to function as the Western Regional Centre (WRC) of ARSI, with headquarters in Bombay. The Indian QSL Bureau has been operating in Bombay under joint sponsorship for the past two years. A national magazine, *Ham Radio News*, is to be published in Bombay by ARSI(WRC) under the editorship of FARSI founder Saad Ali, VU2ST.

Under the terms of the merger, FARSI's assets, programs, and liabilities remain with WRC, and WRC is guaranteed representation on the ARSI Managing Council for a period of six years or three election cycles, whichever is earlier. The establishment of additional Regional Centres in other parts of India is envisioned.

Noting that the merger helps to strengthen Amateur Radio in India, ARSI Vice President Sahruddin said: "We wish to record our appreciation to OM Saad Ali for his contribution of far-reaching importance to the Amateur Radio movement. We congratulate him and his team, individually and collectively, for this gesture. Maj. Haveli Ram, VU2HV, one of the founding members of ARSI in 1953, equally deserves our thanks for having been responsible in reaching this milestone and for having come all the way from New Delhi to participate in the meeting."

SEANET CONVENTION

The Bangladesh Amateur Radio League hosted the 21st SEAnet Convention on the weekend of November 19 through 21, 1993, in the capital city of Dhaka. SEAnet meets daily at 1200 UTC on 14.320 MHz and has served as a "watering hole" for the radio amateurs of South East Asia for more than two decades. The net enjoys a well-deserved reputation for contributing to international understanding in its part of the world, in the finest traditions of Amateur Radio.

The 1994 SEAnet Convention will be held the weekend of November 11 through 13 in the Malaysian coastal city of Malacca, under the sponsorship of the Malaysian Amateur Radio Transmitters' Society (MARTS). Think you might enjoy meeting radio amateurs in a somewhat exotic locale? Contact the Organizing Committee for SEAnet '94, Sangat Singh, 9M2SS, Secretary, c/o MARTS, PO Box 10777, 50724 Kuala Lumpur, West Malaysia.

Thanks to IARU Region 3 Chairman David Rankin, 9V1RH/VK3QV, for assistance with this report.

Conducted By Brian Battles, WS1O
QST Features Editor

A Wilderness VHF/UHF FM Protocol: Your Comments—*Part 2*

◊ A ham friend gave me a copy of your February 1994 FM column "A Wilderness VHF FM Protocol" by William Alsup, N6XMW. It should be of interest to many members of the Appalachian Trail Conference and I'd like to excerpt from it in the next edition of our magazine. Hand-held transceivers are touted as one "safety precaution" in hiking the Appalachian Trail. Not the ideal yet, because of the limitations you mention, but a proposed wilderness protocol is a step in the right direction. I look forward to reading the responses you publish and if we're able to help in any way, please let us know.—*Judith Jenner, Editor,* Appalachian Trailway News, *Harpers Ferry, West Virginia*

◊ I fully support the proposal in February *QST*. Our Linville Gorge Wilderness on the Pisgah National Forest is delightful to see, but horrible for FM communications. At 1400 feet deep and 12 miles long, it's appropriately called the "Grand Canyon of the East." We have difficulty getting out with our hand-held radios unless there's a mobile unit on the rim. I'll be happy to do what I can to help spread the word throughout the agency, if the protocol is adopted by the amateur community. However, I think it's more important to get the information to the users.—*Phil Kromer, N4KOZ, Supervisory Forester, US Department of Agriculture Forest Service, Grandfather Ranger District, Marion, North Carolina*

◊ I read the FM column in February *QST* and I think it's a swell proposal. Even though I don't have my Tech yet, I speak with some experience. I'm 12 years old and just got my Novice ticket a few months ago. My family and I are frequent hikers and campers in the Adirondacks State Park here in New York. Accidents can and do frequently happen, and the suggested times seem very much in order. Although I've only been a ham for a few months, I feel that it's a wonderful hobby and I welcome any aspects of it that improve the safety of the community and my fellow hams. A major part of ham radio is emergency communication. These help to protect the community and the ham, so I encourage your proposal. The only thing I suggest is that hams could monitor the national simplex frequency at 6 PM. At this time of the evening, hikers try to rush down the mountain or trail and this is when accidents happen, such as tripping or falling. What you had to say, however, was well thought out, well presented and well organized.—*Nathan Herrmann, KB2QPU, Scotia, New York*

DON'T WORRY ED, I BROUGHT MY HANDHELD RADIO SO WE CAN CALL FOR HELP!

◊ I just read the February *QST* FM column on backcountry communications on 146.52 MHz. I think it's a great idea. I go out on my Honda FourTrax every chance I get, and there have been times when I couldn't reach any of the local repeaters. Fortunately, there haven't yet been any emergencies where I had to contact someone. I have 146.52 in memory on my hand-held, but never thought of it as a calling channel. Now I will. Thanks for the article.—*Clinton, VE7KNL (packet VE7KNL@VE7CW)*

◊ I read the February column and agree with it totally. I'm a 17-year-old high school senior, and 2 meters is the only amateur band I have equipment for. I'm about 10 miles from the Ocala National Forest; I often go backpacking there, and I carry my hand-held transceiver. There have been many times that I've communicated with other amateurs in the forest while I was in the forest, too, or in my shack. I believe in good communication between amateurs in the forest and those able to help when needed or just to pass the time while trekking.

Before I was licensed, I was injured in the forest; luckily, I had a friend there to help me. Now that I'm licensed, I refuse to go anywhere without my radio.—*Robert Nestved, KD4LOR, Ocala, Florida*

◊ I read with great interest Bill Alsup's article on a wilderness VHF protocol. I just passed my Technician test and I'm waiting for my call sign. One of several reasons I decided to become a ham is because I do wilderness river touring and desert canyon hiking and I've always wanted to have the ability to communicate in an emergency or to help others.

I'm 66 years old and take my wife (who is handicapped) on my six- to seven-day river tours. I usually have at least another manned raft for security, but it would be better to be able to get help quickly, if necessary. What I planned to do before I read the article was to find out the locations of repeaters and the nearest hams, write to them to inform them that I would try to contact them with my hand-held transceiver for practice, and keep them abreast of my progress. Maybe some hams on the wilderness fringes will enjoy chewing the fat with an out-of-towner.

In 1964, I was with a group of Sierra Club backpackers climbing Mt Brewer. One of our party developed pulmonary edema and couldn't hike any more. We had to look for a ranger's cabin and hope he or she would be there to call in a chopper or a mule. It took us more than a day to do so and the ranger did have a transceiver.

We should inform backpacking and paddling magazines of this protocol. Perhaps those of us who read *QST* can test the procedure to work out any "bugs." I commend Bill Alsup for writing the article and I'm willing to be part of any group that takes the time to check out the protocol and eventually inform other wilderness travelers about it.

I agree with the protocol, but I'll have trouble watching the clock because that used to be one of the signs of civilization I tried to get away from. Perhaps a watch with an alarm will work to aim for selected times of monitoring. For safety reasons, I understand that I can't have it both ways!—*R. Kurt Menning, Gualala, California*

◊ I can personally attest to the difficulty of making contacts on VHF ham radio from mountainous areas. In the past two summers, I've made wilderness trips to the Sierra Mountain Range in California, and

between Mt Jefferson and Mt Hood in Oregon.

Bill Alsup is correct to say that wilderness operators and nearby hams must coordinate contacts at well-known times on an established frequency. I agree with the three-hour intervals and the five-minute listening/calling period. I suggest that the contact times be modified: One should be at noon, when wilderness operators usually stop for lunch; and by using three-hour spacing, we also try to make contact at 9 AM, 3 PM and 6 PM. My idea gives one more contact time and having the last scheduled contact time at 6 PM is better than 4 PM because more people are likely to be stopped for the day by 6 PM—I'm often still hiking at 4 PM.

I heartily endorse this proposal. Bill Alsup has brought forward an idea that will enhance the safety of Amateur Radio operators in the wilderness.—*Ethan Schumacher, N7WNC, Portland, Oregon*

◊ I entirely agree with Bill Alsup's proposed VHF FM protocol. I go backpacking and although I haven't needed emergency communications in the wilderness, I'd like to know it's available. Perhaps there's been a time when I was in a critical place and could have helped someone, but I wasn't listening.

I take my hand-held radio when I know I'll be in an area with repeaters or traveling with another hams. I've tried to monitor 146.52 MHz continuously, but even with the battery saver feature on, the result is dead batteries. When hiking, I often lose track of the time and a five-minute window might be too short. Perhaps 15-minute windows instead?

What about HF? I always take along a small 40-meter CW rig. The success has this rig been outstanding! I encourage hams to take HF into the wilderness. How about attempting communications at 1 PM and 4 PM daily on the QRP calling frequencies, 7040 and 7110 kHz. A simple CQ would suffice, and backpackers and the people at home could participate. To reduce the weight and size, I use a small homebrew rig with a VFO and a crystal filter, in a plastic box with a simple antenna. I use AA cells in all the equipment I take so that if needed, they can be swapped between the HF radio, hand-held rig, flashlight and so on. Those are my thoughts on the matter. This season I intend to listen to 146.52 at the suggested times.—*Mike Herr, WA6ARA, Ridgecrest, California*

◊ This sounds like an excellent idea to me. The primary reason I got into Amateur Radio was because I do a lot of hiking in the Cascades and a radio link in case of emergency would be important. I'm a member of an outdoor club called the Cascadians and I'd like to bring this protocol idea before them.—*Duncan McRayde, KB7SOX, Zillah, Washington*

◊ I think the Wilderness VHF FM Protocol is a terrific idea. I'm a backpacker on the Appalachian Trail through parts of Virginia. I feel a lot safer now, having passed my Technician license exam, and I don't worry as much, knowing I can get help if I need it. I live near the Trail and will monitor 146.52 MHz on those hours. It's great to be part of ham radio.—*Bob Matney, KE4IVE, Bluefield, Virginia*

Let's Do It!

There appear to be a *lot* of outdoors explorers among the ranks of hams. Of the replies, support for the Wilderness VHF FM Protocol proposed by Bill Alsup, N6XMW, has been almost unanimous. Because this is a voluntary and, by its nature, self-coordinating activity, there's no need to wait for a pronouncement that it has someone's official "seal of approval." All you have to do to participate is tune in on any ham band's well-known simplex frequency (52.525, 146.52, 223.5, 446.0 or 1294.5 MHz). The protocol also suggests listening at the top of *every* hour for five minutes, when possible.

According to Chairman Tom Anderson, WW5L, the ARRL Public Service Advisory Committee (PSAC) plans to discuss this protocol, with the idea of possibly submitting it to the League's Board of Directors for official endorsement as a recommended voluntary operating technique. There's no need for you to wait to put this plan into action, though. Interested hams can form HF nets and share packet bulletins to further refine operations. Meanwhile, if the Board elects to adopt this protocol as an officially recommended procedure, however, it should help spread the word throughout the ham community. This could lead to a coordinated effort to publicize this service—and perhaps recruit a few more new hams. An officially recognized system can be promoted to reach members of various organizations and readers of publications for backpackers, campers, hikers and other outdoor sports.

Contact your Division's PSAC representative and tell him what you think of this protocol and whether it should be presented to the ARRL Board of Directors for official endorsement (see the ARRL Advisory Committee roster in April 1994 *QST*, p 93).

To synchronize this nationally, let's give it a "kick start" with an inaugural test run on Saturday, May 21, 1994. This provides time for most hams to see this issue and spread the word; it avoids Mother's Day weekend; and it coincides with the ARRL 50 MHz Spring Sprint, which may mean a few extra VHF ears in "them thar hills" to join in. Be sure to *listen* first—if this is a successful test, it may blow a lot of unsuspecting simplex operators off the band! (I wonder if hams in Asia would hear anything if 100,000 US amateurs called CQ on 146.52 all at once?)

Between this topic and the "Dream Rig" survey that appeared in March, I've never seen so much mail for this column. Thanks! Now it's time to shut off my word processor and get packed for the trip to Dayton; I hope you'll stop by the ARRL booth and say Hello!—*WS1O* QST

The Proposed Wilderness VHF FM Protocol suggests that hams announce their presence on the national simplex calling frequencies at 10 AM, 1 PM and 4 PM (local time) for five minutes each period. Comments have been received that support this protocol, and broadening it to add 7 AM and 7 PM, to create five calling windows, each five minutes long, every three hours beginning at 7 AM.

The responses also pointed out the need to get word to alpine groups, Boy Scouts, wilderness rangers and so on. Please help spread the word so that the protocol can be effective for this summer's hiking season. I'll be happy to coordinate comments, suggestions and experiences with this protocol, or on the general subject of Amateur Radio and the wilderness.—*William Alsup, N6XMW, 1120 Ashmount Ave, Oakland, CA 94610*

New Products

AMTOR/PacTOR SOFTWARE

◊ The latest release of *BMK-MULTY* multimode software by M. J. Kerry, G4BMK, is an advanced standalone package for Amateur Radio operation on AMTOR, PacTOR, RTTY and CW, with an ordinary RTTY terminal unit, such as an HD-3030; AEA PK-232, CP-1 and CP-100; Flesher TU-170 and TU-470; HAL ST-6, ST-5000, ST-6000, CRI-100 and CRI-200; Kantronics KAM and Interface II; Dovetron; FSK-1000, etc. No TNC is needed because the data-processing functions are performed by the software running on a PC. Version 3 is a major rewrite that the developer claims dramatically improves PacTOR performance with a unique Multipath Compensation feature. It now also incorporates a logger with an integrated call sign data base for online access. The retail prices are as follows: Base communications package, including AMTOR, RTTY, CW and logger $95; Base package plus PacTOR $145; Base package plus Extended Audio Package, including audio spectrum analyzer (tuner) and reception of HF WEFAX and SSTV $140; Above package plus PacTOR $175; PacTOR alone $50. Steve Schnedler, AC4IW, Spheretron/Schnedler Systems, 25 Eastwood Rd, PO Box 5964, Asheville, NC 28813; tel 704-274-4646.

Conducted by John C. Hennessee, KJ4KB
Regulatory Information Specialist

Our Spectrum: Technical Standards—*Part 1*

The most sacred aspect of all Amateur Radio is its spectrum. Without it, where would we be? A main goal of the ARRL is to preserve existing amateur spectrum and, where possible, obtain additional spectrum for amateurs. This month we'll examine the Amateur Radio band allocations and associated frequency sharing requirements.

Q: Where are the Amateur Radio frequency bands listed?

A: In Part 97, Subpart D—Technical Standards. Section 97.301 lists the specific authorized frequency bands for each class of license. It breaks them down further by International Telecommunication Union (ITU) Region. This makes more sense if you open your *FCC Rule Book* to Subpart D of Part 97. (If you have the Ninth Edition, Second Printing, it's on page 212.)

Q: Who decides what frequencies amateurs get?

A: International and national regulations govern the operational and technical standards of all Amateur Radio stations. These regulations also outline sharing requirements. Without these controls, chaos would reign and the various services would collide.

The ITU operates on an international level and the Federal Communications Commission operates on a national level. The ITU is an agency of the United Nations and plays the vital role of dividing up the range of frequencies for all ocation by the telecommunication authorities of other countries to services in each country. The ITU, headquartered in Geneva, Switzerland, sets the pace for telecommunication worldwide by broadly defining telecommunication services through the development of international Radio Regulations. The US has a responsibility to make rules consistent with these international agreements. Once the international allocations have been decided, it's up to the FCC to decide the best way to allocate frequencies to services using them in the US.

Q: What are ITU "Regions"?

A: For convenience in organizing frequency allocations for the various services, the ITU has divided the world into three administrative regions. North and South America and the adjoining waters comprise Region 2 (see Figure 1).

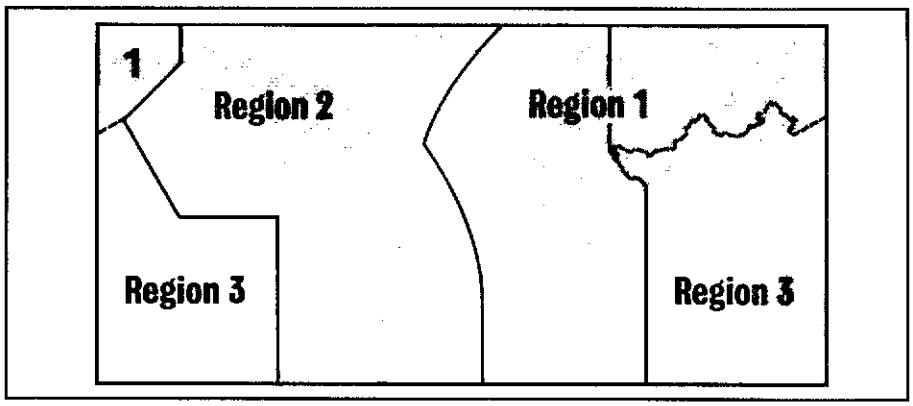


Figure 1—The ITU divides the world into three administrative "regions."

Q: What's this about sharing the ham bands with others? I thought they were "ours"!

A: Amateur Radio is one of many radio services vying for pieces of the radio spectrum. The broadcasting service is another. To accommodate them all, the international and national regulatory agencies place certain services together, taking into consideration the priority of each service and compatibility factors. The result is that, in many instances, we share bands with other services. How we share the bands depends on our status. It can be *primary*, *secondary* or *exclusive*.

Q: What are the sharing arrangements on the HF bands? What's meant by* primary, secondary *and* exclusive *status?

A: There are few *exclusive* allocations in the international Table of Frequency Allocations, and there will be fewer as time goes on and the needs of new services force new sharing arrangements. The Amateur and Amateur-Satellite Services have worldwide exclusive use of parts of the 40, 20, and 2 meter bands and all of the 17, 15, 12, and 10 meter bands. (Technically, the ITU does not regard these as exclusive allocations because they are shared by two services, Amateur and Amateur-Satellite. Amateurs regard the two as a single service, since we are licensed to operate in both.)

In Region 2, amateurs also enjoy exclusive use of parts of the 160 and 80 meter bands, the remainder of the 40, 20, and 2 meter bands, and 6 meters.

In the US, we do a bit better: nonamateur stations are not authorized in the lower half of the 160-meter band, or in any of the HF or VHF bands (including 222 to 225 MHz).

In all of these bands except 30 meters and the upper half of 160 meters, amateurs are *primary*, which means that even in the shared bands we have as much right to operate as stations in other primary services. Primary stations are supposed to avoid causing harmful interference to one another.

In 30 meters, the upper half of 160 meters, and most of the bands above 420 MHz, amateurs are *secondary*. This means that we must avoid causing harmful interference to primary services, and we must accept interference from those services.

Q: Why do I hear shortwave broadcasting stations in the 40-meter band? They wreak havoc with my QSOs!

A: Although many allocations are the same across the three ITU Regions, there are differences. The most glaring example is 40 meters. In Region 1 (Europe and Africa) and 3 (Asia and Oceania), only 7.0 to 7.1 MHz is allocated to the amateur service; 7.1 to 7.3 MHz is allocated to broadcasting. Because Region 1 and 3 amateurs have only 100 kHz of spectrum on 40 meters, they must squeeze many operating modes into that spectrum. The ARRL and the IARU are working to make the 40-meter situarion better for amateurs worldwide.

Q: I hear Puerto Rican stations operating phone between 7.075 and 7.100 MHz. Isn't Puerto Rico in Region 2 and shouldn't KP4 amateurs be operating phone further up the band?

A: FCC Rules state "Phone and image emissions [in the 7.075 to 7.100 MHz segment] may be transmitted only by stations in ITU Regions 1 and 3, and by stations in ITU Region 2 west of 130° West longitude or south of 20° North latitude [97.307(f)(11)]." This means that US amateurs in Puerto Rico, the US Virgin Islands, Alaska and Hawaii, for example, may operate phone and image in that segment because of interference from adjoining ITU Regions. The phone subband in the mainland US still starts at 7.150 MHz.

Q: What about the fishing beacons I hear on 160 meters?

A: In Region 2, any interference they cause to amateurs operating below 1850 kHz is illegal. Above 1850 kHz in Region 2, the band is shared. The ARRL Monitoring System notifies the FCC of its observations of unauthorized operations for possible enforcement action.

Q: Why do I hear foreign amateur operators using voice below 14.150 MHz? The phone band starts at 14.150 MHz, doesn't it?

A: Yes, it does in the US, but certain countries have no mode restrictions. Canadian amateurs, for example, may operate any mode on any authorized frequency. The segment 14.112 to 14.150 MHz is sometimes called the "foreign phone band."

Q: What sharing agreements exist on amateur bands above the 222 to 225 MHz band?

A: The amateur allocations between 420 MHz and 24 GHz are secondary. Above 24 GHz, the general pattern is that we have narrow, primary allocations adjacent to wider, secondary allocations. In the past, military radars were the heaviest users of these shared bands and we've coexisted pretty well with them. Now there is growing pressure for spectrum for new commercial uses, which raises new sharing problems—for example, as discussed in last month's *QST* editorial.

Q: What restrictions apply to 70 cm?

A: Amateur status is secondary to the Government Radiolocation Service in the 70-cm band (420 to 450 MHz). Hams must tolerate interference from and can't cause interference to these stations [97.303(b)]. In Canada, 420 to 430 MHz is not available to amateurs. Between 420 and 430 MHz, US hams are secondary to fixed and mobile services and no operation is permitted north of Line A [97.303(f)(1) and (2)] (see Figure 2). The FCC has allocated portions of the 421 to 430 MHz band to the Land Mobile Service within a 50-mile radius of Buffalo, Cleveland and Detroit. The reallocation was based on the proximity of these three cities to Canada. Amateurs south of Line A in these cities may continue to operate as long as interference isn't caused to other users [2.106, US Footnote 230].

A 50-watt PEP output power limit applies to amateurs in this segment near designated military bases in New Mexico, Texas, Florida, Arizona, California, Nevada, Massachusetts, Alaska and North Dakota [97.313(f) and 2.106, US Footnote 7]. See Chapter 5 of the *FCC Rule Book* for details. Last, amateurs can't cause interference to government and nongovernment stations in the 449.75 to 450.25 MHz segment [97.303(f)(4)].

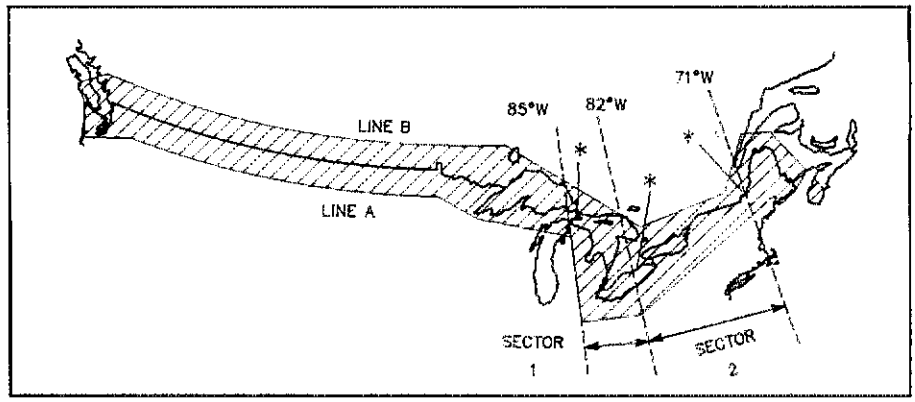


Figure 2—Operation from 420 to 430 MHz is not allowed in the area north of Line A and south of Line B.

Q: How about 33 cm?

A: US amateurs are *secondary* to government radiolocation (radar) service and hams can't cause interference to and must accept interference from those stations in the 33-cm band (902 to 928 MHz) [97.303(b)]. The same principle applies to industrial, scientific and medical (ISM) devices [97.303(g)]. Amateurs must accept interference from microwave ovens on 915 MHz [2.106, US Footnote 215] and we can't cause interference to and must accept interference from Automatic Vehicle Monitoring Systems (used to track automobiles electronically), which are operating in many large cities in the 904 to 912 MHz and 918 to 926 MHz segments [2.106, US Footnote 275]. The ARRL has filed a petition to secure an amateur primary portion of this band. Amateurs in certain parts of Texas and New Mexico can't transmit on this band [97.303(g)(2)]. See Chapter 5 of the *FCC Rule Book* for details.

Q: It sounds as though hams are really restricted on the UHF bands. Is there any chance that the FCC will take them away?

A: There are restrictions on the amateur UHF bands because hams share these bands with other services. It's important for amateurs operating there to recognize this, without detracting from the enjoyment of operating on the band. Nothing is "for sure," but the Amateur Radio service has a proven history of being good sharing partners and this has long been to its benefit.

Q: *What are "band plans"?*

A: Another aspect of sharing the bands is voluntary band plans. Although the FCC Rules set aside portions of some bands for specific modes, there's still a need to further organize amateur bands among user groups by "gentlemen's agreements." These agreements usually emerge by consensus of the band occupants and are sanctioned, but not mandated, by member-societies of the International Amateur Radio Union, such as the ARRL. These agreements allow many modes of operation to be used by amateurs in a given band. The detailed band plans can be found in the *FCC Rule Book*, the ARRL *Repeater Directory* and the ARRL *Operating Manual*.

In the next installment of this column, we'll discuss emission standards, transmitter standards and type acceptance. Stay tuned.

Questions in this column have been prepared by ARRL HQ and are typical of those asked of ARRL Directors, section leaders, HQ staffers and the FCC. Input for future columns can be sent to John Hennessee, KJ4KB, at ARRL HQ. QST

Conducted By Emil Pocock, W3EP*

Sporadic-E Mapping

We have become increasingly sophisticated in our use of sporadic-E propagation on 50 and 144 MHz. Double- and triple-hop paths on 50 MHz, including at least several North America-to-Europe band openings, are now expected occurrences during the late spring and summer months. Sporadic E reaches 144 MHz as many as a dozen times a year in the US, most notably in June and July, when contacts in the 2000-km range are common.

Many of these openings are short-lived and difficult to predict, but there are warnings. Many VHFers have gotten into the habit of watching the 10-meter band for signs of E-skip and then following the maximum usable frequency (MUF) upward until it reaches 50 MHz and higher. Others monitor one of the low-band TV channels (2 through 6) or reliable commercial stations in the 30 to 160 MHz range. Some enthusiasts have rigged up squelch-driven alarms and even more sophisticated devices to provide instant warning of the presence of sporadic E anywhere in the VHF bands. These simple methods are easy and generally effective ways to discover the elusive openings, but more sophisticated information can be extracted even from casual observations

Determining Sporadic-E MUF

The patchy bits of ionization responsible for sporadic-E propagation exhibits an MUF that can be calculated when the frequency and path length of any E-skip signal is known. This can be done from a formula, but a prepared chart makes the chore much easier. Once the MUF and the midpoint of a known signal is plotted, it is easy to predict likely openings on 6 and 2 meters. The entire procedure, including a handy MUF chart, is explained in more detail in "Sporadic-E Propagation at VHF," in April 1988 *QST*, pages 33 to 39.

Here's how this on-the-fly analysis might work. While having a cup of coffee in your Oklahoma City radio room early on a June morning, you hear a contact on 10 meters between Kansas City and Pittsburgh. Instantly you recognize that the distance, about 1250 km, indicates that the MUF must be just touching 50 MHz. You quickly plot the contact on a map and determine that the path midpoint is over central Indiana. Knowing that the maximum possible single-hop sporadic-E distance, about 2300 km, occurs at the MUF, you predict where 6 meters will be open by drawing a 2300-km diameter circle around the central Indiana midpoint. Any pair of 6-meter stations on opposite sides of the circle should be within E-skip range. Thus, the band ought to be open to central New England from your location, but you hear nothing on the band. A quick CQ on 50.125 MHz results in a contact with a W1 in southern New Hampshire. She mentions you are the first DX station heard on the band that day—and you know why.

This technique is commonly used to catch the more elusive E-skip openings on 2 meters. The MUF-path length relationship indicates the MUF reaches 144 MHz when 50-MHz contacts shorten to less than 700 km. You can determine these hyperactive sporadic-E regions by plotting the midpoints of short 6-meter contacts. Then it's an easy matter to plot the likely 2000-km-plus 2-meter paths using the same path midpoint. In practice, these general procedures can be time consuming and confusing, especially when the bands fill with stations and there appear to be several sporadic-E regions active simultaneously.

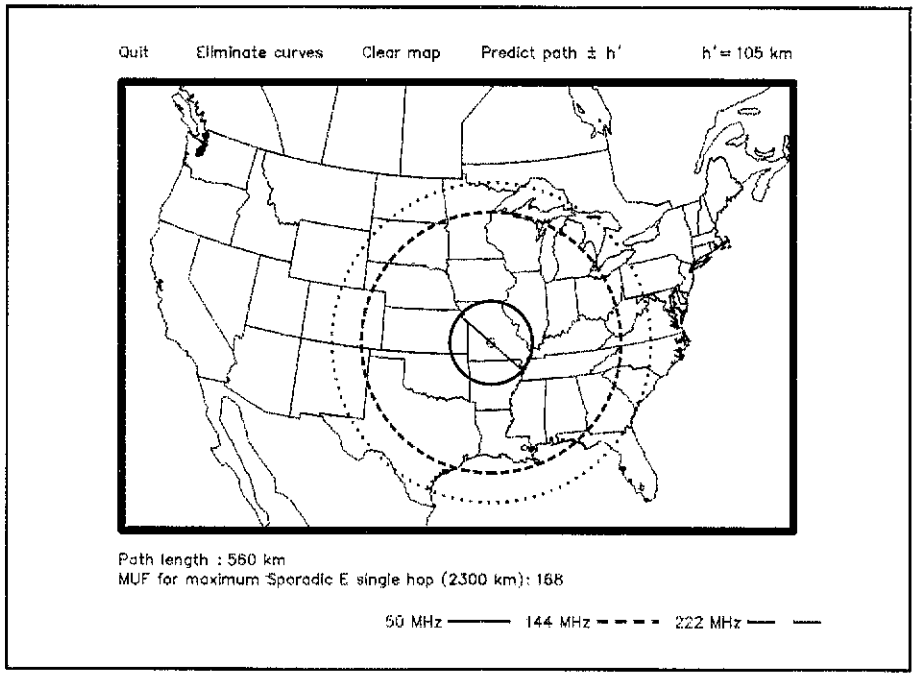
ES-PROP Computer Mapping Program

Now there is a quicker way to do this analysis using *ES-PROP*, a computer mapping program written by Jim Roop, KØBI. The program opens with an outline map of the United States and adjacent parts of Canada and Mexico. You enter the geographic end points and frequency of any sporadic-E signal path. The program shows the path as a great-circle line, determines the distance, midpoint and MUF, and then plots concentric circles corresponding to the extreme points of likely paths at 50, 144, and 222 MHz (when lower than the MUF) as well as at the MUF itself.

The accompanying figure shows a simulated *ES-PROP* screen. The display began by entering two end points, corresponding to a 50-MHz contact between Sioux City and Memphis. All of the graphic information, path length (560 km), and MUF (168 MHz) appear immediately. The inner 560-km diameter circle indicates the end points of other possible 50-MHz paths using the same active sporadic-E region. The second circle shows the limits of E-skip paths at 144 MHz, just below the MUF. Thus 144-MHz contacts between western North Carolina and eastern Colorado, for example, should be possible. The 168-MHz MUF circle appears as well.

The initial path end points are entered using a mouse or the keyboard. When using the mouse, a window automatically shows the grid locator position to six places as you move the pointer around the map. You simply click on the two end points and choose 50, 144, or 222 MHz from the graphic menu below the map. Six-place grid locators can be entered manually via the keyboard. Keyboard entry has the advantage of allowing you to enter any frequency, not just one of three amateur bands. This is very useful if you are using TV channels, the FM broadcast band, or some other nonamateur frequency.

The program can display several midpoints simultaneously, which is a boon in real-world conditions when several active E regions can be distinguished at one time. *ES-PROP* will also automatically plot the second midpoint along a multi-hop path if an existing active region fits the criteria for a likely first-hop midpoint. The display makes limited use of color to plot the concentric



A simulated *ES-PROP* screen, showing a 50-MHz sporadic-E contact between northeastern Kansas and southwestern Tennessee, along with circles representing possible end points of 50, 144 and 168-MHz (MUF) paths (the outer circle, made with a dotted line, indicates the MUF).

*Send reports to Emil Pocock, Box 100, Lebanon, CT 06249. Leave voice messages at 203-642-4347 or fax 203-665-7531.

circles corresponding to path limits at the four possible frequencies (50, 144, and 222 MHz and the MUF). The E-layer height is assumed to be 105 km, but that can be varied from 95 to 115 km.

System Requirements

ES-PROP runs on an IBM (MS-DOS) compatible personal computer with at least an EGA display card and an RGB monitor. Memory requirements are modest. A mouse is needed to make use of all the functions, but necessary data can be entered from a keyboard. The program ran very smoothly and quickly on my 486/25-MHz machine without a math coprocessor, although Jim recommends the extra chip. Loading and starting the program are straightforward.

Obtaining a Copy of ES-PROP

You can obtain a copy of *ES-PROP* 1.1 at no cost from the ARRL Bulletin Board (203-666-0578) or by sending me a formatted MS-DOS compatible floppy disk, a self-addressed mailing envelope and sufficient postage for return. If you prefer, send a request with $5 and I will provide the disk and postage. Please specify a 5.25-inch or 3.5-inch disk with formatting specifications. The disk includes the executable program, graphic files and an ASCII file containing a brief operating manual. The program is copyrighted, but it may be freely copied and distributed, so long as no profit results.

Many thanks to Jim Roop for writing this wonderful program and making it available to interested amateurs. Jim would like to hear from those who try it out and he is willing to offer help for those who encounter problems. Contact Jim Roop, KØBI, PO Box 255, Allegan, MI, 49010.

ON THE BANDS

VHF and UHF activity reached an expected seasonal low in February. There have been no reports of sporadic E or extended tropospheric openings, but stations across the northern half of the US and southern Canada were treated to more than a week's worth of aurora during the month. Much of the activity focused on 144 MHz, but as always, aurora was worked widely on all bands from 50 to 432 MHz.

Aurora

Geomagnetic storms rarely last for more than two or three days, but the geomagnetic field persisted at minor storm levels for a week between February 7 and 13. The mid-latitude geomagnetic A index averaged 34.5 over the 7-day period, while the K index reached as high as 6 on the 7th and 8th. In spite of the unusual duration of the disturbance, apparently only stations across the northern tier of states and southern Canada found any auroral propagation. The best days were February 6 to 7 and 10 to 11.

Severe geomagnetic storms happen only rarely, perhaps no more than once or twice a year. Thus, alert operators were delighted during the afternoon of February 21, when the K index suddenly rose to 7, initiating a rare severe storm. The first reported contacts were made shortly after 2100Z and auroral conditions lasted until at least 0500Z on the 22nd. Several stations reported that auroral intensity diminished briefly between 0030 and 0300Z.

Most of the reports came from the eastern half of the country. Stations as far south as EM73 (W4WDH), EM64 (KA2DRH/4) and EM36 (K5YY) worked into the auroral on 144 MHz. San Hutson, K5YY, made 48 QSOs in 21 grids as far east as FN03 (about 1400 km) and west to NØLL in EN09. Bill Perry, KC4YO (EM75), had 15 QSOs as far as N7EIJ/1 (FN42), about 1450 km to the northeast. Bill also heard a number of VE3s, but could not work them through the QRM.

New England and New York stations worked widely into the Midwest and upper South on 144 MHz. Among the 30 QSOs in my log were stations as far west as Missouri, Iowa and Minnesota, including KØGJX (EN35) at about 1675 km. Mark McMillan, N7EIJ/1, worked two dozen stations and 17 new grids, including KWØA (EM48) at nearly 1750 km for his best DX. Ron Klimas, WZ1V (FN31), worked 1570 km west to KWØA (EM48) and south to KC4YO and KA2DRH between 0445 and 0500Z, just as the aurora was dying out.

The aurora was just as exciting from the Midwest. Darryl Petersen, KDØPY (EN41), made 40 contacts in 30 different grids between 2200 and 0300Z, including W1XR and W1JR (both in FN42), 1600 km to the east, and K5YY to the south. Darryl's last aurora contact was as late as 0547Z. Don Dunbar, WØPN (DN70), heard his propagation alarm go off after 0000Z, but did not get his 150-W brick and two Yagis on the air until 0100Z. Don heard strong auroral signals from Minnesota, Illinois and Wisconsin during the following two hours, and worked WDØCJM (EN25) and K9VGE (EN52) for a new grid. Dave Bostedor Jr, N8NQS (EN72), listed WB9WHQ (EN45), VE2UG (FN08) and VE2CTT (FN07) among the less common grids he worked.

Reports of 222- and 432-MHz activity were sparse. Jim Roop, KØBI/8 (EN72), found K4QIF (FN07) on 432 MHz and heard WA8WZG (EN81) running a series of stations. Jim notes that crowding around the calling frequency made it difficult to make additional contacts. It's encouraging to hear that a number of stations were actually on the band, as a great deal more could probably be done on 432-MHz aurora.

Auroral-E Reports

Several stations observed what appeared to be another rare instance of 144-MHz auroral-E propagation during the February 21 and 22 aurora session. WZ1V reports working KA9IEC (EM69) and others around 0400Z with strong, clear SSB signals, indicative of auroral-E propagation. N7EIJ/1 also heard KB9IEC with a distortion-free signal during his 0432Z contact. KC4YO observed a brief 2-minute period around 0500Z when WZ1V and W3EP/1 lost their Doppler distortion and came through with pure CW notes. Finally, WØPN hooked up with WA8MSF (EM79), 1700 km distant, with nearly clear SSB signals at 0358Z. Did anyone else observe this phenomenon?

VHF/UHF/MICROWAVE NEWS

New Threat to the 2300-MHz Band

Dave Sumner, K1ZZ, outlined the most recent threat to amateur use of the UHF spectrum in his April "It Seems to Us..." column (see April *QST*, page 9). Whether we will lose access to some portion of the 2300 to 2310 and 2390 to 2450-MHz ranges we now share with government radiolocation services, and under what condition, is still to be worked out, but now is the time amateurs can have the most influence on the decision-making process.

The ARRL is formulating a response to the National Telecommunications and Information Administration plan to achieve Congressional mandates on spectrum reallocation. The ARRL staff could use your help, especially in providing the kind of hard data that will make convincing arguments concerning amateur needs in the 13-cm band. Amateurs need spectrum space for weak-signal work, satellites, television, repeaters and modern data modes, but the government wants specific information. The initial response period ends May 11, in preparation for a meeting between government and commercial representatives in late June. There will be further opportunities for comments as the FCC announces specific reallocation plans, but we cannot afford to wait until the band has already been claimed by commercial users.

This Month

May 4	432-MHz Sprint
May 14	902/1296/2304-MHz Spring Sprints
May 21-22	50-MHz Spring Sprint
May 21-22	Good EME Conditions

UKSMG Sporadic-E Contest

The United Kingdom Six-Metre Group runs its annual 50-MHz contest on June 4, 0000 to 2400Z. The contest is open to 6-metre and 6-meter operators around the world. Exchange signal report and grid locator; UKSMG members also exchange their membership number. Score 2 points for each contact with a UKSMG member and 1 point for all other contacts. Multiply contacts points by number of grid locators and then multiply that total by number of different DXCC countries worked for the total score. The same contact may count for both a country and a locator.

There are separate classifications for the United Kingdom, Europe, and the rest of the world. Apparently, North American single- and multi-operator entries compete together for the "rest of the world" section trophy. Send entries, postmarked no later than July 7, to Cliff Ibell, G1IOV, UKSMG Contest Manager, The Corner House, Church Road, Mortimer West End, Reading, Berkshire RG7 2HY, England. Official entry forms can be obtained from the same address, but they are not required if all necessary information is contained in the log and summary sheets.

The UKSMG contest can provide several excellent opportunities for North American stations. Because of a change in the traditional date for the ARRL June VHF Contest, the two events coincide this year. Six-meter contacts can count for both contests! During last year's June VHF contest, a number of US and Canadian 6-meter contesters made European contacts via sporadic E. It could easily happen again, especially as hundreds of Europeans will be on the band for an intense 24-hour operating event.

The UK and European calling frequency is 50.200 MHz and Europeans spread themselves out much more so than Americans. Last year, many transcontinental contacts were lost because US stations crowded the lower part of the band. Spread out! The 50.100 to 50.125 MHz DX window should be strictly left clear for working DX stations. Calling CQ blindly in the window should also be discouraged, as other US stations may be hearing DX even if you are not. Several US stations proved that calling CQ toward Europe high in the band proved much more successful.

Jordan on Six Meters

The UKSMG also announces a special 6-meter DXpedition to Jordan, May 29 to June 26, using the call sign JY7SIX. A team of experienced English and German 6-meter operators will use a 100-W rig and a 6-element Yagi on top of an Amman hotel (KM71), 150 feet above the ground. Expected operating frequencies were

not announced, but the team requests exchanges be limited to call signs and signal reports. The group will operate a beacon with the same call on 50.075 MHz and will monitor the 28.885-MHz liaison frequency. There is a small chance that North American operators can contact Jordan via E_s, because nearly every June, the band has opened to the Mediterranean area. QSL to Paul Simons, G4CCZ, Westwood, Faris Lane, Woodham, Surrey KT15 3DJ, England.

144-MHz Standings

Two-meter band standings are compiled each March 1 for publication in May. At least 10 states worked are needed for inclusion. To ensure that the standings reflect recent activity, updated information must be submitted within the previous two years. Stations dropped for lack of recent reports will be reinstated with a current update. It is not necessary to have worked additional states or grids, but please confirm your continued activity at least every two years. New reporting forms will be supplied with an SASE. Column headings are: call sign and state, US states, DXCC countries and grids worked, and best terrestrial DX in kilometers.

W1JR*	MA	50	22	183	2304
K1FO*	CT	50	—	98	—
WA1OUB*	NH	41	—	155	—
W1AIM*	VT	41	8	143	2092
K2LME/1*	CT	36	14	143	2075
N1AIS	MA	34	4	32	2380
N1GDP	ME	33	4	139	2480
W1RIL	MA	32	—	96	2264
W1GXT	MA	32	2	—	—
W3EP/1	CT	31	3	128	2022
W1EJ	NH	31	—	—	—
K1FWF	MA	30	3	—	—
K1SF	MA	29	1	—	—
WA1AYS	MA	27	3	—	—
WA1LOU	CT	25	—	—	2212
W1PLX	ME	24	2	85	—
KD1DU	CT	23	2	66	1630
WA1HYN	RI	19	—	58	—
K1WVX	CT	12	2	32	—
K2GAL*	NJ	50	59	401	—
W2PGC*	NY	50	10	90	—
N2WK	NY	38	3	162	2279
W2UAD	NY	38	3	120	2300
WA2FUZ*	NY	38	10	102	—
NB2T	NY	38	—	46	—
W2BLV	NJ	37	3	150	2510
WB2CUT	NJ	37	2	—	—
K2OVS	NY	36	4	101	2800
WV2C	NY	32	4	121	—
N2LIV	NY	30	3	93	—
W2WGL	NY	29	—	110	2000
WA2BAH	NY	29	3	84	—
KU2A	NY	26	2	101	2117
N2DXP	NY	26	—	89	—
N2DKP	NY	26	1	89	—
WB2VVV*	NJ	22	6	61	2080
KC2TA	NJ	16	3	37	—
KI3W*	PA	50	61	337	—
KB3PD*	DE	50	18	140	—
K3HZO*	MD	45	29	208	1593
W3CWG	PA	38	—	230	—
K1HTV/3	MD	38	—	152	1470
W3RUE	PA	38	2	129	2560
W3ZZ	MD	37	5	206	2223
KA3WSZ*	DE	37	6	102	—
AE3T	PA	37	—	—	—
W1DGA/3	MD	36	—	136	—
KA3KHZ	DE	35	2	132	2087
W3OTC	MD	35	2	85	—
K3KEL	PA	34	2	101	2120
WA3DMF	MD	32	4	59	2050
W0RSJ/3	PA	24	1	50	—
WA4MVI*	SC	50	27	—	2498
KK4NO*	SC	45	11	103	2092
K4CAW	NC	43	41	183	—
WA4PCS	KY	41	2	—	—
W5SUS*	FL	40	—	322	—
WE4K	KY	40	2	154	1860
W4HHK	TN	40	—	—	—
K4CKS	GA	39	5	216	2400
WB4AXQ	AL	39	1	206	—
WB4DBB	VA	39	—	170	2600
WD4AFY	GA	39	—	160	—
W4LNG	GA	39	—	57	—
K4QIF*	VA	39	2	—	—
W8QXO/4	GA	38	1	170	—
WD4AHZ	FL	37	7	206	2485
W4ISS	GA	37	—	—	1580
NA4I	GA	35	3	1134	—
N4KWX	VA	34	2	107	—
KB3NR	FL	32	3	136	2700
NI4Z*	FL	32	5	135	3056
WD4MGB	FL	32	7	71	2180
WD4KPD	NC	31	2	109	2349
K1FJM/4	FL	30	—	123	—
N4MM	VA	29	5	130	—
WD4FAB	FL	26	1	106	2158
WB4NFS	VA	25	2	50	1500
AA4H	TN	16	—	42	850
WD4O	VA	13	1	35	858
K5YY*	AR	50	30	406	2370
WB5IGF*	AR	50	32	275	2850
W5RCI*	MS	50	9	237	—
W5UWB*	TX	50	—	—	—
WA5VJB*	TX	50	12	—	—
K5UR	AR	48	4	406	—
K5SW	OK	47	6	255	2259
W5FYZ	LA	44	3	236	2386
W5AL	TX	42	3	255	2450
W5NZS	OK	41	—	162	—
KA5WRG	OK	38	1	89	—
N5BBO	TX	35	—	93	—
W5DFU	OK	32	2	130	2132
WA5IYX	TX	30	—	—	—
N5KWB	LA	29	2	148	—
AA5C	TX	29	1	124	2183
KB5EK	OK	29	1	116	—
KF5IU	LA	26	3	112	2174
W5OZI	TX	23	2	128	2288
WA6MGZ*	CA	50	81	346	3778
WA6PEV*	CA	50	35	—	—
K6HXW*	CA	49	32	318	—
K6AAW*	CA	47	20	165	1760
N6AMG*	CA	32	—	—	—
K6QXY*	CA	21	8	—	3794
WA6IJZ	CA	18	4	67	—
N6RMJ	CA	16	4	102	—
K1FJM/6*	CA	16	6	51	1360
KB6IGC	CA	12	3	50	—
W6RXQ	CA	11	—	41	—
W7HAH*	MT	50	70	377	3027
WA7KYM*	WY	47	23	150	—
W7JF*	MT	47	—	—	—
W7RV*	AZ	44	—	169	—
N7WS*	AZ	39	18	—	2150
K7ICW*	NV	30	6	136	—
WA7GSK	ID	24	2	151	3032
NJ7A	UT	24	3	86	1776
W7YOZ	WA	17	2	64	3495
NC7K*	NV	16	3	93	2098
WA6IJZ/7	AZ	12	—	18	—
WA7OEU	WA	10	2	52	2273
K8BHZ*	MI	50	20	184	1914
WB8PAT*	OH	50	34	123	1758
W8WVM*	WV	45	29	110	—
KU8Y	MI	40	2	195	1930
WA8EOJ	OH	39	2	178	2208
W8IDT	MI	39	1	60	1850
K8WKZ	MI	39	—	—	—
KE8FD	OH	38	3	163	—
W8NJR	OH	37	2	150	1934
WB8TGY	MI	37	2	126	—
W8VO	MI	37	—	92	—
W8OUD	OH	19	2	70	965
N8EVA	OH	14	2	42	738
N8LOT	OH	12	—	49	—
W9UD	IL	46	—	200	—
NN9K	IL	45	2	215	—
WB9OJR	IL	43	2	208	2163
N9AQ	IL	42	1	232	1966
W0UC/9	WI	40	2	163	2052
N0AKC/9	WI	40	5	113	1917
WF9M	IN	39	1	157	1700
W9YCV	WI	37	1	156	—
K9SM	IL	37	2	110	—
WB8YFE/9	IN	33	4	144	2486
WA9LWJ	WI	33	2	135	1950
WB9GKA	IL	33	2	121	—
N9CUE	IN	33	2	103	2300
KD9TH	WI	31	—	111	—
AA9AO	WI	25	2	102	1800
WA9PWP	WI	23	2	106	1400
WD9BGA	WI	14	2	44	1462
NZ9U	WI	14	1	41	1550
N9LAG	IL	13	3	48	1781
WD9IAB	WI	12	2	26	1300
K0IFL*	MO	50	54	366	—
KB0HH*	KS	50	—	252	—
W0RT*	KS	50	17	150	2567
W0RWH*	MO	50	44	—	2288
W0HP*	MN	50	60	—	—
K0DAS*	IA	48	2	132	—
N0LL	KS	46	—	302	2359
W0HHE	CO	45	1	200	—
W0FY	MO	44	—	214	—
WQ0P	KS	44	—	180	—
K0CJ	MN	44	2	—	2330
WA0BWE	MN	43	—	147	2560
K0GJX*	MN	43	3	130	—
W0IZ	IA	42	2	208	2445
K0FQA	MN	42	1	114	—
W0DFK	MO	41	2	198	2026
KW0A	MO	41	2	182	2200
W0RAP	IA	41	2	108	2252
KB0ZQ	MN	37	2	156	—
W0JRP	MO	36	3	188	2150
NT0V	ND	32	9	125	2120
N0HJZ	MN	32	2	119	2092
K0RZ	CO	24	2	81	2390
N0KRX	SD	20	2	75	2413
WD0CJM*	MN	20	5	67	1796
WS0H	MN	18	—	48	1150
WA0CQD	IA	16	—	56	—
N9CIQ/0	MN	15	2	50	1550
WA0NTT	MN	12	1	64	1400
VE3FKX*	ON	41	—	—	—
VE3KDH*	ON	37	—	158	—
VE6TA*	AB	36	24	141	2425
VE4AQ	ON	30	2	102	—
VE1MQ*	NB	25	2	64	2500
AL7FS*	AK	50	—	—	—
SV1DH		0	40	201	7230

—Information not supplied
*Includes some EME contacts

QST

Strays

PORTUGUESE HANDBOOK

◊ The first Portuguese-language Amateur Radio handbook has been published by Edusp at the University of São Paulo. With 633 pages, it's about half as thick as the *ARRL Handbook*, and its contents are tailored to the needs of hams in five Portuguese-speaking countries (including Portugal, Brazil, Angola, Mozambique and Cape Verde) and those in 18 Spanish-speaking countries, 95% of whom don't read English. Amateur Radio literature in Portuguese has been scarce for seven decades, and the *Handbook do Radioamador* has been endorsed by REP and LABRE (the national Amateur Radio societies of Portugal and Brazil, respectively). The author is Iwan Thomas Halasz, PY2AH, a broadcast transmitter industry executive who's been a ham for 20 years and has published more than 130 articles on Amateur Radio in Brazilian technical magazines. Write to Iwan at 1662 Cardoso de Almeida, São Paulo 05013-001 Brazil.

I would like to get in touch with...

◊ any Amateur Radio operator who was a member of the air or ground crew of a B-24/PB4Y-1 Liberator bomber during WWII, to set up a B-24 net on HF. Bill Pearce, WØMWO (USNR-Ret), Secretary/Publicity Director, Fred E. Weisbrod/International B-24 Memorial Museum, 31001 Magnuson Ave, Pueblo, CO 81001.

◊ any radio amateurs who served aboard the US Navy carrier USS *Oriskany* (CV-34) before or during the Korean Conflict. Harlow Beene, W5ZSL, PO Box 348, Glorieta, NM 87535.

◊ anyone who served with the 4th Signal Battalion, 10th Corps in Korea, during 1951 and '52. LaVern Smith, K9QZX, Rte 1 Box 368D, Poland, IN 47868.

◊ anyone who was in the "radio gang" on the USS *Los Angeles* while in Korean waters from June 1952 to May 1953. Robert Frie, AA4UH, 8341 Sandberry Blvd, Orlando, FL 32819.

◊ anyone who has a program and documentation for a Digicom 64 v 2.0 and 1.51. G. H. Lunday, KA5GJE, Box 603, Fritch, TX 79036.

◊ anyone who has a diagram for a Lafayette model TE-18 grid dip meter. Sam Beverage, W1MGP, RR 1 Box 858, North Haven, ME 04853-9719.

◊ hams who are members of Amtrak operating crews and ham railfans in my area. Carol Larsen, KA9HFA, 129 N 9th Pl, Sturgeon Bay, WI 54235.

Packet Perspective

Conducted By Stan Horzepa, WA1LOU
One Glen Ave, Wolcott, CT 06716-1442
Internet: horzepa@gdc.com Compuserve: 70645,247

N4QN's HP-48 Packet Calculator

Al Gerheim, N4QN, of Westerly, Rhode Island, wrote to tell me about how he was using his Hewlett Packard HP-48 programmable calculator for packet radio. His story was interesting to me (and I don't even own an HP-48), so I thought I'd pass it along to you.

"You have to be one sick dude to run packet on an HP-48...."

So started the packet message from my cousin John Wrobleski, KF4HH, in Ventura, California. I'd asked him a few questions about the serial interface of the HP-48 pocket calculator and, by the time the message made the circuit, I'd ironed out most of the bugs.

The Hardware Connection

The concept was simple. When you use the fine-print graphics mode of the calculator, there's enough real estate on the calculator's screen for a 33-character, 10-line display. A little sketching indicates that this is plenty of room for the frequency, call sign, date (sans year) and time for 10 DX spots. If this didn't pan out, I was prepared to use paper tape. The menu keys could cover the basic functions: connect, disconnect, show DX (**SH/D**) and issue a DX report. Although full-featured packet operation would be out of the question (except maybe for one QSO on Field Day), the HP-48 would make a compact, functional DX *PacketCluster* terminal.

The interface is wired by connecting the 9-pin connector supplied with the calculator's interface kit to the TNC's 25-pin RS-232 connector as follows:

HP-48	*TNC*
9-pin	25-pin
2	2
3	3
5	7

The 9- to 25-pin adapter provided with the calculator won't work because pins 2 and 3 are reversed. The **SRECV** command works exactly as described in the manual with this wiring.

The Software Connection

Sending wasn't that simple because the HP-48's version of a carriage return (right-shift, period) isn't the real thing. This allowed for some "character building" until a clever solution was discovered: I stole a carriage return off the air, edited it out of the received string and stored it as the variable **EOL** (end of line). (The command sequence *13* **CHR** will produce a real carriage return, too.) The command set is completed by noting that **CTRL-C** is equivalent to command **SBRK**.

The tricks of using the calculator as a DX spotter are parsing the goodies out of the incoming string and using the menu features to keep the typing to a minimum. The program starts by searching the input stream for carriage returns (real ones), using the **SRECV** command, one character at a time. Use this logically to prevent time-outs from triggering the parsing routine. After the carriage return is found, the next character is read and discarded, then three characters are read together. If these three characters contain the substring **DX**, we have a DX bulletin that can be parsed and displayed. The date is left blank to indicate that the source was a bulletin and not a reply to **SH/D**.

If the first three characters are the first three characters in my call sign, they indicate the beginning of a prompt which won't be displayed. Anything else can be assumed to be a response to the **SH/D** command and is parsed accordingly. If anything else comes in, it will be cut up like mincemeat and displayed on the screen (Talk and Announce features can not be supported on the calculator). It's important to have **ECHO ON** so that the carriage return following the command's echo will trigger the parse sequence.

DX reports are generated with the assistance of the **INPUT** command. Only the frequency, call sign and comments need to be entered. Everything else is automatic.

Commanding the HP-48

The menu functions I programmed are as follows:

- **SEND** The basic transmit command. It's provided in case you have to go beyond the preprogrammed commands or need to change the TNC modes. It prompts you for a string, tacks on a carriage return and sends it to the TNC.
- **REC** This is the guts of the program. It receives the input stream and filters out the DX reports. The report can be in two formats: replies to **SH/D** requests or spontaneous DX bulletins issued by other operators. Talk, converse and announce receptions result in garbage.
- **SH/D** Transmits an **SH/D** request. Qualifiers (like 40) are selected from the **QUAL** menu.
- **DX** Prompts you for the DX frequency, call sign and comments, then transmits them in the proper format.
- **CON** Issues a connect request. The stations are user-selected from the **STN** menu.
- **DIS** Disconnect.
- **SBRK** Equivalent to **CTRL-C**; use it to get back to the Command Mode.
- **RALL** Prints the entire incoming data stream on the screen in scrolling format. The output looks awful, but used in conjunction with the **SEND** command, it gives you the option of attempting full-featured packet radio. (John was right—this mode *is* pretty sick, but then again, there are 100 bonus points for one packet QSO on Field Day!)
- **CONV** Sends a **K** to the TNC to return to the **CONVERSE** mode.

Some special commands I included follow:

- **TIME** Reads the calculator's clock and sends the **DAYTIME** message to the TNC to update its clock.
- **FO** Sends **FO BBSWYN** to the TNC to initiate autoforwarding with my local PBBS, BBSWYN.
- **BUCK** Sends a **SH/BUCK** request to the PBBS. It prompts you for a call sign.
- **QSL** Sends a **SH/QSL** request to the PBBS. It prompts you for a call sign.

The parsing routines in **REC** are specific to the formats generated by the NE1R DX cluster and they may have to be revised to accommodate other formats. I use an MFJ-1278, but any TNC should work with the HP-48. The user should load the variable c3 and the menus **STN** and **QUAL** to suit his own needs.

Thanks to the gang in the Yankee Clipper Contest Club for putting up with me during the debugging runs. I SWLed all those spots on 40 just so I could debug the program!

(The listing for this program is available from three sources. You may download it from the ARRL HQ BBS at 203-666-0578, you may request a copy from the ARRL server on Internet (info@arrl.org) or you can get a printed copy of the listing by sending an SASE to HP Horzepa, One Glen Ave, Wolcott, CT 06716-1442.)—*Al Gerheim, N4QN, 1 Woodline Dr, Westerly, RI 02891*

ANDY FREEBORN, NØCCZ, SK

Packet radio pioneer Andy Freeborn, NØCCZ, of Colorado Springs, became a Silent Key on Saturday, February 5, 1994. Andy was a WW II fighter pilot and POW, who retired from the US Air Force in the early '70s with the rank of colonel.

He became involved with the Tucson Amateur Packet Radio Corp (TAPR) at the inception of the TNC Beta Test in 1982. Andy became the beta coordinator for Colorado and, soon thereafter, helped found the Rocky Mountain Packet Radio Association (RMPRA). RMPRA was one of the early regional packet radio organizations devoted to implementing a coordinated packet radio network.

Andy was elected to the TAPR Board of Directors in 1985 and served through 1991. In 1988, he took over the reins of TAPR and served as its president for two years. During this time he organized and sponsored the Eighth ARRL Amateur Radio Computer Networking Conference (1989). He also arranged for TAPR's donation to AMSAT of half the cost of PACSAT (AO-16).

Those of us who had the privilege of knowing and working with Andy will sorely miss him as a wise counselor and friend.—*Lyle Johnson, WA7GXD, Tucson, Arizona*

Genesee County RC Celebrates 60 Years

By William Coale, KB8MBJ
c/o Genesee County RC Inc
PO Box 485
Flint, MI 48501

A year of planning and related activities culminated in the 60th Anniversary/Presidents' Night Banquet, which celebrated the Genesee County (Michigan) RC's 60 years of Amateur Radio service. Ideas for making this special year even more memorable started to surface as the new board of directors took office in January 1993. Over about six months, plans crystallized and the wheels started turning to convert ideas into reality. In June, members operated club station W8ACW as a special-event station from its headquarters in the Red Cross facility in downtown Flint, Michigan. This commemorated the club's being awarded the 1953 Edison Amateur Radio Award for excellence in emergency communication in response to a devastating tornado that ravaged the Beecher area of Flint. The special-event station netted almost 400 contacts, and operators heard from former Flint residents and tornado survivors. A couple of weeks later, we were back at it again with our traditional Field Day activities.

In the second half of the year, club leadership focused on the anniversary banquet. We ordered a plaque listing each of the club's presidents from 1933 to 1993 and we compiled a roster of more than 300 "celebrity" Amateur Radio operators, including famous people and a few who had the same names as well-known people. A stack of letters issued forth and we received 50 responses, some from very well-known people. We asked respondents to provide signed QSL cards, preferably with a short congratulatory note concerning the club's 60th anniversary. Many obliged with a second signed card, which was put up for auction during the banquet. Others sent books they had written and provided signed photographs.

Another avenue to explore was the political arena, and we garnered success there, too. The club received a congratulatory letter from our US representative, and the Genesee County Board of Commissioners issued a special proclamation.

As the date of the banquet approached, we operated a special-event station to commemorate the 60th anniversary. This gave members another way to be active in our celebratory activities and to feel the pride of belonging to an organization with a rich heritage and long tenure of service to the community.

The evening of December 5, 1993, started with a banquet that included displays of the "celebrity" ham QSL cards and messages; the July 4, 1992, SAREX event, which the club sponsored for area youth; and plaques and commendations the club had received over the years. As banquet guests arrived, we took photographs to document the event.

Genesee County RC First Vice President Dan Smith, N8NDV (l), presents the Genesee County Board of Commissioners Proclamation to President Bill Coale, KB8MBJ, at the 60th Anniversary banquet.

Following a delicious feast, the evening program featured a presentation of annual club recognition awards. Then we held a "Roll Call of Presidents," when each of the 44 presidents of the club was recognized. The presentation of the plaque honoring our presidents was held, with many former presidents in attendance accepting the plaque *en masse*.

The keynote speaker was Gennadij Khonin, UL7QF, a visitor to Flint from Alma Ati, Kazakhstan, who gave us a fascinating perspective on Amateur Radio from a viewpoint much different than ours. He's an astrophysicist and is in the US to study theology, Greek and English. Gennadij has become a treasured friend of our club in the short time we've known him, and we hope to continue the relationship after he returns to his native land. The Genesee County RC is establishing "sister club" status with the club in Alma Ati.

The banquet was a wonderful way to close out a special year and to honor those who gave so much time and energy to make a great club better. Thanks to all who made this event possible and here's to 60 more great years for the Genesee County Radio Club!

Correction: Oops—we goofed! Our apologies for misidentifying Mike Branscum, N5XNN, in the photo of the RESPOND of Arkansas ARC in our April column. Mike is the happy-looking fellow on the far left, sitting beside his wife, Nancy.

ARRL SPECIAL SERVICE CLUBS RECOGNIZED

Administered By Vicky Armentano

Congratulations to the following ARRL Special Service Clubs (this list reflects activity in January and February 1994).

Renewing Special Service Clubs, January 1994:

American Red Cross ARC, Silver Lake, MN
Antietam RA Inc, Hagerstown, MD
Augusta ARA, ME
Blue Valley ARC, Beaver Crossing, NE
Central Vermont ARC, Montpelier
Dalton ARC, GA
Fox Cities Amateur RC, Appleton, WI
Golden Empire ARS Inc, Chico, CA
Green Fox Amateur RC, Oshkosh, WI
Inland Empire VHF RC, Spokane, WA
Lincoln ARC Inc, NE
Mecklenburg ARC, Charlotte, NC
Kansas-Nebraska RC Inc, Concordia, KS
Portland ARC, OR
RA of Western New York, Tonawanda
RC of Tacoma Inc, Puyallup, WA
Ripley County Repeater Association, Oldenberg, IN
Rock Creek ARA, Silver Spring, MD
Shy-WY ARC, Cheyenne, WY
Sierra Foothills ARC, Auburn, CA
South Jersey RA, Haddonfield, NJ
Valley of the Moon ARC, Sonoma, CA
Western Carolina ARS, Asheville, NC

New ARRL Special Service Clubs, January 1994:

Inland Empire ARC, Ontario, CA
Palestine Anderson Co ARC, TX
Racine Megacycle Club, WI

Renewing Special Service Clubs, February 1994:

ARC of El Cajon, CA
Atlanta RC, GA
Elkhorn Valley ARC, Norfolk, NE
Milford ARC, Cincinnati, OH
Mt Tom Repeater Association, Springfield, MA
Murgas ARC, Wilkes-Barre, PA
Newington Amateur Radio League, CT
North Coast ARC, Cleveland, OH
Northern Berkshire ARC, Williamstown, MA
Palomar ARC Inc, Vista CA
Portage ARC, Mantua, OH
Poughkeepsie ARC, Wappinger Falls, NY
Southern Peninsula ARK, Hampton, VA
York RC, Villa Park, IL
10-70 Repeater Association Inc, Maywood, NJ

New Special Service Clubs, February 1994:

Electronic Applications Radio Service, Evansville, IN
McKinney ARC, Allen, TX
Orange Park ARC, Jacksonville, FL
South Bay ARS, Chula Vista, CA

Members of the Dayton High School Ham Radio Club of Dayton, Nevada, gather around the club station, where students are active on 2-meter packet and 10-meter phone. Left to right: Shawn Hall, KB7UZB; Toni Parkkinen, KB7SZD (Toni is a foreign exchange student from Finland, and we hope to hear him on the air soon, now that he has returned home); Monique Thomas; Jason Van Hooser; Jose Cabral; and Jared Manning, KB7GJN. *(Thanks to Steve Knight, WB7VFB)*

At the Foundation

Conducted By Mary E. Carcia, N7IAL
Secretary, The ARRL Foundation, Inc

IARU Beacon Network to Benefit From Grant

Active DXers and shortwave listeners rely on HF beacons to help determine long-range openings. Amateur beacons operated by 4U1UN, ZS6DN/B, OH2B and JA2IGY/B on the 14-MHz band help hams quickly determine the prospects for working a sought-after country or to learn of general band conditions.

The Northern California DX Foundation (NCDXF) and the International Amateur Radio Union (IARU) have for many years supported the concept of a multiband, worldwide beacon network. Their joint efforts have resulted in a first: W6WX/B's state-of-the-art, three-band beacon transmitting on 14.100, 21.150 and 28.200 MHz. This beacon is part of a planned upgrade (and new installations) in the entire NCDXF/IARU World-Wide Beacon Network. In addition to multiband capabilities, new beacons are expected to feature Global Positioning System (GPS) timing controls, according to John Troster, W6ISQ, international beacon coordinator. At an estimated cost of $2500 (US) for each new beacon package, the NCDXF is raising funds to finance the acquisitions. Member societies in each IARU Region have been asked to pledge their financial and technical support for this effort. The ARRL Foundation, underwriting the ARRL's commitment to this important project, has awarded a $5000 grant. Want to help? Send your check or money order to NCDXF/IARU World-Wide Beacon Project, Box 2368, Stanford, CA 94309-2368.

In Praise of Repeat Contributors

You know who you are. Your name has appeared more than once in "Contributor's Corner" and you may have included a funny note or warm letter with your generous contribution. Perhaps you're the one who, with every annual renewal of your ARRL Membership, includes a contribution to your favorite Foundation program. Maybe you're an anniversary contributor, whose annual check salutes an Amateur Radio event of personal significance. Whatever your motivation, *QST* readers take notice and admire your generous spirit. We at the Foundation are especially grateful because you provide continuous support for diverse programs for hams. Haven't made a contribution in a while? It's not hard to become one of the notable. Send a contribution today to the ARRL Foundation, 225 Main St, Newington, CT 06111.

Contributor's Corner

We wish to thank the following for their generous contributions to:

The Jesse Bieberman Meritorious Membership Fund

Steel City ARC Inc (PA)
in memory of John Praskach, N3GYF

The Victor C. Clark Youth Incentive Program Fund

Edgar Everhart, AB2F
in memory of Robert Morgan, K2RXO
Jack Farrance, N3BZ
in memory of Lou Aceto, K4MTW
Lew Gordon, K4VX
in memory of Leonard Chertok, W3GRF
Kinston ARS (NC)
in memory of William Ketter, WA4VWP
Richard Scott, W8FDN

The Fred R. McDaniel Memorial Scholarship Fund

W. B. Jackson, W5WJ
E. L. Fowler, W5CML, and Wilma Fowler

The Goldwater Scholarship Fund

Michigan Amateur Communications System
in memory of Ralph Higgins, WD8DJS
Judy Atencio*
Steve Costin*
Charlotte Farr*
Lynn Hamblin*
Chris Heck*
Mike McElreath*
Pat McJunkin*
Jeff Miller*
Tony Pedersen*
Jeff Porter*
Jorga Schmaing*
Diana Sharum*
*in Memory of Paul Knittle, KD7SW
Wolverine Single Sideband Net (MI)
in memory of Vera Degood, K8MSI, and Gary Fox, W8NDI
Clinton ARC (IA)
in memory of Carleton "Stuke" Sloane, KØAEF, and Paul Brewer Sr. NØVVZ

The General Fund

Al Cohen, W1FXQ
in memory of Jim Whitney, WA1YZA; Mike Otnisky, KA1CSA; and Henry Busch, KA1DMO
Craig Kalfey, N1ABY
in memory of Bob Elton, NI2B
George Keller, W2DM
in memory of Daniel Valle, N2SPB
Wayne Wadamoto, WN6OTO**
B. Chandler Shaw, WA6EWY**
in memory of the Bendix ARC (CA) (now disbanded)**
Indiana Radio Club Council (IN)
in memory of Cornelius Head, WB9ZQE
Anthony F. Turrin***
Kelly Smith***
Dept of Biological Sciences/ Rutgers Univ (NJ)***
***In memory of Richard Turrin, W2IMU
Mrs John S. Hopkins
in memory of John S. Hopkins, ex-K6AQ
John Cantron, K5ZA
in memory of Walter Johnston, KH6DH
Edwin Cobb, WB1CGX
Ralph Toye, W1GPL
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George Shipston, KA2OEC
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William Brothers, KF9RI
Tod Olson, KØTO
Elmer Nolte, DJ0BX
Manuel De Aquilar, EA8ZS
Mike Rogers, G4NAR
Danny Sumendap, YC0DZ
Yasuyuki Hashida
Edward Peter

As received and acknowledged during Jan and Feb.

Strays

QST congratulates...

◊ Dean Wallace, K2ANM, age 94, on being the oldest active Amateur Radio operator in Herkimer County, New York. The Ft Herkimer ARC will honor Dean at a party May 1 at the Herkimer County Home for the Aged. Dean was born in 1899 and has held the call signs 8AAF (1919), 8DSM (1922) and W8GLZ (1932). A widower, Dean has five sons and once worked for an electric company, became a projectionist in the days of the silent movies, and went to work for RCA as an installer and instructor when sound arrived. He's a daily check-in on the Carrier Net and regularly operates on 2 meters. Dean's friends know his great spirit and unforgettable sense of humor.—*John Reed, N2WTF, Herkimer, New York*

◊ The following amateurs on 60 years of ARRL membership:
Harrison Hodge, W2CQR, New Milford, NJ
Wally Bernath, K4UAS, Winston Salem, NC
E. Paul Crossno, W5HT, Dallas, TX
S. Arlo Sullivan, W6WXU, Sonoma, CA

◊ The following amateurs on 50 years of ARRL membership:
Henry Treger, W2AMS, Westfield, NJ
Biagio Trimboli, W2PBH, Rosedale, NY
John Vargas, W2ULO, Raleigh, NC
Bert Green, KN4OU, Lake Worth, FL
Arthur Kay Jr, W5APX, Shelbyville, TN
Monty Bancroft, W6NJW, Sun Valley, CA
Marcos Paz, LU7BQ, Buenos Aires, Argentina
Clement Chase, W7JGU, Tucson, AZ
Harry Snyder, WØRN, Carefree, AZ

DIABETES BIKE-A-THON

◊ The American Diabetes Association sponsors its 22nd Annual Bike-A-Thon on May 14 in Missouri and Illinois, from 8:30 AM to 4:30 PM. Volunteer ham radio operators are needed to assist with public service communication support at the following sites: Forest Park, Katy Trail and Jefferson Barracks Park in Missouri, and Great River Road and Scott AFB in Illinois. If you can help, contact Dan Stolts, NØQFJ, 449 Vail Ct, Ballwin, MO 63021.—*Dr Dan Adamovich, KI5UN, St Charles, Missouri*

VHF/UHF CONFERENCE

◊ The Naval Security Group is holding a Beyond Line of Sight (BLOS) VHF/UHF Modeling Conference in Austin, Texas, August 2 through 4. It's being hosted by Applied Research Laboratories, University of Texas (ARL:UT) at Austin. The conference will address issues including BLOS radio-signal propagation, prediction models, observance mode phenomena, experimental validation, real-time sensors and other measures of the environment. Arnold Tucker, PO Box 8029, Austin, TX 78713-8029; tel 512-835-3294; fax 512-835-3259 or Gus Lott, KR4K, Naval Security Group, 3801 Nebraska Ave, Washington, DC 20393; Internet e-mail 0005308381@mcimail.com.

I would like to get in touch with...

◊ anyone with experience building, installing or operating diversity receiving equipment. W. Clem Small, KR6A, 764 Coal Pit Rd, Corvallis, MT 59828.

◊ anyone who has Wegener's Granulomatosis and would like to share information and support. Bud McCollum, W3TYX, PO Box 145, Penns Park, PA 18943.

Coming Conventions

NEBRASKA STATE CONVENTION

May 13 and 14, 1994, South Sioux City

The Nebraska State Convention and Hamboree No.16 is sponsored by the 3900 Club and the Sooland ARA, and will be held at the Marina Inn. Doors open Fri 11 AM, Sat 8 AM. Features include VE sess, flea market, Fri dinner, banquet Sat ($12.25). Admission is $6. Talk-in on 146.91/.31. Flea market info contact Al Smith, WØPEX, 3539 Douglas St, Sioux City, IA 51104; tel 712-258-7475. Convention info contact Dick Pitner, WØFZO, 2931 Pierce St, Sioux City, IA 51104; tel 712-258-1520.

ALABAMA STATE CONVENTION

May 14 and 15, 1994, Birmingham

The Alabama State Convention is sponsored by the Birmingham ARC and will be held at the Civic Ctr, downtown. Doors are open Sat 9 AM to 5 PM, Sun 9 AM to 3 PM. Features include banquet, ARRL forums. Admission is $6. Talk-in on 146.28/.88. Birminghamfest '94, PO Box 10521, Birmingham, AL 35202-0521; tel 205-979-7039.

ATLANTIC DIVISION/NEW YORK STATE CONVENTION

May 20 to 22, 1994, Rochester, New York

The Atlantic Division/New York State Convention is sponsored by the Rochester ARA and will be held at the Monroe County Fairgrounds, Rte 15A and Calkins Rd. Doors open at noon Fri for the flea market, exhibits open 8:30 AM Sat and Sun. Features include equipment, software, shareware, vendors, Sat banquet, programs. Admission is $6 advance, $8 at the door. Talk-in on 146.28/.88. Ticket requests Irv Goodman, AF2K, 515 Drumm Rd, Webster, NY 14580. Contact the Rochester Hamfest office at 716-424-7184.

1994
June 17 and 18
Georgia State, Albany
June 18
Tennessee State, Nashville
July 2 and 3
West Virginia State, Jackson's Mill

WEST GULF DIVISION CONVENTION

May 20 to 22, 1994, Tulsa, Oklahoma

The West Gulf Division Convention is sponsored by the Green County Hamfest and will be held at the Maxwell Convention Ctr, 7th and Houston downtown. Doors are open for setup Fri 1 PM to 9 PM; public Sat 9 AM to 5 PM, Sun 9 AM to 1 PM. Features include forums, free banquet Sat 6 PM. Admission is $8 advance, $10 at the door. Talk-in on 146.28/.88, Millie Warwick, KJ5FH, 918-241-6240.

NORTHWESTERN DIVISION CONVENTION

June 4 and 5, 1994, Seaside, Oregon

The Northwestern Division Convention is sponsored by the Oregon Tualatin Valley ARC. Doors are open Sat 8 AM to 5 PM, Sun 8:30 AM to 2 PM. Features include banquet, flea market, commercial exhibits, seminars, VE sess. Admission is $6 advance, $8 at the door. Talk-in on 146.66. Brad Beach, N7NVC, 503-657-1781

ARRL NATIONAL CONVENTION

June 10 to 12, 1994, Arlington, Texas

The ARRL National Convention is sponsored by Ham-Com and will be held at the Arlington Convention Center, DFW Metroplex. Doors open Fri 11 AM to 9 PM, Sat 6 AM to midnight, Sun 7 AM to 2 PM. Features include world-class DX programs, educational forums and seminars, wall-to-wall exhibits, dealers, flea market, ARRL forums and officials, DX lunch, ARRL banquet, ARRL Wouff Hong ceremony, QCWA breakfast, SKYWARN school. Admission is $10 advance by Jun 3. For info on tickets and preregistration contact Ham-Com '94/ARRL '94 National, attn: Stephanie Gentry, PO Box 861829, Plano, TX 75086; 214-442-1721 (voice and fax).

Attention Hamfest and Convention Sponsors: ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You're encouraged to register your event with HQ as far in advance as your planning permits. Hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register: Registering dates with ARRL HQ doesn't constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests; this must be done by your Division Director. For conventions, approval must be made by your Director and by the Executive Committee. Application forms can be obtained by writing to or calling the ARRL Convention Program Manager, tel 203-666-1541, ext 283.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance. QST

Hamfest Calendar

Administered By Christine N. Hushin
Convention Program Manager

Attention: The deadline for receipt of items for this column is the 5th of the second month preceding publication date. For example, your information would have to reach HQ by **May 5** to be listed in the **July** issue. Hamfest information is accurate as of our deadline; contact the sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance, such as raffles or bingo.

(Abbreviations: *Spr* = Sponsor, *TI* = Talk-in frequency, *Adm* = Admission.)

†**Arizona (Phoenix)—Apr 30.** *Spr:* Arizona ARC. I-17 to Bethany Home Rd, go E 1 mi to 15th Ave, follow signs. Free parking, handicapped accessible. *TI:* 147.28. *Adm:* $1. George Cooney, KQ7C, 602-274-6212.

Arizona (Sierra Vista)—May 7. 7 AM to 4 PM. Spr: Cochise ARA. Vendors, tailgaters, VE sess (contact Frank Ivey, 602-378-9404). *TI:* 146.76/.16, Tim Mize, 602-458-5257.

California (Livermore)—May 1, 7 AM to noon. *Spr:* Livermore ARK. Las Positas College (because of college security concerns, buyers and sellers must stay off college property until 6 AM the day of the swap). Swap meet. *TI:* 147.045 from the W, 145.35 from the E. Noel Anklam, KC6QZK, 474 Humboldt Way, Livermore, CA 94550; tel 510-447-3857 eves, BBS 510-294-8052, GEnie: N.ANKLAM.

†ARRL Hamfest

California (Carmichael)—May 21, 8 AM to 3 PM. *Spr:* North Hills RC, Carmichael Elks Lodge. Refreshments, free parking, commercial vendors, tailgating. *TI:* 145.19. Tables: spaces $10. NHRC, PO Box 41653, Sacramento, CA 95814-0635.

California (Sacramento)—May 15; set up 6 AM, public 7 AM to noon. *Spr:* Student ARC of California State University-Sacramento. CA State University Campus, US 50 and Howe Ave. Swap meet, free parking, refreshments. *TI:* 145.23 (-dup CTCSS 162.2 Hz). *Adm:* buyers free, sellers $10. Gary Webbenhurst, KC6URB, 916-381-6602 eves.

Colorado (Colorado Springs)—May 21; set up Fri 6 PM to 8 PM, Sat 6 AM; public 8 AM to 3 PM. *Spr:* Pikes Peak Radio Amateur Assn. Liberty High School, 8720 Scarborough Dr, exit 151 off I-25. Free parking, handicapped accessible, refreshments, VE sess (9 AM). *TI:* 146.97, 146.52. *Adm:* no adv, door $3, 14 and under free with paying adult. Tables: $10 first, $8 additional. John Kramer, NØVBM, 1765 Kimberly Pl, Colorado Springs, CO 80915; tel 719-550-1489 after 5 PM or Harvey Hunter, WA3EIB, 1437 N Chelton Rd; tel 719-597-8964.

†**Connecticut (Newington)—Jun 5:** dealers 8 AM, public 9 AM to 1 PM. *Spr:* Newington Amateur Radio League. Newington High School, Rte 173 (Willard Ave), just N of Rte 175 (Cedar St). VE sess (no walk-ins), tailgating (weather permitting), tours of ARRL HQ and W1AW. *TI:* 144.85/145.45, 223.24/224.84, 443.05/448.05, 146.52. *Adm:* no adv, door $4. Tables: adv $15, door $20. Tables and general info, Albert Gerke, N1JWF, c/o NARL, 63 N Washington Ave, Plainville, CT 06062-1921; exam info, SASE to Susan Frederickson, WM1B, PO Box 165, Pleasant Valley, CT 06063.

†**Connecticut (Norwich)—Jun 11;** set up 9 AM, public 10 AM. *Spr:* Radio Amateur Society of Norwich, Bozrah Moose Lodge, Fitchville Rd, from Hartford exit 23 off Rte 2; exit 24 from Norwich. Free parking, auction. *TI:* 146.73. *Adm:* Free. Tony, N1MQS, 203-859-2041, or Rick, KD1LC, 203-376-2216.

Connecticut (Vernon)—May 22, 9 AM to 2 PM. *Spr:* Natchaug ARC, I-84 to exit 67, follow signs to Tolland Agricultural Ctr. Flea market, tailgating ($7), parking, refreshments. *TI:* 145.11/144.51, 146.52. *Adm:* $3. Tables: $10. Wayne Rychling, N1GUS, 59 Clint Eldridge Rd, Willington, CT 06279; tel 203-487-1921 eves.

Georgia (Athens)—Jun 11, 9 AM to 3 PM. *Spr:* Athens RC, Bishop Park, Sunset Dr, off US 129. Flea market, tailgating, refreshments, VE sess (9 AM). *TI:* 146.745. *Adm:* Free. George Kelley, WB4VNT, PO Box 6337, Athens, GA 30604; tel 706-546-7713 or Rodney Couch, KE4ANM, 800-959-8273.

Illinois (Chicago)—May 29; set up 6 AM, public 8 AM to 3 PM. *Spr:* Chicago ARC, DeVry Institute of Technology, 3300 N Campbell. Flea market, commercial exhibitors, VE sess, refreshments, free parking. *TI:* 147.255, 444.825. *Adm:* adv $3, door $4. Info 312-666-1606 or 312-545-3622 or write to CARC, 5631 W Irving Park Rd, Chicago, IL 60634.

Illinois (Decatur)—May 22, 8 AM to 2 PM. *Spr:* Cenois ARC, Richland Community College, corner of Reas Bridge Rd and Brush College Rd. Flea market, vendors, refreshments, VE sess (9 AM walk-

ins only). *TI:* 146.13/.73. *Adm:* $4. Decatur Area Hamfest, Spencer Carter, N9LVW, PO Box 4595, Decatur, IL 62525; tel 217-692-2460 eves.

†**Illinois (Godfrey)—May 21**, 8 AM. *Spr:* Lewis and Clark RC, Lewis and Clark Community College, Hwys 67 and 111. Refreshments, forums, commercial vendors, free parking. *TI:* 144.63/145.23. *Adm:* Free. Harold Elmore, KC9GL, 5203 Dixon Dr, Godfrey, IL 62035 or LCRC, PO Box 553, Godfrey, IL 62035.

†**Illinois (Princeton)—Jun 5**, 6 AM to 3 PM. *Spr:* Starved Rock RC, Bureau County Fairgrounds, on US Rte 6 S of I-80. Free parking, refreshments, flea market. *TI:* 146.355/955. *Adm:* adv $4, door $5. Tables: 8 feet $10 each. Bruce Burton, KU9A, or Debbie Burton, N9DRU, 1153 Union St, Marseilles, IL 61341-1710.

Indiana (Evansville)—Jun 5; set up 7 AM, public 8 AM. *Spr:* Tri-State ARS, Vanderburgh County 4H Ctr, Boonville-New Harmony Rd, ½ mi W of US 41N. *TI:* 147.15/146.79. *Adm:* no adv, door $5. Charlie Apfelstadt, N9GWS, TARS, PO Box 4521, Evansville, IN 47724; tel 812-477-7716.

†**Indiana (Wabash)—May 22**, 6 AM to 3 PM. *Spr:* Wabash County ARC, Wabash County 4-H Fairgrounds, Hwy 13 N. Dealers and campers welcome Sat night; refreshments, free parking. *TI:* 147.63/.03, 146.52. *Adm:* adv $4.50, door $5. SASE to Don Spangler, W9HNO, 235 Southwood Dr, Wabash, IN 46992.

Kansas (Augusta)—May 14, 8 AM to 1 PM. *Spr:* Flint Hills ARC, Augusta Airport. Flea market, dealers, refreshments, VE sess (reg 9 AM). *TI:* 147.15, 444.15. *Adm:* $2.50. Tables: $5. SASE to Flint Hills Hamfest '94, PO Box 173, Augusta, KS 67010; or call Leanna Gordon, KFØZL, 316-775-0300.

†**Kentucky (Paducah)—May 21**; set up 6:30 AM, public 8 AM to 2 PM. *Spr:* PARA. Hwys 45 and 60 at Noble Park Civic Ctr. VE sess, refreshments. *TI:* 147.06/.66. *Adm:* no adv, door $5. David Fraser, KQ4IU, 5715 Blandville Rd, Paducah, KY 42001; tel 502-554-7999 or Paul Smith, N4FFO, 229 Nickello Hts, Paducah, KY 42001; tel 502-898-6834; packet address @W4NJA.WKY.KY.USA.NA.

†**Louisiana (Baton Rouge)—May 21 to 22**; Sat 8 AM to 4 PM, Sun 8 AM to 1 PM. *Spr:* Baton Rouge ARC, The Great Hall, 7370 Airline Hwy (US 61), approximately 4 mi N of I-12 on US 61. Demos, forums, VE sess, HANDI-Hams forum, refreshments, banquet, flea market. *TI:* 146.79. *Adm:* adv $3, door $4. Herb Ramey, KB5AQ, 4079 Florida Blvd, Baton Rouge, LA 70806; tel 504-346-0000 days, 504-654-6087 eves or 800-256-FEST.

†**Louisiana (Springhill)—May 28**, 8 AM to 3:30 PM. *Spr:* Springhill ARC and Arkla ARA, N Main St. ARRL, SKYWARN, satellite, packet forums. *TI:* 146.13/.73, .147.99/.39. *Adm:* $3. David Smith, KF5BF, PO Box 812, Springhill, LA 71075; tel 318-539-3226.

†**Maine (Hermon)—Jun 11**, 8 AM to 1 PM. *Spr:* Pine State ARC. I-95 to exit 44 to US Rte 2, take US Rte 2 to Hermon Corner (at the Monument) then take the Billing Rd for 2 mi to the school. Refreshments, free parking, flea market, dealers, VE sess, technical demos, ARRL and Section forums. *TI:* 146.34/.94, 146.58. *Adm:* $3. Roger Dole, KA1TKS, RR Rte 2, Box 730, Bangor, ME 04401; tel 207-848-3846.

Maryland (Grasonville)—May 7, 8 AM to 2 PM. *Spr:* Kent Island ARC, Grasonville VFW. *TI:* 146.94. *Adm:* $4. Tom Dove, K3ORC, 410-643-4675; Glenn Durbin, WN3G, 410-643-1125; Jim Smith, K3UBC, 410-643-3338; Jerry Miante, K1JUM, 410-643-2782.

†**Maryland (Hagerstown)—May 22**, 8 AM to 3:30 PM. *Spr:* Antietam Radio Assn. Exit 32B from I-70 to Rte 40, turn right at Edgewood Rd, drive 1.8 mi to HJC. Refreshments, VE sess. *TI:* 146.34/.94. *Adm:* no adv, door $5. Antietam Radio Assn, PO Box 52, Hagerstown, MD 21741 or call Page Pyne, 301-714-0688 days; Fred Bailey, 301-416-8336 eves.

Massachusetts (Cambridge)—May 15; set up 7 AM, public 9 AM to 2 PM. *Sprs:* MIT Research Society, MIT Radio Society and Harvard Wireless Society, Albany and Main St. Free parking, tailgating (sellers $8 adv, $10 door, includes 1 adm). *TI:* 146.52, 444.725/449.725, (CTCSS 114.8 Hz, PL 2A), WIXM/R. *Adm:* $2. Mail adv reservations before the 5th to Steve Finberg, W1GSL, PO Box 82 MIT Br, Cambridge, MA 02139. For space reservations or info call 617-253-3776.

Michigan (Cadillac)—May 14. *Spr:* Wexaukee ARC, Cadillac Middle School. *TI:* 146.98. *Adm:* $4. Tables: $6. Wexaukee ARC, PO Box 163, Cadillac, MI 49601 or call Dan, KE8KU, 616-775-0998.

Michigan (Grand Rapids)—Jun 18; set up 6 AM, public 8 AM. *Spr:* Independent Repeater Assn, Wyoming National Guard Armory, 44th St, ½ mi W of the 131 X-way. *Adm:* adv $4 (reserved by Jun 11), door $5. Tables: 8 feet $5 each. Tom, KA8YSM, or Kathy, KB8KZH, 616-698-6627 or write IRA, 562 92nd St SE, Byron Ctr, MI 49315.

†**Michigan (Holly)—May 15**, 8 AM to 2 PM. *Sprs:* Fenton Area ARA and Sherman Middle School ARC, 15 mi S of Flint between I-75 (Holly exit) and US 23 (Fenton exit). Refreshments, forums, VE sess (register by 9 AM). *TI:* 146.18/.78, 447.25/442.25. *Adm:* no adv, door $4. Marty Van Gorp, FAARA Hamfest, PO Box 46, Fenton, MI 48430; tel 313-634-9826.

Minnesota (Duluth)—May 7, 9 AM to 3 PM. *Spr:* Arrowhead RAC, Marshall School, 1215 Rice Lake Rd. Free parking, ham and computer gear, refreshments. George Mead, KAØBUM, 4152 Ugstad Rd, Duluth, MN 55811; tel 218-729-6882.

Minnesota (Minneapolis)—May 21; set up 6:30 AM, public 7 AM to 1 PM. *Spr:* Twins LAN ARC, Honeywell Ridgway facility parking lot, 2600 Ridgway Pkwy, Stinson Blvd, exit off Interstate I-35 W. Tailgate swapfest, vendors, refreshments. *TI:* 146.76/.16. *Adm:* $2. Bill Brisley, NØBSN, 18025 Cynthia Dr, Minnetonka, MN 55345-4206; tel 612-474-0118.

†**Missouri (Kansas City)—May 21**; set up Fri after 2 PM, public Sat 8:30 AM to 5 PM. *Spr:* PHD ARA, KC Market Ctr, exit 57 off US I-435 (Front St exit). Handicapped accessible, free parking, seminars, QRP, ATV. *Adm:* $5 before May 9, $7 thereafter. Tables: 8 feet $10 each. PHD ARA, PO Box 11, Liberty, MO 64068-0011; tel 816-781-7313 or 816-792-2647.

New Jersey (Ellenville)—Jun 10 to 13. *Spr:* Chaverim International Association of Jewish amateurs and their friends), Fallsview Hotel, Arnold Halpern, W2GDS, 450 Brighton Ave, Long Branch, NJ 07740; tel 908-222-3009.

†**New Jersey (Harmony Twp)—May 21**; set up 6 AM, public 8 AM to 2 PM. *Spr:* Cherryville Repeater Assn, Warren County Farmers Fairgrounds, exit 3 off I-78. Tailgating ($10/space), VE sess (contact Marty Grozinski, NS2K, 908-806-6944), DXCC checking, free parking, refreshments, handicapped accessible. *TI:* 147.375, 146.82. *Adm:* $6. Keith Burt, KF5FK, 908-788-4080.

†**New Jersey (Teaneck)—Jun 4**, 8 AM to 2 PM. *Spr:* Bergen ARA. Follow Rte 4 to River Rd and follow signs to hamfest. VE sess, refreshments. *TI:* 146.19/.79, 146.52. *Adm:* $2. Jim Joyce, K2ZO, 201-664-6725; for VE info call BARA VE Hotline, 201-797-0151; no calls after 10 PM.

†**New York (Plainedge)—May 22**, 9 AM to 4 PM. *Sprs:* Great South Bay ARC and Suffolk County RC, Plainedge High School, Wyngate Dr. Refreshments, forums, VE sess. *TI:* 146.685/.085, 223.86 (CTCSS 136.5 Hz, PL 4Z). *Adm:* $7. Andy Feldman, WB2FXN, 516-928-3868, 7 PM to 10 PM; or Walt Wenzel, KA2RGI, 516-957-5726.

†**New York (Poughkeepsie)—May 15**; sellers 6 AM, public 8 AM to 1 PM. *Spr:* Mt Beacon ARC, ½ mi on Rte 55 W from the Taconic State Pkwy. Refreshments, VE sess. *TI:* 146.37/.97. *Adm:* $5. Ken Akasofu, KL7JCQ, 914-485-9617.

†**New York (Owego)—May 7**, 8 AM to 4 PM. *Spr:* Southern Tier ARC. Marvin Park Fairgrounds at Rte 17C exit 64. Banquet, VE sess, seminars, ARRL forum, vendors, flea market, refreshments, tailgating. *TI:* 146.16/.76, 146.52. *Adm:* adv $3, door $4. Tables: $15. STARC, PO Box 7082, Endicott, NY 13761-7082.

†**New York (Rome)—Jun 4**, 8 AM to 5 PM. *Spr:* Rome RC, Stanwix Heights Volunteer Fire Dept, Bartlett Rd. Flea market, refreshments. *TI:* 146.28/.88. *Adm:* $4. Tables: $5 each. James Needham, W4BNY, 6387 Bartlett Rd, Rome, NY 13440; tel 315-337-8521.

North Carolina (Gastonia)—May 29; set up Sat noon and Sun 7 AM, public 8:30 AM to 4 PM. *Spr:* Gastonia Area ARC, Karyae Park on Linwood Rd. Free parking, self-contained campers/motor homes welcome. *TI:* 146.805. *Adm:* adv $4, door $5, 12 and under free. Tables: $7. Ticket orders with SASE by May 15 to GAARC, PO Box 85, Iron Station, NC 28080-0085; dealers call Mike, N4AYO, 704-922-3593 eves; general info call Bill, WB4TSW, 704-732-1005, fax 704-434-5832.

†**Ohio (Canfield)—May 22**; set up 6:30 AM, public 8 AM to 3 PM. *Spr:* Twenty Over Nine RC, Canfield Fairgrounds, Rte 46. Free parking, handicapped accessible, flea market. *Adm:* adv $3, door $4. Tables: 8 feet $8. Don Stoddard, N8LNE, 216-793-7072.

Ohio (East Liverpool)—May 7, 8 AM to 3 PM. *Spr:* Triangle ARC, Calcutta Fire Hall. *TI:* 146.70. *Adm:* $4. Tables: $6. Dick Sisley, K8IKB, 1218 Northside Ave, East Liverpool, OH 43920, 216-385-1245.

Ohio (Fulton)—May 15, 8 AM to 4 PM. *Sprs:* Henry Co ARC, Defiance Co ARC and Fulton Co ARC, Fulton Co Fairgrounds, St Rte 108 (at exit 3, OH Tpke). Flea market, VE sess (by appointment only, contact Tom Hay before May 8 at 419-542-6192), overnight camping (available after 5 PM Sat). *TI:* 147.195. *Adm:* adv $3, door $4, under 12 free. Tables: $10 each, call 419-264-7775; SASE to 126 Muntz St, Holgate, OH 43527.

†**Ohio (Milford)—Jun 18**, 8 AM to 2 PM. *Spr:* Milford ARC, Live Oaks Career Development Campus, 5956 Buckwheat Rd. Tailgating, refreshments, commercial vendors, VE sess (9 AM). *TI:* 147.345. *Adm:* $5, under 12 free. Tables: free. Gerry, 513-677-9255, or Pete, 513-631-0728.

Oklahoma (Enid)—May 7, 8 AM to 5 PM. Meadowlake Park on S US 81 Hwy. Free parking, refreshments. *TI:* 147.375. *Adm:* Free. Fred, N5QJX, 405-242-3551; Dick, N5HEL, 405-233-9869; Tom, N5LWT, 405-233-8473.

Ontario (Etobicoke Metropolitan Toronto)—May 14; vendors 7:30 AM, public 8:30 AM to 1:30 PM. *Spr:* Skywide ARC, Westway United Church, 8 Templar Dr. Refreshments, "eyeball" room. *TI:* 146.985, 146.52. *Adm:* $4. Tables: $12 includes 1 adm. John Wilson, VE3WIL, 416-663-0178 or Rex Sweetapple, VE3XER, 416-663-0288.

Ontario (Kitchener)—Jun 4. *Spr:* Central Ontario AR Flea Market, Bingeman Park, Jack Knight, VE3RGY, 35 Brockville Ave, Guelph, ON Canada, N1E 5X5; tel 519-823-1358.

†**Oregon (Klamath Falls)—May 7**, 9 AM to 3 PM. *Spr:* Keno ARC, National Guard Armory, 2501 Shasta Way. Refreshments, VE sess, flea market, forums, free parking, RV free parking. *TI:* 146.25/.85. *Adm:* adv $4, door $5. Tables: $10. Write to PO Box 653, Keno, OR 97627.

†**Pennsylvania (Ephrata)—May 21**, 8 AM. *Spr:* Ephrata Area Repeater Society. *TI:* 144.85/145.45, 449.65/444.65. *Adm:* $4. Tom Youngberg, 270 S Windy Mansion Rd, Denver, PA 17517; tel 717-336-2514.

†**Pennsylvania (Tamaqua)—Jun 5**; set up 7 AM, public 8 AM. *Spr:* Tamaqua Transmitting Society. Follow hamfest signs on Rte 309 to the New England Valley Fire Company, 1 mi SW of Tamaqua. Refreshments, VE sess. *TI:* 147.705/.105, 146.52. Tables: $3. Allen Breiner Jr, K3NYX, 127 Market St, Tamaqua, PA 18252; tel 717-668-3098.

†**Pennsylvania (Wrightstown)—May 15**; set up 6 AM, public 7 AM to 2 PM. *Spr:* Warminster ARC, Middletown Grange Fairgrounds, Penn's Park Rd, vicinity of Rte 232 and Rte 413. Refreshments, VE sess, equipment check out. *TI:* 147.69/.09, 146.52. *Adm:* no adv, door $5. Woody Woodside, N6XES, 215-672-8482.

Quebec (Sorel-Tracy)—May 29. *Spr:* Club Radio Amateur Sorel Tracy Curling Club, C. P. 533, Sorel, Quebec, Canada J3P 5N6.

Rhode Island (Forestdale)—May 21, 8 AM. *Spr:* RI Amateur FM Repeater Service. VFW Post 6342, Main St, take the Forestdale exit off Rte 146 in N Smithfield, take a left at the end of the ramp and go 0.6 mi to the VFW on your right just before the Village Haven Restaurant. Auction (11 AM to 3 PM), flea market, refreshments. *TI:* 146.76, 146.94, 223.76, 447.425. Rick Fairweather, K1KYI, 106 Chaplin St, Pawtucket, RI 02861; tel 401-725-7507 between 7 and 8 PM.

Tennessee (Knoxville)—Jun 4; set up Fri after 6 PM, Sat 6 AM to 7:30 AM, public 8 AM to 4 PM. *Spr:* Radio Amateur Club of Knoxville, Tennessee Valley Fairgrounds, Chilhowee Park. VE sess, flea market, tailgating, refreshments, free parking. *TI:* 147.30, 224.50. *Adm:* $5. For dealer reservations contact Angela Crigger, N4RPR, 2707 Pine Hill Dr, Knoxville, TX 37938; tel 615-694-9071; for additional info contact Ross Ramsey, KC4YDR, 790 N Cedar Bluff Rd, Knoxville, TN 37923; tel 615-690-1520.

Tennessee (Murfreesboro)—May 7; set up Fri 7 to 9 PM, Sat 6 to 8 AM, public 8 AM. *Spr:* Middle TN DX ARC. 1.5 mi E of I-24, Hwy 96. Forums, refreshments, VE sess. *TI:* 145.29/.69. *Adm:* $3, Tables: $10. Bert Noll, K4UVH, 6935 Bethel Rd, Greenbrier, TN 37073; tel 615-227-9500 days, 615-643-7505 eves.

Texas (Sulphur Springs)—May 14; set up Fri 7 PM to 9 PM, Sat 6 AM, public 8 AM. *Spr:* Hopkins County ARC. Hopkins County Regional Civic Ctr. Forums, VE sess, refreshments. *TI:* 146.68, 444.825 (CTCSS 151.4 Hz). *Adm:* adv $4, door $5, under 13 free. Tables: $10 first table, $5 each additional, bring your own extension cords. Nathan Bailey, N5REL, 903-885-3555; Brian Orr, KB5TWB, 903-885-4863; or Eric Martin, N5QNQ, 903-885-7293 (voice or fax); call all after 7 PM.

†**Virginia (Manassas)—Jun 5**, 8 AM to 4 PM. *Spr:* Ole Virginia Hams ARC. From Rte I-66 take Rte 234 exit S toward Manassas, about 7 mi to fairgrounds, from I-95 take Rte 234 exit N approximately 15 mi. Refreshments, handicapped accessible. *TI:* 146.37/.97, 223.06/224.66. *Adm:* no adv, door $5. Commercial call Woody Carver, KD4DEG, 703-368-5180; noncommercial call Mary Lou Blasdell, KB4EFP, 703-369-2877.

†**Washington (Yakima)—May 14 and 15**; Sat 9 AM to 5 PM, Sun 9 AM to 1 PM. *Spr:* Yakima ARC. Selah Middle School. Refreshments, banquet, seminars. *TI:* 146.06/.66. *Adm:* adv $5+, door $5. Dick Umberger, N7HHU, 509-248-3580.

†**West Virginia (Ripley)—May 22**, 9 AM to 2 PM. *Spr:* Jackson County ARC. VE sess (bring original and copy of license), flea market, refreshments, free parking. *TI:* 146.07/.67. *Adm:* $4. Mike Duff, NX8I, PO Box 130, Kenna, WV 25248; tel 304-372-4370.

†**West Virginia (Wheeling)—May 15**, 8 AM to 3 PM. *Spr:* Triple States RAC. Refreshments, flea market. *TI:* 146.31/.91, 146.115/.715. *Adm:* adv $2, door $3. TSRAC, Box 240 RR 1, Adena, WV 43901; phone/fax 614-546-3930.

†**Wyoming (Cody)—May 28 and 29**; Sat all day, Sun 8 AM to 1 PM. *Spr:* Cedar Mtn ARC. Holiday Inn, 17th St and Sheridan Ave. Banquet Sat night, guest speaker astronaut Ken Cameron, KB5AWP. *TI:* 146.85. *Adm:* adv $5, door $7. Jerry Pyle, WB7S, PO Box 163, Basin, WY 82410, or CMARC, PO Box 776, Cody, WY 82414; tel 307-568-2349 after 4 PM. QST

New Books

HAM RADIO CONTESTING

By Robert Halprin, K1XA

Tiare Publications, PO Box 493, Lake Geneva, WI 53147; 73 pp, B&W tables; 8½×11 inches, $14.95. Available from dealers or direct from Tiare Publications ($2 s/h in the US and Canada, $3 s/h elsewhere).

Reviewed By Jim Kearman, KR1S
Assistant Technical Editor

Contests. You either love 'em or you hate 'em. Contest operating is different from the average ragchew, and the pace turns a lot of people off. Still, the amount of activity (which also turns a lot of people off) is indicative of the popularity of "radiosport."

Radio contesters have traditionally learned at the knee of other contesters, and by simply standing up and learning to run. "How-to-do-it" books have been written on just about every other topic imaginable, so it's no surprise to find one on radio contesting.

Bob Halprin has many years' experience in Amateur Radio contesting. *Ham Radio Contesting* is a good introduction to what contesting is all about. Chapters cover such topics as pre-contest preparation, goals and objectives, operating procedures, propagation, antennas and radios and computer logging.

I suggest you start with Chapter 4, Contest Operating Procedures, because most newcomers don't have the foggiest idea of what to send in a contest. In fact, I'd have put READ THE RULES in large type right at the beginning of this chapter. Reading the rules saves you from trying to work other stations in your own country during the ARRL DX Contest, for example (those contacts don't count). Once you read up on the necessity of zero beating on CW and why you shouldn't repeat information without being asked (QRPers are notorious for doing that; they apparently disbelieve their own propaganda about QRP being a viable communications tool) and dealing with pile-ups, you're ready to read the earlier chapters dealing with what to eat and how to set goals!

Chapter 5 covers Propagation and Band Openings. It seems as though everyone who writes a book about HF operating feels an obligation to include a chapter on propagation. I plead guilty myself. Maybe what we need is one definitive book on HF propagation for hams that the rest of us can list in the footnotes.

One mighty good suggestion Bob makes is to start out as a guest operator at a competitive multioperator station. This is the way to experience contesting at the highest levels. It's a good way to make new friends, too. How do you know where to look for guest opportunities? A list of major contest clubs in the US and their contact people would have been a great addition to this book, and one I recommend for future editions. Most clubs are stable enough that this information doesn't change greatly over time.

Something else I'd like to see in this book are pictures! The information is great, but photos of people having fun operating contests would really improve the book. If you got hooked in a recent contest and want to know more about them, *Ham Radio Contesting* is the place to start.

Strays

EXTRA CLASS COUPLES

◊ Extra Class Couples (ECC) is an organization of hams who are couples and hold Extra Class licenses. At last count there were more than 100 member-couples. ECC activity has dropped since the group was founded in the late 1970s, but it's being revived. For information, contact Chris Baldo, A16S, 3 Eton Ct, Berkeley, CA 94705.

DRIVE-THROUGH QSO

◊ I recently stopped at a well-known hamburger chain to order a cup of coffee at the drive-through window. My radio was on, and as I placed my order, I heard a couple of hams finishing a conversation. One ham said, 73." The other ham said, "73." Then the voice on the drive-through speaker said, "73." I was startled. Had the woman at the drive-through window wished me 73? Or had I entered the "Ham Twilight Zone?"

I sat there another moment, and then she said, "That's 73 cents, sir, please drive up to the second window."—*Steve Kremer, N9VRJ, Carmel, Indiana*

GLAD TO MEET A HAM

◊ My wife had heard about a receiver being sold by a shortwave listener (SWL) who was very ill. Glen had purchased the radio in 1976 and wanted it to be disposed of before his departure. He had learned Morse code and mostly listened to 20 meters. He hadn't been active for several years, but was interested in meeting me for the transaction and some radio talk.

He was delighted when I arrived at his bedside with my notebook, containing my license and several awards, which I shared with him. I set my electronic keyer on a book in his lap and let him experiment. He was pleased, and he drowsily moved the paddles for a while, then began to doze. As we prepared to leave, he awoke and said clearly, "Thank you for letting me meet a ham operator."

I was moved by this brief meeting, and wondered how Glen had came to SWLing, learning Morse code, and monitoring the bands without ever becoming—or even meeting—a licensed radio amateur. I can only guess because Glen left us the following week. He lived as a silent brother to us hams, and as such, although not licensed, I consider him a Silent Key.—*Herbert Leyson, AA7XP, Springfield, Oregon*

I would like to get in touch with...

◊ anyone who has an Army Signal Corps BC 442A antenna relay unit for information and hook-up details (it has a Type DW 52 meter, as shown on page 35 of February 1994 QST). Gerald Rose, KB4QGJ, 524 N Quaker Ln, Alexandria, VA 22304-1827.

◊ any radio amateur or SWL who can help provide information about the development of Amateur Radio in the north side of Manchester/Manchester-Bury area, around 1936 to '51. I'm also looking for records of NFD development from local clubs and groups. Eric Taylor, G2ALN, 76 Sidney Rd, Blackley, Manchester M9 3AT, Great Britain; packet mail G2ALN @ GB7BEV.

Silent Keys

Administered by Katherine Fay, N1GZO

It is with deep regret that we record the passing of these amateurs:

N1CBA, John A. Peterson, Augusta, ME
K1CPW, Selwyn N. Blake, Andover, MA
N1DGV, Le Roy E. Gardiner Jr, Warwick, RI
W1EAN, Merrill J. Hudson, Culpeper, VA
KA1EXX, Harry J. Dente, Thomaston, CT
W1FXX, Alban V. Guenette, Salem, MA
W1IMO, Francis S. Matthews, Sagamore, MA
WA1JSH, Edgar L. McKay Jr, Long Wood, FL
K1PBJ, Charles H. Darling, Orleans, MA
WA1YZA, James C. Whitney, Torrington, CT
W2AHV, A. Hector, Ozone Park, NY
W2BV, Burrill T. Warnock, Minotola, NJ
N2EIU, Theodore M. Klein, Sunrise, FL
W2FLB, Walter Schnabel, Dunellen, NJ
KB2GPK, Jeffrey J. Uline, Averill Park, NY
WD2I, Edwin R. DeWitt, Bradenton, FL
W2JQE, Gavin S. MacMillan, Tuckerton, NJ
N2KGI, Alwin E. Bulau, New Port Richey, FL
N2MWH, James M. Berry, Tonawanda, NY
K2OUF, F. Thomas Hally, Martinsville, NJ
KB2PKN, A. Kaplan, Wheatley Heights, NY
KE2TS, Emilio Pasqualoni, Huntington Station, NY
*K2UK, Edward N. Ludin, Cherry Hill, NJ
HI3AFR, Freddy Rodriguez, Paramus, NJ
*N3CIX, John N. Warker Sr, Wernersville, PA
K3CSV, Martin K. Salabes, Nokomis, FL
W3DXG, Oral J. Jones Jr, Silver Spring, MD
WA3EBP, George J. Meyers Jr, Wyomissing, PA
N3EPC, David Souell, West Chester, PA
W3FQH, Howard M. Burns Jr, Bethesda, MD
W3KR, Harry C. Rarick, West Lawn, PA
W3PUH, Carl R. Klaproth Sr, Glendale, AZ
W3UIU, Robert S. Baney, Williamsport, PA
KB4ASV, William H. Sumner, Charlotte, NC
AA4BF, Charles C. Chatterton, St Augustine, FL
KC4BHY, Joseph J. Savoca, St Augustine, FL
K4BRC, Edward F. Gaudet, Beverly Hills, FL
KA4BTU, Allan Elomaa, St Augustine, FL
KE4CUT, Russel Best, Shalimar, FL
*W4CVQ, Theodore W. Whipple, Columbus, GA
W4DPM, Robert E. Ford, Orlando, FL
KB4DXU, Charles A. Linn, Bradenton, FL
WA4HTR, Frank H. Harris Jr, Williamsburg, VA
KD4JRB, William N. Shaddix, St Augustine, FL
K4LOH, Ward S. Webb, Pensacola, FL
W4OFT, Alfred L. Streling, Lakeland, FL
W4OXN, Flavil H. Ford, Louisville, KY
K4PBH, Jack J. Becker, St Augustine, FL
N4RGK, Carney J. Bryan IV, St. Augustine, FL
N4RMT, Robert D. Gray Jr, London, KY
KD4ROF, Hughby W. Bonds, Talladega, AL
W4RZL, Howard L. Schonher, Columbus, GA
WD4SCF, Bernard D. Reams, Lynchburg, VA
KJ4UA, Frank P. Rollins, Fort Myers, FL
KI4VW, Paul S. Bayan, St Augustine, FL
K5AK, Ray Narad, El Paso, TX
W5BE, Leslie B. Essington, San Antonio, TX
*K5CNT, Edward W. Green, Sulphur Springs, TX
WA5EBZ, Lee W. Boyd, Natchez, MS
N5KQM, Dan H. Weber, Seabrook, TX
K5MEC, George M. Guetig, St Rose, LA
WA5NIB, John C. Darby, Lubbock, TX
W5NXD, Murray L. Wykes, Georgetown, TX
WA5QXV, Bernet J. Bauer, Midwest City, OK
WB5SSL, Evelyn V. Losey, Shreveport, LA
AA5ST, James O. Weldon, Dallas, TX
KA5WAF, Joe C. Dillon, El Paso, TX
AA5ZF, O. D. Thompson, Bartlesville, OK
W6AEF, Dallas E. Smith, Marysville, WA
KA6AEX, K. L. Moore, San Rafael, CA
*WH6AFY, Ellwood C. Wilder Jr, Honolulu, HI
KE6CQ, Vernon Starr, La Mirada, CA
W6ERS, Vernon Howard, Burlingame, CA
W6HEX, Lloyd F. Nelson, Glencoe, CA
W6ILE, Christian Jorgensen, Fremont, CA
W6KOS, Clarence H. Albaugh, Los Angeles, CA
W6KZY, Warren G. Moore, Oakland, CA
*WI6L, Corwin A. Roberts, Albany, CA
W6NYU, Monte H. Lovelace, San Fernando, CA
K6PJ, John E. Nelson, Richmond, CA
W6PME, Henry Korczak, Littleton, CO
KA6PSD, Minor D. Robertson, Johannesburg, CA
W6ROW, Edward C. Bosco, San Diego, CA
W6ULY, Eugene D. Olsen, Moorpark, CA
N6WWL, Wesley B. Cooke, La Mesa, CA
KB7ACH, Lonnie R. Titgen, Albany, OR
*WB7AHP, Samuel R. Frazier, Everett, WA
WL7BS, Orwin B. Westwick, Fairbanks, AK
KE7CC, Odis D. Johnston, Bishop, CA
N7CRG, Max A. Mathewson, Salt Lake City, UT
K7ISW, Paul B. Fourtner, Forsyth, MT
W7KKN, John L. Kelley, Lacey, WA
NT7K, Elaine E. Hicks, Seattle, WA
W7VZF, Orville B. Dreyer, Tucson, AZ
N8ADK, James S. Bennett, Dayton, OH
W8BHH, John P. Janda, Muskegon Heights, MI
WD8BSC, John P. Guenthner, St Augustine, FL
K8CFT, Dewey F. Collins, Oak Hill, WV
W8CSL, Edmund A. Unger, Oxford, MI
W8DRN, Robert G. Klausner, Akron, OH
W8EXQ, Richard S. Baldwin, Toledo, OH
W8FNQ, A. O. Kilborn, Jackson, MI
W8HYU, Andrew E. Besonen, Trout Creek, MI
W8IFB, Marvin R. Holter, Ann Arbor, MI
K8IUB, Milan A. Kontosh, Burnswick, OH
W8IUJ, Carl M. Superko, Ann Arbor, MI
WU8I, Doris M. Kilanski, Boyceville, WI
K8KCF, Ralph C. Furman, Muir, MI
W8KWI, Wayne S. McDaniel, Frankford, WV
W8LOR, Milton K. Foxworthy, Lancaster, OH
K8OIP, Wendell Tulencik, Toronto, OH
K8QPG, Andrew J. Csomos, Toledo, OH
*W8QPP, Richard T. Brockmeier, Holland, MI
KA8TEA, Robert L. Smalley, Parma, OH
W9EXI, G. F. Townsend, Princeton, IL
K9FHM, Mildred E. Oras, Cicero, IL
WD9HGX, Jerry D. Lathrop, Terre Haute, IN
W9HQX, Arthur E. Olsen, Valparaiso, IN
N9KLJ, George P. Langan, Springfield, IL
W9QJE, Jerome H. Kleker, Deland, FL
W9RZC, Donald R. Myers, Springfield, IL
WB9VES, Schuyler D. Seavey, Angola, IN
W9WCQ, Henry G. Burda, Mundelein, IL
K9ZIW, R. R. Mattingly, Aurora, IN
KØAB, Edward L. Wood, Elizabeth, CO
WØJOL, Harry C. Glawe, Dana, IA
*WØNVZ, Albert E. Peterson, Des Peres, MO
KAØRXI, Herbert E. Small, LaSalle, CO
WØWKM, John B. Slingsby, Rapid City, SD
VE3ANN, Cliff Dennis, Port Rowan, ON, Canada
VE3BKZ, D. Orr, Maidstone, ON, Canada
VE3RW, John R. Card, Hamilton, ON, Canada
VZ4Y, Johann W. Heinhold, Burpengary, Australia
VE7AOP, Philip W. Patko, Vancouver, BC, Canada
HB9DY, Pierre Berset, Marly, Switzerzand

*Life Member, ARRL

Note: All Silent Key reports sent to HQ must include the name, address and call sign of the reporter as well as the name, address and call sign of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

In order to avoid errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from HQ.

Many hams have remembered a Silent Key with a memorial contribution to the ARRL Foundation. Should you wish to make a contribution in a friend or relative's memory, you might designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund or for the Victor C. Clark Youth Incentive Program Fund or for the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation, Inc, 225 Main St, Newington, CT 06111. QST

75, 50 and 25 Years Ago

May 1919

◊ Ah, to be able to listen to radio again! Writes Clinton B. DeSoto in *Two Hundred Meters and Down* of the Navy's April lifting of the receiving ban: "The instant this announcement was made public, thousands of amateurs throughout the nation rushed frantically up to long-deserted attics or down to musty basements where the old apparatus lay, intact under its seals, in cobwebby, dust-covered decay. Hastily it was brushed off; tenderly idolatrous fingers carried the individual units to old resting places; tremblingly, bell wire was stripped of its insulation and connections wired in place. The towering antenna of old, dismantled in 1917, was mourned for a bit, in silence; and then work started on a new network of wiring, to be strung gingerly aloft from tree or roof or mast. Hungering, codesick ears, sad in the nostalgia of two long weary silent years, absorbed in ecstatic reunion the roaring threnody of the commercial and government stations.

"There was still other work to be done, however. In early May the A.R.R.L. board again met to consider the plan proposed by the finance committee. Briefly, this plan was to borrow $7500 from former League members, issuing in return certificates of indebtedness payable in two years with interest at 5 per cent, per annum. The proposal was approved. The purchase of *QST* was consummated. Secretary Warner was instructed to lay plans immediately for the first issue of the magazine."

May 1944

◊ "Our cover: If you can look at a melange such as appears on the front of this issue and remark philosophically, 'Well, I suppose they're trying to be artistic,' and then say no more about it, you're a person of wit and wisdom and we admire you. If, however, you're the kind who says, 'What in hell is *this* supposed to mean?"—well, to you we can only say that it's supposed to be an attempt to use the varied forms of microphones and keys as a source-theme depicting amateur radio communication..." Editorials mark the month as the 70th anniversary of Morse's code and the 30th anniversary of the League, and revisit the ongoing discussion of amateur transmitter power. A sidebar reports that ARRL past president Dr. Eugene C. Woodruff, W8CMP, died on March 20 at the age of 73. Gold Stars reports the deaths of Hugh S. Glassburn, W9FFZ, and Frederick C. Harrington, W9WDR.

With the world at war and US hamdom shut down for the duration, radio-related features are hard to come by. D. W. Pugsley leads the issue's features with "Fundamentals of Magnetic Recording." C. Irvin Metzger, W8FER, reports "Building War Emergency Radio Service Transceivers in the School Shop." C. W. Moorhouse presents "A High-Fidelity Peak-Limiting Amplifier." Edward M. Noll, ex-W3FQJ, devotes Part 1 of a series on "Practical Applications of Simple Math" to bias calculations. Frederick A. Long, ex-W8NE and W8BSL, details "A Portable Power Supply for WERS." Staffer Hollis M. (W1JLK) French's "A Battery Powered Camper's Companion" describes a transmitter-receiver apparently built in June 1941. Thomas A. Garretson, W2ASB, presents "New Antenna Mast Designs." One month late, Jasper P. Burp reveals a new side of natural history in "Lice, Liberty and the Pursuit of Parasites." John F. Souza Jr, K6PHD, rides a ham-built camera-modulator through adventures with "Television in K6 Land." The Experimenter's Section reports on carrier-current communication—that is, two-way work via low-frequency radio fed over power lines.

May 1969

◊ The cover pictures a 500-W 220-MHz CW/FM transmitter built by ace ampman Dick Stevens, W1QWJ. With Field Day a month away, the editorial emphasizes public relations. Behind the Diamond No. 15 portrays ARRL Communications Manager George Hart, W1NJM.

Doug DeMaw, W1CER, turns up the heat under direct-conversion reception with "The D.C. 80-10 Receiver"—plug-in converters teamed with an 80-meter tuner based on a CA3028A differential-amplifier detector. J. B. Berry Jr, W4PME, shows how to "Legalize Your Phone Patch." Allan A. Simpson, VE4AS, builds "An All-Driven Three-Element Mini-Beam." Q. G. Villard Jr, W6QYT, C. R. Graf, W5LFM, and J. M. Lomasney, WA6NIL, explore "Long Delayed Echoes . . . Radio's 'Flying Saucer' Effect." Gimmicks and Gadgets offers "A 160-Meter Converter for Ham-Band-Only Receivers" by James P. Gillespie, W4LQC/W8BKK." With MF mobile back in the news as a result of recently increased power levels on 160, B. J. Bittner, KØWQN, explores "Mobile Whips and Corona."—*David Newkirk, WJ1Z* QST

Results, Seventeenth ARRL International EME Competition

EME is certainly not only for "big gun" stations!—*Joop Mutter, PAØJMV*

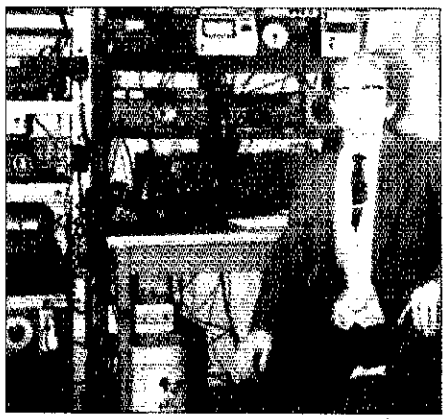
By Billy Lunt, KR1R, Contest Manager and Warren C. Stankiewicz, NF1J, Assistant Contest Manager

It seems like every time the EME Competition is held, everyone remarks how much easier it is to make moonbounce contacts. This year was no exception. The giant VE3ONT operation (see this month's Up Front in *QST* and the World Above 50 MHz, October *QST* page 92 and January *QST*, p 106) gave anyone with an interest in making their first Earth-Moon-Earth (EME) contacts an excellent chance to do so. Their effort helped make this the most successful edition of the contest yet.

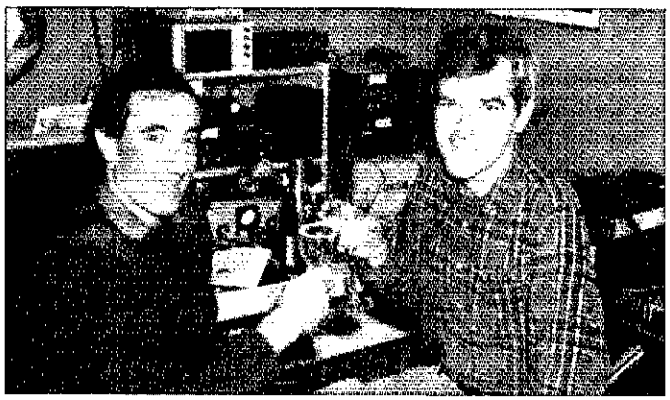
Their objective was simple—mount an operation to put a signal on the band so loud that you could almost hear it with a rubber duck for an antenna. The 150-foot dish at the Algonquin Radio Observatory gave them the mother of all echoes, enabling people with OSCAR-class stations (running 80 to 100 W or so to a small Yagi) to make their first contacts via the exotic moonbounce path.

If you only worked one station, it was probably VE3ONT. A lot of people, however, hung around the band long enough to find that there were other stations loud enough for them to work, and successfully completed contacts they wouldn't have otherwise attempted. Although they may not have fried the ionosphere the way the VE3ONT crew did, Gerald, K5GW, made 316 QSOs on 2 meters, and Lars, SM4IVE, made 188 on 432 MHz. If you worked more than one station during the contest, it was probably one of these.

This added activity paid off handsomely for many people. Hannes, OE5JFL, finished at the top of the single-operator, multiband class with 3.2 million points. All the countries on the air led to a big jump in multipliers. This, in addition to all the newcomers on the bands, contributed to higher scores



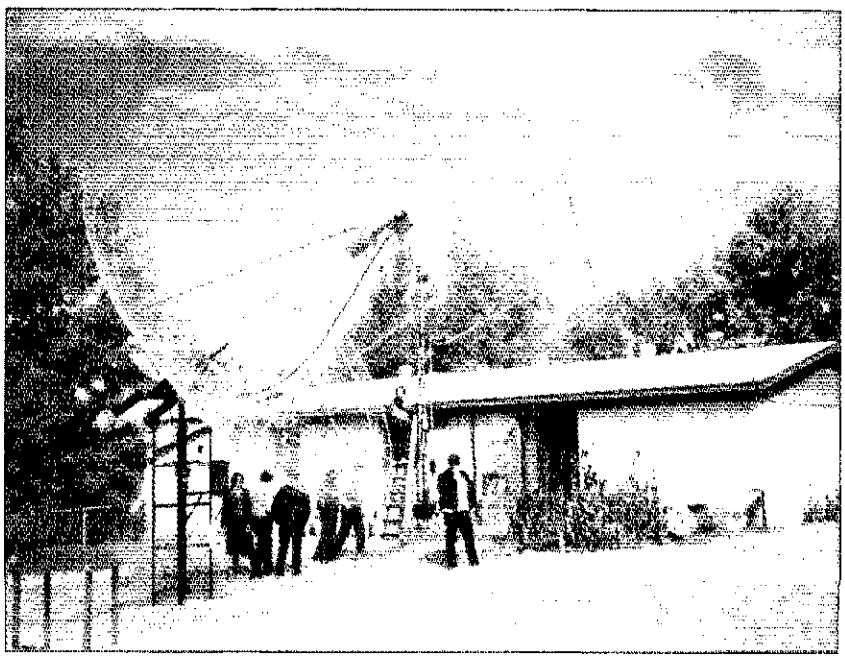
Kiyoaki, JA7GTB, worked Gerald, K5GW, with just 50 W and two 16-element K1FO-type Yagis.



Michael, NV3Z (l), and Joe, NA3T, celebrate their first EME contact in style.

Tommy, WD5AGO (below), got help from students in a local electronics class to finish his 144-MHz array.

Magin, EA3UM, and Enrique, EA3BTZ, used this "wireless" station to make 82 contacts on 432 and 1296 MHz.



Scores

Each line score lists call sign, score, stations worked, multipliers, and band (A = 50 MHz, B = 144 MHz, C = 222 MHz, D = 432 MHz, 9 = 902 MHz, E = 1296 MHz, F = 2304 MHz, I = 10 GHz).

Single Operator, Multiband

OE5JFL	3,263,500	109	37	B
		146	43	D
		50	27	E
SM2CEW	2,073,600	104	39	B
		87	39	D
		25	18	E
SM0PYP	1,232,000	9	8	B
		99	36	D
		46	27	E
		7	6	F
N2IQU	911,400	18	13	B
		99	32	D
		30	17	E
F6DGJ	649,000	79	32	D
		39	23	E
K4QIF	641,900	100	31	D
		31	18	E
VE1BVL	572,400	78	34	B
		21	14	D
		10	6	E
JA4BLC	560,500	56	29	B
		27	20	D
		12	9	E
		1	1	F
W7HAH	530,400	3	2	A
		77	33	B
		24	16	D
G3LTF	445,200	14	10	B
		34	21	D
		38	22	E
W7FN	423,000	55	27	B
		39	20	D
KB2AH	331,200	8	7	B
		45	30	D
		18	11	E
EA2LU	277,500	46	21	B
		30	16	D
F2TU	257,400	23	14	D
		34	21	E
		4	4	F
EA3DXU	247,900	51	26	B
		16	11	D
OH5IY	231,000	16	22	B
		20	13	D
RA3YCR	230,400	20	13	B
		44	23	D
AA4TJ	131,600	29	18	D
		18	10	E
RB5PA	127,600	31	19	B
		13	10	D
SM3AKW	116,000	20	15	D
		20	14	E
JA9BOH	94,500	13	10	B
		22	17	D
GM4JJJ	88,000	40	22	B
		1	1	D
VE4MA	79,200	17	11	D
		19	11	E
JH3EAO	72,000	13	10	D
		17	14	E
HL9UH (KG6UH,op)				
	71,300	13	9	B
		18	14	D
WØRAP	69,200	21	13	D
		7	6	E
S51ZO	43,200	11	9	B
		13	9	D
VE6TA	42,500	16	11	B
		9	6	E
W2CRS	42,500	5	4	B
		30	13	D
K9BCT	42,000	19	18	B
		1	1	D
		1	1	E
VE1ALQ	36,000	1	1	B
		23	14	D
EA3EHQ	28,800	12	10	B
		6	6	D
NTØV	19,200	15	11	B
		1	1	D
DL3YEE	14,400	4	4	B
		4	4	D
		4	4	E
DL7FJ	13,200	9	8	D
		3	3	I
VK6MC	13,200	7	6	D
		5	5	E
UA9XEA	4,200	1	1	B
		6	5	D
OH6NVQ	3,000	4	3	B
		4	2	D
KB2AYU	3,000	4	3	B
		2	2	D
JH7PAV	2,500	2	2	B
		3	3	D
VE1XYL	400	1	1	B
		1	1	D
EA4LY	400	1	1	B
		1	1	E

Single Operator, 50 MHz

K6QXY	8,000	10	8	A
K6MYC	8,000	10	8	A
W6JKV	6,300	9	7	A
I5MXX	2,400	6	4	A
W5FF	1,500	5	3	A
K5FF	300	3	1	A
VK3OT	300	3	1	A

Single Operator, 144 MHz

K5GW	1,706,400	316	54	B
SM5FRH	1,340,900	253	53	B
DL8DAT	1,263,600	234	54	B
SM5BSZ	893,000	190	47	B
HB9CRQ	792,000	165	48	B
LA8YB	690,800	157	44	B
S51WV	589,700	137	43	B
AA4FQ	588,000	140	42	B
AF9Y	584,000	146	40	B
S57TW	430,500	105	41	B
SM2CKR	414,200	109	38	B
LZ2US	406,800	113	36	B
F6IRF	406,600	107	38	B
K2GAL	370,800	103	36	B
IK1MTZ	363,500	101	35	B
W3HP	328,500	93	35	B
N5JHV	280,500	85	33	B
WB4WTC	261,000	87	30	B
SM4RNA	258,400	76	34	B
SM5IOT	249,000	83	30	B
OK9ZY	198,800	71	28	B
G4SWX	198,400	64	31	B
OE5EYM	189,100	81	31	B
PA2CHR	184,800	66	28	B
WA3HMK	156,600	54	29	B
PA0JMV	156,600	54	29	B
DJ3WA	153,400	59	26	B
WA2GSX	148,500	55	27	B
SM0FFS	140,400	52	27	B
W7VXW	132,600	51	26	B
IK1FJI	130,000	52	25	B
PE1DAB	126,000	50	25	B
K8BHZ	117,000	45	26	B
OH9NMS	85,000	34	25	B
LA8KV	83,600	38	22	B
PA3EPD	81,400	37	22	B
RB5AL	70,000	50	14	B
SM6CNU	59,400	33	18	B
ZL1PE	57,000	30	19	B
I1JTQ	54,000	30	18	B
IK2DDR	54,000	30	18	B
VE1KG	51,300	27	19	B
N3AJX	48,600	27	18	B
K6AAW	32,200	23	14	B
W8WVM	32,000	20	16	B
DL9MHG	30,800	28	11	B
KU8Y	26,600	19	14	B
9A2MK	25,200	21	12	B
EA2AGZ	23,800	17	14	B
IK6UBM	23,400	18	13	B
JE1BMJ	20,000	20	10	B
SM1MUT	19,200	16	12	B
JA4KLX	15,400	14	11	B
LA9NEA	15,000	15	10	B
DL4DTU	14,000	14	10	B
F5HRY	11,700	13	9	B
WB4BKC	11,000	11	10	B
K2QE	8,000	10	8	B
OZ9AAR	8,000	10	8	B
LA1K (LA9IY,op)	7,700	11	7	B
NC7K	7,200	9	8	B
VE3KDH	6,300	9	7	B
W6JKV	6,300	9	7	B
AI7K	5,600	8	7	B
PA2GER	5,600	8	7	B
KA2KQM	4,200	7	6	B
WA6YDI	4,200	7	6	B
DL5DTA	4,000	8	5	B
W1AIM	3,000	6	5	B
JA9RNR	3,000	6	5	B
N6PI	2,000	5	4	B
VP5/WA3HMK	1,200	4	3	B
VE3KPB	1,200	4	3	B
N8ZAT	400	2	2	B
W2RS	400	2	2	B
W3EP	400	2	2	B
VE3EQQ	100	1	1	B
WA3HMK	100	1	1	B
VE3NJK	100	1	1	B
N8ZAW	100	1	1	B
N8AXA	100	1	1	B
JA7GB	100	1	1	B

Single Operator, 432 MHz

SM4IVE	827,200	188	44	D
DL9KR	688,000	160	43	D
DJ6MB	592,200	141	42	D
N4JGV	442,800	123	36	D
KD4LT	402,500	115	35	D
DL9NDD	296,400	78	38	D
KØRZ	229,100	79	29	D
KB4WM	175,500	65	27	D
JA2IRJ	145,800	54	27	D
F5MZN	90,300	43	21	D
WA6BJE	78,200	48	17	D
W7CI	62,900	37	17	D
ON4KNG	55,800	31	18	D
WA4OFS	52,200	29	18	D
F5EHO	48,000	32	16	D
ON5OF	46,500	31	15	D
JA2KRW	44,800	28	16	D
I5OTE	44,800	28	16	D
OF6NA	43,500	29	15	D
W8TN	38,400	24	16	D
OK1CA	36,400	26	14	D
I5TDJ	33,600	24	14	D
GP5CJT	33,600	24	14	D
W2UHI	28,600	22	13	D
G4ERG	25,200	21	12	D
DK3FR	24,000	20	12	D
OE6XHF	18,700	17	11	D
S57QM	14,400	18	8	D
JH1MOM	11,700	13	9	D
IK5WJD	10,400	13	8	D
JH4JLV	7,200	9	8	D
JA7UIQ	6,400	8	8	D
JA2ODV	2,500	5	5	D
JR9NWC	400	2	2	D
JH1EFA	400	2	2	D
KN5S	100	1	1	D
JJ1NNJ	100	1	1	D

Single Operator, 1296 MHz

OE9XXL	195,300	63	31	E
SM4DHN	143,100	53	27	E
AA8WI	122,500	49	25	E
F1ANH	105,600	44	24	E
ZS6AZT	98,900	43	23	E
LA8LF	77,000	35	22	E
9M6CKU	77,000	35	22	E
EA6/DF5JJ	54,400	34	16	E
G4CCH	45,900	27	17	E
F5PL	45,900	27	17	E
OZ7UHF (OZ1FTU,op)				
	26,400	22	12	E
IK3COJ	26,000	20	13	E
HB9BBD	20,400	17	12	E
OZ4MM	600	3	2	E
CX9BT	600	3	2	E
N4MW	100	1	1	E
SM5CFS	100	1	1	E
HB9CW	100	1	1	E

Single Operator, 2304 MHz

OE9ERC	9,000	10	9	F
W4HHK	3,000	6	5	F
I6PNN	400	2	2	F

Multioperator, Multiband

JL1ZCG (JM1MCF,JO1BMV, JR4ENY,JRØJFM,ops)

951,300	97	38	B
	38	25	D

DL7MAT (+DDØYD,DG1MHY, DG3MHJ,DG4MHJ,DJ5MN, DK5MV,DL1MAJ,DL3MGL,DL5MAE)

792,000	116	39	B
	28	16	C

WD5AGO (+KB5ZFL,KFUM)

642,000	38	21	B
	26	16	D
	43	23	F

DL3BWW (+DL4EBY)

627,000	53	27	B
	61	28	D

K2UYH (+AK2F,K2TXB,W3EP)

580,000	89	32	D
	27	18	E

I2COR (+I2s TFI,YID,IK2TLA,IW2s AMQ,ATM) 427,500 70 30 D

25 15 E

EA3UM (+EA3BTZ)

369,000	49	26	D
	33	19	E

OK1KIR (OK1s DAI,DAK,ops)

291,800	73	20	D
	21	11	E
	5	5	F
	2	2	I

Multioperator, 144 MHz

W5UN (+N5BLZ)

1,452,800	274	53	B

IJ2FWA (UA2s FF,FJ,FM,ops)

479,700	123	39	B

IK3MAC (+I3YXQ)

336,800	99	34	B

F5JTA (+F1HDI,F6s EPY,HLC)

282,200	83	24	B

EA4ED (+EA3AIR)

159,800	57	28	B

N8AM (+N8ITP) 50,400 28 18 B

LZ1DP (+LZ1s JH,KQ,ZX)

30,800	28	11	B

SK7CA (SM7s NZB,SJR,SJV,THS,ops)

1,200	4	3	B

NV3Z (+NA3T) 100 1 1 B

NX2Q (+W2OZU,WB2ONA)

100	1	1	B

Multioperator, 432 MHz

OH2PO (+OH6DD)

624,800	142	44	D

K1FO (+K1GX,NC1I)

557,700	143	39	D

F5FHI (+F5s DE,MYK,NWK,F8GIN)

525,000	126	43	D

9M8WB (+9M2AV)

51,200	32	16	D

K1FJM/6 (+KV6J) 5,800 8 7 D

Multioperator, Multiband, Commercial Equipment

VE3ONT (VE2DFO,VE3s ASO,RFM, CRU,DSS,EMS,KDH,VD,W9IP,ops)

6,496,000	235	46	B
	246	41	D
	79	29	E

Checklog

ZS6BMN

across the board. It made for a close race in the Multioperator, 432 MHz class—Matti, OH2PO (with help from Jukka, OH6DD), defeated Steve, K1FO, and his crew (Frank, NC1I, and Paul, K1GX) by a narrow margin, working one less QSO, but five more multipliers.

This year's competition saw a return of activity on 6 meters. Eight stations reported making contacts on this band. It may be tougher, but that's where the challenge is. Activity was good on 2304 MHz, too–Paul, W4HHK, reports, "It was unbelievable to observe a three-station pileup on 2304.025." OK1KIR, with Antonin, OK1DAI, and Vladimir, OK1DAK, at the controls, even made two EME contacts on 10 GHz—great job!

We had a record number of entries this year, with 215 stations sending in logs. This is a jump of 18% over the previous mark, set in 1991. If you weren't in on the action, why not start planning your effort now? The rules for the next ARRL International EME Competition will be in September *QST*; that should give you plenty of time to get ready.

SOAPBOX

Mr Faraday did his worst, particularly during the second weekend! As a result, my effort this year was only slightly better than last year's (N4GJV). I spent an inordinate time chasing VE3ONT, but managed to work them on three bands (K9BCT). The ability to switch polarization was again an advantage on 2 and 432, and I found conditions good both weekends. The only problem I had was when my high-voltage supply failed twice (OE5JFL). I doubled my score again and had a lot of fun (N2IQU). This was my first experience in operating EME on four bands. I enjoyed it, but got a little tired (JA4BLC). Bad weather and the gremlins left me alone. My big thrill was working I5MXX via 6-meter EME (W7HAH). Next year, I'm going to get out the chainsaw so I have more than a five-hour window (KB2AH). Multiband operation is much more entertaining because you can change the bands and find new stations to work and you have the ability to operate the band with the best conditions at any given time (EA3DXU). This contest is exciting every year and the appearance of the VE3ONT superstation made it even more exciting. I wish more W/VE stations were active on 1296 MHz (JH3EAO). Murphy struck the November weekend and I was unable to work VE3ONT on 1296 (VE6TA). High winds and heavy rain both weekends limited operation (VE1ALQ). This was my first effort in the EME contest and I had a lot of fun. I was happy to work VE3ONT on 432 with my tropo antennas at my moonrise; I listened for them on 1296 at moonrise, but heard nothing (NTØV). My antenna system was the biggest project I've ever taken on and took all summer to complete. My first EME contact with VE3ONT on 432 was quite a thrill! (KB2AYU). I found conditions on the first weekend quite good, but variable the second weekend. This was my first try at 6 meters during this contest; it was difficult! (K6QXY). Conditions the October weekend were fairly unstable and activity didn't seem very high. Nevertheless, I worked many new stations and new countries, like HL, OK and EA8 (HB9CRQ). Every EME QSO I make is still a thrill, despite being a ham for more than 50 years! (WØHP). I enjoyed the contest, despite auroral attenuation the first weekend and lots of QRM the second weekend from the European Marconi CW contest. My highlight was the random QSO with another 2-Yagi station, EA3DXU (PAØJMV). Sunday morning the second weekend even big stations disappeared for hours (DJ3WA). Conditions were erratic the first weekend; I missed several stations I should have worked (WA3HMK). This was my first EME contest and I enjoyed the challenge. I'm still amazed that I'm able to establish contacts via the moon (K2QE). These were the hardest nine QSOs I've ever made! (NC7K). This was my first EME contest and it was fantastic! (VE3KDH). The trip to VP5 was great—it's too bad the radio portion was cursed! (VP5/WA3HMK). The conditions on the first weekend were very good. The second weekend there was strong Faraday from time to time (DJ6MB).

Results, 1993 ARRL November Sweepstakes

This contest is fun, even for those of us with wimpy stations. —*John Kent, AA2DY*

By Randall Thompson, K5ZD, and Billy Lunt, KR1R
11 Hollis St Contest Manager
Uxbridge, MA 01569

Clean Sweeps on Both Modes

The following 32 stations were able to work all 77 Sections on both CW and phone. They deserve a very special mention. Great job!

AA6KX	K8CX	N4ZZ	NF7P	W4ETO
K2POF	K9ZO	N6TV	NV6O	W6BSY
K5RX	KØPP/7	N6VR	VE7SZ	W6OAT
K6LL	KI3L	N7MMQ	W1FEA	W6TKF
K7FR	KV6H	N7TT	W1XE	W7CFL
K7NO	N3SL	N8RR	W4AQL	W7ZRC
K7OQ	N4XM			

What were you doing the first and *third weekends of last* November? For thousands of amateurs around the US and Canada, these two weekends are permanently reserved in their radio calendars for the ARRL November Sweepstakes. Whether you're a serious competitor or a casual participant, the Sweepstakes offers something for everyone.

Do you think you can make more than 100 QSOs in a whole weekend of CW or phone operation? Do it in the Sweepstakes and you're eligible for an award in the Participation in November Sweepstakes (PINS) program. Many operators begin with this simple goal and find it so much fun they can't stop. Others are adding to their Sweepstakes pin collection from previous years.

Need more of a challenge? Try working *all 77 Sections* to gain a Clean Sweep coffee mug. Whether you're chasing pins or mugs, the challenge is fun and personal. Who knows, you might even win a Section certificate in the process. With separate entry categories for QRP (5 W), low power (150 W), high power and multioperator, there are plenty of opportunities to earn wallpaper.

For serious operators striving for a Division plaque or a Top 10 national finish, the Sweepstakes is the radio equivalent of the Boston Marathon, Super Bowl and World Series all rolled into one. Preparation begins weeks or even months before the contest. Antennas are carefully tuned and radios are tested to ensure top performance for the entire 30 hours. Personal work and travel schedules are manipulated to guarantee a weekend of uninterrupted activity. Family members are sent off to visit relatives or given the "Do not disturb" order. It will take all the operating skill and motivation these ops can muster to achieve their lofty goals.

One ingredient the best Sweepstakes operators share is experience. It takes skill and practice to dig out every last contact. Knowledge of propagation is needed to find the most productive band for contact rate or multipliers. Strategy is crucial in choosing the best operating and off times. If you're new to the contesting game, study the contest results and find an experienced contester to act as your "coach." The satisfaction of contesting, like any competitive activity, increases as your proficiency and goals climb.

Scott, KB9YO, worked with junior op Michael, age 4 weeks. As one person who heard him cry during a contact remarked, "I see you brought your own QRM!"

Top Ten

CW

Single Operator, QRP

N3SL	132,132
W2GD	118,950
W9UP (KA9FOX,op)	115,824
W9RE	111,872
AA2U	110,850
KØSCM	109,500
K1TR	102,448
WA4PGM	100,928
K3WW	92,872
NØAX	90,592

Single Operator, Low Power

NP4A (K7JA,op)	210,518
N5RZ	196,840
KP2/N6OP	180,120
KY7M	179,700
AD5Q	176,484
KØEU	174,900
K6OY	173,712
W1FEA	166,936
AB6FO	163,400
N4AA	158,620

Single Operator, High Power

WM5G (KRØY,op)	236,512
W5WMU (K5GA,op)	235,774
N4RJ (KM9P, op)	231,000
K5GN	221,452
W7RM (N6TR,op)	218,834
N2IC	216,524
NCØP (AG9A,op)	213,136
K6LL	212,982
NM5M	212,212
K9FD (WX3N,op)	209,440

Multioperator

AA5B	223,916
N4ZZ	212,058
N6VR	202,048
WXØB	192,280
W4AQL	191,114
K6XT	179,564
K5OJI	178,024
WØAA	178,024
W3GH	167,808
W6BIP	161,084

Phone

Single Operator, QRP

W9UP (KA9FOX,op)	161,546
N6PEQ	152,614
K1DG (WZ1R,op)	119,504
W2CRS	113,544
KØSCM	109,896
W7CFL	101,794
WB2ODH/6	100,562
WB8G	100,408
N6WMF	99,484
KØTO (NØBSH,op)	95,850

Single Operator, Low Power

K7QQ	278,740
KØEU	273,658
K4VUD	251,328
W1FEA	236,392
VE4GV	235,466
KM5H	231,616
WN9P	228,844
WDØT	213,752
W7ZRC	210,518
AJ9C	206,360

Single Operator, High Power

KI3V/7	338,492
W6QHS (KM9P,op)	338,030
K3LR (K3UA,op)	328,328
K6LL	327,096
KY7M	317,240
K9RS (AA5B,op)	316,162
KØKR	315,546
WC6H	314,468
W5KFT (WB5VZL,op)	313,852
W9RE	295,218

Multioperator

N4ZZ	325,094
WXØB	301,532
W6EEN	297,990
AB4RU	288,750
K9ZO	286,286
N6ND	277,970
KF6OG	277,508
NJ1V	275,198
WF7B	269,808
W3GH	250,096

CW—Another Record Year

On a weekend when the K index never went below 4, propagation favored those to the south. In the High Power category, last year's *Phone Sweepstakes* winner, Jeff Steinman, KRØY, of Dallas, operated from WM5G to gain his first victory on CW. A new record, Jeff's score broke KM9P's 1992 record by 122 QSOs—an incredible jump in one year and a direct result of the popularity of the PINS program. Bill Fisher, KM9P, of *Lilburn, Georgia*, was trying to defend his title from N4RJ, but couldn't keep up with Jeff to the end and finished third. Demonstrating the importance of experience, 1987 winner Bill Bradford Jr, K5GA, of Houston, operated W5WMU in Louisiana to second

Top Five—CW

(Boxes list call sign, score, and class (Q = QRP, A = Low Power, B = High Power, M = Multioperator)

Northeast Region (New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)			Southeast Region (Delta, Roanoke and Southeast Divisions)			Central Region (Central and Great Lakes Divisions; Ontario Section)			Midwest Region (Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)			West Coast Region (Northwestern, Pacific and Southwestern Divisions; Alberta, British Columbia and NWT/Yukon Sections)		
W2GD	118,950	Q	WA4PGM	100,928	Q	W9UP (KA9FOX,op)	115,624	Q	N3SL	132,132	Q	AA2U	110,850	Q
K1TR	102,448	Q	W0MHS/4	81,320	Q	W9RE	111,872	Q	KØFRP	123,600	Q	NØAX	90,592	Q
K3WW	92,872	Q	KB4GID	81,216	Q	WA1UJU	75,600	Q	KØSCM	109,500	Q	N7IR	90,450	Q
W1MJ	80,928	Q	W8DL	79,200	Q	WA8RJF	65,036	Q	N9CIQ	88,200	Q	W7YAQ	85,994	Q
WA1GUV	79,476	Q	N4TG	56,160	Q	K9JU	54,648	Q	N5NMX	64,970	Q	K7MM	84,096	Q
W2TZ	144,892	A	NP4A (K7JA,op)	210,518	A	K4XU	155,344	A	N5RZ	196,840	A	KY7M	179,700	A
WA2SRQ	143,792	A	KP2/N6OP	180,120	A	K6BL	149,264	A	AD5Q	176,484	A	K6OY	173,712	A
NJ2L	134,520	A	N4AA	158,620	A	N4TY	148,888	A	KØEU	174,900	A	W1FEA	166,936	A
KY1H (KB1W, op)	121,800	A	K4PQL	153,520	A	K8CX	144,298	A	WBØHBS	158,004	A	AB6FO	163,400	A
KZ1M	121,752	A	KM5G	151,950	A	AA8AV	133,912	A	WDØT	156,584	A	KD6WW	155,496	A
K3LR	208,544	B	W5WMU (K5GA,op)	236,774	B	K9FD (WX3N,op)	209,440	B	WM5G (KRØY,op)	236,512	B	W7RM (N6TR,op)	218,834	B
K2SS	197,600	B	N4RJ (KM9P, op)	231,000	B	VE3EJ (K5ZD,op)	203,528	B	K5GN	221,452	B	K6LL	212,982	B
KF3P	189,600	B	N8RR	191,268	B	WA8ZDT	182,704	B	N2IC	216,524	B	N6TV	198,814	B
K1TO	188,936	B	W5XX	188,176	B	K8CC	181,336	B	NCØP (AG9A,op)	213,136	B	VE7SZ	193,116	B
K3ZO	184,376	B	AA4NC	185,440	B	KW8N (WD8IXE,op)	180,424	B	NM5M	212,212	B	W6QHS	192,192	B
W3GH	167,808	M	N4ZZ	212,058	M	K9LJN	151,392	M	AA5B	223,916	M	N6VR	202,048	M
WB2PSI	118,864	M	W4AQL	191,114	M	AA9AX	142,728	M	WXØB	192,280	M	K6XT	179,564	M
W3OV	108,984	M	NJ4F	145,160	M	W8EDU	140,296	M	K5OJI	178,024	M	W6BIP	161,084	M
K2QMF	108,528	M	KI4UZ	135,864	M	K9MMS	129,944	M	WØAA	178,024	M	KV6H	160,930	M
WD3P	87,400	M	W4XD	81,750	M	WD8AUB	128,136	M	ABØS	157,234	M	NV6O	102,564	M

Top Five—Phone

(Boxes list call sign, score, and class (Q = QRP, A = Low Power, B = High Power, M = Multioperator)

Northeast Region (New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)			Southeast Region (Delta, Roanoke and Southeast Division)			Central Region (Central and Great Lakes Divisions; Ontario Section)			Midwest Region (Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)			West Coast Region (Northwestern, Pacific and Southwestern Divisions; Alberta, British Columbia and NWT/Yukon Sections)		
K1DG (WZ1R,op)	119,504	Q	WD4AVY	47,742	Q	W9UP (KA9FOX,op)	161,546	Q	W2CRS	113,544	Q	N6PEQ	152,614	Q
AA2U	94,556	Q	WF4U	25,172	Q	WB8G	100,408	Q	KØSCM	109,896	Q	WB2ODH/6	100,562	Q
K3WW	78,540	Q	WR4I	23,322	Q	KO4BI	81,696	Q	W7CFL	101,794	Q	N6WMF	99,484	Q
KD2TT	62,050	Q	KN4QS	20,538	Q	WA8RJF	64,824	Q	KØTO (NØBSH,op)	95,850	Q	WA7BNM	86,700	Q
WA1LNP	55,440	Q	KV8S	20,400	Q	N9NE	53,130	Q	KØFRP	77,234	Q	VE6SH	39,960	Q
KZ1M	181,874	A	K4VUD	251,328	A	WN9P	228,844	A	KØEU	273,658	A	K7QQ	278,740	A
AD8J	153,692	A	N8II	160,006	A	AJ9C	206,360	A	VE4GV	235,466	A	W1FEA	238,392	A
AA2GQ	133,826	A	KA4RRU	136,444	A	K4XU	198,044	A	KM5H	231,616	A	W7ZRC	210,518	A
WA2UUK	124,432	A	AA4LR	126,742	A	AA8AV	167,706	A	WDØT	213,752	A	K7RI	206,052	A
KZ2I	117,450	A	KD3GC	107,030	A	K8BL	154,616	A	ACØW	142,050	A	W7YAQ	177,100	A
K3LR (K3UA,op)	328,328	B	W5WMU	295,064	B	W9RE	295,218	B	K9RS (AA5B,op)	316,162	B	KI3V/7	338,492	B
K1KI	292,908	B	W4MYA	273,966	B	K8CC (WD8IJP,op)	294,294	B	KØKR	315,646	B	W6QHS (KM9P,op)	338,030	B
KF3P	279,202	B	WZ4F	256,102	B	KW8N (NZ4K,op)	270,424	B	W5KFT (WB5VZL,op)			K6LL	327,096	B
WB1GQR (WB2JSJ,op)	278,278	B	NX9T	191,730	B	ND4Y	261,646	B		313,852	B	KY7M	317,240	B
KE3Q	280,742	B	KU4J	189,112	B	AA8U	239,316	B	VE5DX (VE5MX,op)	286,132	B	WC6H	314,468	B
									NØAT	281,820	B			
W3GH	250,096	M	N4ZZ	325,094	M	K9ZO	286,286	M	WXØB	301,532	M	W6EEN	297,990	M
KY2J	237,930	M	AB4RU	288,750	M	K8MJZ	246,092	M	NJ1V	275,198	M	N6ND	277,970	M
W3GNQ	235,928	M	WF7B	269,808	M	N9QX	236,698	M	WVØQ	233,156	M	KI6QG	277,508	M
WA2UKP	219,142	M	KP2N	228,228	M	VE3XD	232,078	M	N5NMX	223,606	M	N6NB	241,318	M
N1MM	216,144	M	N4CXF	224,378	M	KG8CO	188,342	M	WØAA	214,320	M	N6TV	240,548	M

place overall. Another Houston ham who broke the record score was fourth-place finisher Dave McCarty, K5GN, operating from South Texas.

The low-power competition was also dominated by stations from the south—way south! Chip Margelli, K7JA, planted an AEA Isoloop in the spectacular hilltop backyard of Pedro Piza Jr, NP4A, in Ponce, Puerto Rico, and operated to a new record. His score would have placed him in the Top 10 for high power—a remarkable achievement. Chip was chased by last year's low-power winner, Ralph Bowen, N5RZ, of Midland, Texas. Ralph takes advantage of his location in the "rare" West Texas Section, but it wasn't enough this time. Third was Bill Zachary, KP2/N6OP, operating from the Virgin Islands with one of the longest call signs in the contest. Think about having to send his call sign in your exchange every QSO! A close fourth was Lee Finkel, KY7M, in Scottsdale, Arizona. Lee missed two Sections, which cost him a position in the standings. The top "northern" score was turned in by perennial low-power ace, Dick Frey, K4XU, operating from the "black hole" of Illinois.

The awards for operating skill and perseverance must go to those who choose to battle it out in the QRP category. Steve Larson, N3SL, of Franktown, Colorado, took advantage of the high bands from his QTH to gain the victory and set a new record. Steve moved up from a third-place finish last year. The "Avis" award goes to John Crovelli, W2GD, of Milford, New Jersey, who earned his third second-place QRP finish in the past four years! John used excellent low-band conditions to make his big score. It seems unbelievable, but John was standing in a grocery store checkout line when the contest started. Did his 50-minute-late start cost him the contest? Last year's QRP winner, Scott Neader,

Mathew, KBØLFV,claims to like CW better than phone. This 13-year-old Novice made 63 contacts from North Dakota.

Doug, KI7LP, made Sweepstakes a family affair, as (l-r) Kimberly, KB7TZX; Doug; Kristy, KB7VQA; and Roxanne, KB7PXU, combined for a multioperator effort from Arizona. They'll soon be seen sporting their new PINS pins at local hamfests.

ARRL November Sweepstakes Plaque Winners

Listed below are all of the plaque category winners. Only plaques with sponsors will be awarded. If you have won a plaque category without a sponsor, call ARRL HQ for your options.

Category	Winner	Donor
Overall		
QRP Phone	W9UP (KA9FOX,op)	Kenwood Employees ARC, WD6DJY
Low Power Phone	KØEU	Kenwood Employees ARC, WD6DJY
High Power Phone	KI3V/7	Kenwood Employees ARC, WD6DJY
Multioperator Phone	N4ZZ	Kenwood Employees ARC, WD6DJY
QRP CW	N3SL	Kenwood Employees ARC, WD6DJY
Low Power CW	NP4A (K7JA,op)	Kenwood Employees ARC, WD6DJY
High Power CW	WM5G (KRØY,op)	WN4KKN and WØUA
Multioperator CW	AA5B	Kenwood Employees ARC, WD6DJY
Atlantic Division		
QRP CW	K3WW	
Low Power CW	W2TZ	Southern Maryland ARC
High Power CW	K3LR	North Coast Contesters
Multioperator CW	W3GH	
QRP Phone	K3WW	
Low Power Phone	AD8J	
High Power Phone	K3LR (K3UA,op)	North Coast Contesters
Multioperator Phone	W3GH	Mark Sickmeyer, KB3GJ, Memorial
Central Division		
QRP CW	W9UP(KA9FOX,op)	Randy Rand, AA2U
Low Power CW	K4XU	Society of Midwest Contesters
High Power CW	K9FD (WX3N,op)	Hoosier Contesters
Multioperator CW	K9LJN	
QRP Phone	N9NE	
Low Power Phone	WN9P	Society of Midwest Contesters
High Power Phone	W9RE	Western Wisconsin DX Assn
Multioperator Phone	K9ZO	Calumet Amateur Radio Enthusiasts
Dakota Division		
QRP CW	N9CIQ	Tod Olson, KØTO
Low Power CW	WDØT	Twin City FM Club
High Power CW	KØHB	Minnesota Wireless Assn, WØAA
Multioperator CW	WØAA	Minnesota Wireless Assn, WØAA
QRP Phone	KØTO (NØBSH,op)	Tod Olson, KØTO
Low Power Phone	WDØT	Twin City FM Club
High Power Phone	NØAT	Minnesota Wireless Assn, WØAA
Multioperator Phone	WØAA	Minnesota Wireless Assn, WØAA
Delta Division		
QRP CW	N4TG	Pat Sonnier, W5WMU
Low Power CW	KM5R	Tim Totten, KJ4VH
High Power CW	W5WMU (K5GA,op)	Kentucky Contest Group
Multioperator CW	N4ZZ	Fist and Mouth Contest Company
QRP Phone	AC4HF	
Low Power Phone	N8RR	Pat Sonnier, W5WMU
High Power Phone	W5WMU	
Multioperator Phone	N5WA	
Great Lakes Division		
QRP CW	WA8RJF	Bill Maxson, N4AR
Low Power CW	K8BL	Mad River Radio Club
High Power CW	WA8ZDT	North Coast Contesters
Multioperator CW	W8EDU	David Smith, ND4Y
QRP Phone	WB8G	Chris Gay, KU4A
Low Power Phone	AA8AV	Mad River Radio Club
High Power Phone	K8CC (WD8IJP,op)	North Coast Contesters
Multioperator Phone	K8MJZ	
Hudson Division		
QRP CW	W2GD	Bill Keller, W2RQ
Low Power CW	WA2SRQ	John Crovelli, W2GD
High Power CW	N2BA (K8HVT,op)	John Golomb, KZ2S
Multioperator CW	K2QMF	Stuart Silverstein, K3UEI, Memorial
QRP Phone	AA2U	QRP Club of New England
Low Power Phone	KC2AG	Troy ARA
High Power Phone	WB2K	John Hults, KF2BH
Multioperator Phone	KY2J	
Midwest Division		
QRP CW	KØSCM	Jon K Jones, MD, NOØY
Low Power CW	KØRWL	
High Power CW	NCØP	
Multioperator CW	ABØS	
QRP Phone	KØSCM	Suburban Radio Club of St Louis County
Low Power Phone	KMØL	
High Power Phone	K4VX (AAØCR,op)	
Multioperator Phone	WVØQ	
New England Division		
QRP CW	K1TR	Jim Kearman, KR1S
Low Power CW	KY1H (KB1W,op)	Brian Szewczyk, NJ1F
High Power CW	K1TO	Murphy's Marauders Contest Club
Multioperator CW	K2SX/1	Jon Neary, W1UA
QRP Phone	K1DG (WZ1R,op)	Michael Perry, WM1K
Low Power Phone	KZ1M	Naked Chicken Contest Club
High Power Phone	K1KI	Ed Parsons, K1TR
Multioperator Phone	N1MM	Jon Neary, W1UA
Northwestern Division		
QRP CW	NØAX	
Low Power CW	W7ZRC	Ken Kopp, KØPP
High Power CW	W7RM (N6TR,op)	Dennis Motschenbacher, AA7VB (KZ5M)
Multioperator CW	KL7Y	
QRP Phone	WAØRJY	Antenna Resources-K7LXC
Low Power Phone	K7QQ	
High Power Phone	KØPP/7	Willamette Valley DX Club
Multioperator Phone	WS7I	
Pacific Division		
QRP CW	W6JTI	Northern Nevada DX-Contest Club
Low Power CW	W1FEA	Robert A. Wilson, N6TV
High Power CW	N6TV	Richard Hallman, KI3V/7
Multioperator CW	W6BIP	
QRP Phone	N6WMF	
Low Power Phone	W1FEA	Jim Hollenback, WA6SDM
High Power Phone	W6QHS (KM9P,op)	Richard Hallman, KI3V/7
Multioperator Phone	N6ND	
Roanoke Division		
QRP CW	WA4PGM	
Low Power CW	N4AA	Rick Niswander, K7GM
High Power CW	AA4NC	Rick Niswander, K7GM
Multioperator CW	NJ4F	
QRP Phone	WD4AVY	
Low Power Phone	N8II	
High Power Phone	W4MYA	
Multioperator Phone	WF7B	Shenandoah Valley ARC
Rocky Mountain Division		
QRP CW	K6EIL	University ARC, Wyoming
Low Power CW	KØEU	Dave Fisher, WØMHS
High Power CW	N2IC	
Multioperator CW	AAØNC	
QRP Phone	W2CRS	
Low Power Phone	WC7S	
High Power Phone	K9RS (AA5B,op)	
Multioperator Phone	NØRAB	
Southeastern Division		
QRP CW	WØMHS/4	Virgin Islands ARC
Low Power CW	KP2/N6OP	
High Power CW	N4RJ (KM9P,op)	
Multioperator CW	W4AQL	
QRP Phone	KN4QS	Virgin Islands ARC
Low Power Phone	K4VUD	
High Power Phone	WZ4F	
Multioperator Phone	AB4RU	
Southwestern Division		
QRP CW	AA2U	Rich Lindsay, N7RDK & Karen Lindsay, N7XXS
Low Power CW	KY7M	Larry Serra, N6AZE
High Power CW	K6LL	
Multioperator CW	N6VR	Warren Hill, KF7AY
QRP Phone	N6PEQ	
Low Power Phone	N6HC	
High Power Phone	K6LL	
Multioperator Phone	W6EEN	
West Gulf Division		
QRP CW	N5NMX	
Low Power CW	N5RZ	D Craig Boyer, AH9B
High Power CW	K5GN	WØGOW, W5RO Memorial
Multioperator CW	WXØB	Oklahoma Comm Center
QRP Phone	KA5PVB	
Low Power Phone	KM5H	D Craig Boyer, AH9B
High Power Phone	W5KFT (WB5VZL,op)	WØGOW, W5RO Memorial
Multioperator Phone	WXØB	Oklahoma DX Assn
Canada		
QRP CW	VE7YU	
Low Power CW	VE4VV	Don Haney, KA1T
High Power CW	VE3EJ (K5ZD,op)	
Multioperator CW	VE1NH	
QRP Phone	VE6SH	
Low Power Phone	VE4GV	
High Power Phone	VE5DX (VE5MX,op)	D Craig Boyer, AH9B
Multioperator Phone	VE3XD	

KA9FOX, again operated W9UP in Wisconsin, this time finishing third.

The AA5B team, operating from New Mexico, repeated as champion of the multioperator category. It was followed by a close race between N4ZZ in Tennessee and W4AQL in Georgia.

Clean Sweeps were hard to find on CW, with only 73 single ops achieving this goal. VY1JA and VY1CM were on, but poor solar conditions dramatically limited the number of contacts they could make. At the top levels of competition, that last Section for a Clean Sweep is worth between 10 and 15 QSOs. More than one race was decided by the good fortune of finding VY1 for the Sweep.

ARRL HQ received 1376 entries for CW. The most popular category was single-operator "A power" (150 W), with 879. There were 230 "B power" entries and 147 in the QRP class. There were 1252 single operators, 104 multioperators and 17 CW checklogs.

Phone—Something for Everyone

It's amazing what two weeks can do to change radio propagation. The Phone Sweepstakes offered opportunities to every area of the country.

The race for number one in the high-power category was a shootout in the West.

Affiliated Club Competition

Unlimited Category	Score	Entries	CW Winner	Phone Winner
Northern California Contest Club	7,439,544	80	N6TV	KI3V/7
Yankee Clipper Contest Club	5,285,366	70	W2SC	K1KI
Potomac Valley Radio Club	4,302,556	54	KF3P	KE3O
Medium Category				
Southern California Contest Club	6,162,956	49	K6LL	K6LL
Mad River Radio Club	5,246,472	50	K6CC	K6CC (WD6IJP,op)
Society of Midwest Contesters	4,670,094	50	K4VX (WX9E,op)	W9RE
Minnesota Wireless Assn	4,406,446	50	W0AIH (KØFVF,op)	N0AT
North Coast Contesters	3,989,170	38	K3LR	K3LR (K3UA,op)
Frankford Radio Club	3,624,040	48	KZ2S	WB2K
North Texas Contest Club	3,797,630	30	WM5G (KRØY,op)	W5KFT (WB5VZL,op)
Kentucky Contest Group	2,386,186	30	N4TY	ND4Y
Murphy's Marauders	2,168,154	28	K1TO	K1RM
Western Washington DX Club	1,908,206	20	N7TT	N7TT
Mile-Hi DX Assn	1,876,428	19	N2IC	KØKR
Texas DX Society	1,655,230	12	W5WMU (K5GA,op)	KI5L
Southeastern DX Club	1,449,990	9	N4RJ (KM9P,op)	K4BAI
Salt City DX Assn	992,354	11	K2ZJ	K2ZJ (WA2LCC,op)
Rochester (NY) DX Assn	959,730	19	W2TZ	AF2K
Kansas City DX Club	954,534	11	NØXA (KØVBU,op)	KMØL
Cascade Contest Club	938,122	10	AA7NX	W7YAQ
Left Coast Contest Club	872,184	5	K7OQ	K7OQ
New Mexico Big River Contest Club	846,736	7	K7UP (KN5H,op)	K9RS (AA5B,op)
Motor City Radio Club	810,394	34	K8RDJ	K8SAK
Troy ARA	760,320	23	WA1KKM	WA1KKM
Livingston ARK	740,768	15	KW8G	KW8G
Upper Lake Livingston Wireless Assn	731,470	4	AA5BL	N5OLS
Western Illinois ARC	654,574	7	K4XU	K4XU
Woodbridge Wireless	533,824	10	WB4NFS	WD4KXB
Radio Amateurs of Northern Vermont	507,826	3 (WB2JSJ,op)	WB1GQR	WB1GQR (WB2JSJ,op)
Central Virginia Contest Club	517,820	4	W4MYA	W4MYA
South Jersey Radio Assn	472,486	20	WA2VYA	KE2OP
Mississippi Valley DX/Contest Club	471,440	6	K9FD (WX3N,op)	K4VX (AA0CR,op)
Lincoln ARC	466,322	8	KØSCM	KØSCM
Valley Radio Club of Eugene	452,736	6	K7DBV	AI7W
Northern Alabama DX Club	442,174	5	KC4TEO	KU4J
Ventura County ARC	435,582	6	—	K6VMN
Putnam Emergency Amateur Repeater League	411,946	3	WA2UKP	N2IWE
Oklahoma DX Assn	410,134	4	KM5H	KM5H
Wichita ARC	401,300	6	WØAWP	WXØU
Long Island Mobile ARC	343,740	8	K2AU	KS2G
Tri-City ARC	341,222	3	KE7GH (NU7I,op)	KE7GH
St Croix ARC	331,338	4	NP2I	NP2I
Northrop Radio Club	330,508	5	K6HRT	W6CN
Providence Radio Assn	329,736	3	K1PLX	
Western New York DX Assn	327,462	9	WB2YOH	VE3VET
Central Michigan ARC	320,812	20	W8TJQ	W8TJQ
Rip Van Winkle ARS	305,968	21	N2JOH	N2JOH
Calgary ARA	272,544	4	VE6KTT	VE6KTT
Virgin Islands ARC	262,460	4	KP2N	NP2E
Wyoming DX Contest Club	265,388	7	WC7S	WC7S

Medium Category (continued)	Score	Entries	CW Scores	Phone Scores
Hazel Park ARC	260,004	15	WD8S	WD8S
Southern California DX Club	250,550	4	KC6X	KC6X
West Park Radions	226,414	10	W8PN	WB8ORV
Downey ARC	215,586	7	KA3DSE/6	KA3DSE/6
Redwood Empire DX Assn	201,290	7	AA6YX	WB2CHO
Albany ARA	178,706	10	WA2BAH	N2CKV
Jersey Shore ARS	178,264	3	WB2DIN	WB2DIN
Murgas ARC	177,782	10	WB3FAA	N3KAE
North Jersey DX Assn	175,592	7	WA2UDT	WA2UDT
Meriden ARC	161,436	6	W1KKF	WB8IMY
Schenectady ARA	155,168	4	K2UF	K2UF
Fon du Lac ARC	154,500	5	ND9O	K9QYC
Kankakee Area Radio Society	146,628	4	N2CS	N2CS
Poughkeepsie ARC	130,622	9	AA2GS	AA2GS
Talladega RAC	121,508	5	—	AA4UF
Conejo Valley ARC	120,250	5	WB2WIK	KN6RU
Eastern Iowa DX Assn	118,148	5	KFØH	WØPPF
Amoskeag Radio Club	106,074	4	K1ATL	K1ATL
Laurel ARC	105,918	3	KB5IXI	N5KKG
Fox Cities ARC	104,846	7	AA9GF	KB9AIT
Highland ARA	103,666	5	—	WA8KIW
Clark Co (IN) ARC	99,532	5	W4WQD	NX9B
Kettle Moraine Radio Amateurs	90,538	5	N9EZ	KB9AMG
Lebanon Valley Society of Radio Amateurs	87,542	5	N3FQG	N3FQG
OH-KY-IN ARS	87,164	4	KF4AV	N8KOJ/T
Eastern New Mexico ARC	78,738	3	AA5UR	KA5BAT
Hamtesters Radio Club	76,012	3	W9LNQ	W9LNQ
Rowan ARS	75,910	6	W8UT	WB4Y
Eastern Michigan ARC	68,412	5	NT8V	WA8OJR
Lynchburg ARC	61,150	5	WD4ELJ	WB4ZPF
West Allis RAC	60,848	3	K9KR	K9KR
Newington Amateur Radio League	52,026	3	NM1K	N1KWJ
Sterling Park ARC	51,922	4	N4UTY	W4LMJ
Virginia Beach ARC	48,692	3	N4AIG	N4AIG
Capital City ARS	4,536	3	—	K3UAL
Local Category				
River City Contesters	1,443,344	10	AA6WJ	N6YKL
Federation of Amateur Radio Operators	660,968	6	K9BGL	K9BGL
Central Arizona DX Assn	652,648	9	K7NO	K7NO
Blackhawk DX and Contest Club	400,786	4	K9UIY	—
Utah Contest Club	356,220	4	K6EIL	K6XO/7
Overlook Mountain ARC	311,984	3	KU2Q	KY2J
Hoosier Contesters	279,272	3	K9UWA	WO9Z
North Shenandoah DX Assn	238,630	4	N4MM	N4MM
Falmouth ARA	230,592	4	K5MA	KA1IQR
Northern Ohio DX Assn	222,826	4	W8JGU	KØTSE
Sturdy Memorial Hospital ARC	222,410	5	WZ1K	AA1FY
10-70 Repeater Assn	210,984	6	KB2JE	N2CFD
Northern Arizona DX Assn	201,804	3	W7YS	—
Northern Nevada DX and Contest Club	180,426	3	KZ4H/7	AA7EN
Jay Hawks ARS	155,796	4	AAØFO	KBØIDB
Naked Chicken Contest Club	69,996	5	KJ4KB	KJ4KB

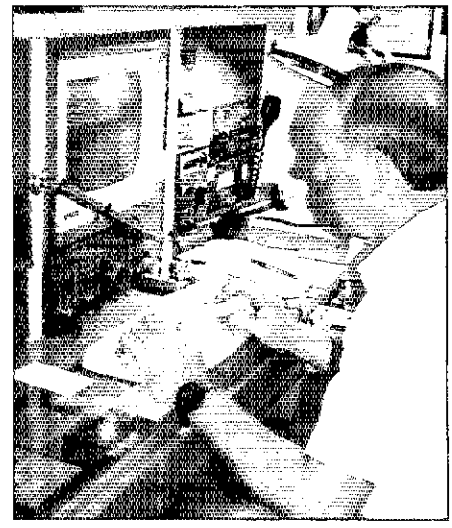
Rich Hallman, KI3V, earned his first major contest victory by outshooting traveling gunslinger Bill Fisher, KM9P. Bill flew from his home in Georgia to operate from the mountaintop location of W6QHS in northern California. Bill arrived just hours before the contest, oriented himself to the station and then tried to learn propagation "on the fly." Rich had a lead of more than 200 contacts at the end of Saturday night, but Bill kept grinding on Sunday and gained back all but 40 of them by closing hours of the contest. In the end, it was the better 40-meter signal of KI3V that nailed down the victory. The difference between first and second was less than two contacts per hour!

Third place was the result of unusual propagation meeting a super operator at a great station. Phil Kuck, K3UA, pushed the K3LR station in Western Pennsylvania to a tremendous score. Incredibly short skip on 20 meters got Phil off to a great start (his first six hours all had more than 130 QSOs/hr). With only eight hours left to go, Phil was leading KI3V and W6QHS! Unfortunately, propagation returned to "normal" Sunday afternoon and he couldn't hold them off. Phil broke the Division record by almost 400 contacts and set the highest score ever east of the Mississippi River.

The low-power competition was as exciting as it gets. Rex Maner, K7QQ, in Washington, squeaked by Randy Martin, KØEU, in Colorado, for the top spot. Randy was up by more than 160 QSOs when they went to sleep Sunday morning. Even with only three hours to go, Randy was maintaining a 78-contact lead, but the difference was in the off-time strategy. Although Randy had some time to kill, Rex motored right to the end and the win. That's what makes Sweepstakes exciting!

For the past several years, the key to big SS scores out west was the huge pool of contacts available in the 10-meter Novice subband. There was quite a change this year, with Rex making only 180 contacts on the band and Randy making none! Rex started the contest on 10 with a disappointing 80-QSO hour, while Randy was racing to a 121-contact hour on 15 meters. Third-place finisher Charles Harpole, K4VUD, in Florida, only made eight contacts on 10 meters. All three had more than 400 QSOs on

The next guy who IDs with just the last two letters of his call sign gets it! Ed, N5XIO, works the pileups at AA8FU in always-rare West Virginia.



Jerry, KG6LF, keeps an eye on his rate during the phone contest.

QSO Number versus Time (UTC)
For Top Three Entries in Each Category

CW

Call Sign	22	00	06	12	18	00	03
WM5G	100	292	822	1023	1285	1518	1609
W5WMU	104	286	781	970	1242	1424	1557
N4RJ	97	284	785	1014	1292	1469	1531
NP4A	101	251	701	858	1098	1278	1388
N5RZ	96	271	675	798	1039	1253	1321
KP2/N6OP	87	236	617	742	954	1148	1219
N3SL	77	180	402	471	629	784	874
W2GD	8	119	374	432	609	755	814
W9UP	38	129	325	347	541	705	788

Phone

Call Sign	22	00	06	12	18	00	03
KI3V	167	500	1043	1220	1574	2062	2281
W6QHS	148	419	911	1045	1457	2015	2242
K3LR	130	399	1161	1389	1743	1969	2163
K7QQ	80	285	625	765	1078	1581	1810
KØEU	121	272	706	924	1277	1659	1797
K4VUD	61	215	569	780	1024	1444	1643
W9UP	46	200	498	564	787	999	1060
N6PEQ	64	203	391	430	632	893	991
K1DG	48	136	345	429	593	760	799

40 meters. It's time to start working on those low-band antennas if you want to be competitive next year.

The top three QRP scores covered coast to coast. Scott Neader, KA9FOX, operated W9UP in Wisconsin to first place and broke the 1000-QSO mark. It's hard to imagine making that many QSOs amid the contest QRM with only 5 W! In second place with an equally impressive score was Dan Dankert, N6PEQ, in California. Charlie Morrison, WZ1R, visited K1DG in New Hampshire to claim the number-three spot. It took at least 600 QSOs to make the QRP Top 10.

Taking advantage of the same conditions that powered K3LR, the multioperator title was won by the team at N4ZZ in Tennessee. They had a good lead over a tight battle between W6EEN and WXØB.

Clean Sweeps were easier on phone than CW. A total of 369 stations submitted entries eligible for collecting Clean Sweep mugs this year. Of the 1655 logs received for phone, 79 were single-operator QRP entrants, 934 low power, 342 high power, 278 multiops and 22 phone checklogs. Many multiop entries were from single operators using their local packet networks to help them brush up a Clean Sweep.

Regional Competition

There's been talk in contest circles lately that the write-ups only recognize the top scores. That's not necessarily bad (the top scorers deserve the recognition), but we're all aware of inequities created by propagation, geography and demographics. Great operators and stations exist all around the country. We need a way to highlight and encourage regional competition in a way that maintains the existing contest framework.

The Sweepstakes has always featured competition at the Division level. Many operators are justifiably proud of winning their categories, and perhaps a plaque, within their Divisions. To further highlight these races, the score listings have been redesigned. Entries are now listed by Division and category. This makes it easy to see how you finished in your Division, and easier to find comparable scores in other Divisions.

To initiate a higher level of regional competition, the US and Canada have been divided into five regions. Each region consists of a combination of ARRL Divisions balanced for "best fit" in terms of common geography or population. The challenge of this competition level will be to make the new Regional Top Five boxes for each category. Let's look at the Regions and some of the exciting races within them.

The Northeast Region includes the New England, Atlantic and Hudson Divisions, and the eastern Canadian provinces (VO1, VO2, VE1, VY2, VE9, VE2). The closest CW race here was for high-power honors between KZ2S, K1TO and K1DG (WZ1R, op). On phone, it was down to the wire for high-power entrants K1KI, WB1GQR (WB2JSJ, op) and K3ZO.

The Southeast Region consists of the Roanoke, Southeast and Delta Divisions. There were three close races for CW position. In low power, N4AA and K4PQL battled for tops in North Carolina. The QRP category in Georgia was a virtual tie between KB4GID and WØMHS/4. The multioperator title was for national honors between N4ZZ and W4AQL.

The Central Region includes the Central and Great Lakes Division and the Canadian Province of Ontario. A handful of QSOs can make the difference in where you end up in this Region. K9FD (WX3N, op) made his goal of becoming the first W9 to achieve the overall Top 10 in almost 30 years! Behind him, KQ8M, K8CC and WA8ZDT were engaged in a tense battle. K8BL, K8CX and N4TY were neck and neck in the low-power race. On phone, the tightest race was between high-power entrants W9RE and K8CC (WD8IJP, op).

The Midwest Region covers the West Gulf, Rocky Mountain, Midwest and Dakota Divisions and the Provinces of Manitoba and Saskatchewan. This Region covers the prime real estate for doing well in the Sweepstakes and includes the highest scores. All five of the Region's high-power CW scores made the national Top 10! On phone, the race between K9RS (AA5B, op) and W5KFT (WB5VZL, op) was settled by a difference of just 15 contacts, 2053 to 2038.

The West Coast Region consists of the Southwestern, Pacific and Northwestern Divisions and the western Canadian provinces (VE6, VE7, VE8, VY1). This Region is equally challenging. It took a Top 10 national finish to win any of the four categories on either mode. The QRP race on CW saw AA2U visiting Arizona (and winning) over a tight race between N7IR and NØAX. On phone, in addition to the top two overall scores, it took an overall Top 10 score to make the Regional box.

This year is the first trial of the new Regional competition and reporting in Sweepstakes. If it adds to the excitement and your enjoyment of the contest, let us know. Enough favorable response and it's sure to become a regular feature. Should we do the same Regions for the ARRL DX Contest as well?

Club Competition

The Affiliated Club Competition might as well be called the California Club Competition! The Northern California Contest Club repeated as champion of the Unlimited Club category. With 80 entries totaling more than 7 million points, the NCCC appears to be beginning another SS dynasty. The second-place Yankee Clipper Contest Club was close with 70 entries, but came up short with a little more than 5 million points.

The Medium Club category saw the Southern California Contest Club move up to the number-one spot after finishing second last year. Competition was fierce, as five of the top six Medium clubs were within two of the maximum allowed number of 50 entries! Look for some 50-entry clubs to move up next year as their memberships grow.

The Local Club Category allows a maximum of 10 entries with all members operating from within 20 miles of the club center. No one has the Sweepstakes prowess within such a small area as the River City Contesters. The RCC smashed the competition in winning its third title of the past four years. It might have been four in a row, but last year they had 11 entries and moved into the Medium category. The Federation of ARO (Illinois) and the Central Arizona DX Association battled it out for second and third.

Final Notes

Special thanks to Assistant Contest Manager Warren C. Stankiewicz, NF1J, and Contest Assistant Anne Jaworski for their help in preparing the results. Mark your calendar for the 1994 Sweepstakes: CW SS is November 5 to 7 and phone SS is November 19 to 21. If you're using a computer for logging, send your entries in electronically.

Ed, AA2PZ, says, "After 30 years of not being on the air, even when you just operate barefoot with a random wire, SS is more fun than ever!"

Craig, NR4E (l), runs stations at N4CXF while Sherman, N4CXF, hunts for an elusive multiplier.

SOAPBOX

CW

We could have done better, but we ran out of Snapple and pepperoni sticks late into the contest (W3GH). Conditions to Europe were terrible—oops, wrong contest (AA7BG). I can't compete with the "big guns," but I still had fun (AA1GE). Contesting was always intimidating to me and I avoided the activity. However, I've become so fond of CW that I thought I'd give the Sweepstakes a try. Suprisingly, I found the experience enjoyable and will probably participate again. I liked the slow-speed CW segments—they were a major impetus for my participation and I suspect other new licensees feel the same way (N1OPZ). Other than my rotator, keyer, computer and antenna problems, and the TVI, it was a great contest (K2SX). It still sounds like I'm hearing CW in the noise from my appliances a day later (A16E). My thanks to my wife for filtering the harmonics (WR1P). We wonder what the round-trip airfare is to Yellowknife (KB2R). The low bands were horrible Saturday night (W1PH). The pileup to work the Pacific Section was incredible! (K1DS). Conditions were so good, it was tough tuning in a couple of signals at a time (NU1P). I'd have clinched the Sweep with an exchange from the Yukon! (NW1S). I only operated CW to confuse the guys used to working KZ2S (KZ2I). The low bands were long! (NJ2L). Sweepstakes should be called "the contest for common hams!" (WA2LUF). This contest is fun even for those of us with wimpy stations (AA2DY). QRP is great for Sweepstakes (WA2ASQ). I don't think I did too bad for 13 hours of participation (WA3SYK). Although circumstances prevented my participating more, I couldn't miss getting in just a little time (N3GUK). I need to find the box with the linear amplifier! (W3HDH). After 128 contacts, my WWII-surplus headsets literally fell apart, so I took my bottle of Nyquil and went to bed (W3IMB). Maine and Yukon must have been frozen solid—I didn't hear either one (N8LM). If I can make 127k barefoot with a vertical, it can only mean one thing—activity must be up! (N4QS). I heard 13 multipliers that couldn't hear me. I need to get an amplifier or find a noisier location (K7GM). Next year, I'll shake a voodoo chicken in the direction of the Yukon (NX4N). My adrenaline was so high, I thought I was going to knock the paddle off the table! (AC4OC). I learned that using a narrow filter isn't good for contests (KP4TK). I've been bitten by the contest bug! (KE4CBB). I couldn't find a VE8, so I called CQ VY1/VE8 for the last 30 minutes. Just two minutes before the end of the contest, VY1JA answered me for the Sweep! (K4LTA). This is the first SS I've participated in and it's a great contest! (N4CT). I knew I shouldn't have missed the four hours! This is my best score yet and I'm looking forward to phone (WA4PGM). Getting that 80-meter dipole up sure helped this year. My amp worked as a great space heater during the contest (WB4NFS). I should have gone to Delaware! You know it's not a good year when you miss the state next door (KX4V). I didn't hear ND, AR or VE8, but it was still my best showing as far as the number of Sections I worked (K4UK). Every time I managed to get a frequency where I could run stations, the kids forced me off the radio (N4JEO). Sweepstakes brings out the best in a fine bunch of ops! (AA3DK). My score improved, but the "big-gun" stations improved more, so I lost ground. I need to keep improving my antennas (N8RR). I never could find the VE8. This contest is the CW man's test! I couldn't believe some of the QRP signals. I had a great time and some new hams watched, and we say that CW is definitely not dead! (K5SL). My keyer kept jamming on the "dah" side (N5FG). I've finished third twice and second thrice. This one felt good (KRØY). I was pleased to work my final Section, Wyoming, with 12 minutes left in the contest! (K5RX). I kept my butt on the operating position and had my best SS CW score as a result (NN5T). This is a good way to get your code speed up. The exchange is a killer! (WD5ABC). How we missed NWT is a mystery to us! (WXØB). I sure hate that I didn't find that VE8 (AA5BL). It's difficult to concentrate while running a fever. These were 16 of the most miserable hours of operating I've ever done (N5NMX). Murphy struck at home, at work and in the shack (WC5D). The slow-speed segments were great. They helped me work up my courage to mix it up at 35 wpm on the other bands (AB5OX). This year, I enjoyed making a Clean Sweep on low power without one TVI complaint (K6OY). This was my first Sweepstakes. It was fun, although I never tracked down a VY1/VE8. I managed to pick up a few states I needed toward 5BWAS (KC6X). I got excited when I found VY1JA for Section No. 76 with almost 3 hours left in the contest. I never could find a VE2 to finish the Sweep (WA6GDS). 10 meters never opened up, but 40 and 80 were great (WB2WIK). I can't believe I missed ENY! (N6GL). The trick to working VY1JA was to be polite and slow down to his speed (N5BF). This was my first CW contest and it was a lot of fun, thanks to the slow-speed CW frequencies (KJ6HO). I decided to see how QRP and Yagis compared to 100 W and a vertical (WA7BNM). This is a sensational contest and my personal favorite (NZ1M). The pins are *still* a great idea. Work only allowed me about four hours of operating time, just enough to make 100 QSOs and qualify for the pin (W6HT). I worked my 77th section on QSO no. 777, and finished with 1313. I'm not superstitious, but maybe I should be! (N6TV). I can't imagine how all my buddies worked PR on phone when I didn't even hear one (AE6Y). I worked Arkansas for the Sweep as Sunday dinner guests were rolling up my driveway (N1GT). I don't know which is worse, copying SS logs or doing my income tax (W6JVA). I could only muster 20 QSOs, but I enjoyed my first CW contest (N2LWL). My score was lower, but I had just as much fun (KK6WS). This was my first time in a CW contest outside of Field Day, and I'm wore out! (KK6IU). Thanks to VY1CM for calling and making a tough one easy (KV6H). I had a blast, but am getting too old to handle the full contest. This is generally the most courteous group of operators I have heard yet (K7NO). I should have gone Christmas shopping instead (AL7CQ). Bring back Cycle 22, the bands were almost dead (NL7DU). The conditions were crummy! (KL7Y). I could hear the Midwest working the East Coast, but couldn't hear the East Coast (K7FR). I operate in a lot of contests, but SS is tops in my book (WA7FAB). I spent my last hour looking for VE6, but no miracles this year (N7LOX). I didn't work a sweep this time, but I did work a bundle of new states on 80 meters for my 5BWAS (NØAX). Propagation got off to a poor start on Saturday, but things seemed a bit livelier on Sunday (KX7L). This was my first SS in 33 years. Where was NLI? (AA7VG). I had a great time this year! Someday I'll be competitive! (KF8QE). I haven't set any records, but I keep beating my old score (KZ8F). 40 meters provided the bulk of my contacts, but conditions were good enough on 15 for many of my western multipliers (WK8V). I dropped 50 QSOs from last year, but I think I learned something (KV8Q). I left the amplifier on the shelf and fired up the old spare transceiver barefoot. I had a ball! (K8SJ). This is a real contest with lots of participation (K8MBH). Where were the Canadians and the activity on 10 meters? I couldn't find either. I didn't know I could have so much fun running barefoot with modest antennas (KC8BK). After working more than 800 QSOs on 40 and 80, I'll be hearing static crashes for a month (K9BG). It's amazing what 100 W and a low G5RV will do! (WD9HTC). Last year, I missed only Delaware; this year, I missed half of Canada (KB9YO). This was my first time operating QRP! I learned a lot for next time! (W9RE). This one wore me out! (KJ9C). I can understand getting stumped by VE8, but not by VE6! (AA9FG). It was almost like Field Day—no refrigerator, no microwave and no bathroom! (KA9FOX). I had great fun operating in the slow-speed CW portions of the band. My goal was to make 100 contacts for the pin, but when I got to 100, I couldn't stop! (AA9GE). You know you're getting old when only 8 out of 358 stations send a lower check than yours (WØLQ). I'm getting my CW confidence back (WBØHZL). The Iron Curtain may have come down, but someone strung up an electromagnetic curtain at about the Canadian border (KØBJ). I flipped when VY1JA answered my CQ YU with 20 minutes left in the contest! (WX9E). TVI complaints slowed me down and made me run barefoot on 40 and 80 (KMØL). QRP is a challenge and a lot of fun (NØEID). The aurora made it rough this year (WBØO) I had a good time, but I need a sharper filter (VE2WAT). QRP is great, although it takes more effort to complete a contact (VE3FSV). It was interesting to see the 100-kHz spread of CW on 80 meters Saturday evening (VE3EKF). This was my first attempt at a CW contest in the slow-speed segments (VE5ZD). Being a VE6 in this contest makes up for running QRP (VE6SH).

Phone

I can't believe I missed North Florida. I have yet to work anyone from VE8 during SS (WB1DWO). Propagation was unusual on 15 and 10 Saturday evening, but on 15 it allowed me to work W8NR, whom I hadn't seen or worked in more than 30 years! (K8JLF). This was my third Clean Sweep in a row (WB1HBB). We had fun, even though we didn't get the Clean Sweep (WB1EDI). Using a check of 19 causes a lot of repeat requests (W1OP). I missed 10 meters, which was dead this year. Also, no one was on 160 (WA1JTZ). This was my first attempt at QRP and I was amazed at the results. I was only going to work for the pin, but was happy with 75 Sections (W1BYH). My score indicates that my vertical is only slightly better than a dummy antenna, and I loved every minute of it (N1JAC). This isn't the biggest score in the world, but after moving, it was nice to be back on the air (WA1MKE). I wish I could put in enough time to get serious (KB2HUN). I didn't operate as much as last year, but I loved every minute of it (N2MFZ). This was my first contest and I had a great time (N2SIJ). I finally worked SD for WAS! (N2QAN). Lots of coffee and lots of contacts made for a fun weekend. The highlight of the weekend came late Sunday, when I found a KP4 for my last multiplier and my first Clean Sweep! (WA2PNI). I didn't put in a lot of time, but still had lots of fun. After 33 years of SS, the thrill is not gone! (WA2UDT). Conditions on 10 meters were pretty bad for us Novice and Technician operators. My score was lower than last year, but I had a great time trying to run stations on 10 during a band opening Saturday evening (N2LDU). This was the first year that I was able to make a Clean Sweep. On Sunday morning, the temperature on my shack window thermometer read 20°—a lot can be said for operating "B" class. The amplifier sure kept the shack warm! (WA2WYR). Having the flu Saturday took the competitive edge off (KZ2J). I can't understand how I missed SD and PAC for the Sweep with 1500+ QSOs (K2ZJ). SS is always a lot of fun and keeps your listening skills sharp (K2ZR). This was the most fun I've had yet in Sweepstakes! I got my third straight pin and missed the Sweep by only two Sections (AA2IZ). I complied with all rulemaking entities, including my wife, which is why my score is so low (WB2DVU). The pins and the cups are an outstanding awards idea (WA2POW). There were tons of people on! (NW3C). Every year, it's a different Section that gets harder to contact (WW3S). After getting a Sweep last year, the first time we ever tried SS, I manned the rig all night and was bummed to miss it by about 8 Sections this year—I think we were having too much fun off mike. At least we get those neat pins! (WS1O). This was my first Sweep and it felt good (K4SB). The best moment was working VY1QST on the first call Saturday afternoon (AA4LR). It became difficult to work the close-in Sections with little or no ground wave (WA4AIP). I made 514 QSOs on 40 and 80 and not one Arkansas station called me (KI4HN). Yes, you can work SS with QRP—honest! (WD4AVY). The Clean Sweep is challenging and fun! (N4CT). This was my first Sweepstakes and although I didn't make a Clean Sweep, I enjoyed it. It's definitely possible to have fun with SS even when one's antenna is limited to a wire tossed up in a tree (AC4WC). I love this contest! I wish 10 meters was in better shape, though (WF7B). Where were VE1 and VE8? (N5FG). I worked hard, but couldn't make a Sweep on either mode this year (NN5T). The fun I had guarantees that I'll be back for more (KA0RNY). Conditions were excellent and I'm sure some Sweep records will be broken this year (WY7U). Conditions had to be fantastic, as I got good reports for my QRP signal (KA5PVB). When 20 meters died, it went instantly. It seems that conditions were better than they were for CW, though (AB5OX). I never did hear anyone from KP4. This was the first time in four years without a Clean Sweep (WS5R). I'd never heard 10 meters so quiet! (WR6R). I felt like I was running QRP. Were conditions that bad? (AB6FO). My heart was pounding as I worked KP4CZ for the Sweep and I don't even drink coffee! (AB6DI). I can't wait until next year! (KJ6HO). Once again, I didn't work Quebec. The QRP category seemed very competitive this year (WA7BNM). I don't believe I've ever heard so many weak signals before (W6TKV). The pins make it worthwhile to get on for a few hours (W6HT). It certainly was a good feeling to have Clean Sweep with more than 3½ hours of contest time remaining (WA6DJS). Did someone forget to put a quarter in the propagation machine? (KK6RV). I never thought Delaware would be so hard to get. I had two VE2s waiting in line! (WA6SDM). The multipliers came so quickly that my planned 2 or 3 hours stretched out to 8 hours in a vain attempt to make a Sweep (N6XI). I just can't avoid dupes after my brain has been irradiated with all that RF energy for 24 hours (AB6YL). My 3-element 40-meter beam went up an hour before the contest. I love these LeMans starts (KF6V). I'm always amazed at how propagation changes during the hours of the contest (KI6PG). What other contest can one do well in and use almost anything for an antenna? (WA0KDS). Where were all the VE4s? (KC7NX). I enjoyed myself this year; I was shooting for the pin and I got it! (N7XCZ). Running QRP is a humbling experience (W7CFL). I was surprised to see how well I got out on 40 (K7QQ). I know that if I ever had 24 hours of propagation, I could make the top 10 (AL7CQ). I only operated for a short time, but now I know how rare-DX stations feel (N7SEH). The cups are becoming a much sought-after award and I'm one happy operator to have gotten another one (AA8AV). I was sweating out PR and it was great to find NP4Z calling CQ (AA8FE). With an amplifier at my elbow, it was a great temptation to go high power—but I restrained myself! (W8AP). Darn, we were doing great until Sunday morning when we had an omelet attack—it cost us 3 hours and 150 contacts (KG8EF). I'm not much of a phone person, but it was fun getting close to the contester's grail—the Clean Sweep coffee mug (KZ8E). What happened to the KH6s? Did the islands sink and no one tell us? (N6WLX). There's no better way than Sweepstakes to test out the summer's antenna projects (AF8A). I worked 51 Sections in only 89 QSOs—not bad for my first phone SS (KF8BC). I've worked in three Sweepstakes and have a Clean Sweep in all three. You bet this is my favorite contest (WM8W). My two sons joined me and it made for a fine family effort (AA8FU). This is a real contest with lots of participation (K8MBH). I can taste the coffee in my Clean Sweep mug already! (WA9TPQ). We couldn't have asked for better conditions! (KE9YR). This was my first contest after 20 years away from ham radio (N9OTD). I found and worked my last three multipliers for the Sweep in a 25-minute span! (KB9YO). It was nice to have conditions to the West Coast (W9RE). I had hoped to get another coffee cup, but no luck (WB9CEP). Everybody's signal was strong but mine (AA9FG). It was nice to hear the 10-meter band open, it only seems to do that during contest time (K9DIY). I heard more ND and MB stations than ever before. I had last year's score beat by 2 AM Saturday (WN9P). It paid to check 10 meters! I worked 300 East Coast and W8 stations during a five-hour E_s opening from 2200Z to 0300Z Saturday evening (KA9FOX). I was thrilled to work WAS on my last contact (W2CRS). I was wiped out by the flu after 9 hours (W0SK). 10 meters was incredible! (N0MQC). The main thing I don't like about Sweepstakes is that it will be another year before we can do it again! (KA0RCK). I used a better antenna than last year's and one tenth of last year's power and doubled my score (KB0EEB). I made 1600 contacts and didn't work South Dakota! (K0IJL). This was my first time over 100k! What a fun time! (N0HJZ). As always, I learned a lot and understand what a long way I have to go! (AA0CR). Where, oh, where was South Dakota? (K0SCM). Most of the stations I tried to work without success on 40 and 80 Saturday were easy calls on Sunday (ND1H). This was my first Clean Sweep after coming so close so many times before (VE3VET). Conditions were suprisingly good on 10 meters. It was nice to work so many other QRP stations (VE6GK).

Ask the Coach!

New contesters or those with smaller stations often wonder what techniques they can use to improve their scores in the Sweepstakes. Let's listen in on one operator and his "coach."

Op: *I have a small station so I usually have to call stations. I seem to only be able to average about 20 to 30 contacts per hour. How can I improve my rate?*

Coach: Tune faster. You should be able to search and pounce (S&P) on a new band early in the contest at about 50 to 60 QSOs/hour. For the first hour, every station you hear will probably be a new one. Whether you know the call sign or not, as soon as you hear "QRZ," call them. Get the call sign when it's sent as part of the exchange.

Op: *I usually find a new station and then spend a lot of time calling to bust the pileup. What can I do about this?*

Coach: If you don't get through, put the frequency in the rig's memory or use the second VFO, and keep tuning for another contact. Use the waiting time to locate another potential QSO. That's more efficient use of your time.

Op: *When should I try to call CQ?*

Coach: Even though you have a small station, there are lots of opportunities to call CQ. Be opportunistic. If you hear a clear spot, spend a few minutes CQing. You may eventually get pushed off the frequency by a louder station, but you have the chance to get a "run" of easy QSOs in just a few minutes.

Op: *When should I worry about multipliers?*

Coach: The most important thing in the SS is to make contacts. The multipliers will come as your contact total grows. Know what the most difficult Sections are (such as NWT, VY1, VI, PR, DE, WV, WY and VE1) and make an extra effort to work them if you hear them.

Op: *The Sweepstakes only allows 24 hours of operation out of the 30-hour contest period. When should I take my off times?*

Coach: This depends on the strengths of your station and what part of the country you're in. The rates are usually better on Saturday than Sunday, so operate as much as possible the first night. Many operators go the first 12 hours before taking their first off time. It's usually better to spread your off time over several periods, rather than just one long one. Off times can be any length, but they must be at least 30 minutes.

Op: *What else do you suggest?*

Coach: Stay motivated and keep pushing. It only takes a little more than 40 contacts per hour to break 1000—a great goal for either mode. Don't waste time listening to your competition. Concentrate on finding and making the next QSO as quickly as possible. Good luck!

Scores

Scores are listed by Divisions and Canada. CW scores are listed first followed by phone. Line scores list call sign, score, QSOs, multipliers, hours, class (Q = QRP, A = Low Power, B = High Power, M = Multioperator), and Section abbreviation. **Bold** denotes a new Division record.

CW

Atlantic Division

K3WW	92,872	611	76	24	Q	EPA
K3TM	46,200	330	70	12	Q	MDC
WT3W	41,588	281	74	24	Q	EPA
N2WK	41,344	304	68	12	Q	WNY
NY3C	24,108	246	49	14	Q	DE
NW2I	20,650	175	59	14	Q	WNY
WO3B	18,704	167	56	14	Q	MDC
WN3F	15,982	131	61	9	Q	WPA
K3TW	12,760	116	55	4	Q	MDC
N3IGA	11,400	114	50	14	Q	EPA
WE3C	9,680	110	44	5	Q	EPA
WA2ZZX	2,254	49	23	16	Q	SNJ
WA3GYW	1,768	34	26	3	Q	MDC
W8IJ	792	22	18	2	Q	WPA
KA2SJG/N	98	7	7	2	Q	WNY
W2TZ	144,892	979	74	24	A	WNY
NJ2L	134,520	885	76	24	A	WNY
N2MM	121,600	800	76	20	A	SNJ
K3MQH	113,400	756	75	24	A	EPA
WU3M	102,150	681	75	24	A	EPA
K3UA	100,740	690	73	11	A	WPA
NW3C	98,696	676	73	21	A	WPA
WJ2W	93,832	634	74	21	A	WNY
AA2PZ	88,500	590	75	22	A	SNJ
K3DI	88,038	603	73	18	A	MDC
WN3K	86,184	567	76	20	A	DE
N3IXR	85,410	585	73	24	A	WPA
AD8J	84,632	596	71	17	A	WPA
N3BGV	83,496	588	71	24	A	WPA
N2EY	81,400	550	74	23	A	EPA
K3MD	79,240	566	70	15	A	WPA
WA3HAE	74,022	507	73	24	A	WPA
NA2O	64,380	435	74	22	A	WNY
WA2EYA	63,344	428	74	21	A	WNY
W3HDH	58,896	409	72	24	A	WPA
K3EI	57,120	420	68	21	A	MDC
WB2DIN	56,388	381	74	17	A	SNJ
WB3ESR	53,868	402	67	16	A	EPA
N4MO/3	53,290	365	73	20	A	DE
W3BGN	53,268	386	69	8	A	EPA
WF2L	51,992	388	67	20	A	WNY
AG3H	51,976	356	73	14	A	WPA
W2FR	48,300	350	69	16	A	WNY
K2MK	46,916	317	74	14	A	SNJ
WB2ABD	46,282	317	73	9	A	WNY
WA3SCW	43,332	314	69	24	A	MDC
W2EA	42,296	311	68	19	A	SNJ
AA2GQ	41,026	281	73	12	A	SNJ
W3ERU	39,424	308	64	17	A	MDC
WU2M	39,390	303	65	24	A	WNY
KZ2I	35,360	260	68	15	A	SNJ
W2OMV	33,792	256	66	15	A	WNY
WA2ABN	33,768	252	67	24	A	WNY
WT3P	33,660	255	66	11	A	EPA
K2QR	33,120	240	69	15	A	WNY
WA3SYK	33,000	250	66	14	A	EPA
WW3S	32,660	230	71	14	A	WPA
K5ME	32,640	240	68	14	A	MDC
WB2JFP	32,640	255	64	24	A	WNY
W2KKZ	32,232	237	68	13	A	WNY
KB2NMV	31,500	225	70	17	A	WNY
NM2J	30,774	223	69	22	A	WNY
KM2L	30,420	234	65	24	A	WNY
W2FXA	29,820	210	71	9	A	WNY
W2MTA	29,678	209	71	24	A	WNY
WA2LBT	29,610	235	63	15	A	SNJ
W3CPB	29,172	221	66	14	A	MDC
WØVU/2	28,944	216	67	8	A	WNY
N3UN	28,428	206	69	24	A	MDC
K3TLX	27,448	188	73	10	A	MDC
WB6VGI/3	27,264	213	64	15	A	MDC
W2EZ	27,008	211	64	19	A	WNY
W3EE	26,660	215	62	12	A	MDC
N3FOG	25,016	212	59	12	A	EPA
W3UAD	25,016	212	59	12	A	MDC
NW3Y	24,720	206	60	6	A	DE
W3JX	23,424	183	64	17	A	MDC
W2NZH	22,320	155	72	15	A	SNJ
W2IMO	21,472	176	61	8	A	WNY
WB3FAA	20,384	182	56	9	A	EPA
K3COO	19,800	165	60	7	A	DE
W3CEI	18,792	162	58	10	A	EPA
KC3ME	17,928	166	54	20	A	MDC
W3QOS	17,670	155	57	5	A	WPA
WB2WPM	17,516	151	58	24	A	WNY
AA3FY	17,464	148	59	18	A	EPA
W3UT	17,100	114	75	14	A	MDC
NR3Z	17,040	142	60	8	A	EPA
WM3L	16,820	145	58	24	A	EPA
K3YDX	15,800	158	50	8	A	MDC
NU3Z	15,600	150	52	11	A	EPA
WN3C	14,872	143	52	9	A	MDC
N3KFN	14,790	145	51	24	A	EPA
N2FY	14,022	123	57	8	A	SNJ
K3APM	13,310	121	55	7	A	MDC
AE2N	13,000	125	52	11	A	SNJ
WW3V	11,552	76	76	13	A	DE
NJ3K	11,250	125	45	6	A	WPA
WA2LUF	11,136	116	48	11	A	WNY
WI2G	10,750	125	43	5	A	WNY
NV3V	10,434	111	47	24	A	MDC
WA3YON	9,900	110	45	9	A	EPA
N3HUV	9,288	108	43	24	A	MDC
WA3GPP	9,030	105	43	13	A	WPA
KB2LTF	9,020	110	41	13	A	WNY
W3TDF	8,904	106	42	24	A	EPA
WV2B/3	8,820	105	42	24	A	EPA
KW3U	8,736	112	39	24	A	EPA
WQ3I	8,560	107	40	12	A	EPA
AA3GJ	8,190	117	35	12	A	WPA
WF2V	8,056	106	38	20	A	WNY
AA3EI	7,062	107	33	24	A	MDC
W3SSS	6,464	101	32	16	A	EPA
N3FZB (K3DI,op)	6,084	78	39	4	A	MDC
K2JE	5,070	65	39	24	A	SNJ
KB4VL	3,828	58	33	6	A	WNY
KE3KD	3,828	58	33	9	A	WPA
N3CZB	3,564	66	27	11	A	EPA
AA2FC	3,328	52	32	14	A	WNY
W3DZH	3,300	50	33	3	A	EPA
K2TD	2,726	47	29	6	A	SNJ
N3KLJ	1,950	39	25	12	A	EPA
N2KJB	1,658	36	23	8	A	WNY
N3MPV	1,386	33	21	9	A	MDC
WB3LNZ	828	23	18	2	A	EPA
N3GUK	736	23	16	4	A	EPA
N3HXF	540	18	15	5	A	DE
WD8LAQ	468	18	13	2	A	MDC
N3PJO	198	11	9	5	A	EPA
W2ORA	120	10	6	3	A	SNJ
N3AFT	60	5	5	3	A	MDC
N3KWQ	32	4	4	1	A	EPA
WF3W	24	4	3	24	A	EPA
K3LR	**208,544**	**1372**	**76**	**24**	**B**	**WPA**
KZ2S	197,600	1300	76	24	B	SNJ
KF3P	189,600	1264	75	24	B	MDC
K3ZO	184,376	1213	76	24	B	MDC
K2ZJ	173,584	1142	76	24	B	WNY
AA3B	158,700	1058	75	24	B	EPA
AB2E	148,504	977	76	24	B	SNJ
N3AM	123,728	836	74	17	B	MDC
K3SA	121,600	800	76	18	B	MDC
WJ2O	96,944	664	73	18	B	WNY
WB2YQH	66,880	440	76	13	B	WNY
W3GN	62,604	423	74	14	B	MDC
W3AZ	56,700	405	70	15	B	MDC
NN3Q	56,168	407	69	12	B	EPA
K2PS	48,384	336	72	24	B	SNJ
WT3H	23,940	210	57	9	B	EPA
KT3R	11,592	126	46	22	B	DE
WA3EOQ	11,220	110	51	5	B	MDC
K3TUP	10,388	106	49	5	B	WPA
W3GH (+W9XR)	167,808	1104	76	24	M	WPA
WB2PSI (AA2JN,K2s MP,OS,N2QFZ, WA2s VEZ,ZKD,ops)	118,864	782	76	24	M	WNY
W3OV (+NET)	108,984	717	76	24	M	EPA
WO3P (+NET)	87,400	575	76	24	M	MDC
W2SEX (K2s DB,ZR,N2s PEB,TWI, NG2P,KB3YW,ops)	86,832	603	72	18	M	WNY
W3ZZ (+NET)	83,144	547	76	24	M	MDC
W3HVQ (+NET)	81,472	536	76	24	M	MDC
WY3A (+KA3ZVJ)	70,848	492	72	20	M	EPA
WA2RZJ (+AE2T)	63,218	433	73	24	M	WNY
W3MUM (KA3s IXG,OGL,OTN, KB3JA,N3s BIE,NFO,OZS,NE3P, WN3N,WW3U,ops)	52,682	371	71	23	M	EPA
K4IX/3 (+NW3K,WD4GOY)	47,320	338	70	24	M	DE
AA2OF (+W2GLN,WA2ISC)	36,300	275	66	23	M	WNY
WR3G (+NET)	30,100	215	70	8	M	WPA
K3JGJ (+NET)	27,512	181	76	9	M	SNJ
KA3WDW (+WA3LVR)	11,000	110	50	5	M	EPA
N3PNV/T (+N3OHQ)	7,548	102	37	10	M	EPA
N3AVZ (+W3DZH)	7,310	85	43	5	M	EPA
KY2T (+NET)	6,700	67	50	24	M	SNJ

Central Division

W9UP (KA9FOX,op)	115,824	762	76	24	Q	WI
W9RE	111,872	736	76	24	Q	IN
WA1UJU	75,600	525	72	24	Q	WI
K9JU	54,648	396	69	15	Q	IL
K9WA	51,380	367	70	14	Q	IL
N9NE	35,912	268	67	12	Q	WI
NI9C	26,908	217	62	12	Q	WI
N9HH	18,792	162	58	24	Q	IL
AE9K	16,632	154	54	8	Q	WI
NW9S	6,308	83	38	5	Q	IL
N9OX	1,276	29	22	1	Q	IN
NØBSH (WE9V, op)	448	16	14	24	Q	WI
K4XU	**155,344**	**1022**	**76**	**24**	**A**	**IL**
WE9V (NØBSH, op)	132,696	873	76	24	A	WI
KO9Y	131,208	852	77	24	A	IN
K9UIY	124,336	818	76	23	A	IL
N9JF	120,600	804	75	24	A	IL
WA9TPQ	118,256	778	76	24	A	IL
N9CKC	112,176	738	76	23	A	WI
KM8I	91,584	636	72	23	A	IN
K9ZO	91,014	591	77	24	A	IL
KF9YR	90,450	603	75	21	A	IL
WB9HRO	90,288	627	72	24	A	WI
W9KIA	82,416	606	68	22	A	IL
N2CS	80,446	551	73	17	A	IL
W9LO	71,424	496	72	20	A	WI
WB9TIY	66,654	483	69	10	A	IL
KF9PL	66,430	455	73	24	A	IL
W9XU	64,600	475	68	18	A	WI
AA9BJ	62,338	439	71	24	A	WI
KJ9C	62,196	426	73	24	A	IN
AJ9C	61,344	426	72	8	A	IN
WD9HTC	60,590	415	73	15	A	IL
WO9S	57,720	390	74	11	A	IL
AA9FG	54,908	371	74	13	A	IN
K9JWI	50,370	365	69	18	A	IN
NOFFZ	47,610	345	69	19	A	IL
W9SZ	45,500	325	70	14	A	IL
AC4HI	45,126	327	69	23	A	IN
ND9O	44,220	330	67	15	A	WI
W9JOO	43,878	309	71	17	A	IN
N2CKZ	43,560	330	66	19	A	IL
NEØP	43,488	302	72	24	A	IL
WA9AXL	42,076	314	67	11	A	IL
K9UQN	39,128	292	67	10	A	IL
WA9QNU	38,152	251	76	19	A	IL
WB9MLY	37,800	300	63	12	A	IL
WB9PRG	37,800	300	63	24	A	WI
W9MOK (AA9CG,op)	34,720	280	62	10	A	IN
K9KI	34,572	258	67	21	A	IN
K9PPW	34,320	264	65	9	A	IL
W9LNQ	31,390	215	73	8	A	IL
K9OYC	30,336	237	64	20	A	WI
WD9CIR	29,484	234	63	16	A	IL
NA1R	29,000	250	58	8	A	IL
W9ERW	28,006	209	67	12	A	WI
AC9C	27,144	234	58	7	A	IL
WA9VVU	26,980	190	71	6	A	IL
WB9UGX	24,720	206	60	20	A	IL
N9EZ	24,644	202	61	24	A	WI
W9ZEN	23,880	199	60	11	A	IL
W9MSE	23,058	183	63	7	A	WI
W4WQD	20,764	179	58	24	A	IN
N9NCX	20,532	177	58	24	A	IL
W9HBI	19,470	165	59	9	A	IL
N9ENA	17,700	150	59	7	A	IL
W9HR	17,064	158	54	10	A	WI
AA9GF	16,500	150	55	22	A	WI
N9JAK	16,128	144	56	12	A	WI
KB9AMG	15,496	149	52	18	A	WI
K9AHH	15,484	158	49	19	A	IL
N9JW	14,820	130	57	8	A	WI
WB5PRV	14,080	128	55	15	A	IN
N9BGM	13,970	127	55	25	A	IL
N9MDK	13,056	128	51	15	A	IL
KA9ORN	12,546	123	51	11	A	IN
W9REC	12,540	95	66	14	A	IL
WA9GON	12,100	110	55	9	A	WI
W9KHH	12,000	120	50	6	A	WI
K9CUN	11,610	129	45	8	A	IN
W9FBC	11,200	140	40	16	A	WI
WK9Y	10,948	119	46	16	A	IL
WA9YAS	10,192	104	49	6	A	IL
WW1M	10,094	103	49	6	A	WI
N9XX	8,568	102	42	2	A	WI
K9KR	8,250	125	33	9	A	WI
AA9CS	7,568	88	43	14	A	IN
WA9SLU	7,560	105	36	6	A	IN
K9OSH	5,226	67	39	4	A	WI
KB9IPX	4,636	61	38	12	A	IL
WE9A	3,808	56	34	24	A	IL
AG9G	3,744	52	36	3	A	WI
K9DIY	1,672	38	22	11	A	IN
KA9IRS	1,200	40	15	3	A	IN
N9TMU	950	25	19	10	A	IL
N9PNO/T	32	4	4	4	A	IL
K9FD (WX3N,op)	**209,440**	**1360**	**77**	**24**	**B**	**IL**
WØAIH (KØFVF,op)	162,624	1056	77	24	B	WI
KE9I	162,162	1053	77	24	B	IN
K9BGL	156,080	1040	76	24	B	IL
K9BG	145,530	945	77	23	B	IL
WG9L	139,062	903	77	24	B	IL
W9YH	128,896	848	76	24	B	IL
WV9T	125,100	834	75	24	B	IL
W2WOE/9	113,392	746	76	24	B	WI
K9CC	100,350	669	75	18	B	IL
KS9W	96,792	654	74	15	B	IL
WT9O	95,850	675	71	20	B	WI
WB8SVN	76,896	534	72	16	B	IL
K9UWA	76,608	504	76	24	B	IN
W9NA	71,850	479	75	12	B	WI
WN9P	54,312	372	73	22	B	WI
NA9J	42,642	309	69	10	B	IL
W9OF	33,120	240	69	14	B	IL
NE9U	10,658	73	73	11	B	WI
K9LJN (KS9O,WEØB,ops)	151,392	996	76	24	M	IL
AA9AX (+KD4ULP,NJ9C)	142,728	939	76	24	M	IN
K9MMS (+ops)	129,944	878	74	24	M	WI
KK9G (+AA9EA,K9PUI,N9VEX)	50,112	348	72	24	M	IN
KB9YO (+NET)	49,420	353	70	24	M	IL
N9LCR (+AA9GG,N9RUC)	24,704	193	64	21	M	IL
KF9MP (+N9OBM)	2,000	50	20	4	M	IN

Dakota Division

N9CIQ	88,200	588	75	24	Q	MN
WAØRPI	59,228	442	67	24	Q	MN
AAØOD	48,144	354	68	24	Q	MN
AAØOB	36,432	276	66	17	Q	MN
WØYHE	32,830	245	67	16	Q	MN
KØTO	20,862	183	57	8	Q	MN
WDØT	156,584	1058	74	24	A	SO
NØAT	152,760	1005	76	24	A	MN
WØHW	131,632	866	76	23	A	MN
KØIJL	127,680	840	76	24	A	MN
WOPI	107,596	727	74	22	A	MN
AIØY	100,350	669	75	24	A	MN
WØUC	82,644	582	71	14	A	MN
WØFL	73,292	502	73	24	A	MN
WTØK (K1LL,op)	65,940	471	70	15	A	ND
KBØIHM	61,880	455	68	17	A	MN
ND1H	60,060	429	70	17	A	ND
KØIHG	51,952	382	68	10	A	MN
KØMPH	46,230	345	67	13	A	MN
KØUXQ	41,538	301	69	13	A	MN
KØTK	40,200	300	67	7	A	MN
KØLR	35,632	262	68	11	A	MN
KEØA	26,796	203	66	11	A	ND
WAØWWW	22,000	200	55	12	A	MN
KØJE	18,480	165	56	13	A	MN
NØTNK	16,900	130	65	20	A	MN
KZ7I	16,128	126	64	24	A	MN
KØJA	15,568	139	56	10	A	MN
KIØF	14,496	151	48	7	A	MN
NØAXL	13,622	139	49	24	A	MN
KDØNH	13,038	123	53	5	A	MN
WAØWOV	9,476	103	46	7	A	MN
KBØLFV/N	4,158	63	33	10	A	ND
KØWIU	3,770	65	29	4	A	SD
KØTG	2,106	39	27	3	A	MN
AAØGP	128	8	8	2	A	MN
KØHB	110,850	739	75	22	B	MN
KMØO	106,560	720	74	14	B	MN
KØAD	95,312	644	74	22	B	MN
WBØO	93,010	655	71	12	B	ND
K9WIE	60,480	432	70	24	B	MN
KBØZQ	55,200	400	69	10	B	MN
WA2HFI	15,930	135	59	9	B	MN
WØAA (WAØPEV,WBØADO,ops)	178,024	1156	77	24	M	MN
AAØAW (+AAØBY,NØUOZ)	130,112	856	76	24	M	MN
NØHJZ (+KE9QT)	49,840	356	70	24	M	MN

Delta Division

N4TG	56,160	390	72	12	Q	TN
KI5EZ	9,464	91	52	9	Q	AR
NØAPH	9,152	104	44	19	Q	TN
N5ODV	6,966	81	43	12	Q	MS
KM5G	151,950	1013	75	24	A	AR
N4IR	121,650	811	75	21	A	TN
KØEJ	121,144	797	76	21	A	TN
K5SL	111,750	745	75	23	A	LA
N8VV	102,450	683	75	24	A	AR
K5HYB	81,472	536	76	17	A	AR
AA4DO	80,550	537	75	15	A	TN
WB4FDT	65,408	448	73	12	A	LA
NA4K	65,100	434	75	10	A	TN
K4OAQ	52,780	406	65	10	A	TN
WA5JWU	46,360	305	76	24	A	LA
N4ZCO	42,140	301	70	23	A	TN
AB4CA	37,572	303	62	13	A	TN
AC4ZD	26,352	216	61	24	A	TN
KB5IXI	25,704	204	63	9	A	MS
W8TYU	24,552	198	62	10	A	TN
KV4B	13,184	103	64	9	A	TN
N4USG	12,328	134	46	12	A	TN
N5FG	10,608	104	51	5	A	MS
KB5OHT	8,140	110	37	13	A	MS
K5JH	4,992	78	32	7	A	AR
W4AY (WA4ZZU,op)	3,420	57	30	5	A	TN
KF5PN	2,250	45	25	7	A	AR
AD4F	2,184	52	21	12	A	TN
KI5IB	1,344	32	21	3	A	MS
W5WMU (K5GA,op)	**235,774**	**1531**	**77**	**24**	**B**	**LA**
N8RR	191,268	1242	77	24	B	LA
W5XX	188,176	1238	76	24	B	MS
K4LTA	97,328	632	77	24	B	TN
N5WA	59,020	454	65	6	B	LA
N4CT	39,976	263	76	10	B	TN
K5TYP (N5XA,op)	36,704	296	62	8	B	MS
AA5ZT	27,846	221	63	13	B	LA
K3CQ	23,790	195	61	6	B	TN
W4OGG	16,500	150	55	8	B	TN
N5OCD	13,566	133	51	10	B	LA
W5KL	3,468	51	34	2	B	AR
N4ZZ (+W9WI)	**212,058**	**1377**	**77**	**24**	**M**	**TN**
KI4UZ (+KC4IIS)	135,864	918	74	24	M	TN
KI5EE (+KI5EQ,KJ5NS)	16,358	141	58	16	M	LA

Great Lakes Division

WA8RJF	65,036	458	71	24	Q	OH
WK8V	42,560	304	70	17	Q	MI
W8VK	36,708	266	69	23	Q	OH
KA4IQD	34,706	259	67	17	Q	KY
WB8AAX	30,870	245	63	17	Q	MI
N8COA	24,426	177	69	18	Q	MI
KB8GAE	23,790	195	61	15	Q	OH
K8BL	149,264	982	76	24	A	OH
N4TY	148,888	1006	74	24	A	KY
K8CX	144,298	937	77	24	A	OH
AA8AV	133,912	881	76	24	A	MI
N4QS	127,350	849	75	24	A	KY
AB4RX	121,600	800	76	21	A	KY
KV8O	120,080	790	76	24	A	OH
N8AA	117,040	770	76	18	A	OH
WD8LLD	115,368	759	76	24	A	OH
WB4FOT	103,500	690	75	24	A	KY
K8DD	93,784	617	76	19	A	MI
K8NZ	92,416	608	76	14	A	OH
KZ8E	90,280	610	74	22	A	MI
W8UMP	85,848	588	73	23	A	MI
K8RDJ	76,066	521	73	22	A	MI
WA8YRS	69,552	504	69	19	A	OH
W8JGU	69,000	460	75	17	A	OH
KW8G	65,968	434	76	16	A	MI
K8SB	61,200	450	68	18	A	MI
W8TJQ	59,472	413	72	21	A	MI
K8CV	58,692	402	73	10	A	MI
W8PN	57,670	395	73	16	A	OH
K9ALP	55,044	417	66	14	A	OH
W8VPC	54,464	368	74	14	A	MI
NA8G	51,356	347	74	21	A	MI
K8SJ	44,850	325	69	10	A	OH
K4FU	42,194	289	73	9	A	KY
WB4FDK	41,752	307	68	17	A	KY
WB8BUQ	40,200	300	67	14	A	MI
WA8RXI	40,044	282	71	15	A	MI
W8KZM	39,664	268	74	15	A	MI
WA8RCN	39,450	263	75	6	A	OH
WT8P	39,168	306	64	22	A	OH
KF8ES	37,084	254	73	18	A	OH
K8BZ	35,912	268	67	14	A	MI
WD8S	35,742	259	69	22	A	MI
K8SAK	33,528	254	66	14	A	MI
K8OUA	33,048	243	68	13	A	OH
WA8AHK	32,912	242	68	11	A	OH
KB8NTY	30,552	228	67	14	A	OH
KF8TM	30,400	200	76	22	A	OH
W8UE	30,114	239	63	12	A	MI
NS8O	30,056	221	68	10	A	OH
WA8YPY	27,216	216	63	12	A	MI
WO8T	26,880	210	64	14	A	MI
N8MIS	26,784	216	62	14	A	MI
KA8CBZ	26,668	226	59	9	A	MI
AA8FP	25,200	200	63	11	A	MI
N8JOX	25,200	180	70	10	A	OH
AC8W	24,644	202	61	9	A	MI
KE8OC	24,000	200	60	9	A	MI
W8EGI	22,692	183	62	10	A	MI
WB8VPA	22,464	156	72	13	A	OH
N8DPH	22,458	197	57	24	A	MI
KD4LHA	21,728	194	56	18	A	KY
NX8K	21,112	182	58	21	A	MI
KF8BE	20,880	180	58	20	A	MI
W8VOI	20,880	180	58	10	A	OH
NU4N	19,840	160	62	11	A	KY
W8MVN	19,800	165	60	17	A	OH
K8QLK	19,596	142	69	24	A	MI
KU4A	18,544	152	61	10	A	KY
N4XFF	18,212	157	58	21	A	KY
W9VNE	17,936	152	59	7	A	OH
KD8IH	17,214	151	57	7	A	OH
WT8C	16,632	154	54	12	A	OH
K3GP	16,188	142	57	13	A	OH
KB8HGM	15,912	153	52	22	A	MI
NT8V	15,708	119	66	15	A	MI
AA8FE	15,510	141	55	11	A	MI
ND4Y	15,276	134	57	5	A	KY
W8ROS	14,750	125	59	12	A	MI
KE8QM	14,148	131	54	3	A	OH
KC8EG	13,800	150	46	12	A	OH
WS8S	13,566	133	51	10	A	OH
WD8B	12,288	128	48	11	A	OH
WB8RUQ	12,096	112	54	5	A	MI
WA8OJR	11,526	113	51	4	A	MI
N8OC	11,220	110	51	4	A	MI
KF4AV	10,304	112	46	5	A	KY
N8MK	10,120	110	46	5	A	MI
WA8MEM	10,000	100	50	24	A	OH
AA8EG	9,990	111	45	6	A	MI
N8UZE	9,976	116	43	19	A	OH
N8QYM	9,588	102	47	14	A	MI
K8LJG	7,700	110	35	4	A	MI
N8DDW	7,140	85	42	11	A	MI
W8CAR	6,480	81	40	3	A	OH
KC4WQ	5,408	52	52	4	A	KY
WA8FRD	5,180	70	37	6	A	MI
K8RDN	4,410	63	35	9	A	MI
KB8LFQ	4,248	59	36	9	A	MI
WB8NMW	4,092	66	31	11	A	MI
N8VEN	3,740	55	34	15	A	MI
KA8WBQ	3,036	69	22	24	A	MI
N8SFD/T	2,552	44	29	15	A	MI
KF8BC	2,548	49	26	5	A	OH
WA8NVW	2,320	40	29	8	A	OH
WX8G	1,584	36	22	3	A	OH
W8XT	1,500	30	25	2	A	OH
WB8ORV	1,380	30	23	24	A	OH
KE8QT	1,008	28	18	3	A	MI
KI8O	810	27	15	8	A	OH
KW8M	572	22	13	3	A	OH
N8VKU	476	17	14	2	A	MI
KA8GOM	390	15	13	2	A	MI
KA8IZE	352	16	11	6	A	MI
N8MVP	176	11	8	1	A	MI
WB8ATZ	112	8	7	3	A	MI
KA8TPQ/T	64	8	4	3	A	MI
WA8ZDT	**182,704**	**1202**	**76**	**24**	**B**	**MI**
K8CC	181,336	1193	76	24	B	MI
KW8N (WD8IXE,op)	180,424	1187	76	24	B	OH
KQ8M	178,752	1176	76	24	B	OH
W8FN	159,296	1048	76	23	B	OH
NZ8O	147,150	981	75	22	B	OH
KF8OE	132,392	871	76	24	B	MI
W5ONL	129,600	864	75	24	B	OH
N4XM	121,352	788	77	21	B	KY
AA8U	119,850	799	75	24	B	MI
NG8D	93,632	616	76	15	B	OH
WB4PRU	89,250	595	75	20	B	KY
N4AR	63,758	449	71	8	B	KY
K8MJZ	62,640	435	72	13	B	MI
KU8E	41,580	315	66	6	B	OH
W8RC	25,872	231	56	6	B	MI
W8EDU (AF8A,N8ARD,WB8WTS, ops)	140,296	923	76	24	M	OH
WD8AUB (+KF8TY,NF8R)	128,136	843	76	24	M	OH
KB8INK (+WD5HIO,KB8NGG,WA8VHQ)	91,960	605	76	24	M	MI
W8VM (AF8C,W8IDM,ops)	61,272	414	74	21	M	OH
WD8O (+NET)	51,224	337	76	15	M	MI
WU8A (+NET)	43,362	297	73	14	M	OH

W8CCI (N2ERI,AA8s HH,MC, K8TOR,KB8DJ,KF8s RW,ZK, N8s OMW,ORM,W8KVU,WB8TIB, WD8MQJ,ops)
30,704 202 76 15 M OH
AA8LZ (+WX3M,N8LXL)
30,000 200 75 11 M MI
KF8YC (+N8MMB)
27,950 215 65 24 M MI
WA8OSE (+NET)
15,544 116 67 10 M OH
W8PLP (K8TPQ,N8s PVZ,VKU,ops)
11,700 130 45 19 M MI
KD4NXS (+KQ4JL)
8,446 103 41 13 M KY
AA8KR (+N8WIQ)
2,646 49 27 24 M MI

Hudson Division

W2GD 118,950 793 75 24 Q NNJ
KD2TT 43,470 315 69 21 Q NLI
KB2JE 28,990 223 65 24 Q NNJ
WA2ASO 24,662 209 59 16 Q NNJ
WB2CZB 19,200 150 64 15 Q NNJ
KD2IX 16,116 158 51 17 Q ENY
N1CC/2 11,500 125 46 6 Q ENY
K2HID 3,696 56 33 10 Q NLI
N2MNN 2,100 42 25 7 Q NNJ

WA2SRQ 143,792 946 76 24 A NNJ
WA2STM 117,750 785 75 24 A ENY
WA2VYA 110,852 749 74 24 A NNJ
AA2FB 100,936 682 74 24 A NLI
K2SHL 91,874 647 71 24 A NNJ
W2HCA 72,150 481 75 21 A NNJ
K2UF 64,240 440 73 21 A ENY
WA2S 61,050 407 75 22 A NNJ
AA2DY 54,168 366 74 19 A ENY
N2JOH 48,404 358 69 18 A ENY
K2YGM 49,236 373 66 14 A NLI
AA2Y 40,128 304 66 16 A ENY
K2POF 39,578 257 77 24 A ENY
WK2T 38,840 280 69 22 A NNJ
WA2MAV 38,458 287 67 16 A NLI
WA2BAH 34,720 280 62 24 A ENY
WF2Z 32,832 228 72 16 A NNJ
WA4VKO 30,150 225 67 24 A ENY
NY2U 29,436 223 66 16 A ENY
N2LSK 27,140 230 59 12 A NLI
WB2BXO 26,240 205 64 9 A NLI
W2KTF 26,040 217 60 6 A NLI
K2TWK 25,420 205 62 12 A NNJ
N2TFM 24,428 197 62 13 A NNJ
WD2K 23,450 175 67 22 A ENY
W2XM 23,296 208 56 12 A ENY
WB2FOB 21,090 185 57 14 A ENY
KE2SX 20,618 169 61 24 A NLI
AA2GS 20,400 170 60 9 A ENY
WA2VZQ 20,400 170 60 6 A NLI
N2CJJ 19,592 158 62 14 A ENY
WA3INC 18,972 153 62 10 A ENY
N2BIM 18,788 154 61 7 A NNJ
W1GD 18,150 121 75 6 A NNJ
WA2C 17,472 156 56 24 A NNJ
KF2JA 17,442 153 57 18 A ENY
W2PA 15,846 139 57 4 A ENY
W2NRD 13,600 100 68 12 A ENY
N2DCM 13,176 122 54 13 A ENY
W2EJG 13,020 93 70 13 A ENY
N2LBR 12,800 128 50 15 A ENY
WB2YLR 10,672 116 46 7 A ENY
KW2D 10,560 110 48 6 A ENY
WA2PJL 9,936 108 46 10 A NLI
WE2G 9,894 97 51 6 A ENY
WB2HKR 9,792 102 48 13 A ENY
N2CDD 9,592 109 44 21 A NNJ
N2KJM 9,588 102 47 4 A NNJ
WW2X 8,528 104 41 13 A NNJ
KA2ANF 8,282 101 41 24 A NNJ
WA2FVL 7,632 106 36 14 A NNJ
WB2TCV 7,310 85 43 8 A ENY
K2GBH 7,056 84 42 2 A ENY
N2FTR 6,240 104 30 9 A ENY
N2LBZ 6,210 69 45 19 A ENY
W2TI 6,200 100 31 24 A NNJ
N2LKF 5,376 84 32 8 A NNJ
N2LSJ 4,736 74 32 10 A NLI
KB2PSX 4,582 79 29 19 A ENY
KE2WO 2,700 45 30 5 A ENY
N2CKV 2,700 50 27 9 A ENY
K2HVN 2,352 49 24 2 A NLI
N2HOR 1,702 37 23 10 A ENY
AA2JP 1,452 33 22 14 A ENY
N2OJZ 1,064 28 19 7 A ENY
N2MZH 748 22 17 2 A NNJ
K2RI 96 8 6 1 A ENY

N2BA (K8HVT,op)
158,100 1054 75 24 B ENY
W2RQ 157,650 1051 75 22 B NNJ
WA1KKM 93,240 630 74 22 B ENY
WAØQOA 92,264 607 76 22 B NNJ
K2AU 52,578 381 69 15 B NLI
WA2UDT 27,200 200 68 8 B NNJ

K2QMF (+NET)
108,528 714 76 23 M NLI
WA2UKP (+WA2JQK)
58,050 387 75 23 M ENY
WO2X (+KF2HC,N2s KJM,MZH,WA2s BTR,LXU,WB2JGZ,WT2R)
49,312 368 67 24 M NNJ
KU2Q (+K5NA)
31,950 213 75 9 M ENY
K2PF (+NET)
29,520 205 72 24 M NNJ
KF2LW (+N7LOD)
26,962 221 61 22 M ENY
KF2MR (+N2s PEN,POS,OIP)
21,350 175 61 22 M ENY
NK2F (+KA2YHS)
4,104 57 36 21 M ENY
WB2K (+NET)
3,300 50 33 3 M NNJ

Midwest Division

KØSCM 109,500 750 73 24 Q NE
NØEID 32,890 253 65 20 Q MO
WVØQ 9,776 104 47 7 Q KS
KE4KE 64 7 8 8 Q IA

KØRWL 126,160 830 76 24 A MO
KZ6E/Ø 120,300 802 75 18 A MO
AJØI 75,828 534 71 24 A NE
AAØFO 75,044 514 73 20 A MO
WBØSYV 66,654 483 69 19 A NE
NSØB 63,900 450 71 12 A MO
NWØF 57,392 422 68 17 A NE
KFØH 54,720 380 72 8 A IA
NUØQ 54,234 393 69 24 A IA
NØFMR 52,114 367 71 22 A KS
AAØOR 51,474 373 69 24 A KS
WAØIYY 42,612 318 67 16 A MO
WBØYJT 38,412 291 66 22 A KS
KØINR 30,100 215 70 14 A IA
WIØR 28,248 214 66 20 A KS
WØAWP 25,792 208 62 18 A KS
KIØW 25,010 205 61 6 A MO
WAØOZP 22,540 161 70 13 A KS
WØYZZ 22,320 180 62 10 A MO
KAØP 21,080 170 62 7 A MO
WØRNG 19,560 163 60 5 A MO
NØNEN 14,472 134 54 16 A NE
NØIZZ 13,992 132 53 11 A MO
WØYRN 11,466 91 63 15 A KS
KAØZAF 11,424 112 51 7 A KS
KØIFL 11,340 105 54 13 A MO
NØLAQ 10,272 107 48 4 A NE
KBØIDI 8,858 103 43 16 A MO
KØJPL 8,450 65 65 11 A MO
KFØXV 8,100 90 45 7 A KS
WAØDFF 7,000 100 35 13 A IA
AAØME 5,538 71 39 4 A IA
KAØCKN 4,608 64 36 24 A KS
KCØJA 3,744 48 39 8 A MO
WØKVM 3,300 50 33 24 A NE
KGØAD 1,426 31 23 7 A NE
WB9TNZ 1,200 30 20 24 A MO
NØUAX 850 25 17 5 A NE
WØRNM 756 21 18 5 A MO

NCØP (AG9A,op)
213,136 1384 77 24 B IA
K4VX (WX9E,op)
191,268 1242 77 24 B MO
NØXA (KØVBU,op)
183,008 1204 76 24 B KS
KMØL 144,704 952 76 24 B MO
KØDEQ 111,720 735 76 20 B MO
KØBJ 87,450 583 75 16 B KS
NJ8M 62,020 443 70 10 B KS

ABØS (+KØWA,WØCEM)
157,234 1021 77 24 M KS
WYØC (+KAØAAM,KGØIW,NØQHZ)
27,652 223 62 24 M KS

New England Division

K1TR 102,448 674 76 24 Q NH
W1MJ 80,928 562 72 24 Q EMA
WA1GUV 79,476 537 74 23 Q VT
K1CGJ 70,050 467 75 24 Q EMA
KA1O 62,860 449 70 24 Q NH
W1WAI 61,488 433 71 17 Q EMA
W1MK 57,218 427 67 16 Q EMA
W1AW (KH6CP,op)
53,400 356 75 20 Q CT
WB2CPU 48,714 353 69 19 Q EMA
W1CK 44,622 333 67 24 Q CT
NO1J 21,168 189 56 10 Q EMA
NC1E 17,110 145 59 9 Q CT
KA1CZF 16,240 145 56 13 Q CT
W1FD 15,000 150 50 7 Q CT
NM1K 13,860 126 55 9 Q CT
NF1J 9,568 104 46 3 Q CT
WA1OFT 9,212 94 49 24 Q RI
WA1WPR 7,004 103 34 10 Q ME
KN1H 5,092 67 38 6 Q VT
AA1DL 3,720 60 31 5 Q ME
AA1GE 2,538 47 27 24 Q CT
KA1UEH 252 14 9 3 Q ME
NU1P 84 7 6 3 Q WMA

KY1H (KB1W, op)
121,800 812 75 24 A WMA
KZ1M 121,752 801 76 22 A WMA
N4DW 121,508 821 74 24 A VT
KM1X 117,800 786 75 24 A RI
AI6E 115,736 782 74 24 A EMA
W1PH 115,500 770 75 18 A NH
WA1S 110,352 726 76 24 A NH
NW1S 105,640 695 76 20 A VT
WA1U 80,408 529 76 18 A CT
W1KKF 79,716 546 73 23 A CT
WS1E 78,884 533 74 19 A NH
AA1HJ 78,192 543 72 24 A NH
K1BV 77,848 526 74 16 A NH
K8JLF 75,920 520 73 18 A EMA
W1ECH 74,296 502 74 17 A CT
N1HFE 73,584 504 73 22 A NH
KX1E 73,130 515 71 23 A ME
K1DW 66,500 475 70 17 A CT
K1NTR 61,800 412 75 15 A EMA
K1PLX 60,918 429 71 20 A EMA
W1KEE 60,000 400 75 20 A EMA
K1DS 58,608 407 72 18 A RI
W1BYH 49,500 330 75 14 A WMA
KI1M 43,200 300 72 16 A NH
NX1Q 42,742 301 71 9 A CT
KA1WIF 41,072 302 68 17 A CT
KC2GE 40,120 295 68 16 A WMA
N1JW 40,040 286 70 10 A CT
AA1HB 38,682 307 63 24 A EMA
KB1T 38,528 301 64 18 A NH
AB1T 38,190 285 67 16 A VT
W1TCJ 37,808 278 68 16 A CT
K1DH 37,752 286 66 24 A CT
WZ1K 36,850 275 67 17 A EMA
NO1V 36,432 253 72 14 A NH
AA1AK 35,100 270 65 8 A CT
W5TEH 35,074 247 71 19 A RI
KB1KM 30,240 210 72 21 A EMA
N1JAC 30,150 225 67 20 A VT
KS1N 29,854 253 59 13 A NH
WA1ECA 28,280 202 70 19 A CT
K1RT 27,600 200 69 9 A CT
K1TN 26,568 246 54 24 A CT
NA5E 26,536 214 62 12 A NH
N1QME 25,704 204 63 13 A RI
KQ1O 24,444 194 63 14 A CT
KR1S 23,280 194 60 9 A RI
K1VSJ 22,302 189 59 9 A RI
K1TG 19,604 169 58 9 A CT
K1ATL 19,154 157 61 13 A NH
K1UCA 18,648 126 74 20 A EMA
K8SH 18,542 127 73 11 A EMA
WA1FCN 17,034 167 51 24 A CT
WS1H 15,704 151 52 9 A EMA
AA1EX 13,000 130 50 14 A NH
N8RA 12,900 129 50 5 A CT
W1RFQ 11,440 104 55 5 A RI
AA1FK 10,340 110 47 24 A CT
W1XN 10,120 110 46 5 A ME
WA1IML 10,120 115 44 3 A EMA
WA1G 9,844 107 46 3 A EMA
K5FUV/1 9,776 104 47 6 A CT
KR1B 6,148 106 29 5 A ME
KB1ACN/1 4,928 77 32 21 A CT
KA1TQM 4,488 66 34 8 A CT
N1HMX 3,960 60 33 7 A CT
N1MHB 3,700 50 37 12 A ME
KC1WD 3,248 56 29 8 A EMA
W1SR 2,944 46 32 2 A EMA
N1OPZ 1,656 36 23 12 A CT
KA1FMR 1,320 33 20 6 A NH
KA1PU 784 28 14 6 A WMA
KA1RRX 640 20 16 5 A VT
N2LTK 338 13 13 2 A CT

K1TO 188,936 1243 76 24 B CT
W2SC 180,880 1190 76 24 B WMA
K1DG (WZ1R,op)
180,424 1187 76 24 B NH
W1WEF 162,184 1067 76 24 B CT
WB1GQR (WB2JSJ,op)
150,072 1014 74 24 B VT
N1SW 86,688 602 72 21 B RI
K1RM 81,000 540 75 8 B CT
N1MM 78,150 521 75 16 B CT
K1JB 73,000 500 73 12 B ME
W1BIH 61,200 408 75 10 B CT
K5MA 57,760 380 76 8 B EMA
KA1IOR 50,184 369 68 8 B EMA
K1JKS 47,886 347 69 14 B EMA
WR1P 36,312 267 68 10 B EMA
KJ4KB 31,680 240 66 10 B CT
W1DL 31,374 249 63 10 B EMA
K1ZZ 21,340 194 55 3 B CT
K1IN 19,824 168 59 20 B CT
N4XR 17,228 118 73 5 B CT

K2SX/1 (+NET)
82,800 552 75 24 M CT
N1NCI (+WA1LNP)
75,000 500 75 24 M NH
KB2R (+WA2CJT)
70,992 493 72 22 M EMA
WS1F (+NET)
60,000 400 75 19 M CT
KC1F (+NET)
34,408 253 68 5 M NH
KA1YWZ (+KB1ASU,KW1Z,NT1KRU, WB1FDY)
28,536 246 58 21 M RI
KZ1O (+N1OEZ)
25,960 220 59 13 M NH
WB1BXB (+KB1OU,KD1LB,N1s FIL, HKO,JKT,KIM,KLP,NLT,ORD,WA1RLO, WW1G,KD6LRY)
25,060 179 70 24 M NH
WA1ALM (+NET)
23,188 187 62 11 M NH
WB1E (+K1CZ,N1DYM,NQ1L, WA1ERJ,WE1J)
19,824 177 56 12 M ME
WE1B (+WF1L)
17,176 113 76 24 M WMA

Northwestern Division

NØAX 90,592 596 76 24 Q WWA
W7YAQ 85,994 589 73 24 Q OR
K7MM 84,096 576 73 22 Q EWA
K7PJT 24,190 205 59 14 Q OR
K7BFL 11,224 122 46 6 Q EWA
N7VVG 7,878 101 39 18 Q ID
N7RVD 5,076 57 27 4 Q WWA

W7ZRC 152,152 988 77 24 A ID
K7QQ 147,840 960 77 24 A WWA
KQ7I 138,624 912 76 23 A OR
K7FR 132,594 861 77 24 A EWA
N6MZ 126,434 821 77 24 A WWA
AA7KF 122,512 806 76 24 A OR
AA7BG 117,140 781 75 24 A MT
N7LOX 109,136 718 76 24 A WWA
KI7Y 76,500 510 75 21 A OR
KX7L 68,400 475 72 14 A WWA
K7DBV 65,660 445 74 21 A OR
WA7VNI 55,042 377 73 22 A WWA
W7ON 48,180 365 66 18 A WWA
AA7CP 47,304 324 73 24 A OR
K7NHA 47,168 352 67 21 A ID
AA7VG 42,700 305 70 24 A WWA
K7NPN 35,360 260 68 24 A WWA
N7YOR 34,840 260 67 24 A EWA
W7MHO 34,336 296 58 10 A EWA
N7DM 30,246 213 71 14 A WWA
W7POE 29,890 245 61 14 A WWA
W7RGL 29,280 240 61 21 A WWA
KE7X 26,320 235 56 6 A MT
W7HWR 24,940 215 58 10 A OR
NX7K 24,416 218 56 4 A WWA
WC7Q 23,852 178 67 8 A WWA
W7TC 22,572 198 57 9 A OR
N7ICK 20,060 170 59 13 A OR
W7KJJ 19,038 167 57 2 A WWA
WZ7O 18,240 160 57 24 A WWA
KK7A 17,516 151 58 5 A ID
KI7OT 17,238 169 51 22 A WWA
K7IOO 13,600 136 50 11 A EWA
N7IXG 13,536 144 47 8 A OR
KB7OOP 13,034 133 49 14 A WWA
N7RV 12,000 125 48 8 A WWA
N7DOE 10,710 119 45 14 A WWA
N7VXG 8,272 94 44 19 A ID
KA9SNF 8,056 106 38 17 A EWA
KL7FAP 4,060 70 29 10 A AK
K7WPC 3,294 61 27 4 A OR
NL7OU 3,224 52 31 5 A AK
K7SMW 3,024 56 27 24 A EWA
KB7OLZ/T 1,428 34 21 7 A WWA

W7RM (N6TR,op)
218,834 1421 77 24 B WWA
AA7NX 182,798 1187 77 24 B OR
KØPP/7 168,476 1094 77 24 B MT
N7TT 158,312 1028 77 24 B WWA
KR7G 150,304 976 77 24 B WWA
K7OD 146,762 953 77 17 B ID
N7MMQ 144,606 939 77 24 B OR
WA7FAB 118,200 788 75 22 B OR
KS6H/7 105,524 713 74 24 B ID
K7RO 103,896 702 74 24 B OR
WA7UVJ 101,088 702 72 19 B WWA
W1TR 74,176 488 76 24 B EWA
AI7B 73,146 501 73 8 B OR
W7WHY 54,416 358 76 13 B OR
AL7CQ 31,388 266 59 15 B AK
N6PZ 15,120 135 56 8 B OR

KL7Y (+NL7GP,KB8N)
89,540 605 74 23 M AK
N7MPS (+KB7GZU)
87,856 578 76 24 M ID
W7UQ (KA1POR/7,KB7LFO,KI7RO, ops)
45,508 367 62 24 M ID

Pacific Division

W6JTI 81,928 539 76 24 Q SF
W6IO 63,232 416 76 23 Q SCV
N6WMF 50,616 342 74 23 Q SV
W6REC 43,056 299 72 14 Q SCV
W6PRI 23,436 189 62 24 Q SCV
WB6ITM 7,360 80 46 4 Q SJV
K6GPB 5,254 71 37 15 Q SF
KB6GK 374 17 11 10 Q EB

W1FEA 166,936 1084 77 24 A SV
KD6WW 155,496 1023 76 24 A SJV
W6OAT 140,140 910 77 22 A SCV
KZ4H/7 138,776 913 76 24 A NV
AE6Y 123,662 803 77 22 A SCV
W6RGG 109,288 719 76 20 A EB
N6PN 103,816 683 76 20 A EB
AA6MC 103,664 682 76 24 A SCV
W6PYX 99,150 661 75 24 A SV
N6NF 90,666 621 73 13 A SCV
AC8Y 87,600 600 73 19 A SCV
N6DA 64,650 431 75 11 A EB
AA6DX 64,500 430 75 19 A SF
K6PBB 64,468 454 71 23 A SV
N3ZZ 61,420 415 74 21 A SCV
N6NM 55,440 360 77 14 A SCV
AA6OY 48,162 349 69 24 A SCV
AA6YX 43,310 305 71 16 A SF
N6ZFO 40,448 316 64 19 A SF
KK6WS 38,280 319 60 12 A SF
WB6IYS 35,100 234 75 22 A SCV
WA6LLY/6 33,264 231 72 10 A SF
N6YKL 29,232 232 63 16 A SV
N6PT 27,068 202 67 13 A SCV
K6MJ 26,144 172 76 14 A SCV
WB6DSV 23,546 193 61 6 A EB
K6MA 22,538 191 59 9 A SCV
KM6YS 22,082 181 61 23 A SCV
N6YEU 22,016 172 64 16 A SF
KJ6DL 21,518 203 53 9 A SJV
WB6AIG 21,106 173 61 22 A SCV
N6EE 20,944 154 68 12 A SJV
K6DGW 19,950 175 57 8 A SV
WW6D 16,610 151 55 4 A SF
WD6DXH 11,220 110 51 6 A SCV
K3WA/KH6
11,088 126 44 13 A PAC
WA6BZR 9,506 97 49 9 A SF
AB6TY 8,400 105 40 18 A SJV
W6ASH 8,400 100 42 3 A SCV
NGØX/6 3,968 64 31 10 A SCV
N6YE 3,654 63 29 6 A SCV
WB6ETY 1,540 35 22 7 A EB
WN4KKN/6 1,064 28 19 1 A SCV
N2ALE 2 1 1 1 A SCV

N6TV 198,814 1291 77 24 B SCV
W6QHS 192,192 1248 77 24 B SCV
N6RO 191,268 1242 77 24 B EB
NF7P 175,252 1138 77 21 B NV
AA6KX 168,476 1094 77 24 B SCV
AA6WJ 164,164 1066 77 24 B SV
K2MM 159,852 1038 77 23 B SCV
W6ISO 137,550 917 75 20 B SCV
WA6AUE 136,800 900 76 21 B SV
K6PJY 127,974 831 77 22 B EB
N6ZB 115,962 753 77 24 B SCV
N6IP 114,750 765 75 24 B SCV
K6SG 107,100 714 75 20 B SV
W6XR 106,264 718 74 15 B SCV
W6BSY 102,718 667 77 22 B EB
W6NKR 79,464 516 77 18 B SV
NI6T 79,310 515 77 16 B SCV
K6FO 73,436 503 73 21 B SV
N6VI/KH6 53,760 384 70 10 B PAC
W6FSJ 36,856 271 68 7 B EB
N6WFK 29,232 252 58 8 B SCV
AJ6V 24,822 197 63 4 B SCV
N4TQO 24,282 213 57 4 B SF
N3AHA 23,896 206 58 3 B SCV
WA6CTA 21,760 170 64 6 B SF
W6CF 9,718 113 43 2 B SCV

W6BIP (+N1EE)
161,084 1046 77 24 M SF
KV6H (+NB6G)
160,930 1045 77 24 M SV
NV6O (+KN6OX)
102,564 666 77 24 M SV
AB6EO (+KD6NOS)
38,640 276 70 21 M SCV
KK6IU (+KD6TAX)
34,416 239 72 14 M SJV
WA6SDM (+NET)
18,032 161 56 24 M SCV
W6PW (KD6s AJX,VWD,W6s VV,YE, W7IIN,NJ8T ops)
17,784 171 52 13 M SF

Roanoke Division

WA4PGM
100,928 664 76 20 Q VA
W8DL 79,200 528 75 22 Q WV
N4ROA 52,910 407 65 20 Q VA
KV8S 46,720 320 73 1 Q WV
W8JWX 20,790 165 63 9 Q WV
WF4U 10,152 108 47 13 Q VA
K4GEL 9,400 100 47 9 Q VA
AA3DK/4 4,150 83 25 24 Q VA
K3SS 2,116 46 23 7 Q VA
K4JO 1,920 40 24 24 Q NC
WB4PNE 378 27 7 24 Q NC

N4AA 158,620 1030 77 24 A NC
K4PQL 153,520 1010 76 24 A NC
WJ9B 133,348 901 74 24 A NC
W4MYA 125,096 823 76 18 A VA
WD4JHY 119,140 805 74 24 A VA
K4BAM 89,790 615 73 23 A VA
KA4IKH 79,570 545 73 24 A NC
KA4RRU 65,274 473 69 17 A VA
W4YE 64,610 455 71 12 A VA
W4YDD 63,240 465 68 19 A SC
N3OS 61,880 455 68 17 A VA
K7GM 61,344 426 72 9 A NC
K4FPF 51,100 350 73 16 A VA
KX4V 50,256 349 72 15 A VA
KI4HN 47,886 347 69 19 A NC
K4UK 46,768 316 74201 A VA
WT9B 43,820 313 70 19 A SC
W4MFZ 40,936 301 68 24 A VA
KC4UH 40,612 286 71 14 A SC
N4JEO 40,600 290 70 14 A VA
W8NR 36,500 250 73 21 A WV
AA4KD 33,138 263 63 23 A VA
W3TB 32,760 252 65 9 A NC
N4LJS 31,200 240 65 24 A VA
WB5QVN 30,550 235 65 24 A VA
W6UZ/4 28,968 213 68 9 A VA
W4LDF 28,294 301 47 8 A VA
AA4EL 27,900 186 75 15 A VA
KC8BK 27,600 200 69 24 A WV
K4UL 26,800 200 67 24 A NC
W4VC 25,742 211 61 11 A VA
KC4EWT 25,090 193 65 17 A VA
KE8SX 24,696 196 63 15 A WV
NU4G 23,632 211 56 14 A NC
WD4ELJ 22,320 155 72 10 A VA
KS4S 20,856 158 66 10 A NC
KD4QZW 18,592 166 56 24 A NC
N4UTY 18,020 170 53 14 A VA
KB8PQK 15,860 122 65 24 A WV
N6MW 15,540 105 74 12 A VA
N4MM 15,390 135 57 11 A VA
KE4CBB 15,232 136 56 16 A SC
W3GRG 14,400 150 48 11 A NC
WN4BBJ 14,152 122 58 6 A SC
WA4RTS 13,860 110 63 15 A VA
N4WR 13,780 130 53 12 A SC
N4AIG 12,900 129 50 5 A VA
KA4RLJ 12,096 108 56 24 A VA
AC4ZO 11,520 128 45 24 A NC
WB4EEA 10,920 130 42 12 A VA
W4SNH 10,658 73 73 19 A VA
KC4GIA 9,180 102 45 24 A VA
AL7HW/4 8,200 100 41 5 A VA
AC4XT 7,052 86 41 11 A VA
KO4XE 4,958 67 37 24 A SC
WS8A 4,536 63 36 11 A VA
WB4ZPF 2,720 40 34 7 A VA
WY2V 2,050 41 25 24 A VA
KD4YRN/T 1,936 44 22 12 A NC
W8UT 1,100 25 22 1 A NC
WD4FJP 640 20 16 5 A SC
N4EE 2 1 1 1 A SC

AA4NC 185,440 1220 76 24 B NC
KT3Y 173,400 1156 75 24 B VA
W8LT 146,072 961 76 24 B WV
KE9A 142,650 951 75 24 B VA
K3JT 135,150 901 75 24 B WV
W4BTZ 126,900 846 75 22 B SC
W1IHN 108,680 715 76 20 B NC
K8MBH 102,120 690 74 16 B WV
WB4NFS 87,840 610 72 24 B VA
WB8BMV 82,880 560 74 22 B NC
W8PC 80,250 535 75 24 B SC
K8OQL 32,736 248 66 8 B WV
K4RZ 32,120 220 73 19 B NC
NQ1W 31,326 227 69 9 B VA
W8CNL/4 23,408 152 77 24 B SC
W4UQ 19,240 130 74 11 B VA
W2VMX 476 17 14 1 B NC

NJ4F (KB4CG,N4GUS,K8EI,ops)
145,160 955 76 24 M VA
W4XD (+K4SAD,KD4SYW,N4YET, WB4PJW,WD8LDY)
81,750 545 75 24 M VA
N4MPQ (+AD4DT,KD4s OKT,YYD, KE4CLE,KI4TP,KQ4IY,N4s LST,TWM, XFT,W4DYW,WA4SRD,KC5F)
44,616 338 66 24 M NC
KC4DY (+NET)
42,090 305 69 23 M VA
K3SW/4 (+NET)
20,724 157 66 8 M VA
WA8AHV (+KC4UFN,KD4UFS)
10,320 120 43 15 M VA
W4RV (+K1FR)
1,428 34 21 2 M VA

Rocky Mountain Division

N3SL 132,132 858 77 24 Q CO
K6EIL 57,794 407 71 21 Q UT
KT5X 57,720 390 74 12 Q NM
AB5OU 3,876 57 34 24 Q NM

KØEU 174,900 1166 75 24 A CO
WBØHBS 158,004 1026 77 24 A CO
W7CFL 150,920 980 77 24 A UT
KB5UL 120,536 793 76 22 A NM
KGØDS 120,080 790 76 24 A CO

WC7S	63,360	440	72	24	A	WY
W0RSR	49,558	349	71	14	A	CO
WØLQ	49,404	358	69	19	A	CO
W5TTE	47,302	353	67	24	A	NM
N6KL	42,560	304	70	16	A	CO
KØAP	34,100	275	62	9	A	CO
WØSG	30,016	224	67	14	A	CO
K9BOL	27,972	222	63	7	A	CO
KG0HV	26,240	205	64	13	A	CO
KFØQS	25,742	211	61	12	A	CO
AA5UR	25,132	206	61	19	A	NM
AA0PB	23,546	193	61	15	A	CO
NA7R	21,960	183	60	24	A	WY
NYØQ	20,246	191	53	14	A	CO
NO5I	16,756	142	59	8	A	NM
N5OP	15,392	148	52	4	A	CO
N7GVV	13,200	100	66	15	A	WY
W9KV	10,752	128	42	6	A	CO
KI7KA	9,984	104	48	11	A	UT
WBØNHA	9,592	109	44	6	A	CO
W0DSW	8,880	111	40	6	A	CO
KØKR	8,820	90	49	2	A	CO
W5GR	2,288	44	26	21	A	CO
WB0HZL	1,824	38	24	7	A	CO
N5ZR	1,232	28	22	4	A	CO
N7PLJ	234	13	9	24	A	WY
AA7TB	128	8	8	2	A	WY
N2IC	**216,524**	**1406**	**77**	**24**	**B**	**CO**
AH3C	207,438	1347	77	24	B	CO
K7UP (KN5H,op)	197,752	1301	76	24	B	NM
W1XE	194,194	1261	77	24	B	CO
W4ETO	140,602	913	77	18	B	CO
KJØG	104,424	687	76	24	B	CO
AI9X	69,788	478	73	9	B	NM
N5CT	40,576	317	64	6	B	UT
N7LMO	20,618	169	61	11	B	UT
NQØI	18,032	196	46	3	B	CO
WIØS	12,720	120	53	9	B	CO
AA5B (+K5TA,K9RS)	**223,916**	**1454**	**77**	**24**	**M**	**NM**
AAØNC (+KBØEBH)	99,718	683	73	19	M	CO
K6XO/7 (+K7RW)	82,050	547	75	11	M	UT
NZ7T (+KB7MFJ,KG7TE,KI7s KY,ST, N7JSH)	71,000	500	71	24	M	UT
AA7WQ (KI7TS,N7PLJ,NC7O WC7S, WBØTCZ,ops)	33,396	253	66	24	M	WY

Southeastern Division

W0MHS/4	81,320	535	76	24	Q	GA
KB4GID	81,216	564	72	24	Q	GA
N4QB	49,248	324	76	16	Q	AL
KP4DDB	27,690	195	71	22	Q	PR
KE2WB	16,560	120	69	17	Q	GA
WB8PAF	13,156	143	46	9	Q	NFL
N4TUA	3,604	53	34	20	Q	GA
NP4A (K7JA,op)	**210,518**	**1367**	**77**	**24**	**A**	**PR**
KP2/N6OP	180,120	1185	76	24	A	VI
KØLUZ	130,130	845	77	17	A	NFL
WD4AHZ	123,424	812	76	24	A	SFL
KP4TQ (KP4TK,op)	122,640	840	73	24	A	PR
NP2I	121,360	820	74	19	A	VI
KC4TEO	99,308	671	74	24	A	AL
WO5L	97,500	650	75	20	A	AL
W4RVU	97,488	677	72	21	A	NFL
K4SB	95,304	627	76	18	A	GA
N8LM	84,300	562	75	21	A	GA
WG4F	82,052	552	73	23	A	AL
KN4QV	73,112	494	74	16	A	GA
W4NTI	69,750	465	75	24	A	AL
W1UA	58,108	398	73	20	A	GA
KW4E	46,106	359	67	9	A	GA
K4OGG	46,930	361	65	18	A	GA
WB4VKW	42,344	316	67	24	A	AL
K7UPJ	38,340	270	71	16	A	SFL
AC4OC	36,850	275	67	24	A	NFL
K4LDR	34,408	253	68	14	A	GA
AD4KM	28,768	232	62	24	A	AL
WW1N	15,792	141	56	6	A	SFL
W3IMB	15,616	128	61	7	A	AL
KC4TEK	15,400	110	70	20	A	GA
N4XQN	14,960	136	55	16	A	GA
KO4OL	13,950	155	45	13	A	AL
AC4PQ	12,152	124	49	20	A	GA
K1FIR/4	10,976	112	49	7	A	SFL
KD3GC	8,190	91	45	8	A	GA
KA4HDZ	8,000	100	40	13	A	AL
WB4GWQ	5,396	71	38	9	A	SFL
KI4Y	4,392	61	36	5	A	GA
KQ4VG	1,276	29	22	5	A	GA
N4RJ (KM9P, op)	**231,000**	**1500**	**77**	**24**	**B**	**GA**
W74F	156,864	1032	76	24	B	AL
K4BAI	153,976	1013	76	24	B	GA
N4BP	150,000	1000	75	20	B	SFL
NX4N	86,724	594	73	9	B	NFL
KY2P	75,440	530	74	15	B	GA
K1ZX	53,480	382	70	7	B	SFL
AE4Y	51,264	356	72	24	B	GA
KP2/WV5S	26,380	215	66	15	B	VI
KP2N	21,716	178	61	9	B	VI
W4AQL (N4CXF,WD4DWN,N9HZQ, KØDI,ops)	**191,114**	**1241**	**77**	**24**	**M**	**GA**
AB4RU (+NET)	25,656	202	64	6	M	GA

Southwestern Division

AA2U	**110,850**	**739**	**75**	**24**	**Q**	**AZ**
N7IR	90,450	603	75	24	Q	AZ
WD7I	38,068	307	62	19	Q	AZ
WB6JJE	32,120	220	73	11	Q	LAX
W6JVA	30,192	222	68	12	Q	SDG
W6ZH	28,600	220	65	11	Q	LAX
N7JXS	26,650	205	65	17	Q	AZ
N5BF	18,480	154	60	13	Q	LAX
W9SE	16,800	150	56	4	Q	AZ
AD6T	13,630	145	47	12	Q	SB
N6RVC	12,720	120	53	7	Q	LAX
KI6SN	10,578	123	43	8	Q	ORG
WA7BNM	10,400	100	52	10	Q	LAX
N6AZR	1,872	39	24	8	Q	SB
N2LWL/6/T	600	20	15	7	Q	SDG
KY7M	**179,700**	**1198**	**75**	**24**	**A**	**AZ**
K6OY	173,712	1128	77	24	A	LAX
AB6FO	163,400	1075	76	24	A	LAX
W6UQF	142,728	939	76	24	A	SDG
N7CIX	122,250	815	75	17	A	AZ
AA6PW	120,300	802	75	24	A	ORG
N6HC	114,000	760	75	21	A	ORG
WA6GDS	108,680	715	76	22	A	LAX
WA6FGV	104,100	694	75	24	A	SB
K6HRT	90,450	603	75	20	A	ORG
W7YS	87,704	577	76	18	A	AZ
NW6S	74,460	510	73	24	A	ORG
KA3DSE/6	72,668	491	74	23	A	LAX
NZ1M/6	64,944	451	72	21	A	ORG
NG7S	62,050	425	73	22	A	AZ
WB2WIK	60,480	420	72	11	A	LAX
W6HAL	58,646	413	71	22	A	ORG
K6VI	56,942	401	71	14	A	ORG
NC6U	53,290	365	73	10	A	ORG
NN7A	52,050	347	75	17	A	AZ
WA7TWI	50,832	353	72	23	A	AZ
N6TW	43,736	308	71	13	A	SB
WB6YNI	41,676	302	69	12	A	ORG
W7ZMD	41,344	272	76	17	A	AZ
WZ6P	39,936	312	64	15	A	SB
K7SDW	35,508	269	66	13	A	SB
AB6NE	30,420	234	65	19	A	SDG
W6JXA	29,832	226	66	7	A	SDG
N6GL	29,784	219	68	24	A	LAX
W6TKV	26,230	215	61	11	A	ORG
WA6RND	25,200	210	60	9	A	ORG
W6NT	25,172	217	58	18	A	ORG
KD9E	23,100	175	66	9	A	SDG
N7KFL	17,100	150	57	13	A	LAX
AA6AN	15,444	143	54	14	A	SDG
NE6Q	15,092	154	49	9	A	SDG
W7ON	14,750	125	59	7	A	AZ
KJ6HO	13,500	135	50	14	A	LAX
KF7JF	11,160	124	45	7	A	AZ
W7ERU	10,800	100	54	11	A	AZ
W6AEF	10,752	112	48	19	A	AZ
KN6LM	10,560	132	40	13	A	LAX
W6BKY	10,272	107	48	6	A	SB
NU7V	9,288	108	43	4	A	AZ
W2HTX	7,742	79	49	5	A	AZ
KD7VI	6,868	101	34	3	A	AZ
NA2D	5,874	89	33	12	A	LAX
K6ZCL	5,852	77	38	17	A	LAX
N6OPR	4,418	47	47	24	A	LAX
KB7PDL	3,234	49	33	12	A	AZ
KI7LP	2,576	46	28	7	A	AZ
N6ICZ	224	14	8	2	A	LAX
KN6RU	32	4	4	2	A	SB
K6LL	**212,982**	**1383**	**77**	**24**	**B**	**AZ**
K6NA	186,956	1214	77	23	B	SDG
W6EEN (KA6SAR,op)	181,566	1179	77	24	B	ORG
K7NO	156,618	1017	77	22	B	AZ
KI6X	152,608	1004	76	24	B	ORG
KE7GH (NU7I, op)	145,530	945	77	24	B	AZ
KA5O	141,218	917	77	19	B	SDG
KC6X	139,840	920	76	21	B	LAX
K6JYO (K9VV,op)	126,434	821	77	24	B	SDG
W6TKF	122,892	798	77	20	B	SB
W6MVW	100,870	655	77	24	B	SDG
K2PLF	95,400	636	75	18	B	ORG
WA5VGI	90,812	622	73	24	B	SB
W6AO (WA6OTU,op)	62,342	427	73	24	B	LAX
N6KI	53,132	359	74	9	B	SDG
N6AZE	41,026	281	73	18	B	SDG
W6OUL	35,000	250	70	11	B	SB
WZ9J	21,712	184	59	6	B	SB
N6SMW	11,224	122	46	24	B	SDG
W6HT	10,622	113	47	4	B	ORG
W6UE	1,890	35	27	4	B	LAX
N6VR (+AC6T,N8SR)	**202,048**	**1312**	**77**	**24**	**M**	**SB**
K6XT (+K6ZH)	179,564	1166	77	24	M	SDG
KB7YCS (+AA7YP)	13,416	129	52	16	M	AZ
N6XTT (+N6RMJ)	9,000	100	45	24	M	LAX

West Gulf Division

N5NMX	64,970	445	73	16	Q	STX
KG5U	53,576	362	74	12	Q	STX
WA5RES	47,600	350	68	23	Q	OK
N5BA	29,696	232	64	24	Q	STX
AF8Z	27,480	229	60	10	Q	STX
KD4HZ/5	26,752	209	64	8	Q	STX
K5DP	16,200	150	54	8	Q	OK
KB5KYO	11,872	112	53	21	Q	NTX
N5RZ	**196,840**	**1295**	**76**	**24**	**A**	**WTX**
AD5Q	176,484	1146	77	24	A	STX
AC5K	140,144	922	76	14	A	STX
NN5T	106,800	712	75	23	A	NTX
K5ED	81,936	569	72	15	A	WTX
W5XD	81,360	565	72	17	A	STX
KF5AA	70,546	477	74	14	A	NTX
WA5TOS	69,116	467	74	18	A	STX
K5WXZ	65,700	438	75	22	A	NTX
N5AW	55,024	362	76	8	A	NTX
WYZU	53,048	349	76	24	A	STX
N4CD	51,750	375	69	8	A	NTX
AA5TZ	48,988	331	74	24	A	NTX
WD5K	37,630	265	71	10	A	NTX
WC5D	36,708	266	69	9	A	STX
KO9X	31,878	231	69	18	A	OK
W5NZ	31,688	233	68	15	A	STX
AA5LF	29,394	213	69	20	A	STX
K5DX	28,560	204	70	10	A	STX
AB5EA	26,964	214	63	11	A	STX
WD5ABC	25,610	197	65	24	A	NTX
AA5WE	25,452	202	63	18	A	NTX
K5CM	21,318	187	57	8	A	OK
N5KAE	19,782	157	63	12	A	STX
AJ4F	18,480	154	60	5	A	STX
AA5UO	15,496	149	52	24	A	NTX
W5TZN	15,470	119	65	19	A	OK
N5NA	13,664	122	56	5	A	WTX
N5XUS	13,176	122	54	14	A	STX
KC5BDJ	11,600	116	50	24	A	STX
W5RRR (WB5PYI,op)	11,424	112	51	11	A	STX
KC5NT	11,124	103	54	18	A	NTX
AB5OX	11,040	120	46	10	A	STX
WA5MUF	9,546	111	43	10	A	NTX
AA5OJ	9,504	108	44	24	A	OK
AB5PP	8,692	106	41	6	A	OK
KD5GM	7,560	84	45	18	A	STX
AA5HV	2,610	45	29	4	A	OK
N5KW	980	35	14	1	A	OK
KAØRNY	384	16	12	3	A	OK
AB5EL	98	7	7	4	A	OK
WM5G (KRØY,op)	**236,512**	**1556**	**76**	**24**	**B**	**NTX**
K5GN	221,452	1438	77	24	B	STX
NM5M	212,212	1378	77	24	B	WTX
K5MR	209,304	1377	76	24	B	NTX
AA5BL	199,880	1315	76	24	B	STX
KI3L	190,498	1237	77	24	B	STX
W5KFT (WB5VZL,op)	186,504	1227	76	24	B	STX
W5XJ	175,714	1141	77	21	B	NTX
W5ASP	152,000	1000	76	18	B	STX
W5WQN	110,726	719	77	24	B	STX
K5RX	108,878	707	77	13	B	NTX
K5LZO	88,008	579	76	24	B	STX
KM5H	58,890	453	65	6	B	OK
WB5B	52,992	384	69	12	B	NTX
K5NW	38,688	312	62	8	B	NTX
W5NR	21,228	174	61	8	B	STX
K5EC	4,158	63	33	24	B	STX
WXØB (+NA5Q,WA9ZBV)	**192,280**	**1265**	**76**	**24**	**M**	**NTX**
K5OJI (KC3N,KD5PJ,KT5V,ops)	178,024	1156	77	24	M	NTX
NJ1V (+N5RJM)	152,608	1004	76	23	M	OK
KS1G (+NET)	75,776	512	74	8	M	NTX
KB5YVT (+KB5UHS)	46,800	325	72	17	M	STX
KA5W (+KS1G)	38,502	279	69	24	M	NTX

Canada

VE7YU	43,194	313	69	22	Q	BC
VE6BIR	37,660	269	70	20	Q	AB
VE6SH	16,800	150	56	14	Q	AB
VE5AEO	12,240	136	45	15	Q	SK
VE2BLX	3,136	49	32	8	Q	PQ
VE2ABO	1,584	36	22	7	Q	PQ
VE3FSV	1,218	29	21	10	Q	ON
VE3RHJ	900	25	18	5	Q	ON
VE4VV	135,828	882	77	24	A	MB
VE4GV	128,850	859	75	24	A	MB
VE5VP	72,588	526	69	21	A	SK
VE1AZN	53,872	364	74	16	A	MAR
VE7IN	53,480	382	70	19	A	BC
VE2EM	53,108	374	71	15	A	PQ
VE3ST	40,442	277	73	10	A	ON
VE5SF	32,984	266	62	15	A	SK
VE7RCN (VE7CYT,op)	30,680	236	65	19	A	BC
VE5GC	26,562	233	57	13	A	SK
VE3ZIH	20,592	156	66	11	A	ON
VE3LPE	19,264	172	56	24	A	ON
VE3TEE	17,040	142	60	12	A	ON
VE2WAT	16,468	179	46	24	A	PQ
VE6KTT	16,170	147	55	19	A	AB
VE3WZ	16,124	139	58	7	A	ON
VE3OQZ	14,820	130	57	15	A	ON
VE2FFE	12,144	132	46	8	A	PQ
VE7BAV	10,752	112	48	12	A	BC
VO5SF	5,700	75	38	5	A	MAR
VE5ZD	912	24	19	7	A	SK
VE3EJ (K5ZD,op)	203,528	1339	76	24	B	ON
VE7SZ	193,116	1254	77	24	B	BC
CH7CC	186,648	1212	77	24	B	BC
VE3AWF	52,360	374	70	11	B	ON
CH2AWR	28,416	222	64	17	B	PQ
VE1NH (+NET)	66,990	435	77	24	M	MAR
VE3BXI (+VE3HGE)	62,926	431	73	23	M	ON
VE6AO (VE6s AJL,AMR,CIZ,CNN, GAV,GLR,IC,KC,KVB,ops)	51,474	373	69	24	M	AB
VE3EKF (+NET)	13,420	122	55	8	M	ON

PHONE

Atlantic Division

K3WW	78,540	510	77	24	Q	EPA
NW2I	30,520	218	70	16	Q	WNY
W3SMX	29,832	226	66	19	Q	WPA
N3IGA	17,640	140	63	10	Q	EPA
KB2SF	17,400	150	58	6	Q	WNY
WE3C	10,560	110	48	6	Q	EPA
WB0IWG/T	3,886	67	29	13	Q	WPA
KA3YLY/N	16	8	1	24	Q	EPA
AD8J	153,692	998	77	24	A	WPA
AA2GQ	133,826	869	77	23	A	SNJ
WA2UUK	124,432	808	77	24	A	WNY
K2ZI	117,450	783	75	23	A	SNJ
W3BGN	117,040	760	77	15	A	EPA
K2DB	111,034	721	77	17	A	WNY
WN3K	105,490	685	77	19	A	DE
WJ2W	98,648	649	76	21	A	WNY
WB2DIN	93,016	604	77	13	A	SNJ
K3DI (WD4IEH,op)	90,180	601	75	18	A	MDC
WA3HAE	87,562	608	72	24	A	WPA
AG3H	77,308	502	77	16	A	WPA
N3IXR	75,000	500	75	21	A	WPA
NA2Q	71,852	506	71	19	A	WNY
WW3V	70,640	460	77	17	A	DE
N3BGV	69,116	467	74	20	A	WPA
AA2PZ	62,624	412	76	18	A	SNJ
WT3P	62,250	415	75	14	A	EPA
WW3S	61,446	399	77	18	A	WPA
NY3C	58,404	471	62	9	A	DE
AA3CE	56,544	372	76	16	A	WPA
KE2OP	54,362	353	77	18	A	SNJ
K2ZR	53,320	430	62	7	A	WNY
N2PEB	49,558	349	71	20	A	WNY
WF2I	48,980	395	62	13	A	WNY
N3KAE	47,652	361	66	16	A	EPA
K2MK	47,064	318	74	13	A	SNJ
W2IMO	46,800	325	72	14	A	WNY
N3IMF	42,720	178	120	15	A	EPA
WA2LBT	42,280	302	70	22	A	SNJ
N3MLV	40,964	266	77	24	A	EPA
W2TZ	40,392	374	54	6	A	WNY
WB2MWW	37,950	275	69	19	A	WNY
WA3YON	36,112	244	74	11	A	EPA
KA3ZVJ	35,072	274	64	10	A	EPA
W3EKT	34,916	301	58	24	A	MDC
W2EA	33,120	240	69	20	A	SNJ
N3OHQ	32,886	261	63	24	A	EPA
W2FGY	32,208	244	66	22	A	SNJ
WB3AAK	31,330	241	65	14	A	EPA
KA3POA	31,326	227	69	20	A	WPA
NM2J	30,774	223	69	21	A	WNY
N3KFN	30,366	241	63	24	A	EPA
W2OMV	30,240	240	63	15	A	WNY
WA2ZZX	30,008	242	62	11	A	SNJ
WB3LNZ	28,424	209	68	13	A	EPA
KB3AGZ	27,600	200	69	16	A	EPA
W2ORA	27,594	219	63	12	A	SNJ
WB2WPM	27,010	185	73	24	A	WNY
WA2LUF	26,800	200	67	10	A	WNY
N2WK	26,718	219	61	6	A	WNY
WD8LAQ	25,792	208	62	10	A	MDC
NO3A	25,256	164	77	19	A	WPA
N2MKO	24,948	198	63	13	A	WNY
N2FY	23,600	200	59	14	A	SNJ
AA3AH	22,440	187	60	20	A	EPA
K4VOS	22,250	159	70	18	A	WNY
N3MCJ	21,948	186	59	4	A	MDC
KM2L	20,916	166	63	24	A	WNY
KA3CMV	20,292	178	57	16	A	EPA
KA3LCF	20,178	171	59	18	A	EPA
N3FOG	19,886	163	61	14	A	EPA
N3HUV	19,370	149	65	15	A	MDC
KB4VL	18,924	166	57	8	A	WNY
N2ARG	18,696	164	57	9	A	WNY
W2EZ	18,290	155	59	12	A	WNY
N3KLG	17,490	165	53	9	A	EPA
K3TM	17,400	150	58	4	A	MDC
KF2EY	17,400	150	58	24	A	WNY
W3TDF	17,264	149	58	7	A	EPA
WQ3I	17,236	139	62	11	A	EPA
K3KHL	16,616	134	62	8	A	EPA
N3ICS	15,876	126	63	10	A	EPA
KA3TOV	15,582	147	53	9	A	EPA
W3CPB	15,008	134	56	9	A	MDC
WA3HGW	14,740	134	55	9	A	WPA
KO3TS	14,560	130	56	12	A	EPA
N3AFT	14,280	102	70	17	A	MDC
N3LBC	14,268	123	58	9	A	EPA
KB2XR	14,112	126	56	5	A	WNY
AA2PO	13,716	127	54	24	A	WNY
KD3IQ	13,462	127	53	15	A	MDC
N3PJO	13,152	137	48	19	A	EPA
W3ABC	12,508	118	53	24	A	MDC
AA3EI	12,378	119	52	24	A	MDC
WB3IZF	12,250	125	49	9	A	EPA
KE3FC	12,204	113	54	11	A	EPA
NT2V	12,144	132	46	6	A	SNJ
KA3WZY	11,424	119	48	7	A	EPA
N3OWF/T	11,180	130	43	24	A	WPA
N3KBI	10,848	113	48	20	A	MDC
KA3TGY	10,800	108	50	8	A	MDC
N2DM	10,764	117	46	24	A	WNY
AA3DP	10,578	123	43	16	A	EPA
K2HPJ	10,526	112	47	8	A	SNJ
W3SSS/2	10,208	116	44	12	A	SNJ
KE3KD	10,192	104	49	8	A	WPA
WA2CVJ	9,400	100	47	9	A	SNJ
WB2BZR/3/T	9,048	116	39	24	A	MDC
W3KWH (K3RYA,op)	8,856	108	41	5	A	WPA
W3DZH	8,840	85	52	5	A	EPA
WD2F	8,712	99	44	6	A	WNY
K3SA	8,052	122	33	2	A	MDC
KA3UIH	7,600	100	38	24	A	MDC
N3OVD	6,660	90	37	10	A	MDC
N3LYX	6,600	100	33	11	A	EPA
K3YDX	6,400	80	40	4	A	MDC
NJ2L	5,402	73	37	2	A	WNY
K3UAL	4,352	64	34	7	A	MDC
K3TLX	4,320	60	36	7	A	MDC
AA3GE	3,904	61	32	5	A	EPA
N2LQQ	3,840	60	32	7	A	WNY
K2TD	3,658	59	31	3	A	SNJ
KD2AE	2,666	43	31	3	A	SNJ
W3EIW	1,496	34	22	7	A	WPA
W3IAR	1,100	55	10	5	A	EPA
W2IFR	1,080	30	18	7	A	SNJ
WN3F	1,008	28	18	5	A	WPA
WJ3N	960	30	16	2	A	MDC
W8IJ	704	22	16	2	A	WPA
N3KWQ/T	624	48	13	4	A	EPA
WB2DVU	572	22	13	24	A	WNY
W3MY	360	18	10	25	A	EPA
W3XE	240	12	10	2	A	MDC
KA3DOF	112	8	7	5	A	MDC
WB3KIC	72	6	6	1	A	MDC
KA3GSV	40	6	4	1	A	MDC
WA2YSW	2	1	1	1	A	SNJ
K3LR (K3UA,op)	**328,328**	**2132**	**77**	**24**	**B**	**WPA**
KE3Q	280,742	1823	77	24	B	MDC
KF3P	279,202	1813	77	24	B	MDC
K3ZO	277,662	1803	77	24	B	MDC
WA3A	253,176	1644	77	24	B	WPA
K2ZJ (WA2LCC,op)	234,900	1566	75	24	B	WNY
NW3C	233,618	1517	77	24	B	WPA
AA3B	218,424	1437	76	24	B	EPA
AB2E	214,368	1392	77	24	B	SNJ
K3TUP	194,040	1260	77	16	B	WPA
KE2VB	152,306	989	77	24	B	WNY
AF2K	129,668	842	77	24	B	WNY
N3AM	79,050	527	75	8	B	MDC
AK3V	70,070	455	77	14	B	EPA
K3IXD	63,196	427	74	14	B	MDC
WF2V	58,080	440	66	16	B	WNY
NA2A	53,534	377	71	8	B	WNY
AA2IZ	45,900	306	75	23	B	WNY
W2PAU	40,848	276	74	11	B	SNJ
W3DQI	38,808	252	77	12	B	MDC
W3YEY	38,346	249	77	14	B	WPA
WT3H	36,704	248	74	10	B	EPA
KA2KFO	36,000	240	75	18	B	SNJ
K2PS	29,700	225	66	24	B	SNJ
K2RXN	25,860	222	65	13	B	SNJ
WJ2O	26,836	257	54	5	B	WNY
WB3CIW	26,334	171	77	24	B	EPA
K3MD	23,142	203	57	3	B	WPA
WA2POW	21,868	142	77	17	B	EPA
W8AXX	20,352	212	48	6	B	MDC
KE3EO	19,250	125	77	13	B	EPA
KD3TB	16,060	146	55	5	B	EPA
KB2NU	11,552	76	76	5	B	WNY
N2AWC	11,186	119	47	14	B	SNJ
W3GN	700	25	14	1	B	MDC
W3GH (+W9XR)	250,096	1624	77	24	M	WPA
W3GNQ (+K3MQH)	235,928	1532	77	24	M	MDC
N3MKZ (+N3BUB,WU3M)	155,540	1010	77	24	M	EPA
WA3LVR (+KA3WDW)	143,990	935	77	22	M	EPA
WB2PSI (KA1NJE,AA2JN, WA2ZKD,ops)	136,290	885	77	21	M	WNY
KY3W (+KF3Y)	105,952	688	77	22	M	EPA
W3ZZ (+NET)	92,554	601	77	24	M	MDC
WU2M (+AA2PS)	77,924	506	77	21	M	WNY
NK8O (+N2FAM)	63,602	413	77	20	M	EPA
K3LA (+NET)	62,832	408	77	12	M	WPA
NX3A (+NET)	60,214	391	77	12	M	DE
K3PZN (+N3MCB)	58,240	416	70	24	M	MDC

W8MUM (KA3s IXG,OTN,KE3FD,N3s BVE,DGK,MPK,QZS,NE3P,NT3B, WW3U,ops)
54,576 379 72 24 M EPA

KF2U (+NET)
51,898 337 77 14 M SNJ

WR3L (+NET)
48,664 316 77 16 M MDC

N3AZZ (+KA3s SMF,TMK,KD3SB, KE3ED,N3s EIX,GZZ,SD,WN3W)
46,818 304 77 24 M WPA

AA2OF (+KA2OJM,KB2MMI,N2s LFG, OMY,TUE,TUF,WTC,W2GLN,WA2ISC)
45,360 324 70 24 M WNY

KE3GA (+NET)
39,270 255 77 16 M EPA

KA3TCC (+N3s BWK,KJQ,LDR)
35,140 278 65 17 M MDC

WR3G (+NET)
32,186 209 77 8 M WPA

KA3OUT (+KE3GB)
32,000 250 64 18 M MDC

N2MM (+NET)
23,760 198 60 4 M SNJ

KE2UV (+NET)
23,100 180 77 12 M WNY

K3TW (+NET)
18,170 105 77 10 M MDC

Central Division

W9UP (KA9FOX,op)
161,546 1049 77 24 Q WI

N9NE 53,130 385 69 17 Q WI
KF9PL 44,208 307 72 16 Q IL
N9HH 30,600 225 68 24 Q IL
KE9YR 22,356 162 69 6 Q IL

WN9P 228,844 1486 77 24 A WI
AJ9C 206,360 1340 77 24 A IN
K4XU 198,044 1286 77 24 A IL
K9QVB (N2KCZ,op)
145,530 945 77 24 A IL
N9NCX 100,254 651 77 24 A IL
WE9V 91,448 644 71 14 A WI
W9MOK (AA9CG,op)
81,200 580 70 16 A IN
WE9A 80,234 621 77 24 A IL
KE9QT 66,960 465 72 24 A WI
W9ANA 66,452 449 74 14 A WI
WD9CIR 63,688 419 76 20 A IL
AK9N 59,348 401 74 17 A IL
W9JOO 55,746 362 77 22 A IN
NX9B 53,576 362 74 20 A IN
W9SZ 53,048 349 76 20 A IL
AA9FG 52,122 357 73 13 A IN
WW1M 51,150 341 75 14 A WI
KB9ENB 50,370 365 69 18 A IL
NE0P 49,348 338 73 24 A IL
KB9FVM 46,764 334 73 22 A IL
KO9Y 44,988 326 69 6 A IN
K9GH 44,100 315 70 18 A IL
W9HLY 42,504 276 77 23 A IN
N9MSG 39,744 286 69 22 A IL
N2CS 35,712 246 72 10 A IL
N9BBM 35,052 254 69 22 A IL
AA9AX 34,928 236 74 10 A IN
K9QYC 34,656 228 76 11 A WI
KC9MZ 34,500 250 69 17 A IL
N9JAK 30,848 241 64 13 A WI
W9NFM 29,964 227 68 12 A IL
N9ITX 29,500 250 59 6 A IL
AA9CS 29,480 220 67 14 A IN
KF9GO 29,200 200 73 21 A WI
N9OKS 28,672 224 64 14 A WI
W9LNO 27,462 199 69 6 A IL
WD9BJN 25,662 193 67 13 A IL
WD4IXL 25,192 188 67 24 A IN
N9ISN 25,172 217 58 7 A WI
W9RZW 25,074 199 63 24 A WI
W9MYY 24,278 199 61 18 A IL
WB9GKA 23,302 191 61 8 A IL
KB9AIT 23,254 151 77 14 A WI
AA9FW 23,184 168 69 14 A WI
KB8AMG 22,968 198 58 15 A WI
ND9O 22,230 171 65 24 A WI
K9OSH 22,204 182 61 7 A WI
AE9K 21,672 172 63 7 A WI
KF9OB 19,500 130 75 24 A WI
N9MBK/T 19,364 208 47 11 A IL
KB9IVG/N 18,398 218 42 9 A IL
W9FBC 17,898 157 57 13 A WI
KB9CYL 17,160 158 55 11 A IL
K9MMS 17,094 111 77 11 A IL
WI9B 15,750 105 75 23 A IL
WR9M 15,290 139 55 6 A IL
N9OTD 14,734 139 53 11 A IL
KF5JQ 14,630 133 55 6 A IL
W9BZP 14,396 118 61 14 A IL
KE7UA 13,680 152 45 7 A IL
K9NA 13,440 105 64 12 A IL
AC4HI 13,338 117 57 5 A IN
WA9GON 12,978 103 63 15 A WI
N9AOT 12,876 111 58 24 A WI
WN9K 11,730 115 51 9 A WI
KA9ORN 11,600 100 58 19 A IN
KF9KH 9,676 118 41 7 A WI
W9REC 9,372 71 66 12 A IL
KA9TVT 9,040 113 40 24 A WI
WO9C 8,856 108 41 9 A IN
WA9SLM 8,700 75 58 8 A IL
WA9YAS 8,400 105 40 6 A IL
K9JK 8,280 90 46 5 A IL
WA9SLU 6,656 104 32 4 A IN
K9WTF 6,248 71 44 24 A WI
KF9KG 6,160 77 40 12 A IN
AG9G 5,200 65 40 4 A WI
K9DIY 3,960 60 33 8 A IN
KB9GSS 3,172 61 26 9 A IL
N9KQK 3,008 47 32 4 A IN
KB9ARA/T 1,476 41 18 4 A WI
N9THK/T 700 25 14 5 A WI
KB9ITE/N 576 24 12 3 A IL

W9RE 295,218 1917 77 24 B IN
WA9TPQ 230,538 1497 77 24 B IL
WQAIH (N9AXL,op)
201,586 1309 77 24 B WI
K9BGL 198,814 1291 77 24 B IL

K9PW 195,624 1287 76 24 B IL
W9XT 154,154 1001 77 16 B WI
KB0C 144,144 936 77 18 B IN
K0FVF 136,800 912 75 14 B WI
WB9CEP 116,180 785 74 18 B IN
NE8J 115,050 767 75 24 B WI
WO9Z 110,880 720 77 18 B IN
K9BG 108,750 725 75 14 B IL
WD9HTC 101,640 660 77 21 B IL
WO9B 96,486 652 74 15 B WI
WG9L 91,050 607 75 11 B IL
K9LUW 89,850 599 75 20 B WI
W9OF 62,216 202 57 22 B IL
W9XU 61,174 419 75 16 B WI
WA9DRE 56,260 375 75 16 B IL
WV9T 51,940 371 70 8 B IL
K9KR 46,350 309 75 16 B WI
K9DN 45,844 314 73 13 B IL
WD9GIG 38,000 250 76 20 B IL
KA9IRS 30,530 215 71 15 B IN
WB9TIY 29,000 250 58 3 B IL
K9UQN 24,190 205 59 7 B IL
WD9EJK 16,756 118 71 11 B IL
K9CC 13,920 145 48 2 B IL
NE9U 11,858 77 77 9 B WI
W9HBI 11,000 110 50 4 B IL
WA9QNU 9,030 105 43 2 B IL

K9ZO (+WX3N,AG9A,WX9E)
286,286 1859 77 24 M IL
N9QX (+KE9I,WO9S)
236,698 1537 77 24 M IN
AA9BV (+K9XR,N9RBT,NW9S, WB9LRK)
132,748 862 77 24 M IL
WA9ZZV (+KA9PDA,KB9s BTB,HTN. N9s MLF,TBZ,WD9GWH,KB0CET, WB0WOT)
114,422 743 77 24 M WI
N9JF (+KB9CEQ,N9MTX)
100,100 650 77 17 M IL
K9UWA (+KA9A,KC9LA,KR9U)
91,784 596 77 12 M IN
K0HMO (+N9KLI)
78,386 509 77 22 M IL
KB9FIN (+N9KUT)
71,136 468 76 21 M IL
KB9YO (+NET)
66,374 431 77 24 M IL
KK9G (+AA9EA,K9PUI,N9VEX)
65,400 436 75 24 M IN
K9YUG (+KB9BA,N9CRP,WB9WUW)
62,196 438 71 14 M IL
W9YH (N4OGW,KB9FKO,N9s NTI. RRE,ops)
59,024 434 68 12 M IL
WU8B (+NET)
54,516 354 77 15 M WI
N9LCR (+AA9GG,N9RUC)
50,204 326 77 23 M IL
N9LJY (+N9NPP,NW9V,WB9RGZ)
46,950 313 75 19 M IL
WB9RQR (+N9s LLT,NNA,NNB, NNG,QQA,UNR,VGA,WB9LNL,WI9M)
41,076 326 63 24 M WI
N9KCS (+N9ABD)
32,518 229 71 16 M IL
N9XX (+NET)
19,712 126 77 13 M WI
WB9IL (KA9AND,KB9s BWS BWT,IMG, KD9AD,KF9NB,N9PLQ,WC9V,WX9D, ops)
18,960 158 60 12 M IL
N9RVW (+N9VBD)
10,416 124 42 24 M WI
KF9MP (N9s NAU,OBL,O9M, N9VKS,ops)
9,898 101 49 24 M IN

Dakota Division

KØTO (N0BSH,op)
95,850 639 75 19 Q MN

NØAFW 70,224 456 77 12 Q ND
WØYHE 29,700 226 66 12 Q MN

WDØT 213,752 1386 77 24 A SD
ACØW 142,050 947 75 24 A MN
NØHJZ 109,896 723 76 20 A MN
ND1H 78,660 525 73 16 A ND
AAØOB 57,744 401 72 20 A MN
KBØZQ 56,000 400 70 10 A MN
KØMPH 49,800 332 75 12 A MN
WØUC 44,160 320 69 8 A MN
KØUXQ 40,200 268 75 16 A MN
WAØWWW
39,390 303 65 11 A MN
KØLR 38,220 273 70 16 A MN
RØWIU 33,604 271 62 15 A SD
KBØIHM 33,062 271 61 12 A MN
KØTG 28,060 230 61 8 A MN
W9RXJ 26,668 189 67 19 A MN
KØVWG 26,532 201 66 15 A ND
KFØUK 25,916 209 62 11 A MN
NØBHC 16,800 150 56 8 A MN
N4QLY 15,876 147 54 10 A SD
AAØOD 13,056 136 48 7 A MN
KEØA 10,400 100 52 5 A ND
NYØC 9,270 103 45 4 A MN
KBØKFW 6,020 86 35 5 A ND
WAØWOV 5,858 101 29 4 A MN
AAØGP 2,376 41 29 4 A MN
KAØZPP/M 1,426 31 23 4 A MN

NØAT 281,820 1830 77 24 B MN
KØIJL 243,048 1599 76 24 B MN
KAØZFX 226,534 1471 77 21 B ND
KØHB 203,742 1323 77 21 B MN
KFØGV 169,554 1101 77 19 B MN
WBØO 126,000 840 75 10 B ND
K3WT 103,026 669 77 11 B MN
K9WIE 85,520 455 72 24 B MN
KMØO 64,184 452 71 6 B MN
WA2HFI 27,594 219 63 7 B MN
NØMNO 19,494 171 57 2 B MN
KØAD 5,920 74 40 2 B MN

WØAA (WAØPEV,WBØADO,ops)
214,320 1410 76 24 M MN

KRØB (+AF9T,KAØJZV,KJØB,KSØT, N0BKL)
212,800 1400 76 24 M MN
KØFC (+AAØU,K0s AD,BUD,KG0AG, N0s BG,KBD,MGQ,NFU,NYH,RUA, VMB,VYK,WØPOY,WB0ESO, WGØM)
120,384 792 76 24 M MN
KØJE (+KBØJA)
52,852 362 73 24 M MN
KAØRBQ (+op)
33,456 246 68 19 M MN
WØDCO (KØOR,KAØs FUI,FGV,N0RIE,WSØV,ops)
25,600 200 64 14 M SD
NØMSB (+KBØs CKB,GIP,KHZ)
15,120 136 56 19 M MN
NØXYX (+KBØLFV)
13,400 134 50 17 M ND

Delta Division

AC4HF 19,722 173 57 7 Q TN
AD4JB 18,144 126 72 19 Q TN
KI5EZ 12,636 117 54 7 Q AR

N8RR 25,922 493 77 8 A LA
N4IR 74,382 483 77 14 A TN
AC4ZD 62,496 434 72 17 A TN
KI4UZ 61,800 400 77 17 A TN
WD5DJW 60,568 452 67 16 A AR
N5QDE 59,422 407 73 22 A MS
K2QZH 51,800 350 74 18 A TN
KF5PN 42,980 307 70 18 A AR
WB5TPW 41,538 301 69 24 A LA
AB4CA 31,800 265 60 10 A TN
N4CT 30,800 200 77 10 A TN
WB4TDB 28,272 228 62 8 A TN
AD4F 26,800 175 76 15 A TN
N4ZCO 22,792 154 74 11 A TN
N5SMQ 22,440 187 60 8 A LA
KR4FK 21,390 155 69 14 A TN
N8VV 20,706 167 62 9 A AR
KF5YO 19,250 125 77 24 A AR
WD4CQE 19,200 192 50 19 A TN
AA5XI 19,072 149 64 10 A LA
WA5JWU 17,176 113 76 24 A LA
K5JH 13,500 125 54 8 A AR
KK4QE 13,482 107 63 15 A TN
K4IOQ 12,126 129 47 8 A TN
N5ZND 10,584 108 48 9 A MS
N4PUQ 10,290 105 49 6 A TN
W4AY (WA4ZZU,op)
9,240 105 44 4 A TN
N5TKA 9,024 94 48 14 A LA
K4OAQ 2,940 49 30 3 A TN
KD4KSR 600 25 12 3 A TN
N5KKG 442 17 13 1 A MS

W5WMU 295,064 1916 77 24 B LA
N5PST 177,748 1201 74 24 B LA
WA5OYU 160,622 1043 77 22 B MS
K5DOC 81,774 531 77 15 B TN
K4LTA 75,300 502 75 12 B TN
W4ODG 41,606 293 71 12 B TN
K3CO 38,412 291 66 8 B TN
KX5H 32,956 214 77 24 B LA
KC4US 12,012 78 77 24 B TN
N9BED 11,468 122 47 9 B AR
W9KI 9,696 101 48 7 B AR

N4ZZ (+W9WI)
325,094 2111 77 24 M TN
N5WA (+AA5ZT,AB5FW,KB5SSC, KF5XV,KG5VK,N5s DUH,OCD,XIO)
206,052 1338 77 24 M LA
W5GAD (AB5DB,KB5NMZ,N5s OGW, TEA,TFK,UXT,UVB,YCP,W5YCR, WA9TMC,WB9TVN,ops)
132,594 861 77 24 M LA
W5IGM (AB5LE,KB5s IDB,ZXS. KI5HA,N5WUM,KA9IVY,ops)
129,750 865 75 24 M AR
K5SL (+K5UIC,KB5s WNA,ZRD, KC5OOT,KI5HR,KJ5SU,N5OZB, WB5MJY)
122,400 816 75 24 M LA
KC5BVO (+KB5s WUS,YMO,ZYC, KI5BV,KJ5PE)
99,946 649 77 24 M AR
KB5IXI (+KB5s FET,ROF,RQL,VLA, KG5MZ,N5KKG,WD5DBW)
79,772 518 77 19 M MS
KE5DX (WA5ZGI,KBCKYS,ops)
61,466 421 73 18 M AR
N5FG (+WD0GML)
47,550 317 75 24 M MS
AA4OO (+NET)
44,506 289 77 12 M TN
WA4UCI (AC4LS,K4SE,KB4NVD,KD4s EDL,YWW,KE4s ABV,GNE, N0HOY,ops)
28,800 225 64 24 M TN
KI5EE (+KJ5NS)
24,318 193 63 14 M LA
WB4PHW (+KD4LIF)
23,936 176 68 18 M TN
KA4OTB (+KA4OTC)
15,600 150 52 8 M TN
WA4IZB (+KD6TAX)
11,440 104 55 12 M TN
KJ5PH (+N5VEI)
10,944 114 48 8 M MS

Great Lakes Division

WB8G 100,408 652 77 24 Q MI
KO4BI 81,696 552 74 23 Q KY
WA8RJF 64,824 438 74 24 Q OH
W8VK 33,434 229 73 49 Q OH
NQ8Y 31,800 212 75 19 Q OH

AA8AV 167,706 1089 77 24 A MI
K8BL 154,616 1004 77 23 A OH
N8AA 111,660 725 77 16 A OH
AA8PE 103,642 673 77 21 A MI
KU4A 102,000 680 75 16 A KY
WT8C 101,850 679 75 15 A OH
WA8YRS 95,338 653 73 19 A OH
N4EQT 85,264 584 73 21 A KY

K8YSE 82,852 538 77 18 A OH
N8FEH 73,920 480 77 23 A MI
WD8S 72,534 471 77 19 A MI
K8SAK 69,934 479 73 19 A MI
N8DDW 69,276 502 69 15 A MI
WA8OSE 63,140 410 77 21 A OH
W8UM (KE8RA,op)
62,480 440 71 20 A MI
WA8RCN 59,072 416 71 10 A OH
WA8KIW 58,546 401 73 17 A OH
WB8BUQ 56,000 400 70 12 A MI
N8CPO 54,144 376 72 24 A MI
AC4XL 52,560 365 72 20 A KY
KA8GOM 52,122 357 73 16 A MI
NX8R 50,320 340 74 15 A OH
N8MIS 48,720 348 70 14 A MI
WB8VPA 48,510 315 77 12 A OH
KD4LHA 47,838 328 73 17 A KY
WA8MJY 46,292 325 71 17 A MI
K8SB 46,200 350 66 16 A MI
K8RDJ 46,008 324 71 19 A MI
KE8OC 45,288 306 74 13 A MI
W8UPH 44,496 309 72 12 A OH
WA8FRD 42,918 311 69 18 A MI
KB8IFM 40,260 305 66 17 A MI
K8CV 39,996 303 66 8 A MI
AC4PY 39,744 288 69 24 A KY
N4XM 39,498 237 77 14 A KY
KE4GHI 36,000 250 72 17 A KY
WD8NWL 35,872 236 76 20 A OH
N8CDA 35,850 239 75 17 A MI
WD8B 34,020 243 70 6 A OH
W8TJQ 33,120 240 69 14 A MI
WB8ATZ 31,152 236 66 21 A MI
N8QYM 30,384 211 72 14 A MI
KD8BD 29,700 225 66 16 A MI
N8TNR 25,908 217 62 16 A MI
WB8AFO 25,216 226 59 15 A MI
WB4FDK 25,082 207 63 9 A KY
KF8BE 25,806 187 69 14 A MI
W8KZM 25,080 190 66 8 A MI
KD4MOU 24,676 199 62 13 A KY
N8MVP 24,128 208 58 20 A MI
N8KSK 24,024 156 77 13 A OH
K8QLK 23,864 187 76 24 A MI
KD4ULP 23,168 181 64 13 A KY
N8YBW 23,040 180 64 24 A MI
NX8K 22,936 188 61 21 A MI
N4XFF 22,378 167 67 24 A KY
WA8VPY 22,320 186 60 12 A MI
N8FSQ 21,672 172 63 16 A OH
WB8GNX 21,450 165 65 7 A OH
K3UWO 21,420 170 63 18 A MI
N8LMT 21,140 151 70 12 A MI
KB8HGM 20,460 186 55 21 A MI
N8WAK 20,160 140 72 21 A MI
WD9INF 20,060 170 59 5 A OH
WR8F 18,920 172 55 18 A MI
AA8HB 18,522 147 63 22 A OH
W8EGI 18,000 150 60 8 A MI
N8KOJ/T 17,800 178 50 12 A OH
N8FPN 17,748 168 58 11 A MI
W8AP 17,284 148 58 18 A MI
WJ8C 16,940 110 77 11 A OH
WA8CJR 16,610 151 55 21 A MI
WD8R 15,872 128 62 14 A MI
N8RPA/T 15,840 165 48 14 A OH
KA8IZE 15,620 142 55 14 A MI
W8HNI 15,600 150 52 10 A MI
N8IKX 14,664 141 52 10 A OH
N8MEY 14,364 133 54 6 A OH
N8WOZ/T 13,818 141 49 14 A MI
N8SFD 13,452 118 57 13 A MI
W8ROS 12,992 112 58 11 A MI
NU8U 12,852 118 54 8 A OH
AA8JN 12,528 116 54 24 A MI
WA8QNR 12,432 111 56 5 A OH
WB8REI 12,320 110 56 6 A OH
K8OUA 12,210 111 55 7 A OH
N8MK 12,100 110 55 24 A MI
WC8T 11,880 110 54 7 A MI
N8HFM 11,448 108 53 16 A MI
W8UE 11,408 124 46 4 A MI
K8NZ 11,232 104 54 2 A OH
KF8ES 11,130 105 53 7 A OH
N8NNC 11,040 115 48 24 A MI
WX8G 11,024 106 52 6 A OH
WB8W 10,816 104 52 9 A OH
WD8AIL 10,788 87 62 24 A OH
AI8O 10,780 110 49 10 A OH
KF8BJ 10,750 125 43 11 A MI
KA8WBQ 10,500 105 50 24 A MI
KE8QT 10,400 100 52 5 A MI
AA8ML 10,230 93 55 10 A OH
WA8ZJI 10,200 102 50 24 A MI
AF8A 9,888 103 48 3 A OH
N8INT 9,720 108 45 10 A OH
N8VEN 9,588 102 47 16 A MI
KA8YIU 9,540 106 45 11 A KY
WB8ORV 9,090 101 45 24 A OH
KB8MST 9,020 110 41 9 A MI
KF8BC 8,976 88 51 24 A OH
W8VPC 8,712 99 44 5 A MI
N8CC 8,364 102 41 5 A MI
WS8S 8,280 115 36 4 A OH
KB8QIT 8,080 101 40 24 A MI
KU8O 8,050 115 35 6 A OH
W8PN 7,138 83 43 5 A OH
W8PPG 6,688 88 38 9 A MI
WB8NMW 6,232 82 38 6 A MI
WW8O 6,206 107 29 4 A OH
KB8LFQ 5,928 76 39 6 A MI
WD8KZP 5,760 80 36 11 A MI
WB8YTQ 5,832 86 31 8 A OH
KC4WQ 4,608 48 48 3 A KY
K8RDN 3,900 65 30 4 A MI
N8PVZ 3,696 58 31 10 A MI
WD8AIG 2,870 41 35 3 A OH
KE8XK 2,430 45 27 5 A OH
W8XT 2,162 47 23 2 A OH
WB8HNJ 1,900 38 25 5 A MI
WD8KXZ 1,750 35 25 3 A MI
KQ8M 1,542 151 51 3 A OH
KW8M 1,440 36 20 2 A OH
WA8NVW 1,410 47 15 3 A OH
WA8RXI 720 20 18 1 A MI
W8QIY 700 25 14 3 A MI
WD8KTM 572 22 13 1 A OH

AA8LB 190 15 13 1 A MI
W8VZE 352 16 11 1 A OH
N8MMF/T 112 8 7 2 A MI
KD8UC 70 7 5 2 A OH

K8CC (WD8IJP,op)
294,294 1911 77 24 B MI
KW8N (N2AK,op)
270,424 1756 77 24 B OH
ND4Y 261,646 1699 77 24 B KY
AA8U 239,318 1554 77 24 B MI
NZ8D 204,974 1331 77 24 B OH
KF8DE 202,356 1314 77 24 B MI
N8ATR 178,178 1157 77 24 B OH
K8LX 153,230 995 77 24 B MI
K8MR 148,302 963 77 14 B OH
KG8CW 140,550 937 75 24 B OH
KW8G 139,678 907 77 18 R MI
W8SJU 111,958 727 77 24 B OH
NG8D 111,188 722 77 10 B OH
N4FFO 100,100 650 77 19 B KY
WD8NFX 92,708 602 77 20 B MI
W8FN 81,774 531 77 13 B OH
KC4DWT 78,584 517 76 19 B KY
KF8YC 70,070 455 77 23 B MI
KE8NU 68,520 385 76 24 B OH
N8WLX/8 51,984 342 76 8 B OH
WQ8GP 45,732 309 74 19 B MI
WJ8E 34,950 233 75140 B OH
KU8E 32,256 288 56 4 B OH
W8LU 30,020 130 77 22 B MI
N8UQB 16,324 106 77 24 B OH
AB4RX 15,400 154 50 3 B KY
W8PIT 10,488 114 48 11 B MI
W8NHO 9,792 102 48 8 B OH
WB8NJS 9,120 120 38 8 B OH
AA4RX 8,640 120 36 2 B KY

K8MJZ (+NET)
246,092 1598 77 24 M MI
KG8CO (+KB8ECG)
188,342 1223 77 24 M MI
NT8V (+AC8W,K8DD)
173,712 1128 77 24 M MI
NU8Z (+NET)
163,394 1061 77 24 M MI
KG8EF (+K8AQM)
154,770 1005 77 24 M MI
K8CX (+WR8G)
138,600 900 77 24 M OH
KF8LJ (+KA8MMG,KB8AZR,N8LMJI
132,804 898 74 24 M OH
W8FW (KB8s MBP,MUV,N8s BCM, QBZ,ops)
130,746 849 77 24 M OH
WB8MTT (+KG8BK)
119,584 808 74 24 M MI
W8BI (KB4TLH,KB8IDM,KF8HM,ops)
112,728 732 77 15 M OH
KB8INK (+WD8HIO,KB8NGG, WA8VHQ)
92,850 619 75 22 M MI
K8DZ (+KB8s CPD,ID,QBN,N8s SSD, SSE,SSH,ZRB,NI8T,W8MVN,WB8s NBA,OVZ)
87,626 569 77 23 M OH
W8VM (AF8C,N8OJM,W8DM. WA8NVW,WB8s JBR,ORV,ops)
73,704 498 74 22 M OH
WD8O (+NET)
61,104 402 76 15 M MI
W8TNO (N8s RGZ,SNM,SWO,TVX,T WF,WB8MUQ,WD8PLE,ops)
55,648 376 74 24 M MI
N8UDT (+N8CWU)
61,898 337 77 21 M OH
WX3M (+AA8LZ,N8LXL)
48,202 313 77 18 M MI
WU8A (+NET)
47,586 309 77 17 M OH
K8SCH (KF4AV,KI4QJ,WB4SUV, WA6EZV,AA8s KJ,KK,KB8s IZB, PSD,PVO,KF8YX,N8s FU,KOJ,UYZ, VRF,ZFM,WA8M,WB8DTT,WD8N)
46,208 304 76 24 M KY
KZ8E (+NET)
45,448 299 76 9 M MI
KF8IF (+N8QFU)
41,560 277 75 24 M MI
N5XHT (+WA1LRL)
38,216 281 68 19 M MI
KA8D (+NET)
30,800 200 77 8 M OH
W8CCI (N2ERI,AA8s GC,HH,LM. MC,KB1CR,KB8s HGY,PFT,KF8RW, N8OMW,W8KVU,WB8TIB,ops)
30,338 197 77 14 M OH
WD8AUB (+NET)
27,824 188 74 8 M OH
AA8KR (+N8WIQ)
25,288 218 58 21 M MI
N8WCO (+N8QCB)
24,830 191 65 14 M OH
KB8DP (+NET)
24,640 160 77 18 M OH
N8SVM (+KB8NSU)
20,636 154 67 10 M MI
WM8W (+AA8KJ,KA8ZMY)
19,096 124 77 24 M OH
KF8QR (+NET)
17,040 142 60 13 M MI
N8NJE (+N8MMF)
15,196 131 58 15 M MI
N8UZE (+N8ZNW)
14,224 127 56 16 M OH
N8JZB (+N8JZC)
12,566 103 61 12 M OH
WD8IFL (+N8VYC)
10,120 115 44 8 M MI
N8QWI (+KB8RCM)
3,100 50 31 2 M OH
W8PLP (N8PVZ,WA8LAY,ops)
532 19 14 2 M MI

Hudson Division

AA2U 94,556 614 77 24 Q NNJ
KD2TT 62,050 425 73 20 Q NLI
KB2JE 31,552 252 68 24 Q NNJ

N1CC/2 26,496 207 64 9 Q ENY
N2KPY 2,704 52 26 7 Q NLI
W2HLI 2,450 35 35 5 Q NLI
KD2IX 1,804 41 22 7 Q ENY

KC2AG 112,800 750 75 24 A ENY
WA2PNI 94,248 612 77 24 A NNJ
K5ZG 89,540 605 74 17 A NLI
K2UF 80,080 520 77 19 A ENY
WA2DHF 60,590 415 73 8 A NNJ
K2YGM 60,200 430 70 14 A NLI
N2JOH 43,248 318 68 12 A ENY
K2POF 40,040 260 77 24 A ENY
WB2HKR 39,564 314 63 15 A ENY
WB2FQB 38,016 297 64 14 A ENY
KA2VBI 37,760 295 64 16 A ENY
NY2U 33,902 255 67 17 A ENY
N2DCM 33,534 243 69 21 A ENY
N2LBR 33,138 263 63 18 A ENY
N2CKV 31,104 243 64 12 A ENY
WA2ASQ 31,000 250 62 17 A NNJ
W1GD 30,800 200 77 8 A NNJ
WW2X 29,256 212 69 17 A NNJ
N2NKG 28,696 211 68 24 A NNJ
WA1MKE 26,740 205 64 24 A ENY
N2LBZ 26,112 204 64 20 A ENY
WB2TCV 24,522 201 61 14 A ENY
WB2KHE 23,936 187 64 17 A ENY
WD2K 23,874 173 69 17 A ENY
KA1QQ 23,660 169 70 16 A NNJ
AA2NM 22,920 191 60 14 A NNJ
WA2C 22,244 166 67 24 A NNJ
K4ZMCU 21,890 199 55 18 A ENY
KA2ANF 21,560 140 77 24 A NNJ
K2WA 21,294 159 63 22 A NNJ
WB2MRX 21,204 171 62 12 A ENY
AA2GS 20,880 180 58 6 A ENY
N2INN 20,300 175 58 24 A NNJ
N2MTG 19,398 163 53 16 A ENY
N2CDD 18,900 135 70 21 A NNJ
WB2YLR 15,840 144 55 7 A ENY
N2SIJ 15,458 131 59 24 A NLI
AA2OI 15,300 150 51 12 A ENY
K2JCN 15,182 133 57 8 A ENY
WB2BXO 14,670 163 45 8 A NLI
WF2Z 13,804 119 58 9 A NNJ
N2ULW 12,696 138 46 24 A NNJ
AA2JP 12,240 153 40 13 A ENY
WB2AZE 12,100 121 50 10 A NNJ
N2LDU/T 11,232 144 39 11 A NNJ
K2RI 10,752 112 48 5 A ENY
WK2S 10,340 110 47 8 A ENY
N2OAN 10,120 115 44 24 A NLI
N2KYP 9,630 107 45 8 A NLI
N2ELW 8,480 106 40 9 A NNJ
W2XM 7,920 90 44 5 A ENY
KB2EZN/T 7,600 100 38 10 A NLI
K2RO 6,943 131 53 10 A NNJ
KB2PSX 6,800 85 40 8 A ENY
KW2P 6,476 79 41 10 A NLI
WA2VYA 6,162 79 39 3 A NNJ
NJ2F 6,106 71 43 7 A NNJ
AA2QL 5,148 66 39 24 A ENY
KF2CE 4,824 67 36 7 A ENY
N2TFM 4,636 61 38 7 A NNJ
N2OJZ 4,094 89 46 5 A ENY
W2NRD 3,600 50 36 8 A ENY
N2NYP 3,224 68 31 13 A NNJ
N2MBM 2,790 45 31 5 A NLI
KE2WO 2,496 48 26 3 A ENY
KE2XF 1,476 41 18 10 A ENY
N2CJJ 900 25 18 3 A ENY
N2JZK 800 29 16 9 A ENY
K2HVN 798 21 19 2 A NLI
WA4VKD 432 18 12 24 A NNJ
N2SHP 364 14 13 5 A NLI

WB2K 232,694 1511 77 24 B NNJ
WM2V 144,450 963 75 24 B NLI
N2IWE 134,750 875 77 24 B ENY
WA2SYN 113,004 774 73 22 B NLI
WA1KKM 101,024 656 77 23 B ENY
N2CFD 64,680 420 77 24 B NNJ
WM2Y 40,320 288 70 23 B ENY
WA2UDT 39,888 277 72 7 B NNJ
K2LG 36,300 275 66 10 B NNJ
N2BIM 30,800 200 77 10 B NNJ
KB2HUN 25,488 216 59 7 B ENY
W2XI 22,176 144 77 24 B NNJ
K2AU 21,204 171 62 15 B NLI
KA2NWO 18,876 143 66 7 B NLI
N2BCC 13,104 104 63 24 B NNJ
W2GD 11,858 77 77 4 B NNJ
KE2DF 9,360 117 40 8 B ENY
W2KZE 8,736 104 42 24 B NLI
KC2Q 6,720 70 48 3 B NNJ
KD2NN 5,740 70 41 5 B ENY
N2KLO 4,848 53 41 6 B ENY

KY2J (+KA2TIP,KU2Q,WA2STM, K5NA,JA9SSY)
237,930 1545 77 24 M ENY
WA2UKP (+AA2DY,K2JSC,N2s SKH, STD,WA2JCK)
219,142 1423 77 24 M ENY
KF2LW (N2s PEN,POS,N7LODI)
91,048 599 76 23 M ENY
N2KRK (+KB2LHH,KF2CP)
89,782 583 77 23 M NNJ
AD2S (+KA2UYI)
83,952 583 72 15 M NLI
NN2V (+NO2X)
62,216 404 77 24 M NNJ
NN2T (+NO2T)
59,752 388 77 24 M NNJ
N2KJM (+N2s MZH,TES)
54,020 365 74 22 M NNJ
KF2MR (+N2QIP)
48,512 323 72 24 M ENY
N2MFZ (+NET)
42,104 277 76 21 M ENY
WA2OFI (+N2AIH)
41,328 287 72 18 M NNJ
N2LSK (+KA2GWM,KB2PTK, KF2EP,N2s STU,SXY,IKA,WB2BPR)
31,138 307 67 24 M NLI
N2PBN (+N2LDR)
34,020 270 63 22 M ENY

K2MFF (AA2LT,N2s MSO,MTA,PVD, TBK,WW2I,ops)
32,944 232 71 18 M NNJ
K2ONP (+NET)
30,940 221 70 8 M ENY
KD2L (+NET)
30,600 204 75 10 M NNJ
K2QMF (+NET)
28,952 188 77 11 M NLI
WA2WYR (+NET)
27,720 180 77 16 M NNJ
WB2RQX (+KB2MER)
27,720 180 77 24 M NNJ
KB2JZJ (+KB2KDY)
23,058 183 63 21 M ENY
KF2BH (+NET)
21,312 144 74 24 M NNJ
WA2ZGO (+op)
20,790 135 77 12 M NNJ
KC2OM (+N2TDS)
10,800 120 45 8 M NNJ
W2CXN (KB2NPJ,N2RQ,ops)
5,810 83 35 5 M NLI

Midwest Division

KØSCM 109,896 723 76 24 Q NE
WØGWT 18,000 150 60 24 Q MO
KE4KE 14,760 123 60 17 Q IA
AD9P 11,220 102 55 5 Q MO
NØEID 10,682 109 49 12 Q MO
KGØBZ 7,396 86 43 17 Q KS

KMØL 140,448 924 76 24 A MO
WNØG 99,850 599 75 20 A IA
KØHOF 77,848 526 74 12 A MO
KFØMJ 59,860 410 73 14 A KS
KØPFV 53,436 366 73 22 A NE
WA8ZNC 53,392 376 71 20 A KS
KØVGB 51,800 350 74 16 A KS
KØVBU 51,408 357 72 11 A KS
KBØIDI 50,662 347 73 19 A MO
KCØGM 48,500 310 75 24 A IA
WA9LKD 44,928 312 72 22 A IA
KGØAD 44,238 303 73 19 A NE
NIØS 41,144 278 74 14 A KS
KCØGL 35,376 254 67 19 A KS
NUØQ 31,416 231 68 10 A IA
KCØCL 29,748 222 67 24 A MO
KEØYY 24,700 190 65 10 A MO
KAØCKN 24,120 201 60 23 A KS
NØKLN 22,100 170 65 10 A MO
WXØG 21,228 174 61 9 A MO
KEØAH 21,000 150 70 20 A MO
WB9TNZ 20,608 161 64 24 A MO
KBØIDB 20,538 163 63 13 A MO
WØSPF 20,384 182 56 18 A KS
NØIZZ 18,012 158 57 11 A MO
NØIXY 16,740 135 62 12 A IA
KGØED 16,275 134 57 7 A NE
NØLAQ 14,080 128 55 4 A NE
AAØOR 13,624 131 52 9 A KS
WBØQLU 13,482 127 53 9 A MO
KAØBHO 13,440 120 56 10 A KS
NSØB 12,960 120 54 4 A MO
KAØEIC 12,644 109 58 11 A KS
NØVVF 11,752 113 52 12 A MO
WAØOUL 11,564 118 49 5 A MO
NØUWI 10,682 109 49 7 A IA
NØJHX 10,600 106 50 6 A MO
WØYZZ 10,094 103 49 8 A MO
KAØBAT 9,870 105 47 7 A KS
AAØPC 9,728 128 38 8 A KS
NØKZY 9,576 114 42 13 A IA
WØKVM 9,000 90 50 24 A NE
KØIPL 5,320 65 64 6 A MO
NWØF 8,000 100 40 4 A NE
WAØIYY 7,398 93 43 8 A MO
NØUAX 7,828 103 38 5 A NE
WS9E 7,800 100 39 5 A MO
NØOFX/T 6,572 106 31 11 A MO
KBØJNK/N 5,916 87 34 3 A KS
KØINR 2,184 42 26 2 A IA
KAØP 1,872 36 26 2 A NE
NØUVP/T 32 2 2 5 A NE

K4VX (AAØCR,op)
220,220 1490 77 24 B MO
KØDEQ 164,160 1080 76 17 B MO
WXØU 157,472 1036 76 21 B KS
NØMQC 116,772 789 74 18 B IA
NØOCT 74,480 510 73 23 B MO
W6HDK 53,048 349 76 24 B MO
WØPPF 25,606 217 59 23 B IA
KCØJA 24,480 180 68 10 B MO
AAØA 7,918 107 37 3 B MO
WVØQ (+NJ8M,ABØS,KØWA)
233,156 1514 77 24 M KS
KØGND (+NØSAG,WAØWRI,WDØEGK)
190,190 1235 77 23 M NE
AAØFB (+KBØJCB,KDØAY,KGØBZ, NØPDL)
149,112 981 76 24 M KS
NDMMA (+KA7OEN,KD9KX, WB9GKV,KØDAS,KBØJKH,KCØVT, NØLNO)
148,656 976 76 24 M IA
WBØYJT (+ops)
100,594 689 73 24 M KS
KAØRCK (+NØs LQT,MRZ,TYW,ZGO)
95,326 618 77 24 M KS
ACØE (+KAØRID,NØs BCW,OOK)
65,564 449 73 22 M KS
WWØH (+KBØIDQ,NØTYS)
56,700 405 70 13 M KS
NØVRP (+WBØJDK)
49,742 323 77 19 M KS
NØUJT (+KBØJSU)
28,288 221 64 24 M NE
KBØEEB (+NØOVT,WVØs R,S)
25,196 222 59 12 M KS
WØCET (KAØKAN,KBØJYL,KFØSB,NØs WFN,YIR,ops)
9,460 110 43 5 M KS
NØOFR/T (+NØUJZ)
2,068 47 22 4 M NE
NØPGV (+NØPGW)
1,254 33 19 13 M KS

New England Division

K1DG (WZ1R,op)
119,504 776 77 24 O NH
WA1LNP 55,440 360 77 23 O NH
KH6CP/1 39,120 326 60 24 O CT
W1BYH 32,850 219 75 15 O WMA
NM1K 17,516 151 58 7 Q CT
KA1CZF 12,446 127 49 9 O CT

KZ1M 181,874 1181 77 21 A WMA
AC1Z 95,484 654 73 22 A NH
W1XN 95,480 620 77 22 A ME
K1VSJ 76,000 500 76 17 A RI
WA1S 70,700 505 70 11 A NH
WB1HBB 66,682 433 77 21 A NH
WB1DWO 66,284 454 73 16 A CT
K5ZO 64,800 432 75 8 A WMA
WA1LJP 60,522 393 77 24 A CT
KB1KM 57,304 377 76 22 A EMA
AA1EY 51,830 355 73 21 A WMA
KC1SQ 50,646 387 69 12 A EMA
AA1AK 50,120 358 70 10 A CT
W1ECH 44,198 287 77 9 A CT
WB8IMY 40,256 298 68 13 A CT
AA1HB 40,044 282 71 24 A EMA
N1HKV 35,500 250 71 12 A EMA
WA1IML 34,224 248 69 8 A EMA
KB1KA 32,562 243 67 14 A RI
NQ1K 28,500 190 75 10 A CT
KA1TQM 26,650 205 65 14 A CT
K2MN 25,586 211 63 12 A RI
K1RT 24,600 164 75 11 A CT
WA2SCA 24,190 205 59 12 A EMA
K8JLF 24,034 197 61 7 A EMA
N1LGN 23,058 189 61 13 A ME
K1HMO 22,192 152 73 9 A RI
K1ATL 21,580 166 65 15 A NH
N1KWJ 20,650 175 59 17 A CT
AA1GE 20,008 164 61 24 A CT
WA1LXP 17,160 143 60 14 A EMA
K1JBS 16,758 147 57 12 A CT
KA1VY 15,976 147 54 10 A EMA
K5FUV 15,370 145 53 24 A CT
WB2UMF 15,312 132 58 7 A EMA
N2LTK 15,048 114 66 11 A CT
N1MHB 14,880 124 60 13 A ME
WA1ITZ 14,600 146 50 20 A VT
N1NCI 13,680 114 60 17 A NH
AA1GC 13,440 112 60 5 A WMA
KD1DC 13,230 135 49 9 A CT
KS1N 12,544 112 56 7 A NH
KA1ALT 12,240 120 51 24 A EMA
WU1F 11,600 100 58 24 A EMA
NO1J 11,172 133 42 5 A EMA
KD1FF 11,116 109 51 9 A EMA
KA1OKH 11,040 120 46 11 A WMA
N1IST 10,332 123 42 24 A EMA
WM1G 9,800 100 49 8 A EMA
N1OPV 9,600 120 40 15 A ME
K1AGM 7,680 80 48 10 A EMA
NW1S 5,928 78 38 2 A VT
KA1WIF 3,626 49 37 3 A CT
N1QKE/T 2,900 50 29 11 A CT
KJ4KB 1,872 39 24 2 A CT
KA1PU 748 22 17 3 A WMA
KA1PRD 260 13 10 2 A ME
KA1LDS 126 9 7 24 A VT

K1KI 292,908 1902 77 24 B CT
WB1GQR (WB2JSJ,op)
278,278 1807 77 24 B VT
N6BV/1 275,198 1787 77 24 B NH
K1RM 260,680 1715 76 24 B CT
AA1AA 235,928 1532 77 24 B EMA
W1WEF 233,772 1518 77 23 B CT
K1RQ (NJ1F,op)
221,920 1460 76 23 B ME
KC1F 190,344 1236 77 16 B NH
KY1H (WM1K,op)
170,632 1108 77 22 B WMA
N1SW 159,698 1037 77 22 B RI
K1JB 151,848 999 76 20 B ME
NY1E 130,130 845 77 18 B ME
KA1IOR 115,736 752 74 18 B EMA
W1AW (AA2Z,op)
105,820 715 74 7 B CT
KX1G 92,254 607 76 13 B EMA
K1TR 86,394 561 77 9 B NH
KC2GE 86,240 560 77 20 B WMA
AA1FY 82,544 536 77 18 B EMA
WV1C 77,404 523 74 24 B CT
K1CLN 63,616 497 64 11 B VT
KV1W 57,660 400 72 16 B WMA
K1IN 50,974 3331 77 16 B CT
KB1W 46,230 345 67 5 B WMA
WA1G 43,920 323 68 5 B EMA
KC1OH 31,374 249 63 13 B CT
AA2Z 27,720 231 60 4 B CT
WR1X 21,648 164 66 14 B WMA
N8RA 21,600 200 54 4 B CT
W1RFQ 15,544 134 58 6 B RI
K5MA 6,912 108 32 2 B EMA
WA1OEM 4,794 51 47 24 B CT

N1MM (+K1NYK)
216,144 1422 76 24 M CT
W1GP (K1s DS,PLX,N1BBM, NS1K,ops)
210,210 1365 77 24 M RI
W1QK (+N1OFZ)
152,768 992 77 24 M CT
W1NG (+NET)
118,888 772 77 11 M CT
K1KP (+N1OEK,WB1AOP WX1Z)
113,190 735 77 24 M EMA
K1DW (+K1NCD,KA1MM,N1EOL)
104,720 680 77 24 M CT
W1YK (KA1s PIU,OKJ,KD1QP,N1s ILZ,KJP,LSH,QOL,NO1R,WX1H, N2KLQ,KB5WXZ,ops)
92,554 601 77 23 M WMA
WK1P (+KA1ZMX,KB1AJS,N1KWF, WA1WJE)
92,400 600 77 24 M NH
KA1YWZ (+KB1ASU,N1s IVB,KRU)
86,856 564 77 24 M RI
K2SX/1 (+NET)
77,452 503 77 24 M CT

WX1Q (+WE3Z)
77,000 500 77 24 M VT
W1FM (+op)
65,512 467 68 10 M EMA
AK1N (+NET)
63,140 410 77 15 M CT
WZ1K (+KA1ZFO,N1DPY)
54,750 365 75 24 M EMA
K1DII (+NET)
50,920 335 76 24 M CT
N1JAC (+KA1YTR)
50,250 335 75 20 M WMA
NX1Q (+NET)
49,434 321 77 12 M CT
K1TO (+NET)
45,738 297 77 6 M CT
WB1BXB (+N1s FIL,HKO,JKT,KIM,KLP, NLT,ORD,WA,WA1RLO,WW1G)
40,280 265 76 23 M NH
WS1F (+NET)
34,650 225 77 15 M CT
WB1EDI (+N1QZF)
30,208 236 64 19 M NH
WA1ALM (+NET)
30,150 225 67 10 M NH
N1NUA (+W1DLC)
30,044 203 74 20 M ME
WE1J (+K1CZ,N1s DYM,JRO,KHU, NO1L,WA1ERJ)
29,380 226 65 24 M ME
KZ1O (+N1OEZ)
24,000 200 60 14 M NH
W1BK (+NET)
23,562 153 77 12 M EMA
KD1GG (+NET)
21,560 140 77 11 M EMA
NG1J (+NET)
17,100 114 75 8 M CT
KA1FMR (+KG1L)
14,874 111 67 15 M NH
KA1OOH (+WA1YTW)
13,536 141 48 14 M NH
W1BIH (+NET)
13,244 86 77 24 M CT
WF1L (+N1LDQ)
12,320 80 77 17 M WMA
W1FY (KA1USL,KD1QS,N1s JFO, LOO,QHD,QJP,QMA,ops)
10,058 107 47 24 M EMA
N1ISQ (+N1GRC)
2,968 53 28 10 M EMA
N1QME (+op)
1,040 26 20 2 M RI

Northwestern Division

WA6RJY 39,200 280 70 24 Q WWA
N7RWH 26,934 201 67 24 Q EWA
WB9HZT 1,000 25 20 3 Q OR

K7QQ 278,740 1810 77 24 A WWA
W7ZRC 210,518 1367 77 24 A ID
K7RI 208,052 1338 77 24 A WWA
W7YAQ 177,100 1150 77 24 A OR
K7MM 171,248 1112 77 24 A EWA
N7LOX 124,944 822 76 24 A WWA
KC7NX 101,840 670 76 24 A MT
W7DN 67,344 488 69 15 A WWA
WS7V 65,664 432 76 14 A EWA
KA7SDW 62,764 442 71 17 A OR
N7SKI 59,176 404 72 24 A MT
W7DK (WA7UQV,op)
55,188 378 73 10 A WWA
KC7NY 43,680 336 65 13 A MT
KK7A 40,064 313 64 6 A ID
AA7BG 40,020 290 69 10 A MT
W7PQE 38,056 284 67 18 A EWA
KA7MYU 36,500 250 73 17 A WWA
W7WKB 34,080 240 71 17 A EWA
W7WMO 32,376 228 71 9 A EWA
N7OYR 32,096 236 68 18 A WWA
N7DOE 29,832 212 68 13 A WWA
NI7T 28,488 172 77 15 A OR
KY7K 26,220 190 69 17 A WWA
WB7GYO 24,000 200 60 9 A ID
K7IOO 23,184 168 69 8 A EWA
AA7KF 22,800 200 57 5 A OR
W7RGL 22,388 193 58 19 A WWA
AA7NX 21,452 173 62 8 A EWA
N7ICK 20,862 171 61 9 A OR
KI7KF 19,890 153 65 16 A ID
KL7FAP 18,216 198 46 11 A AK
WA7NFE 18,172 154 59 14 A WWA
KG7VQ 16,642 157 53 18 A MT
WS7O 15,312 132 58 11 A OR
AA7VT 15,228 141 54 12 A WWA
W7KJJ 12,744 118 54 24 A WWA
KB7VGZ 12,100 121 50 16 A OR
KG7CC 10,560 110 48 9 A WWA
N7OZN 10,080 112 45 16 A WWA
WA7UVJ 9,990 111 45 4 A WWA
N7RV 9,800 100 49 6 A WWA
AA7XP 9,476 103 46 24 A OR
N7VYJ 9,240 110 42 24 A ID
KB7NKP 8,800 110 40 7 A WWA
AL7B 7,418 103 36 7 A AK
KA4SWL 6,972 83 42 7 A WWA
KD7LJ 6,794 79 43 5 A WWA
KL7WP 6,320 79 40 14 A AK
W7OVJ 3,162 51 31 7 A MT
KB7WDF 1,120 28 20 3 A ID
K7SMW 714 21 17 24 A EWA
KA9X 288 12 12 1 A OR

KØPP/7 299,982 1883 77 24 B MT
N7TT 255,948 1662 77 24 B WWA
AI7W 219,758 1427 77 21 B OR
K7FR 209,594 1361 77 23 B EWA
WA7FOE 197,274 1281 77 24 B WWA
NB7N 183,106 1189 77 20 B WWA
N7MMQ 182,798 1187 77 21 B OR
AL7CQ 159,578 1093 73 11 B AK
W7OM 118,580 770 77 15 B WWA
KE7X 68,228 461 74 10 B MT
W1TR 60,912 423 72 24 B EWA
K7GWK 45,122 293 77 18 B OR
W7LZP 42,658 277 77 13 B WWA
WA7PVE 38,720 255 72 24 B WWA
N7WJJ 36,068 254 71 24 B OR

KF7S/KL7 30,240 240 63 14 B AK
WB7UZO 15,540 111 70 24 B WWA
W7IMP 13,618 92 74 11 B OR
KQ7I 9,800 100 49 24 B OR

WS7I (+WA7EGA,WB7AVD)
231,462 1503 77 24 M EWA
K7IR (+ops)
169,480 1115 76 19 M EWA
WL7MA (+KC7RN)
88,060 595 74 13 M AK
W7UQ (KB7LPO,KI7RO,ops)
86,724 594 73 23 M ID
K7GDN (+N7IXG)
54,750 365 75 20 M OR
N7LUF (+N7LUG)
29,800 200 57 19 M WWA

Pacific Division

N6WMF 99,484 646 77 24 Q SV
AA6GM 3,300 50 33 3 Q EB

W1FEA 238,392 1548 77 24 A SV
N6NF 164,464 1082 76 18 A SCV
N6YKL 161,084 1046 77 20 A SV
WR6R 157,324 1063 74 23 A EB
W6PYX 137,560 905 76 24 A SV
AE6Y 135,280 890 76 20 A SCV
KH6GMP 90,672 614 74 18 A PAC
W6QEU 76,540 510 77 24 A SV
NC7K 76,750 505 75 13 A NV
WA6LLY 72,534 471 77 13 A SF
KB7HM 71,928 486 74 14 A NV
N6ZB 64,532 442 73 17 A SCV
KN6BD 59,276 408 73 18 A SV
WA6TKV 54,144 376 72 20 A SJV
W6FAH 49,128 319 77 11 A SJV
KG6IF 47,088 327 72 10 A EB
KA1RYI 46,720 320 73 16 A SCV
AA7EN 39,600 275 72 13 A NV
N6GRJ 38,106 261 73 18 A EB
AB6YL 36,540 261 70 22 A SCV
W6IXP 36,352 256 71 24 A SCV
N6IYS 35,904 264 68 16 A SV
AA6DX 30,600 225 68 10 A SF
W6PLJ 30,380 217 70 17 A SCV
WH6DY 27,202 203 67 11 A PAC
KD6HQ 19,488 157 62 12 A SF
K6BPB 19,266 169 57 10 A SV
N6WVF 17,464 148 59 14 A EB
KI6PG 17,228 146 59 17 A SJV
N2ALE 17,024 152 56 20 A SCV
K6DGW 14,148 131 54 4 A SV
KF7VE 12,852 119 54 13 A SV
AA6YX 12,720 120 53 24 A SF
WW6D 10,908 101 54 24 A SF
N7XCZ 10,176 106 48 13 A NV
N4DLA/6 9,682 103 47 24 A EB
NG0X 8,350 104 45 6 A SCV
KM6LH 7,636 83 46 24 A SCV
N6PN 5,660 90 37 20 A EB
WA6RRV 5,000 75 40 6 A SF
KA6ING/T 3,306 57 29 4 A SV
KC6UFN 3,060 51 30 17 A SV
K6VGW 1,564 34 23 2 A SCV
K6GSS/KH6 80 8 5 1 A PAC

KI3V/7 338,492 2198 77 24 B NV
W6QHS (KM9P,op)
338,030 2195 77 24 B SCV
WC6H 314,468 2042 77 24 B SJV
N3AHA 251,020 1630 77 24 B SCV
AA6KX 234,080 1520 77 24 B SCV
W6BSY 172,480 1120 77 22 B EB
KI6CG 169,400 1100 77 24 B SCV
KJ6DL 160,314 1041 77 23 B SJV
AB6WM 148,148 962 77 16 B SCV
W6BIP 142,050 947 75 21 B SF
K6SG 131,100 874 75 20 B SV
W6ISQ 126,434 821 77 19 B SCV
AA6WJ 111,106 781 73 22 B SV
WB6YIK 110,400 736 75 21 B SJV
WA6SDM 91,830 595 77 18 B SCV
K6PJY 89,072 586 76 18 B EB
N6XI 76,780 505 76 9 B SCV
W6REC 75,000 500 75 7 B SV
N6WFK 72,200 475 76 12 B SCV
N6IP 70,840 480 77 17 B SCV
AJ6T 48,080 320 72 24 B SCV
WB2CHQ 43,736 308 71 24 B SF
N6WR 35,372 239 74 21 B SV
N6NM 34,272 252 68 13 B SCV
KE6ARG 21,480 179 60 22 B SF
N6VI/KH6 17,496 162 54 2 B PAC
K2MM 16,320 160 51 3 B SCV
W6XKG 16,218 159 51 3 B SCV
W6CF 15,360 160 48 3 B SCV
WW7D 12,980 118 55 11 B NV
K6FO 10,952 74 74 6 B SV
W6XR 10,464 109 48 5 B SCV
N6ZWC 8,000 100 40 7 B SV
KN6ER 2,060 41 25 2 B SV
KQ6F 1,364 31 22 5 B SJV
WB6DSV 1,224 34 18 1 B EB

N6NB (+N6MU)
241,318 1567 77 24 M SJV
N6TV (+N1EE,AA6NC)
240,548 1562 77 24 M SCV
KV6H (+K3EST,NB6G)
239,008 1552 77 24 M SV
NV6O (+AA6LB,KF6A,KJ6TC,KN6OX, N6SNO)
230,384 1496 77 24 M SV
NF7P (+KZ4H,NT7E)
218,526 1419 77 21 M NV
WB6AT (+W6RGG)
170,170 1105 77 24 M SCV
AB6EO (+KD6NOJ)
100,776 663 76 18 M SCV
AD6E (+NET)
87,472 568 77 16 M SCV
N6TNX (+N6TNW)
60,882 417 73 20 M SJV
AB6DI (+KD6KQW)
46,200 300 77 24 M EB
N6EE (+NET)
32,264 218 74 12 M SJV

W6PW (W6VV,KD6s CFW,ETI,ICY,
MOT,VWP,YDY,N8GWT,ops)
28,032 219 64 24 M SF

Roanoke Division

WD4AVY 47,742 327 73 21 Q NC
WF4U 25,172 203 62 13 Q VA
WR4I 23,322 169 69 15 Q VA
KV8S 20,400 150 68 8 Q WV
K3SS 7,830 97 45 6 Q VA
KC4LSG 5,360 60 28 7 Q SC
N4ZAK 264 22 12 17 Q NC

N8II 160,006 1039 77 14 A WV
KA4HRU 136,444 886 77 24 A VA
KI4HN 102,200 700 73 24 A NC
KC4UH 88,858 577 77 18 A SC
AB4XG 61,138 397 77 19 A NC
K7GM 58,800 420 70 7 A NC
KE4VD 57,524 394 73 17 A SC
N8RAT 57,000 375 76 24 A WV
KO4AV 54,720 360 76 24 A NC
N4MM 52,514 341 77 15 A VA
N1CDO 47,596 326 73 24 A VA
WY2V 45,024 336 67 24 A VA
AC4WC 42,612 318 67 17 A VA
KD4HYT 40,800 300 68 15 A VA
WT9B 39,072 264 74 17 A SC
W4YDD 38,280 290 66 12 A SC
W8NBX 36,448 272 67 24 A NC
K4UK 33,726 231 72 18 A VA
WD4AVP 32,340 231 70 9 A NC
WB4PLA 31,626 251 63 15 A NC
WB4Y 29,930 205 73 14 A NC
KJ8J 29,212 218 67 24 A WV
WA4DAI 28,968 213 68 10 A VA
AC4XT 28,542 201 71 19 A VA
WS8A 28,380 215 66 14 A VA
WB4VIM 28,350 225 63 18 A NC
KE4CBB 25,792 208 62 18 A SC
KO4OO 21,670 197 55 8 A NC
AD4DG 21,114 153 69 17 A VA
KO4XE 20,570 187 55 24 A SC
KO4AL 20,184 174 58 14 A VA
KA4IKH 19,488 232 42 14 A NC
KQ4XJ 18,358 137 67 23 A VA
N4AIG 18,096 156 58 7 A VA
N4WR 15,904 142 56 9 A SC
AA4KD 15,618 137 57 13 A VA
W4LMJ 15,400 140 55 6 A VA
KC4ZHQ 15,336 142 54 10 A VA
KO4SO 14,640 122 60 16 A VA
N6MW 13,248 92 72 11 A VA
KO4CS 12,500 125 50 10 A VA
AC4WN 12,480 120 52 9 A SC
W4YE 11,730 115 51 4 A VA
KN4XF 11,628 114 51 8 A NC
KD4IBI 11,180 130 43 12 A VA
AF4D 10,658 73 73 10 A NC
KB2BBG 10,560 110 48 24 A NC
N4GUS 10,584 118 44 5 A VA
KB4CG 8,118 99 41 6 A VA
K4IX 7,696 104 37 3 A VA
KR4GV 7,216 88 41 21 A NC
KB4VDG 3,896 68 31 8 A VA
W2VMX 2,028 39 26 2 A NC
WD4ELJ 1,250 25 25 2 A VA
KE4MF 1,026 27 19 2 A VA
KE4GWV 840 28 15 5 A VA
W8UT 540 18 15 1 A NC
N4EE 2 1 1 1 A SC

W4MYA 273,968 1779 77 23 B VA
NX9T 191,730 1245 77 24 B NC
WD4KXB 158,620 1030 77 24 B VA
K8OQL 150,300 1002 75 23 B WV
WB4IUX 105,336 693 76 14 B SC
K4RZ 93,450 623 75 18 B NC
K3JT 85,396 577 74 24 B WV
WR3I 72,600 550 66 17 B NC
N4BNO 53,312 392 68 12 B NC
W8NR 52,052 338 77 20 B WV
WS8L 40,460 289 70 20 B WV
NQ1W 36,000 250 72 9 B VA
W4XD 32,760 260 63 13 B VA
WF2G 29,768 244 61 6 B NC
KE9A 26,082 207 63 4 B VA
WA8ZDL 25,410 165 77 20 B WV
W8PC 24,624 162 76 24 B SC
W4YDY 24,600 205 60 24 B NC
KQ4WD 22,200 150 74 15 B NC
WD4PLF 20,040 167 60 8 B SC
KO4UE 18,104 124 73 12 B VA
WB8BMV 17,100 150 57 6 B NC
AA4EL 17,094 111 77 16 B VA
W4VC 16,080 134 60 24 B VA
WB4ZPF 15,620 110 71 10 B VA
W1IHN 13,500 125 54 24 B NC
N4UH 12,012 78 77 7 B NC
W3FTG 9,102 123 37 24 B VA
N3RC 6,600 100 33 3 B VA

WF7B (+NET)
269,808 1752 77 24 M VA
KK4WW (+KB4NT,KC4WK,WA4RDI)
223,608 1452 77 24 M VA
KC4DY (+NET)
199,430 1295 77 24 M VA
N4PMQ (+N3NVF,WV3H,KD4LSN,
KR4DO,N4s OGR,SLR,TRX)
161,546 1049 77 24 M VA
AB4YZ (+KN4SK)
137,952 958 72 24 M VA
KD4RFW (+KD4URA)
91,464 618 74 24 M NC
AA8FU (+N8s MRX,XIO)
88,038 603 73 24 M WV
K8MBH (+NET)
86,548 562 77 12 M WV
K3SW/4 (+NET)
80,234 521 77 12 M VA
W8CNL (+KB4GYT,KC4ELO)
78,232 508 77 20 M SC
WA4RTS (+AA4FF)
69,300 450 77 18 M VA
WN4BBJ (+NET)
65,100 434 75 11 M NC
KQ4ZP (+KD4JQA)
55,594 361 77 24 M NC
W3YY (+NET)
28,952 188 77 8 M VA
WD4KQJ (+KC4DCL)
24,924 201 62 16 M VA
KC8FS (+NET)
23,254 151 77 12 M WV
WB4NFS (+NET)
18,532 226 41 6 M VA
WA4TGF (N1NHR,KD4s KJE,WRK,
KO4s BS,SJ,N4s XDR,ZBE,ops)
17,696 158 56 11 M VA
KD4HTX (+NET)
8,484 101 42 24 M SC

Rocky Mountain Division

W2CRS 113,544 747 76 7 Q CO
W7CFL 101,794 661 77 24 Q UT
KØFRP 77,234 529 73 13 Q CO
WBØHBS 16,368 132 62 5 Q CO
KN5H 7,544 92 41 5 Q NM

KØEU 273,658 1777 77 24 A CO
WC7S 88,652 599 74 24 A WY
KDØDI 82,782 567 73 17 A CO
N6LHZ 82,650 551 75 17 A NM
KD7RX 81,250 625 65 15 A WY
N3SL 77,000 500 77 13 A CO
KEØPX 68,036 456 73 19 A CO
N6KL 67,452 438 77 15 A WY
AA5MK 40,200 268 75 20 A NM
KI7KA 31,974 219 73 14 A UT
KA5BAT 28,548 234 61 11 A NM
WA6HXE 22,440 187 60 24 A UT
KGØHV 18,788 154 61 8 A CO
AA7TB 16,214 121 67 10 A WY
WBØNHA 13,938 101 69 10 A CO
AAØPB 12,348 126 49 8 A CO
N5RKD 11,880 110 54 6 A NM
K7UP 11,858 77 77 8 A NM
WBØHZL 11,000 110 50 7 A CO
W5JOV 10,920 105 52 5 A NM
N7SEM/T 928 29 16 1 A WY
N5ZR 648 27 12 3 A CO

K9RS (AA5B,op)
316,162 2053 77 24 B NM
KDKR 315,546 2049 77 24 B CO
W1XE 238,700 1550 77 24 B CO
KB3EI 229,200 1528 75 24 B NM
KS6H/7 189,266 1229 77 24 B WY
W4ETO 177,716 1154 77 17 B CO
K6XO/7 145,376 944 77 13 B UT
KØGAS 133,826 869 77 24 B CO
WØOSK 93,092 629 74 10 B CO
WS7W 72,864 506 72 10 B WY
KFØDJ 65,462 461 71 24 B CO
N7GVV 65,450 425 77 21 B WY
WØRSR 43,026 303 71 10 B CO
KB7M 29,784 204 73 17 B WY
KJ1N 25,600 200 64 8 B CO
N7PIB 24,012 174 69 24 B WY
N7LMO 21,480 179 60 8 B UT
AI9X 19,716 159 62 5 B NM
NOØI 16,416 216 38 2 B CO

NØRAB (NØs DYQ,IVN,ops)
94,950 633 75 24 M CO
KE5BL (+KB5DUZ)
80,864 532 76 20 M NM
AA5UR (+KD4JDT,KA5BAT,KB5s
TTS,ZSK)
25,058 187 67 24 M NM
N7PLJ (+AA7TB,N7s MZW,SDI,WC7S)
23,936 176 68 14 M WY

Southeastern Division

KN4QS 20,538 163 63 24 Q AL
NP2E 12,296 116 53 8 Q VI
AA7XR 10,080 105 48 10 Q SFL
KN4QV 9,800 100 49 6 Q GA
KP4DDB 1,160 29 20 2 Q PR

K4VUD 251,328 1632 77 24 A SFL
AA4LR 126,742 823 77 23 A GA
KD3GC 107,030 695 77 22 A GA
KC4TEO 90,872 614 74 24 A AL
AA4UF 74,844 486 77 19 A AL
AB4KL 67,336 443 76 16 A NFL
NP2I 65,250 435 75 14 A VI
KD4FNA 50,512 328 77 17 A GA
K4LDR 49,558 349 71 20 A GA
WB4ZAY 45,450 303 75 19 A NFL
WP2C 41,236 338 61 14 A GA
N4UQD/T 30,804 302 51 9 A AL
KØHT 30,000 200 75 15 A GA
KC4MW 29,100 194 75 98 A SFL
AC4OC 27,872 208 67 24 A NFL
KD4HXT/T
25,792 248 52 16 A NFL
N4XWC 24,800 200 62 24 A AL
WG4F 24,000 200 60 10 A AL
N4XON 23,562 187 63 10 A GA
KB4LCR 23,100 175 66 8 A SFL
AD4DA 22,608 157 72 14 A AL
AD4ES 18,000 150 60 16 A SFL
KQ4VG 15,840 110 72 15 A GA
AD4CY 14,478 127 57 10 A AL
AD4JU 13,888 124 56 11 A GA
WA4AIP 13,764 111 62 9 A GA
W3DHN 12,768 114 56 8 A SFL
KN4RI 12,180 105 58 7 A SFL
KD4UIE 11,448 108 53 10 A NFL
W3AZD 11,424 119 48 9 A SFL
KQ4YY 11,172 114 49 17 A NFL
KJ4WH 10,812 106 51 24 A SFL
W1TUM 10,800 108 50 7 A NFL
KI4Y 10,290 105 49 6 A GA
N4IBO 9,752 106 46 7 A GA
WA4ERU 8,034 103 39 8 A AL
WD4AHZ 7,544 82 46 2 A SFL
K1FIR/4 7,120 89 40 9 A SFL
N4FBY 6,798 103 33 11 A NFL
AC4PQ 5,796 63 46 14 A GA
KD4BHF/T 5,656 101 28 12 A AL
KE4BXT/T 4,830 69 35 11 A NFL
KO4OL 3,922 53 37 6 A AL
AD4KM 1,824 38 24 24 A AL
NP2DJ 220 11 10 5 A VI

WZ4F 256,102 1663 77 24 B AL
KU4J 189,112 1228 77 18 B AL
K4BAI 188,480 1240 76 23 B GA
K4SB 133,672 868 77 18 B GA
W1UA 132,440 860 77 20 B GA
WQ5L 62,700 418 75 17 B AL
W4WKQ 58,756 397 74 15 B NFL
KD4COJ 53,960 380 71 22 B NFL
N4BP 44,100 350 63 3 B SFL
KY2P 40,040 260 77 11 B GA
KB4GID (N4LDZ,op)
16,320 136 60 24 B GA

AB4RU (+AA4GA,KB4GID)
288,750 1875 77 24 M GA
KP2N (+NP2s BT,GM,Q,W,Y)
228,228 1482 77 23 M VI
N4CXF (+N4JQD,NR4E)
224,378 1457 77 24 M GA
W4AQL (KC4QFR,KD4OGI,
KE4HAH,WA4ABY,WD4DWN,N9s
HZQ,JSR,KØDI,ops)
215,292 1398 77 24 M GA
N4ID (+N4s MLK,MUH,WB4POC)
106,856 722 74 22 M NFL
KQ4HC (+KO4EW,WA4LJU)
96,052 649 74 20 M GA
NP2B (+NP2R,KV4JC)
82,390 535 77 14 M VI
KN4MK (+AD4S)
69,146 449 77 23 M GA
AD4IK (WA6PUT,WØMHS,ops)
50,468 341 74 24 M GA
KE4XT (+KE4FNP)
38,690 265 73 15 M GA
W4NVU (WQ3G,AC4SB,KC4ZNI,KD4s
HRD,OYY,PXD,VIM,VIN,KQ4MR,N4s
OLE,PBF,WA4QKO,K7UPJ,ops)
34,790 245 71 16 M SFL
K4IJK (+KD4RBM)
14,560 140 52 18 M SFL

Southwestern Division

N6PEQ 152,614 991 77 23 Q ORG
WB2ODH/6
100,562 653 77 23 Q LAX
WA7BNM 86,700 578 75 22 Q LAX
N7JXS 30,810 237 65 22 Q AZ
W6CN 23,598 171 69 20 Q SDG
N6AZR 20,880 174 60 15 Q SB
AB6NE 17,136 119 72 19 Q SDG
KN6TZ 14,478 127 57 18 Q SB
W9SE 11,610 129 45 4 Q AZ
WB6JJE 8,978 67 67 8 Q LAX
KC6WYX/T 1,932 42 23 9 Q LAX

N6HC 143,184 942 76 20 A ORG
AB6FO 141,988 922 77 24 A LAX
KJ6HO 116,700 778 75 24 A LAX
WA6GDS 110,110 715 77 20 A LAX
W6UQF 108,416 704 77 22 A SDG
W6HAL 93,328 614 76 14 A ORG
K6ZH 77,848 526 74 24 A SDG
WA6FGV 75,184 508 74 14 A SB
N7UJJ 63,910 415 77 24 A AZ
K6VT 61,320 438 70 15 A ORG
KA3DSE/6
58,536 382 74 21 A LAX
WA7TWI 50,652 347 73 23 A AZ
KC6SKQ 49,786 341 73 16 A ORG
KI7LC 48,528 337 72 19 A AZ
N6TW 48,240 335 72 18 A SB
AA7YP 45,448 299 76 17 A AZ
N6OKU 41,440 370 56 9 A ORG
WB6NFO 38,776 262 74 18 A LAX
K6ZCL 34,914 253 69 22 A LAX
K6RUB 33,768 252 67 11 A ORG
N6OPR 31,360 224 70 24 A LAX
N6SLX 27,720 220 63 19 A SB
W6MVW 24,522 183 67 8 A SDG
KB7PDL 23,660 182 65 18 A AZ
NC6U 22,800 190 60 8 A ORG
W6UGU 22,400 175 64 15 A LAX
AA6EE 20,956 169 62 11 A SDG
KI7MN 20,234 151 67 20 A AZ
KA7AKJ 19,800 150 66 10 A AZ
KD6JP 19,530 155 63 16 A LAX
K6BVE 18,460 142 65 14 A ORG
N7PVL 18,354 161 57 12 A AZ
KD6YNH 17,520 146 60 14 A SB
W6JXA 15,876 147 54 5 A SDG
KD6DCW 14,740 134 55 17 A ORG
K6XT 13,200 132 50 24 A SDG
KI7RK 12,636 117 54 7 A AZ
KK6RV 12,342 121 51 8 A SB
NE6O 11,750 125 47 6 A SDG
WD9HBC 10,976 112 49 9 A LAX
KN6RU 10,600 106 50 11 A SB
W4VZR 9,996 119 42 11 A AZ
KB7GGM 7,260 110 33 5 A AZ
W7YS 4,248 59 36 3 A AZ
N6TCZ 3,672 54 34 8 A LAX
W6JOB 330 15 11 24 A ORG

K6LL 327,096 2124 77 24 B AZ
KY7M 317,240 2060 77 24 B AZ
N6UF (N6DLU,op)
261,338 1697 77 24 B LAX
W6TKF 216,678 1407 77 21 B SB
N6VR 212,828 1382 77 24 B SB
W6AQ (WA6OTU,op)
202,050 1347 75 24 B LAX
KE7GH 171,248 1112 77 24 B AZ
WAØKDS 165,088 1072 77 22 B AZ
W2KVA/6 138,754 901 77 16 B SB
KT6V 134,134 871 77 20 B SDG
K7NO 118,580 770 77 11 B AZ
N6MB 112,882 733 77 20 B SB
K6VMN 108,300 722 75 19 B SB
W6TKV 104,828 718 73 15 B ORG
WA6DJS 92,400 600 77 19 B SB
KC6X 75,544 497 76 11 B LAX
N7BXX 54,150 361 75 24 B AZ
KD6QK 53,136 369 72 14 B SDG
W6JVA 40,348 262 77 12 B SDG
W6OUL 30,636 222 69 8 B SB
W6HT 24,544 208 59 7 B ORG
N6SMW 14,384 124 58 24 B SDG
AA7WD 9,844 107 46 8 B AZ

W6EEN (+K6XC,KA6SAR)
297,990 1935 77 24 M ORG
N6ND (+N6AZE,NL7GP,K9VV)
277,970 1805 77 24 M SDG
KF6OG (KE6CF,N6RPL,WA6OWM,ops)
277,508 1802 77 24 M ORG
N6KI (+AB6PU,KD6LMW,KM6s
WF,WG,XA,N6s AZE,KI,UZH,NE6O,
WB6NBU)
197,752 1301 76 24 M SDG
K6HRT (+KC6RDI,N6s XSS,YZT,
KØNW)
173,400 1156 75 24 M ORG
KI6X (+N4EA,KN6BU,WB6JMS)
164,010 1065 77 24 M ORG
WR7A (+KN1Q,W2AZD,KF7SI,
KG7EH,N7s ERG,MXR,OFY,OJT,
WO7F,KDØH,NØADI)
147,300 982 75 21 M AZ
N6RMJ (+KC6s JNX,KUP,TXO,
KG6IT,N6s XTT,XXI)
107,800 700 77 24 M LAX
WA6SNG (+KB6RAA,WB6JBL)
89,096 602 74 24 M LAX
W7ON (+N7NFX)
38,766 273 71 18 M AZ
W6TOI (NA2D,KB6ATT,KM6WY,KN6s
LM,SE,ops)
34,170 255 67 22 M LAX
AB6BX (+AB6s RW,SR,KC6s ACI,OIK,
N6s UBC,YSU,YTB)
33,810 245 69 16 M LAX
K6TZ (AB6S,KD6s OBE,VEX,KN6s
OX,UQ,ops)
26,352 216 61 23 M SB
W6VPZ (+N6LVX,WA6s BFW,HFI)
24,600 205 60 11 M LAX
KC6WLC (+KØBGL)
16,368 124 66 12 M SB
KI7LP (+KB7s PXU,TZX,VQA)
15,476 146 53 16 M AZ

West Gulf Division

KA5PVB 16,356 141 58 24 Q STX
KG5SC 11,682 99 59 9 Q NTX

KM5H 231,616 1504 77 24 A OK
WD5K 133,000 875 76 21 A NTX
K5OJI (WBØNSA,op)
131,362 853 77 22 A NTX
KE5FI 118,580 770 77 22 A STX
WS5R 110,200 725 76 24 A WTX
NN6T 88,616 583 76 20 A NTX
NT5V 81,322 557 73 11 A NTX
WA6IYX 71,856 499 72 24 A STX
N5PSQ 64,050 427 75 21 A NTX
N5NA 51,984 361 72 7 A WTX
N5UD 51,590 335 77 10 A NTX
N5TUW 50,410 356 71 14 A NTX
WA5TOS 49,058 336 73 12 A STX
KE5ND 48,422 341 71 18 A NTX
AB5C 47,740 310 77 20 A NTX
KAØRNY 43,026 303 71 19 A OK
WK5K 42,420 303 70 24 A NTX
KD5PJ 40,960 320 64 8 A NTX
WB5E 30,800 220 70 14 A NTX
KC5NT 30,284 226 67 18 A NTX
N5KAE 30,000 200 75 14 A STX
W5RRR (WB5PYI,op)
26,398 197 67 14 A STX
KC1MK 26,260 202 65 16 A STX
N5VJH 26,260 202 65 24 A OK
WY7U 25,872 168 77 24 A STX
AA5NT 25,564 166 77 23 A NTX
KB5IRL 24,192 192 63 18 A OK
KC5DEX 22,820 163 70 14 A NTX
N5KXI 18,450 123 75 24 A OK
K5AVH 17,908 121 74 10 A NTX
KE5DY 17,400 145 60 17 A NTX
N5SEM 17,360 140 62 14 A NTX
AB5OX 16,100 161 50 10 A STX
KO9X 14,076 138 51 11 A OK
W5UFA 12,992 116 56 11 A STX
KB5STS 10,560 110 48 13 A OK
W5LK 10,486 107 49 13 A STX
W5TZN 10,272 107 48 7 A OK
KC5AKV/T 9,660 105 46 16 A NTX
N5PZS 9,328 106 44 87 A STX
N5RBC 7,200 100 36 10 A STX
K5WXZ 5,460 70 39 4 A NTX
WC5D 3,920 70 28 1 A STX

W5KFT (WB5VZL,op)
313,852 2038 77 24 B STX
K5RX 273,196 1774 77 24 B NTX
N5OLS 243,012 1578 77 24 B STX
KI3L 239,778 1557 77 23 B STX
K5MR 200,816 1304 77 15 B NTX
K5TSQ 179,256 1164 77 14 B STX
W5ASP 171,710 1115 77 17 B STX
NA4M 134,596 874 77 24 B STX
N5RZ 130,800 872 75 10 B WTX
AH9B/W5
101,178 657 77 24 B OK
KI5NE 45,264 328 69 24 B NTX
KA5W (KS1G,op)
21,526 229 47 2 B NTX
AB5KD 18,480 120 77 13 B STX
KI5OO 16,000 125 64 12 B STX
W5GVP 15,768 108 73 14 B NTX
AA5UO 12,250 125 49 6 B NTX
W5XD 10,560 110 48 4 B STX
W5FIO 9,752 106 46 7 B NTX

WXØB (+NA5Q,NM5M)
301,532 1958 77 24 M NTX
NJ1V (+N5CE,N5RJM,WV5S)
275,198 1787 77 24 M OK
N5NMX (+N5NMY,NX6Y)
223,608 1452 77 24 M STX
W5EHM (AA5BT,KA5WSS,KB5SJN,
N5s SNN,TDI,N9IWD)
169,164 1143 74 23 M STX
NF9D (+N5THJ,KD9FT,N9MM)
134,596 874 77 24 M NTX
KI5JC (+KY5N)
111,650 725 77 22 M NTX
K5EC (+NET)
99,000 660 75 24 M STX
W5FC (KA5s FJA,TXL,KB5s EQL,YYQ,
KM5L,N5s KSA,TTL,UOW,ops)
83,622 543 77 18 M NTX
KB5YVT (+KB5UHS,N5QVS)
81,158 527 77 23 M STX
KRØY (+NET)
71,136 468 76 9 M NTX
WDØGTY (+KB5RBX,N5SAM)
63,560 454 70 24 M OK
K5LZO (+WB5RUS)
53,712 373 72 24 M STX
W5LM (N2HNU,KB5s UMH,KC5DIE,
KJ5PL,N5s TSZ,XKV,ops)
50,552 356 71 20 M NTX
AB5EA (+KB5SKN)
31,640 226 70 15 M STX
WB5B (+NET)
30,328 223 68 7 M NTX
KB1ZO/5 (+N1LPN)
27,720 198 70 24 M OK
AA5XU (+KB5s KOE,KTN)
22,780 170 67 9 M NTX
KJ5ER (+N5SQK)
9,762 106 46 4 M WTX

Canada Division

VE6SH 39,960 270 74 15 Q AB
VE4GV 235,466 1529 77 24 A MB
VE6KTT 117,348 762 77 20 A AB
VE7IN 108,332 742 73 19 A BC
VE5SF 106,096 698 76 21 A SK
VE6WQ 101,992 671 76 14 A AB
VE7CV 89,166 579 77 20 A BC
VE6ATT 86,688 602 72 14 A AB
VE3XN 84,392 548 77 13 A ON
VE7CFU 75,888 527 72 20 A BC
CH6JAV 74,936 493 76 19 A AB
VE1JBC 66,750 445 75 16 A MAR
VE7RCN 65,262 447 73 20 A BC
VE1MQ 63,516 474 67 24 A MAR
VE5GC 53,504 418 64 18 A SK
VE3VID 47,158 323 73 15 A ON
VE2WAT 42,600 300 71 24 A PQ
VE4AMC 41,942 313 67 12 A MB
VE6EX 37,346 263 71 18 A AB
VE3PRF 36,564 277 66 19 A ON
VE5ZD 36,432 276 66 9 A SK
CH2AWR 33,540 258 65 22 A PQ
VE3TDG 30,576 273 56 24 A ON
VE3IXU 30,104 212 71 12 A ON
VE7XT 28,428 206 69 6 A BC
VE2TSM 27,694 227 61 20 A PQ
VE3EFE 26,792 197 68 20 A ON
VE3ZTH 24,874 169 73 13 A ON
VE7BAV 23,814 189 63 14 A BC
VE4CS 18,444 159 58 15 A MB
VE3OQZ 18,360 153 60 15 A ON
VE6GK 15,974 163 49 8 A AB
VE5TO 15,876 126 63 13 A SK
VE3TEE 14,000 125 56 7 A ON
VE1GFH 12,376 119 52 18 A MAR
VE4KU 7,268 79 46 17 A MB
VE3MTG 4,514 61 37 8 A ON

VE5DX (VE5MX op)
286,132 1858 77 24 B SK
VE7SZ 277,970 1805 77 24 B BC
VE7KD 107,800 700 77 13 B BC
VE2ZP 46,576 328 71 5 B PQ
VE3VET 43,582 283 77 16 B ON
VE2HBE 22,806 181 63 9 B PQ

VE3XD (VE3s BF,BIA,BIE,IVU,LNS,
WG,ops)
232,078 1507 77 24 M ON
VY1QST (NL7s TB,VJ,ops)
141,360 930 76 22 M YUK
VE6NN (+VE6s HX,II,JWB,WIL,XD)
92,708 602 77 23 M AB
VE6AO (+ops)
87,552 576 76 24 M AB
VE2CUA (VE2s DUB,IRL,ops)
75,576 564 67 6 M PQ
VE3VSM (+NET)
43,320 285 76 24 M ON
VE1NH (+NET)
38,502 279 69 24 M MAR
VE2MAB (VE2s BRT,DWT,EDO,ESP,
GWM,HAX,MRD,MTM,NAM,OME,
SMW,YH,ops)
36,920 284 65 24 M PQ
CH3ITA (+ops)
24,332 158 77 10 M ON
VE3MFB (+ops)
22,484 146 77 8 M ON
VE2XID (+NET)
20,976 152 69 8 M PQ
CH3LRL (+NET)
15,862 103 77 14 M ON

Checklogs

CW

AD4FX, K1JKS, KØFRP, KØRF (WØUA,op), KA3VSH, KA7WXN, KF8UN, KR1R, N1CDO, N6ZVA, VE5JZ, W8IZS, W9LNX, WØZN, WA1MBK, WA4UCI, WB4RUA.

Phone

K1UQE, KB1AWE, KF8UN, KJ9C, KR1R, N4NFI, N6ZVA, N7OHW, N8SFD, NK6F, NO9M, VE3BR, VE3VID, W2UH, W4YCZ, W7LOU, WØDGS, WA1MBK, WA1KSF, WA2FVL, WA7OGM, WD5CBQ.

QST

Field Day Rules

1) **Eligibility**: Field Day is open competitively to all amateurs in the ARRL/Canadian Field Organization (plus Yukon and NWT). Foreign stations may be contacted for credit, but are not eligible to compete.

2) **Object**: To work as many stations as possible on any or all amateur bands **(except the 10, 18 and 24-MHz bands)** and in doing so, to learn to operate in abnormal situations under less-than-optimum conditions. A premium is placed on skills and equipment developed to meet the challenge of emergency preparedness and to acquaint the public with the capabilities of Amateur Radio.

3) **Dates**: June 25 and 26, 1994.

4) **Field Day Period**: From 1800 UTC Saturday until 2100 UTC Sunday. Class A and Class B (see below) stations that do not begin setting up until 1800 UTC Saturday may operate the entire Field Day period of 27 hours. Others must begin their set-ups no earlier than 1800 UTC Friday and may operate no more than 24 consecutive hours; ie, once on-the-air Field Day operation has started, it must end 24 hours from that point.

5) **Entry Categories**: Field Day entries are classified according to the maximum number of simultaneous transmitted signals, followed by the designation of the nature of the individual or group participation. Below 30 MHz, once a transmitter is used for a contact on a band, it must remain on that band for at least 15 minutes. During this 15-minute period, the transmitter is considered to be transmitting a signal, whether it is or not, for the purpose of determining transmitter class. Switching devices are prohibited.

(Class A) Club/nonclub portable: Club groups (or nonclub groups with three or more licensed amateurs) set up specifically for Field Day. Such stations must be located in places that are not regular station locations, and must use no facilities installed for permanent station use, or any structures installed permanently for Field Day use. Stations must be operated under one call sign (except when the Novice/Technician position is used) and under the control of a single licensee or trustee for each entry. All equipment (including antennas) must lie within a circle whose diameter does not exceed 300 meters (1000 feet). All contacts must be made with transmitter(s) and receiver(s) operating independent of commercial mains. Entrants who, for one reason or another, operate a transmitter or receiver from commercial mains for one or more contacts will be listed separately at the end of their class.

Any Class A group whose entry classification is two or more transmitters (nonNovice) may also use **one** Novice/Technician operating position (Novice subbands only) without changing its basic entry classification. For Field Day purposes only, any Canadian "Amateur" licensee, who has been licensed for less than six months prior to Field Day, shall be considered a "Novice" to provide a means for Canadian Field Day Class A stations with two or more transmitters to participate with a "Novice/Technician" operating position. This "Canadian Novice station" is restricted to the US Novice subbands and power/mode restrictions. The Novice/Technician station (including antennas) should be set up and operated by Novice and Technician licensees and should use the call sign of one of the Novice/Technician operators.

(Class A—Battery) Club/nonclub portable: Club groups (or nonclub groups with three or more licensed amateurs) set up specifically for Field Day and all contacts are made using an output power of 5 W or less and the power source is other than commercial mains or motor-driven generator (eg, batteries, solar cells, water-driven generators). Other provisions are the same as for Class A.

(Class B) One- or two-person portable: Nonclub stations set up and operated by not more than two licensed amateurs will be placed in Class B. Other provisions are the same as for Class A. One- and two-person Class B entries will be listed separately in the results.

(Class B—Battery) One- or two-person portable: Nonclub stations set up and operated by not more than two licensed amateurs and all contacts are made using an output power of 5 W or less and the power source is other than commercial mains or motor-driven generator (eg, batteries, solar cells, water-driven generators). Other provisions are the same as for Class A. One- and two-person Class B—Battery entries will be listed separately in the results.

(Class C) Mobile: Stations in vehicles capable of operating while in motion and normally operated in this manner, including antenna. This includes maritime and aeronautical mobiles.

(Class D) Home stations: Stations operating from permanent or licensed station locations using commercial power. Class D stations may count contacts only with Class A, B, C and E Field Day groups for points.

(Class E) Home stations—emergency power: Same as Class D, but using emergency power for transmitters and receivers. Work stations in Class A, B, C, D and E.

6) **Exchange**: Stations in any ARRL/Canadian Section will exchange their Field Day operating class and ARRL/Canadian Section (see page 8 in any *QST*). For example, if your club group was operating in the three-transmitter, Class A category from Missouri, you would send "3A Missouri." Foreign stations send RS(T) and QTH.

7) **Miscellaneous Rules**:

A) Operators participating in Field Day may not, from any other station, contact for point credit the Field Day portable station of the group with which they participated.

B) A station used to contact one or more Field Day stations may not subsequently be used under any other call during the Field Day period. Family stations are exempted.

C) Each phone and each CW segment is considered as a separate band. All voice communication contacts are equivalent, and packet/RTTY/ASCII/AMTOR is counted as CW. A station may be worked once on each band. Crossband contacts are not allowed. The use of more than one transmitter at the same time on a single band is prohibited, except that a Novice/Technician position may operate on any Novice band segment at any time. No repeater contacts are allowed.

8) **Scoring**: Scores are based on the number of valid contact points times the multiplier corresponding to the highest power used at any time during the Field Day period, plus bonus points. Phone contacts count one point each, and CW contacts count two points each. *Power multipliers*: If all contacts are made using an output power of 5 W or less and **if a power source other than commercial mains or motor-driven generator is used (eg, batteries, solar cells, water-driven generators), multiply by 5.** If any or all contacts are made using an output power of 150 W or less, multiply by 2. Multiply by 1 if any or all contacts are made using an output power of more than 150 W. Batteries may be charged while in use for Class C entries only. For other classes, batteries charged during the Field Day period must be charged from a power source independent of the commercial mains.

A) **Bonus points**: The following bonus points will be added to the score (after the multiplier is applied) to determine the final score. Only Class A and B stations are eligible for bonuses. Check the box on the Field Day Summary Sheet to indicate that you qualify for the bonus and attach the necessary proof.

1) **100% emergency power**: 100 points per transmitter for 100% emergency power. All equipment and facilities at the Field Day site must be operated from a source independent of the commercial mains. Example: A club operating 3A, using 100% emergency power may claim 300 bonus points.

2) **Public relations**:

A) 100 points for media publicity. Publicity must be obtained or a *bona fide* attempt to obtain publicity must be made. Evidence must be submitted in the form of a newspaper clipping, a memo from a BC/TV station stating that publicity was given or a copy of the material that was sent to the news media for publicity purposes.

Send for Your Field Day Package

Send to HQ a 9×12-inch self-addressed envelope with four units of First-Class US postage or four IRCs for the official Field Day Entry Package. This package includes one Publicity Kit, one Field Day Summary Sheet, one large dupe sheet with instructions and a checklist to ensure that your entry is complete. If you require more dupe sheets, indicate so in your request and affix one unit of additional First-Class postage to your SASE for each two additional dupe sheets requested.

W1AW Field Day Bulletin Schedule

In addition to the regular schedule detailed on page 102 of April *QST*, extra CW bulletins will be run at 1400 UTC (10 AM EDT) and extra phone bulletins at 1500 UTC (11 AM EDT) Saturday and Sunday mornings.

B) 100 points for physically locating in a public place (eg, shopping center, park, etc) with significant access by the public. The intent here is for Amateur Radio to be on display to the public.

C) An additional 100 points can be earned by such display stations in public places actively conducting an information booth for the visiting public, and dispensing information handouts, maintaining a visitor's log, etc, as an information/recruiting tool for Amateur Radio. Evidence submitted for (B) and (C) may consist of copies of handouts, visitor's log, brief report on activities conducted, photos, etc.

3) **Message origination**: 100 points for origination of a message by the club president or other Field Day leader, addressed to the SM or SEC, stating the club name (or nonclub group), number of operators, field location and number of ARES members participating. The message must be transmitted during the Field Day period, and a fully serviced copy of it must be submitted with the entry, in standard ARRL message form, or no credit will be given.

4) **Message relay**: 10 points for each message received and relayed during the Field Day period, up to a maximum of 100 points. Copies of each message, properly serviced, must be included with the Field Day report.

5) **Satellite QSO**: 100 points can be earned by completing at least one QSO via satellite during the Field Day period. The repeater provision of Rule 7C is waived for satellite QSOs. A satellite station **(one)** does not count as an additional transmitter. On the summary sheet, show satellite QSOs as a separate "band."

6) **Natural Power**: Field Day groups making a minimum of five QSOs without using power from commercial mains or petroleum derivatives can earn 100 points. Intuitively, this means an "alternate" energy source of power such as solar, wind, methane or grain alcohol. This includes batteries charged by natural means (not dry cells). The natural-power station counts as an additional transmitter. If you do not wish to change your entry class, take one of your other transmitters off the air while making the natural-power QSOs. A separate list of natural- power QSOs should be enclosed with your entry.

7) **W1AW message**: A bonus of 100 points will be earned by copying a special ARRL Field Day bulletin sent over W1AW on its regularly announced frequencies just before and during Field Day. This message can be received directly from W1AW or by any relay method. An accurate copy of the received message should be included in your Field Day report.

8) **Packet Radio**: 100 points can be earned by completing at least one QSO on packet radio during the Field Day period. The repeater provision of Rule 7C is waived for packet radio QSOs. A packet station **(one)** does not count as an additional transmitter. On the summary sheet, show packet radio QSOs as a separate "band."

9) **VHF/UHF**: 100 points can be earned by completing at least 10 QSOs (excluding packet contacts) on any band or combination of bands above 50 MHz (VHF/UHF bands) during the Field Day period. A VHF/UHF station **(one)** does not count as an additional transmitter. This station is not limited to making just 10 QSOs. It may be operated for the entire Field Day period and all contacts (excluding packet contacts) count for QSO points credit, including the first 10.

9) **Reporting**: Entries must be postmarked by July 27, 1994. No late entries can be accepted. A complete entry consists of an official ARRL Summary Sheet (or reasonable facsimile) and a list of stations worked on each band/mode during Field Day, plus bonus proof. The list of stations worked on each band or mode may take the form of official ARRL dupe sheets or an alphanumeric listing of call signs worked per band and mode. This list may be computer-generated. Incomplete or illegible entries will be classified as checklogs. A copy of Field Day logs should be kept by your Field Day group, but should not be sent in unless specifically requested later by the ARRL.

10) **Condition of Entry**: Each entrant agrees to be bound by the provisions and the intent of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

11) **Disqualifications**: See January 1994 *QST*, page 124.

QST

ARRL June VHF QSO Party Plaque Program

Listed below are the plaques that will be awarded in the 1994 ARRL June VHF QSO Party. Sponsors as of March 1 are shown adjacent to the corresponding category. If you're interested in sponsoring one or more of the plaques that haven't been sponsored, call the Contest Branch at ARRL HQ. The cost is $50.

The list of sponsored plaques may change because of *QST* lead time, so please call us for a list of what's available before sending payment. We salute all who have helped make the Plaque Program a success!

Single Operator

Position	*Donor*
1st	Mt Greylock Expeditionary Force, W2SZ/1
2nd	Bald Knob VHF Contest Group, AA9D
3rd	Kenwood USA Corp
4th	Midwest VHF/UHF Society
5th	Delaware Valley VHF Society
6th	Ed Parsons, K1TR
7th	Eastern VHF/UHF Society
8th	Wellesley ARS, Mt Equinox Contest Crew
9th	KS VHF/UHF Ops Annual on the Hill Get Together
10th	

QRP Portable—Single Operator

Position	*Donor*
1st	Dick, K2RIW and Jay, K2OVS
2nd	Peter Putman, KT2B
3rd	Long Island Mobile ARC
4th	West Coast VHFer
5th	KS VHF/UHF Ops Annual on the Hill Get Together

Rover

Position	*Donor*
1st	W2SZ/1, in Memory of Dick Goodman, WB1HIH

Multioperator

Position	*Donor*
1st	Randy Stegemeyer, W7HR
2nd	N2LIV, N2GHR, N2BFJ Contest Team
3rd	Kenwood Employees Radio Club, WD6DJY
4th	Harry Stein, W3CL, Memorial
5th	KS VHF/UHF Ops Annual on the Hill Get Together
6th	Rochester VHF Group
7th	Northern Lights Radio Society and W0UC
8th	Flagpole Knob Contest Group, W4IY
9th	Schenectady ARA, K2AE
10th	

Limited Multioperator

Position	*Donor*
1st	W3EP/K9AKS/W9IP
2nd	Kenwood USA Corp
3rd	Kenwood USA Corp
4th	WA2TEO, W2GKR, W2GKO, KA1FVG
5th	Big Mountain ARC

Marine Mobile

Position	*Donor*
1st	Wayne Yoshida, KH6WZ

DX Single Operator

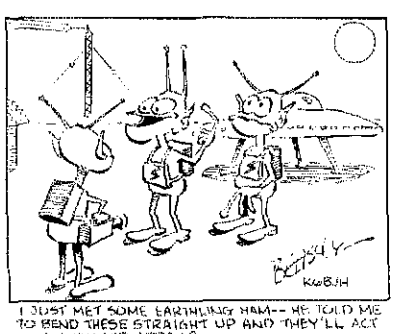
Position	*Donor*
1st	Bill Tynan, W3XO

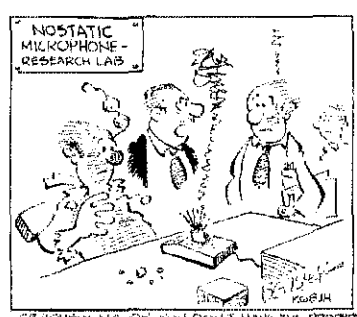
DX Multioperator

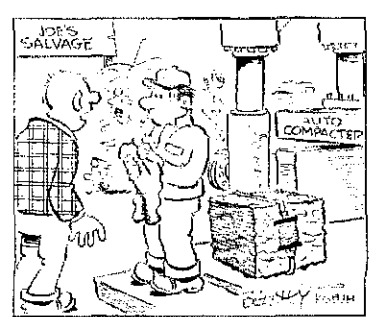
Position	*Donor*
1st	Robert Carpenter, W3OTC

QST

Cartoons by Beasley







Rules, June VHF QSO Party

1) **Object**: To work as many amateur stations in as many different 2°×1° grid squares as possible using authorized amateur frequencies above 50 MHz.

2) **Contest Period**: Begins 1800 UTC Saturday, June 4, and ends 0300 UTC Monday, June 6.

3) **Categories**:

A) **Single Operator**: One person performs all operating and logging functions.

1) *Multiband*.

2) *Single band*: Single-band entries on 50, 144, 222, 432, 902, 1296 and 2304-and-up categories will be recognized in *QST* score listings and in awards offered. Contacts may be made on any and all bands without jeopardizing single-band entry status. Such additional contacts are encouraged and should be reported. Also see Rule 9, Awards.

B) **Single Operator, QRP Portable**: Run 10-W output or less using a portable power source from a portable location. The intent of this rule is to encourage operation from "remote" locations, not to have home or fixed stations run low power.

C) **Rover**: One or two operators of a single station that moves among two or more grid squares during the course of the contest, and making contest contacts, using the same equipment and antennas at each site, will be considered a rover. Rovers sign "rover" on phone and /R on CW after their call signs. The intent of the rover category prohibits fixed station scores to be included with rover operations; stations may, however, enter the rover category with a separate log for rover activities. All rovers are encouraged to adopt operating practices that allow as many stations as possible to contact them.

D) **Multioperator**: Multioperator stations must locate all equipment (including antennas) within a circle whose diameter does not exceed 300 meters (1000 feet).

E) **Limited Multioperator**: Multioperator stations that submit a maximum of four bands for score are eligible. Logs from additional bands used should be included as checklogs.

4) **Exchange**: Grid locator (see Jan 1983 *QST*, page 49). Example: W1AW in Newington, Connecticut, would send FN31. Exchange of signal report is optional.

5) **Scoring**:

A) *QSO points*: Count 1 point for each complete 50- or 144-MHz QSO. Count 2 points for each 222- or 432-MHz QSO. Count 3 points for each QSO on 902- or 1296-MHz. Count 4 points for each 2.3-GHz-or-higher QSO.

B) *Multiplier*: The total number of different grid squares worked per band. Each 2°×1° grid square counts as one multiplier on each band it is worked.

C) *Final score*: Multiply the total number of QSO points from all bands operated by the total number of multipliers for final score (see scoring example).

D) *Rovers only*: The final score consists of the total number of QSO points from all bands times the total number of multipliers from all grid squares in which they operated.

6) **Use of FM**:

A) Retransmitting either or both stations, or use of repeater frequencies, is not permitted. This prohibits use of all repeater frequencies. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts.

B) Use of the national simplex frequency, 146.52 MHz, or immediate adjacent guard frequencies is prohibited. Contest entrants may not transmit on 146.52 MHz for the purpose of making or soliciting QSOs. The intent of this rule is to protect the national simplex frequency from contest monopolization. There are no restrictions on the use of 223.50 MHz.

C) Only recognized simplex frequencies may be used, such as 144.90 to 145.00; 146.49, .55 and .58; and 147.42, .45, .48, .51, .54 and .57 MHz on the 2-meter band. Local-option simplex channels and frequencies adjacent to the above that do not violate the intent of (A) or (B) above or the spirit and intent of the band plans as recommended in the ARRL *Repeater Directory*, may be used for contest purposes.

7) **Miscellaneous**:

A) *Stations may be worked for credit only once per band from any given grid square, regardless of mode.* This does not prohibit working a station from more than one grid square with the same call sign (such as a rover). Crossband QSOs do not count. Aeronautical mobile contacts do not count.

B) Partial QSOs do not count. Both call signs, the full exchange and acknowledgment must be sent and received.

C) A transmitter used to contact one or more stations may not be used subsequently under any other call sign during the contest period (with the exception of family stations where more than one call sign is assigned to one location by FCC/DOC); one operator may not give out contest QSOs using more than one call sign from any one location. The intent of this rule is to accommodate family members who must share a rig, not to manufacture artificial contacts.

D) Only one signal per band (6, 2, 1¼ meters, etc) at any given time is permitted, regardless of mode.

E) While no minimum distance is specified for contacts, equipment should be capable of real communication (ie, able to communicate over at least 1 km).

F) Multioperator stations may not include QSOs with their own operators except on frequencies higher than 2.3 GHz. Even then, a complete, different station must exist for each QSO made under these conditions.

Scoring Example

Band (MHz)	*QSOs*	*QSO Points*	*Grid Squares*
50	25 (×1)	25	10
144	40 (×1)	40	20
222	10 (×2)	20	5
432	15 (×2)	30	10
1296	6 (×3)	18	3
Totals	96	133	48

Final score = (QSO points) × (total no. grid squares): (6384 = 133 × 48).

G) A station located *precisely* on a dividing line between grid squares must select only one as the location for exchange purposes. A different grid-square multiplier cannot be given out without moving the complete station (including antennas) at least 100 meters.

H) Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs using coherent radiation on transmit (eg, laser) and employing at least one stage of electronic detection on receive.

I) Marine Mobile (and Maritime) entries will be listed separately as "Marine Mobile" in the score listings and compete separately for awards.

J) Participants are reminded that the segment 50.100 to 50.125 MHz is by convention reserved for intercontinental QSOs only.

8) **Reporting**:

A) Entries must be postmarked no later than 30 days after the end of the contest (July 7, 1994). No late entries can be accepted. Use ARRL June VHF QSO Party forms, or a reasonable facsimile, or submit entry on diskette. Send entries to ARRL Contest Branch, 225 Main St, Newington, CT 06111.

1) Official entry forms are available from HQ for an SASE with two units of First-Class postage.

2) You may submit your contest entry on diskette in lieu of paper logs. The floppy diskette must be IBM compatible, MS-DOS formatted, 3½- or 5¼-inch (40- or 80-track). The log information must be in an ASCII file, following the ARRL Suggested Standard File Format, and contain all log exchange information (band, date, time in UTC, call sign of station worked, exchange sent, exchange received, multipliers [marked the first time worked] and QSO points). One entry per diskette. An Official Summary Sheet or reasonable facsimile with a signed contest disclaimer is required with all entries.

B) Logs must indicate band, date, time in UTC, call signs and complete exchanges (sent and received), multipliers and QSO points. Multipliers should be marked clearly in the log the first time they are worked. Entries with more than 200 QSOs total must include cross-check sheets (dupe sheets).

9) **Awards**:

A) Plaques (if sponsored) will be awarded in the following categories:

1) Top 10 single operator scorers

2) Top five single operator QRP-portable scorers

3) Top rover scorer

4) Top 10 multioperator scorers

5) Top five limited-multioperator scorers

B) Certificates will be awarded in the following categories:

1) Single operator

A) Top single-operator score in each ARRL/Canadian Section.

B) Top single operator on each band (50, 144, 222, 432, 902, 1296 and 2304-and-up categories) in each ARRL/Canadian Section where significant effort or competition is evidenced. (Because the highest score per band will be the award winner for that band, an entrant may win a certificate with additional single-band achievement stickers.) For example, if WBØTEM has the highest single-

operator all-band score in the Iowa Section and his 50- and 222-MHz scores are higher than any other Iowa single op's, he will earn a certificate for being the single-operator Section leader and endorsement stickers for 50 and 222 MHz.

C) Top single-operator QRP-portable in each ARRL/Canadian Section where significant effort or competition is evidenced. QRP-portable entries are not eligible for single-band awards.

2) Top rover in each ARRL/Canadian Section where significant effort or competition is evidenced. Rover entries are not eligible for single-band awards.

3) Top multioperator score in each ARRL/Canadian Section where significant effort or competition is evidenced. Multioperator entries are not eligible for single-band awards.

4) Top limited-multioperator score in each ARRL/Canadian Section where significant effort or competition is evidenced. Limited-multioperator entries are not eligible for single-band awards.

10) **Condition of Entry**: Each entrant agrees to be bound by the provisions and the intent of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

11) **Disqualifications**: See January 1994 *QST*, page 124. QST

W1AW schedule

Pacific	Mtn	Cent	East	Sun	Mon	Tue	Wed	Thu	Fri	Sat	UTC
6 am	7 am	8 am	9 am			Fast Code	Slow Code	Fast Code	Slow Code		1300
7 am	8 am	9 am	10 am			Code Bulletin					1400
8 am	9 am	10 am	11 am			Teleprinter Bulletin					1500
9 am	10 am	11 am	noon								1600
10 am	11 am	noon	1 pm		Visiting Operator Time						1700
11 am	noon	1 pm	2 pm								1800
noon	1 pm	2 pm	3 pm								1900
1 pm	2 pm	3 pm	4 pm	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	2000
2 pm	3 pm	4 pm	5 pm	Code Bulletin							2100
3 pm	4 pm	5 pm	6 pm	Teleprinter Bulletin							2200
4 pm	5 pm	6 pm	7 pm	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	2300
5 pm	6 pm	7 pm	8 pm	Code Bulletin							0000
6 pm	7 pm	8 pm	9 pm	Teleprinter Bulletin							0100
6:45 pm	7:45 pm	8:45 pm	9:45 pm	Voice Bulletin							0145
7 pm	8 pm	9 pm	10 pm	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	0200
8 pm	9 pm	10 pm	11 pm	Code Bulletin							0200
9 pm	10 pm	11 pm	Mdnte	Teleprinter Bulletin							0300
9:45 pm	10:45 pm	11:45 pm	12:45 am	Voice Bulletin							0345

❑ ***Morse code transmissions:***

Frequencies are 1.818, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13 and 15 wpm.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 wpm.

Code practice text is from the pages of *QST*. The source is given at the beginning of each practice session and alternate speeds within each session. For example, "Text is from July 1992 *QST*, pages 9 and 81," indicates that the plain text is from the article on page 9 and mixed number/letter groups are from page 81.

Code bulletins are sent at 18 wpm.

❑ ***Teleprinter transmissions:***

Frequencies are 3.625, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are send at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.

On Tuesdays and Saturdays at 6:30 PM Eastern Time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

❑ ***Voice transmissions:***

Frequencies are 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

❑ ***Miscellanea:***

On Fridays, UTC, a DX bulletin replaces the regular bulletins.

W1AW is open to visitors during normal operating hours: from 1 PM until 1 AM on Mondays, 9 AM until 1 AM Tuesday through Friday, from 1 PM to 1 AM on Saturdays, and from 3:30 PM to 1 AM on Sundays. FCC licensed amateurs may operate the station from 1 to 4 PM Monday through Saturday. Be sure to bring your current FCC amateur license or a photocopy.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

Headquarters and W1AW are closed on New Year's Day, President's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving and the following Friday, and Christmas Day. On the first Thursday of September, Headquarters and W1AW will be closed during the afternoon.

Strays

QCWA BANQUET AT DAYTON

◊ Southwest Ohio Chapter 9 of the Quarter Century Wireless Association (QCWA) holds its 1994 Annual Banquet on Friday, April 29 (the first night of the Dayton HamVention), at Alex's Continental Restaurant. Cash bar at 7 PM, banquet at 7:30. Reservations are required, but QCWA membership is not necessary. Tickets are $15 each, payable to Robert Dingle, Treasurer, Chapter 9. Mail to 1117 Big Hill Rd, Kettering, OH 45429-1201. —*Robert Dingle, KA4LAU, secretary/treasurer, QCWA Southwest Ohio Chapter 9*

BICYCLE MOBILE EVENT

◊ The Bicycle Mobile Hams of America (BMHA) invites amateurs and nonhams to attend two forums. The fifth annual BMHA forum will be held at the Dayton HamVention on Sunday, May 1, at 8:30 AM. The two-hour program will include demonstrations of equipment and techniques, with a similar program on Saturday, May 28, at 3 PM, at the Great Western Bicycle Rally at the Paso Robles (California) Fairgrounds. The BMHA has more than 300 members in 41 states and five countries. For more information and a sample copy of the *BMHA Newsletter*, contact Hartley Alley, NA0A, Chairman, BMHA, Box 4009, Boulder, CO 80306.

Contest Corral

Conducted By Warren C. Stankiewicz, NF1J
Assistant Contest Manager

MAY

3

West Coast Qualifying Run, 10 to 35 wpm, 0400Z May 4 (9 PM PDT May 3). W6OWP prime, W6ZRJ alternate. Frequency is approximately 3.590 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL HQ for grading. Please include your full name, call sign (if any) and complete mailing address. A large self-addressed, stamped envelope (SASE) will help expedite your award or endorsement.

4

ARRL Spring Sprint, 432 MHz. See Mar *QST*, p 120.

7-8

ARI International DX Contest, see Apr *QST*, p 114.

Georgia QSO Party, see Apr *QST*, p 114.

Danish SSTV Contest, sponsored by the Danish SSTV Group, 0000Z May 7 until 2400Z May 8. SSTV only. Use SSTV frequencies recommended by IARU Region 1 on 80, 40, 20, 15, 10, 6 and 2 meters. Work stations once per band. Count 2 points for the first QSO with any DXCC country, count 1 point for additional QSOs with that country. Count 1 bonus point for each Danish QSO. Final score is sum of points. Awards. Send logs before Jun 7 to Carl Emkjer, Soborghus Park 8, DK 2860 Soborg, Denmark.

Ten-Ten International Net Spring CW QSO Party, sponsored by the Ten-Ten International Net, 0000Z May 7 until 2400Z May 8. Open to all amateurs, but only paid-up 10-10 members are eligible for awards. Single operator only. CW and RTTY. Work stations once on 10 meters only. Contacts must be in the CW subband. Exchange call sign, name, state and 10-10 number (if member). Count 2 points for each QSO with a member and count 1 point for each QSO with a nonmember. Final score is total QSO points. Awards. Send logs with cover sheet and dupe sheet postmarked before Jun 1 to City of Lights Chapter, c/o Joe Dubeck, NA9A, PO Box 1383, St Charles, IL 60174.

11

W1AW Qualifying Run, 10 to 40 wpm, 0200Z May 12 (10 PM EDT May 11). Transmitted simultaneously on 1.818 3.5815 7.0475 14.0475 18.0975 21.0675 28.0675 147.555 MHz. See May 3 listing for details.

14-15

ARRL Spring Sprint, 902 MHz. See Mar *QST*, p 120.

ARRL Spring Sprint, 1296 MHz. See Mar *QST*, p 120.

ARRL Spring Sprint, 2304 MHz. See Mar *QST*, p 120.

A. Volta RTTY Contest, see Apr *QST*, p 114.

CQ-M Contest, see Apr *QST*, p 114.

Nevada QSO Party, sponsored by the Frontier ARS, 0000Z May 14 until 0600Z May 15. 160 through 6 meters. CW/SSB/SSTV/RTTY/packet. Work stations once per band per mode. Nevada stations exchange RS(T) and county; others exchange RS(T) and state/province/DXCC country. Count 1 point for phone QSO, 2 points per contact via other modes. Multiply points by number of Nevada counties worked (Nevada stations multiply by state/province/DXCC country total). Awards. Mail logs by Jun 1 to Jim Frye, NW7O, 4120 Oakhill Ave, Las Vegas, NV 89121.

21-22

ARRL Spring Sprint, 50 MHz. See Mar *QST*, p 120.

MFJ 90's RC May QRP CW Contest, see Apr *QST*, p 114.

Michigan QSO Party, see Apr *QST*, pp 114-115.

Spring NWQRP Sprint, see Apr *QST*, p 114.

Armed Forces Day—This year marks the 45th anniversary of communications tests between the Amateur Radio community and the Military Communications System. Special commemorative QSL cards will be issued to amateurs achieving a verified two-way radio contact with any of the participating military radio stations. Those who receive and accurately copy the Armed Forces Day CW and/or RTTY message from the Secretary of Defense will receive a special commemorative certificate.

Crossband Radio Contacts—The military-to-amateur crossband operations will be conducted from 1300Z May 21 until 0200Z May 22. Military stations will transmit on military frequencies and will announce the specific amateur band frequencies being monitored. Limit contacts to three minutes. The following stations will transmit on the designated frequencies (in kHz): AAE, Ft Sam Houston, TX: LSB—4030.5; USB—13994.5 27992.5; CW—20941.5 RTTY/LSB—7358.5. AAH, Ft Lewis, WA: SSB/CW/RTTY—4021.5 6988 7312.5; USB—14488.5 18212.5 20975. AAR, Ft Bragg, NC: LSB—4033.5; RTTY/CW—7309.5; LSB/CW/RTTY—6911.5; USB—14440 20105.5 27810. AAZ, Ft Huachuca, AZ: LSB—4.36.5 7422.5; CW—6908 21825.5; USB—13965 27790. AIR, Andrews AFB, MD: LSB—4025 7315; USB—14408; RTTY—13986.5; CW—6995.5 12997.5. WAR, Ft Detrick, MD: LSB—4018.5; CW—6998.5 13992.5; SSB/CW/RTTY—7361.5; USB—14403.5 20995.5. NAM, Norfolk, VA: LSB/RTTY/CW—4005 7393 10255. NAV, Cheltenham, MD: SSB/RTTY/CW—4040 7365; CW/RTTY—10259.5; USB—14393. NAV-8, Honolulu, HI: SSB/CW/RTTY—7301.5 14820. NBL, Groton, CT: SSB/RTTY/CW—6835 14385 20375. NMH, Alexandria, VA: SSB/CW/RTTY 4015 7346.5 14468.5. NMN, Chesapeake, VA: SSB/RTTY/CW—6970 13975.5 24783.5. NPG, Twentynine Palms, CA: SSB/RTTY/CW—4008.5 14465 20937.5. NPL, San Diego, CA: SSB/RTTY/CW—7382.5 14385 20625. NZJ, El Toro, CA: SSB/RTTY/CW—7375 14480 24805

Receiving Test—The CW and the RTTY broadcasts will be special Armed Forces Day messages from the Secretary of Defense to any Amateur Radio operator or shortwave listener (SWL) desiring to participate. A 10-minute tuning call will precede each transmission. The CW broadcast will be transmitted at 25 wpm beginning at 0240Z May 22. It will be transmitted by the following stations on the listed frequencies (in kHz): AAE, Ft Sam Houston, TX—7358.5 20941.5; AAH, Ft Lewis, WA—6988 10151.5 14488.5 18212.5; AAR, Ft Bragg, NC—7309; AIR, Andrews AFB, MD—6995.5 12997.5; WAR, Ft Detrick, MD—6998.5 13992.5; NAM, Norfolk, VA—7393; NAV, Cheltenham, MD—10259.5; NAV-8, Honolulu, HI—14820; NBL, Groton, CT—14385; NMH, Alexandria, VA—7346.5; NMN, Chesapeake, VA—6970; NZJ, El Toro, CA—14480; NPG, Twenty-Nine Palms, CA—20937.5. Three RTTY broadcasts will be transmitted. The first will begin at 0330Z May 22 and transmitted at 100-wpm Baudot using 170-Hz shift. The second will begin at 0430Z and will be transmitted via packet, and the third via AMTOR (FEC mode) at 0530Z. They will be transmitted by the following stations on the listed frequencies: AAE, Ft Sam Houston, TX—7358.5; AAH, Ft Lewis, WA—6988 10151.5 14488.5 18212.5; AAR, Ft Bragg, NC—7309.5; AIR, Andrews AFB, MD—13986.5; WAR, Ft Detrick, MD—13992.5. NAV, Cheltenham, MD—10259.5; NAM, Norfolk, VA—7393; NAV-8, Honolulu, HI—14820; NBL, Groton, CT—14385; NMH, Alexandria, VA—7346.5; NMN, Chesapeake, VA—6970; NZJ, El Toro, CA—14480; NPG, Twentynine Palms, CA—20937.5.

Submission of Test Entries—Transcriptions of the CW and/or RTTY Receiving Tests should be submitted "as received." No attempt should be made to correct possible transmission errors. The time, frequency and call sign of the military station copied, and the name, call sign and address of the individual submitting the entry must be indicated on the page containing the test message. Entries must be postmarked no later than May 26 and submitted to the respective military command as follows: AIR to USAF MARS Armed Forces Day Celebration, 89CG/SCOJM Alabama Ave STE 3, Andrews AFB, Washington, DC 20331-6345; AAE, AAH AAR, or WAR to Armed Forces Day Test, Commander, USAISC; ATTN: ASOP-HF; Ft Huachuca, AZ 85613-5000; NAM, NAV, NMH, NMN, NPG, NPL, NZJ, NAV-8 or NBL to Armed Forces Day Celebration, HQ Navy-Marine Corps MARS, Bldg 13, 9190 Commo Rd, NCD Cheltenham, Washington, DC 20397-5161.

27

W1AW Qualifying Run, 10 to 35 wpm, 2000Z May 27 (4 PM EDT). See May 11 listing for details.

28-29

***CQ* WW WPX Contest**, CW, see Feb *QST*, p 109.

World Telecommunications Day, CW, sponsored by LABRE, 0000Z until 2400Z May 28 (phone 0000Z until 2400Z May 29). Phone and CW are separate contests. Work stations once per band. Exchange signal report and serial no., starting with 001. Categories: Single operator/single transmitter and multioperator/single transmitter. Contacts between stations on different continents are worth 3 points on 10/15/20 and 6 points on 40/80/160; contacts between stations in different countries on the same continent are worth 2 points on 10/15/20 and 4 points on 40/80/160; Contacts between stations in the same country are worth 1 point on 10/15/20 and 2 points on 40/80/160. Multipliers are countries and Brazilian states worked per band. Brazil does not count as a country for this purpose. Final score is total QSO points times total multipliers. Send logs by Jul 31 to LABRE WTD Contest Committee, PO Box 07-0004, 70359 Brasilia (DF), Brazil.

JUNE

1

West Coast Qualifying Run, 10 to 35 wpm, 0400Z Jun 2 (9 PM PDT Jun 1). See May 3 listing for details.

4-6

ARRL June VHF QSO Party, see this issue, p 134.

Portugal Day Contest, sponsored by Rede dos Emissores Portugueses, 0700Z-2400Z Jun 4. Single operator, phone only. Work stations once per band. Exchange RS plus serial no.; CT1, CT4 and special CT-prefix stations give RS plus two-letter county identification. Score 1 point for DX contact; 2 points per CT1, CT4, special CT-prefix and EA1-EA7 contact. Multipliers are CT counties (18), DXCC countries and continents worked. Final score is QSO points × DXCC countries × continents. Awards. Send summary sheet and logs by Jul 30 to REP Contest Manager/DP94, Apartado 2483, 1112 Lisboa Codex, Portugal.

11-12

ATV Quest Contest, see Mar *QST*, p 120.

ANARTS WW RTTY Contest, sponsored by the Australian National Amateur Radio Teleprinter Society, 0000Z Jun 11 until 2400Z June 12. Single operators may not operate more than 30 hours. Use the 80, 40, 20, 15 and 10-meter bands. All digital modes (RTTY/AMTOR (A)/AMTOR (B)/ASCII/packet) permitted. No satellite operation allowed. Single operator and multioperator, only one transmitted signal allowed at any time. Exchange RST, time (UTC) and *CQ* Zone. Work stations once per band. Point scoring is by a chart, which is available from the sponsor. Add 100 bonus points for each VK worked on 14 MHz, 200 for each VK worked on 21 MHz, 300 for each VK worked on 28 MHz, 400 for each VK worked on 7 MHz and 500 for each

(continued on page 138)

Special Events

Conducted By Warren C. Stankiewicz, NF1J
Assistant Contest Manager

Mojave Desert, California: The Billy Holcomb Chapter of E Clampus Vitus will operate KC6LUC **Apr 29** to **May 1** to commemorate Ft Cady. Operation will be in the phone portions of the General 80, 40, 20 and 15-meter subbands and in the Novice 10-meter subband. For certificate, send QSL and a 9×11-inch SASE to Sid Blumner, KC6LUC, 1458 Albright Ave, Upland, CA 91786-2722.

Columbia, South Carolina: Cub Scout Pack 308, BSA, will operate N4WR 1600Z to 2000Z **Apr 30** at the Indian Waters Council Scouting Expo '94. For information, contact Slaine Hayes, 125 Marabou Dr, West Columbia, SC 29169.

Toad Suck, Arkansas: The Faulkner County ARC will operate W5AUU 1600Z **Apr 30** to 0400Z **May 1** to celebrate the Toad Suck Daze Festival. 3.9875 7.275 14.275 21.375 and 2 meters. For certificate, send QSL and SASE to FCARC, PO Box 324, Conway, AR 72032.

Wamego, Kansas: The Mahar ARC will operate KBØGPR 1400Z to 2000Z **May 1** to celebrate the annual Mahar Family Reunion. Operation will be in the General 40- and 20-meter phone subbands, 28.350 and 146.58. For certificate, send QSL and SASE to Mitch Anderson, KBØGPR, PO Box 931, New Strawn, KS 66839-0931.

Ft Davis, Texas: The Southwest Region of the Astronomical League will operate K5GH **May 9** through **May 14** at the 13th annual Texas Star Party. 7.265 14.265 21.365 28.365. For QSL, send QSL and SASE to K5GH-TSP, 2619 Bordeaux, McKinney, TX 75070.

Holland, Michigan: The Holland ARC will operate **May 4** through **May 14** to celebrate Tulip Time. Operation will be in the lower portion of the General 20- and 15-meter subbands and 28.400. For certificate, send QSL with call signs worked and a 9×12-inch SASE to Barbara Siebelink, N8NXA, 6418 Otis Rd, Saugatuck, MI 49453.

Kensington, Maryland: The Rock Creek ARA will operate W3RCN 1300Z to 2100Z **May 7** to celebrate the Town of Kensington's centennial. Operation will be in the General portions of the 40, 20 and 15-meter phone subbands, the Novice 10-meter phone subband, and on satellite via RS-12. For QSL, send QSL and SASE to Rock Creek ARA, PO Box 1913, Silver Spring, MD 20915.

Mountain Ranch, California: N5EL and N6EL will operate 1500Z to 2300Z **May 7** as a "Twin Net." 28.400 146.55. For QSL, send QSL and SASE to Lloyd Bumpus, N6EL, PO Box 297, Mountain Ranch, CA 95246.

De Kalb, Illinois: The Kishwaukee ARC will operate WA9CJN 1600Z to 2200Z **May 7** to help celebrate the Three Fires Council BSA Scout-O-Rama show. 28.430. For certificate, send SASE to KARC, PO Box 264, Sycamore, IL 60178.

Fairmont, West Virginia: The Mountaineer ARC will operate W8SP 0000Z **May 7** to 2400Z **May 8** to commemorate the first official observance of Mother's Day. Operation will be in the bottom portion of the General 80 to 10-meter subbands. For certificate, send QSL and a 9×12-inch SASE to Chuck McClain, K8UQY, Rte 4 Box 161, Grafton, WV 26354.

Las Cruces, Mew Mexico: The New Mexico State University ARC will operate W5GB 1700Z to 2200Z **May 7 and 8** to commemorate the 75th anniversary of the founding of the club. Operation will be in the lower portion of the General 20, 15 and 10-meter phone and CW subbands. For certificate, send QSL, contact no. and a 9×12-inch SASE to W5GB, c/o Matt Ormsby, KA1MWD, PO Box 3735, Las Cruces, NM 88003.

Aberdeen, Washington: The Grays Harbor ARC will operate W7ZA 2300Z **May 7** to 2300Z **May 8** to celebrate its 40th birthday. CW—Novice 80, 20, 15 and 10-meter subbands and the General 20-meter subband; phone—General 80, 40, 20, 15 and 10-meter subbands and the Novice 10-meter subband. For QSL, send QSL and SASE to GHARC, PO Box 2250, Aberdeen, WA 98520.

Promontory, Utah: The Ogden ARC will operate W7STB 0000Z to 2100Z **May 10** to commemoratre the driving of the Golden Spike. 3.970 7.270 14.280 21.375 28.415. Send QSL and SASE to Ogden ARC, PO Box 3353, Ogden, UT 84409.

Staten Island, New York: The Staten Island ARA will operate W2CWW 0000Z **May 13** to 1500Z **May 15** to celebrate the 4th Annual Kings Point Invitational Boy Scout Camporee. Operation will be in the lower portion of the General 80, 40, 20 and 15-meter phone subbands. For QSL, send QSL and SASE to SIARA, PO Box 140495, Staten Island, NY 10314-0018.

San Antonio, Texas: The San Antonio RC will operate W5SC 2200Z **May 13** to 2200Z **May 15** to celebrate its diamond anniversary. Operation will be in the bottom 50 kHz of the General 80 to 10-meter phone bands. For certificate, send QSL and a 9×12-inch SASE to SARC Diamond Jubilee, 10227 Mt Crosby, San Antonio, TX 78251.

Batesburg, South Carolina: The Batesburg-Leesville Middle School ARC will operate KB4KEN 1500Z to 1900Z **May 14** at the Poultry Festival. 14.270 21.360 28.340. For QSL, send QSL and SASE to BLMS ARC, 101 W Columbia Ave, Batesburg, SC 29006.

Greenville, South Carolina: The Roper Mountain Experimenter's Group will operate WD4KTI 1500Z to 2000Z **May 14** to dedicate the opening of the Amateur Radio Station at the Roper Mountain Science Center. 7.234 14.340 21.340 28.340. For certficate, send SASE to Fred Tuck, WD4NTI, 108 Holly Cir, Lyman, SC 29365.

Vald'or, Quebec: The North Western Quebec RC will operate CJ2CNR 1200Z to 0200Z **May 14 and 15** to celebrate the 75th anniversary of the Canadian National Railway in the region. Operation will be CW and phone in the General portions of the 80, 40, 20 and 15-meter bands. For certificate, send QSL, contact no. and a 9×12-inch SASE to Vald'or Tourist Bureau, 20 3rd Ave E, PO Box 1543, Vald'or, PQ J9P 5Y8 Canada.

Broken Arrow, Oklahoma: The Broken Arrow ARC will operate AB5EE 1500Z **May 14** to 0300Z **May 15** to commemorate Rooster Days. Operation will be in the General phone and CW subbands and 146.91/.31. For certificate, send QSL and a 9×12-inch SASE to BAARC, PO Box 552, Broken Arrow, OK 74013.

York, Pennsylvania: Members of the York ARC will operate 0000Z **May 14** to 1900Z **May 15** to celebrate York as the first capital of the US. Send QSL to Millard Martin, NN3Z, 2070 Thelon Dr, York, PA 17404.

Carlisle, Pennsylvania: The Cumberland ARC will operate K3EIC 1300Z **May 14** to 0100Z **May 15** and 1300Z **May 15** to 0100Z **May 16** to celebrate the club's 30th anniversary. Operation will be phone and CW on the 160- through 6-meter bands. For QSL, send QSL and SASE to CARC, 107 Hilltop Rd, Boiling Springs, PA 17007.

Hawaii: Hawaiian hams will operate **May 15 through June 15** to commemorate the beatification of Father Damien. For QSL, send QSL, SASE and name of operator worked to Anne Shaver, AH2CU, 84-265 Farrington Hwy, Apt 608, Waianae, HI 96792.

Buckhannon, West Virginia: The Buckhannon ARK will operate WV8Y 0000Z to 2400Z **May 20** to celebrate the 53rd annual West Virginia Strawberry Festival. 1.887 3.887 7.287. For certificate, send QSL and a 9×12-inch SASE to Buckhannon ARK, WV8Y, PO Box 2044, Buckhannon, WV 26201.

Angels Camp, California: The Calaveras ARS will operate WA6YGA 1700Z to 0100Z **May 20** to **May 22** in celebration of the Calaveras County Fair and Frog Jumping Jubilee. Operation will be in the lower 25 kHz of the General 40, 20 and 15-meter subbands, 28.400 and 146.46. For certificate, send QSL and a 9×12-inch SASE to CARS, PO Box 391, Angels Camp, CA 95222.

Haines Falls, New York: The Long Island Mobile ARC's Junior Operators Committee will operate K2YEW **May 20 through 22** from their QRP Camping Weekend. 3.560 7.040 14.060. Send QSL to Robert Todaro, N2JIX, 2218 E 73rd St, Brooklyn, NY 11234.

Brunswick, Maine: Hams for the Maine Jamboree will operate K2BSA 2000Z **May 20** to 1700Z **May 22** from the Maine Boy Scout Jamboree. Operation will be in the General 160- to 10-meter subbands. For QSL, send QSL, contact no. and SASE to Robin Walls, N1NFK, 34 Tufton St, Brunswick, ME 04011.

Washington, DC: Boy Scout Troop 170 will operate K2BSA/3 1500Z to 2100Z **May 21** as part of "Scouting on the Mall." CW—Novice 40-meter subband; phone—General 20- and 15-meter subbands and the Novice 10-meter subband. For QSL, send QSL and SASE to Jay Chamberlain, KD4OOI, 27 Fox Run Ln, Fredericksburg, VA 22405.

Sacramento, California: Members of the Center for Military History and the Communications Detachment of the California State Military Reserve will operate 1600Z to 2400Z **May 21** to celebrate Armed Forces Day. Operation will be in the lower portion of the General 20 and 15, and the Novice 10-meter phone bands. For QSL, send QSL and a 9×12-inch SASE to station worked.

Baltimore, Maryland: The Maryland Mobileers ARC will operate WA3PIQ 1400Z to 2000Z **May 21** to honor the US Navy Submarine Service. 7.240 14.240 21.340 28.340 146.805/.205. For certificate, send SASE to MMARC, PO Box 935, Severn, MD 21144-0935.

Baltimore, Maryland/Washington, DC: The Bay Area ARS and Anne Arundel Country Historical Society will operate KM3I 1300Z to 2000Z **May 21** to commemorate the 150th anniversary of the "What hath God wrought" telegraph message. 7.125 14.125 21.125 21.225 28.125. For certificate, send QSL and a 9×12-inch SASE to Greg Ocfemia, BAARS, 419 Brooks Ct, Glen Burnie, MD 21061.

Monterey Park, California: The Monterey Park ARC will operate K6GIP 1600Z to 2300Z **May 21** to celebrate the 78th birthday of Monterey Park. 3.985 7.285 14.285 21.385 28.385 144.350. For certificate, send QSL and a 9×12-inch SASE to Monterey Park ARC, PO Box 403, Monterey Park, CA 91754.

Wheaton, Illinois: The DuPage ARC will operate W9DUP 1600Z to 2300Z **May 21** to celebrate Armed Forces Day. 7.040 7.250 14.290 28.400 145.25/144.65. For certificate, send QSL and SASE to Jack Carr, NV9S, DARC, PO Box 71, Clarendon Hills, IL 60514.

Erie, Pennsylvania: The RA of Erie will operate W3GV 1330Z to 2130Z **May 21** from the brig *Niagara*. Operation will be in the General 80- through 15-meter phone subbands and in the Novice 10-meter subband. For certificate, send QSL and a 9×12-inch SASE to RA of Erie, PO Box 844, Erie, PA 16512.

Scott ARB, Illinois: KF9IA will operate **May 21** to commemorate Armed Forces Day. Operation will be on the 160 through 10-meter bands. For QSL, send QSL and SASE to Kenneth Davis, KF9IA, 806 E Illinois St, New Baden, IL 62265-1921.

San Diego, California: The Convair ARC will operate W6UUS 1700Z **May 21** to 0500Z **May 22** to celebrate the 35th anniversary of the Atlas Centaur space launch vehicle. Operation will be in the lower portions of the General 40, 20, 15 and 10-meter subbands. For certificate, send QSL and a 9×12-inch SASE to Ken House, N6WLC, 10159 Embassy Way, San Diego, CA 92126.

St Charles, Missouri: The St Charles ARC will operate WBØHSI 1300Z to 2100Z **May 21 to 22** as part of the Lewis and Clark Rendezvous. 7.265 14.265 21.365 28.465 146.67/.07 AO-13. For certificate, send a 9×12-inch SASE to St Charles ARC, PO Box 1429, St Charles, MO 63302-1429.

Hanska, Minnesota: The New Ulm ARC will operate KBØIWV 1600Z **May 21** to 0400Z **May 22**

and 1600Z to 2300Z **May 22** to celebrate Hanska's 10th annual *Syttende Mai* Celebration. 7.250 14.250 147.33/.93. For certificate, send QSL and a 9×12-inch SASE to NUARC, Pat Mathiowetz, KBØIWV, RR4 Box 14-A, New Ulm, MN 56073.

Intake, Montana: The Lower Yellowstone ARC will operate 0000Z **May 21** to 2400Z **May 22** during the opening of the spring paddlefishing season. Operation will be in the 40, 20 and 15-meter General phone subbands and in the Novice 10-meter phone subband. For certificate, send SASE to Kaye Braun, N7AFE, PO Box 101, Savage, MT 59262.

San Angelo, Texas: The San Angelo ARC will operate W5QX 1500Z to 2300Z **May 22** during the Goodfellow AFB Air Show. Operation will be in the lower General portions of the 40, 20 and 10-meter bands. For certificate, send QSL, contact no. and a 9×12-inch SASE to San Angelo ARC, W5QX, PO Box 4002, San Angelo, TX 76902.

Bellevue, Nebraska: The Bellevue ARC will operate WØWYV 1300Z to 2200Z **May 28 and 29** from the Strategic Air Command Museum. Operation will be in the lower portion of the General 40, 20 and 15-meter phone subbands, and the Novice 10-meter phone subband. For QSL, send QSL, contact no. and SASE to John Sheffield, N4OWG, 1311 Greenwood Ave, Omaha, NE 68133-2526.

North Syracuse, New York: The Liverpool ARC will operate WA2ISC 2000Z **May 28** to 2200Z **May 29** to commemorate the Mid-Empire State Chapter 293 Vietnam Veterans of America's Watchfire VII. CW—lower 25 kHz of the General 40- and 20-meter subbands; phone—7.240 14.240; RTTY—on the 40- and 20-meter bands. For certificate, send QSL and a 9×12-inch SASE to LARC, PO Box 103, North Syracuse, NY 13212.

Poughkeepsie, New York: The Poughkeepsie ARC will operate K2KN 1200Z to 2400Z **May 28** and 1300Z to 2100Z **May 29** to celebrate the annual opening of the Locust Grove Historical Landmark. 3.703 7.103 10.103 14.230 21.103 For a certificate, send QSL and a 9×12-inch SASE to Theodore Zulkowski, K2JMY, 4 Bishop Dr, Poughkeepsie, NY 12603.

Sacramento, California: The North Hills RC will operate K6IS 1700Z to 0400Z **May 28 through May 30** to celebrate the 21st annual Sacramento Jazz Jubilee. 3.880 7.265 14.275 21.375 28.375 145.19/144.59 147.42. for certificate, send QSL, contact no. and a 9×12-inch SASE to NHRC, PO Box 41635, Sacramento, CA 95841-0635.

Massillon, Ohio: The Massillon ARC will sponsor W8NP 1500Z to 0200Z **May 28, 29 and 30** for Glory Days. CW—3.700 7.125 14.050 18.080 21.125 28.125; phone—3.870 7.270 14.270 18.150 21.350 24.950 28.350 and on 2 meters. For certificate, send QSL and a 9×12-inch SASE to MARA, c/o Don Wade, WD8DEA, 5245 Portage St NW, North Canton, OH 44720.

Elgin, Illinois: The Elgin ARS will operate W9IKN 1200Z to 1700Z **May 30** to commemorate the annual running of the Valley Fox Trot. Operation will be in the lower portions of the General phone and CW subbands. For certificate, send SASE to EARS, PO Box 1351, Elgin, IL 60123-1351.

Belleville, Michigan: N8BIB will operate 1200Z to 2300Z **May 30** from the Yankee Air Museum. Operation will be in the phone portion of the General 80 through 10-meter subbands. For certificate, send QSL and a 9×12-inch SASE to Frank Nagy, N8BIB, 24315 Waltz Rd, New Boston, MI 48164.

Special-Event Announcements: Items for this column can be sent on a *MS-DOS floppy disk* in ASCII format to ARRL HQ, fax at 203-665-7531, via modem (203-665-0090), via Internet (to contest@arrl.org) or in letter form. The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **Jun 1** to make the **Aug** issue. Please include the name of the sponsoring organization, the call sign of the special-event station, the city location, dates and times (Z), suggested frequencies and QSL information. Requests for donations will not be published.

QSLing Special-Event Stations: To get your QSL card or certificate from the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed, stamped envelope (SASE). If sending for a certificate, use a 9×12-inch envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail your QSL card and your SASE to the address listed or to the address given on the air by the station you QSO. Be patient; special-event stations often print their cards and/or certificates after the operation is over so they'll know how many to order. QST

Contest Corral

Continued from page 136

VK worked on 3.5 MHz. Multipliers are zones, continents, DXCC countries and US/VE/Japan/Australian call areas. Contacts within own country count for QSO credit, but not for multipliers. Final score is QSO points × countries worked × continents worked + bonus points. Awards. Send logs by Sep 1 to Contest Manager, ANARTS, PO Box 860, Crow's Nest, NSW 2065, Australia.

16

W1AW Qualifying Run, 10 to 35 wpm, 0200Z Jun 17 (10 PM EDT Jun 16). See May 11 listing for details.

18-19

All-Asian DX Contest, CW, sponsored by the Japan Amateur Radio League, 0000Z Jun 18 until 2400Z Jun 19. (phone contest is Sep 3 and 4). 160 through 10 meters. Entry classes: Single operator, single band; single operator, multiband; multioperator, multiband. No crossband QSOs. Single operators may have only one transmitted signal at any given time. Multioperators may have a maximum of one signal per band. Exchange signal report and a two-digit number denoting the operator's age. YL stations may send 00. Count 1 point per QSO with Asian stations on 7 through 28 MHz, 2 points on 3.5 MHz and 3 points on 1.9 MHz. Multiply by the number of different Asian prefixes (WPX rules) worked per band. Note: JD1 stations only on Ogasawara count for Asia. Use separate logs for each band. Mark multipliers the first time worked. Provide a complete summary. JARL Asian countries list: A4 A5 A6 A7 A9 AP BV BY EK EX EY EX EP HL/HM HS HZ/7Z JA-JS JD1 JT JY OD S2 TA UA/UW-UZ/RA/RV-RW/RZ9-0 UN-UQ V85 VS9M/8Q VU XU XV 3W XW XX9 XZ YA YI YK ZC4 5B4 1S 4J 4L 4S 4W 4X/4Z 7O 9K 9M2 9N 9V. Enclose SAE and IRC for results. Mail logs to arrive by Sep 30 (Nov 30 for phone) to JARL, PO Box 377, Tokyo Central, Japan.

SMIRK QSO Party, sponsored by the Six Meter International Radio Klub, 0000Z Jun 18 until 2400Z Jun 19. Six meters only, all contacts between the 48 contiguous states must be made above 50.125 MHz. Exchange call sign, SMIRK no. and grid square. No crossband or partial contacts allowed. Scoring: 2 points for each contact with a SMIRK member and 1 point for each contact with a non-SMIRK member. Final score is total points × total of grid squares worked. Send a legal-sized SASE for copy of log forms. Awards. You must be a paid-up SMIRK member to receive contest awards. Others may exchange SMIRK no. for points. Send log requests or logs (postmarked no later than Jul 6) to Pat Rose, W5OZI, PO Box 393, Junction, TX 78649.

24

W1AW Qualifying Run, 10 to 35 wpm, 1300Z Jun 24 (9 AM EDT). See May 11 listing for details.

25-26

Field Day, see this issue, p 132.

Contest Announcements: Items for this column can be sent on a 5¼- or 3½-inch MS-DOS floppy diskette in ASCII format to ARRL HQ, fax at 203-665-7531, via modem (ARRL HQ BBS, 203-665-0090), via Internet (to contest@arrl.org) or in written form. The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **Jun 1** to make the **Aug** issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111. QST

Strays

I would like to get in touch with...

◊ anyone with information (schematic, instruction or service manual) for an FXR model 2800A spectrum analyzer with its model S-900B S-band head. There has been no reply from the address on the unit: FXR Inc, Electronic X-Ray Division, Woodside 77, NY. Pierre Dehez, ON4IV, 10 Chausee de Wavre, 1370 Jodoigne, Belgium.

I would like to get in touch with...

◊ anyone who has designed and built an enclosed station console. I'm interested in "lessons learned," such as equipment placement, utilities, RF shielding and ergonomic considerations. Dennis Ashworth, K7FL, 15035 S Greentree Dr, Oregon City, OR 97045.

◊ other hams who are Coast Guardsmen or former USCG who would like to establish an informal Coast Guard Ham Operators Club. Please send an SASE for full information to Don Gardner, AD4PT, 3908 Briarwood Ave, High Point, NC 27265-1204.

***QST* congratulates...**

◊ ARRL Technical Advisor Jerry Sevick, W2FMI, of Basking Ridge, New Jersey, on having his paper "Design and Realization of Broadband Transmission Line Matching Transformers" published in the Institute of Electrical and Electronics Engineers (IEEE) Emerging Practices in Technology (EPT) series. Papers published in the EPT series cover practices in areas of technology that have been reviewed by peers in relevant IEEE committees and that may have potential for future standardization. Jerry is the author of the ARRL book *Transmission Line Transformers*.

Section News

Administered by Steve Ewald, WV1X

The ARRL Field Organization Forum

Field Organization Abbreviations	
ACC	Affiliated Club Coordinator
ARES	Amateur Radio Emergency Service
ASM	Assistant Section Manager
BM	Bulletin Manager
BPL	Brass Pounders League
DEC	District Emergency Coordinator
EC	Emergency Coordinator
LGL	Local Government Liaison
NCS	Net Control Station
NM	Net Manager
NTS	National Traffic System
OBS	Official Bulletin Station
OES	Official Emergency Station
ORS	Official Relay Station
OO	Official Observer
OOC	Official Observer Coordinator
PBBS	Packet Bulletin Board Station
PIC	Public Information Coordinator
PIO	Public Information Officer
PSHR	Public Service Honor Roll
SGL	State Government Liaison
SEC	Section Emergency Coordinator
SM	Section Manager
STM	Section Traffic Manager
TCC	Transcontinental Corps
TA	Technical Advisor
TC	Technical Coordinator
TS	Technical Specialist
VC	Volunteer Counsel
VCE	Volunteer Consulting Engineer
VE	Volunteer Examiner

ATLANTIC DIVISION

DELAWARE: SM, Randall K. Carlson, WB0JJX @ WB0JJX–Feb saw the worst ice storm in many years hit the DE coast. The southern half of the state was a block of ice. Amateurs from all 3 counties were requested to assist the Red Cross to man shelters and Emergency Centers in Kent and Sussex Counties and the state EOC for 52 straight hours! Thanks to the following for their assistance during this disaster: WA3PHT, N3FRO, WA3EWK, KC3TI, WB3FUP, N2BJV, WA3I, KB3PD, N3KPT, WA3HDS, N3HZN, N3QJL, WB3HSP, NS3E, KA3JCA, WB3ILO, KE3DM, K3BY, N3OAE, KA3MJM, N3JCP, WB3ILS, WB3ILV, N3KRX, KA1FYL, K3JP, KC3OO, N3KWW, NR3W, K4CHE, N3KH, N3OMO, N3BUH, N3IOC, WB3AXX, K3PFW, K3KNT, MW3Y, W3BEZ, N3IBE, N3AWP, KD3AL, N3QJK, N3JRB, N3NPH, W3CDY, NEOEG, K3JL, KA3JVL, N3LGO, N3IJI, KA3NZY, N3IOD, N3CGQ, N3HPA, KA3UGT, KD3UI. 73, Randall.

EASTERN PENNSYLVANIA: SM, Bob Stanhope, KB3YS @ N3KDS–ASMs: W3ZXV @ N3ACL, WB3FPL @ WB3FYL, K3DCU @ N3KDS, WA3PZO @ WB3JOE, N3ECL. ACC: N3HMD @ WB3FYL. BM: KD3OA @ KD3OA. OOC: W3IS. PIC: W3ZVX @ N3ACL. SGL: WA3IAO @ WA3TSW. SEC: KB3QW @ KB3QW. STM: W3KOD @ KB3QW. TC: WB2LGJ @ WB3JOE. A previous unknown situation involving amateur license plates was recently discovered and resolved by Glenn Kurzenknabe, K3SWB. His old-style vanity amateur license plate was starting to look a little rough, so he requested to have it replaced. The Dept of Motor Vehicles refused on the grounds that they won't have 2 current license plates in circulation. He promptly contacted his Representative, Bruce Smith, of York County, and explained the problem. As a result of his quick action, you can now get a replacement by following these 3 steps: (1) Obtain a copy of form MV-904. This is the standard form you used to get for your original plate. (2) Take your current plate off the car and make a photocopy of it and (3) Send this and the $20 fee for your new tag. Thanks, Glenn, for passing this along. Members of the Delaware Lehigh ARC were recently written up in the local newspaper for their volunteer efforts in helping nurses and other essential personnel get to work after the heavy winter snows we've seen this winter. In a plan conceived early in 1993 Emergency Coordinator Clarence Snyder, W3PYF, and local officials recognized a need for this service. They lined up local hams with 4x4 cars and trucks and hospital officials made a list of employees who might need their service. In the face of heavy snows, the amateurs were assigned people to transport. The hams then worked out arrangements directly with these key personnel and saw to it that they got to work on time. A nifty idea, as here in this area, doctors and nurses were reported to sleep in service areas so they could be available for work! Until next month, 73 de Bob, KB3YS. *Tfc* (Feb): Official Relay Stations: W3KOD 565, N3DRM 468, N3AT 118, N3CSE 108, W3HK 92, W3DP 85, N3DEJ 76, W3ADE 73, N6FLT 68, W3IPX 57, W3JKX 56, N3EFW 33, KD3AO 32, W3KAG 32, AA3CN 27, W3NNL 25, WC3F 23, WA3WQP 21, WB3EVL 18, N3FLE 15, W3IVS 15, K3TX 15, WA3CKA 13, KA3KMH 13, N3DCG 11, KA3FTG 11, N3KWO 10, W3BNR 9, KA3TOV 9, WB3GCX 8, W3TWV 7, K3ARR 5, KA3LVP 5. BPL award to W3KOD, Orig 1. Rcvd 284, Sect 273 and Divd 7. Total 565. PSHR: N3DRM 1/60 2/24 3/24 4/48 5/32 6/0 Total 188. AA3CN 1/48 2/15 3/0 4/1 5/1 6/10 Total 73. *Section Nets:* CCAR 77/2, D6ARES 96/26, EPA 285/202, EPAEPTN 396/146, LHCARES 136/1, MARCNET 39/1, MARCTN 174/32, NLCARES 48/16, PFN 214/82, PTTN 149/72, SCESN 91/10, SEPTN 90/1 and WCARES 33/1. *@PBBS:* N3DPU 9/9, WB3JOE 19/19 and WA3TSW 6/7.

MARYLAND/DC: SM: Bill Howard, WB3V, 410-551-6775–ACC: Tony Young, WA3YLO @ KA3RFE, 301-262-1917. ASM: Jerry Gavin, NU3D @ WB3V, 410-761-1423. ASM/RACES Coord: Al Nollmeyer, W3YVQ. ASM/Youth: Cynthia Mann KA3ZNQ, 410-647-0005. BM: Bill Dillon, WA3SCW @ WB3V, 410-787-1580. PIC: Mel Morenz, N3EKZ @ WB3V, 410-760-9426. SEC: Mike Carr, WA1QAA, 410-799-0403. STM: Bruce Fleming, N3EGF @ K3HKI, 301-663-6582. TC: Bob Bruninga, WB4APR @ WB3V, 410-553-6021. I have, so far, received 1994 annual ARRL Club Report Forms (FSD- 2) from the following clubs: BRATS, Metrovision ATV, US Naval Academy, Easton ARC, Leisure World ARC, S PAX ARC, Moose ARC, Chesapeake Bay ARC, Potomac Area VHF Soc, Somerset Co ARC, Antietam RA. Thank you and I look forward to receiving input from our clubs throughout the year! Congratulations to new appointments: K2EB Asst SEC, N3PDK OES, WA3FYZ ORS and N3BWF PIO for the MMARC. The number of new appointees continues to rise and I encourage you to seek these volunteer appointments! Give one of us a call to find out how. A Section cabinet meeting was held Mar 19 and results will be forthcoming in the next MDC Section News. Field Day is just around the corner. I hope your club is in the final stages of planning for this event. Have you made signs so that visitors can understand what's going on? Do you have a single-page leaflet with information on your club that you can pass out to visitors? Look for me at the ARRL table in the hamfests. 73, Bill. With the nets–*NM/QND/QTC/QNI:* MSN/KC3Y 28/44/398, PON/W3DFW 22/2/220, MDD/WJ3K 66/177/398, (MDD Top Brass K3JL/133 KC3Y/103 W3YVQ/100 WA3YLO/100) MEPN/KK3F 28/103/398, MEPN (Late entry Jan):KK3F 31/172/681, MPTN/K2EB 28/61/538. *Tfc:* KK3F 615, K3NNI 364, WB3V 160, WJ3K 104, K3USO 102, KC3Y 93, WI3A 85, W3UT 84, W3YVQ 67, N3PDK 53, N3EGF 52, N3LDY 35, N3DE 31, WA1OAA 28, KJ3E 20, KA3T 20, KX3U 17, WB3LTA 15, W3DQI 15, NU3N 14, K3ORW 13, W3SWD 10, KA3ZCI 7, WN3C 4, KE3FL 4, KC3ME 4, WA3FYZ 4, K2EB 3, WA3GYW 2, PSHR: KK3F 191, W3YVQ 155, WJ3K 152, N3PDK 125, KC3Y 121, KJ3E 99, WB3V 92, N3LDY 90, WI3A 89, WB3LTA 77, KA3CZI 74, WN3B 70.

SOUTHERN NEW JERSEY: SM: Bruce Eichmann, KE2OP (@ K2AA)–ASM: W2OB, KA2YKN, WB2LOO, KB2ADL, K2GA. SEC: W2HOB. STM: WB2UVB. ACC: K2IXE. TC: W2EKB. SGL: K2GA. BM: N2LCR. OOC: K2RCG. PIC: WA2ABF. TSs: K2JF, W2PAU, AB2Y, WB2MNF. I recently visited the New Lisbon Developmental Center ARC to present the ARRL Charter to the club. Sgt Trent Davis of the State Police is its counselor and is doing a great job with this new venture. The following is a list of VE testing opportunities: OMARC, 2nd Wed each month, 6 PM, Ft Monmouth MARS Station in Eatontown. Contact Gerry Silverman, WB2GYS, 908-741-9490. OBARC, quarterly at Ocean Co Recovery Center in Manahawkin. Contact Dave Burgess, WA2TVS, 908-698-2872. JSARS, quarterly on the 3rd Sat, Amvets Post no 2 in Jackson. Contact Dave McCauly, WJ2F, 908-350-5363. DVRA, quarterly at the Mercer County Library, Hopewell. Contact Dave Wright, AA2F, in Pennington. Bellmawr, 3rd Thu each month, Bellmawr Community Center, 1 block E of the Black Horse Pike. Contact Bill Helmetag, WA2VQG, 609-546-7710. Until next month, 73. *Tfc:* WB2UVB 202, WA2CUW 142, K2UL 92, K4FFM 19 N2FHJ 18, N2WFN 16, KB2CDB 14, KA2CQX 12, N2SXO 12 W2AZ 11, W2FFE 11, KA2ANJ 9, N2FET 9, K2JJC 4, KB2HJJ 4, N2EPH 4, N2SOE 2, N2TGM 2, WB2IOE 2, WA2JSG 2.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA–Mar *QST* lost Dec BPL: N2JAW 2566, AA2CX 1516, N2LTC 1149, KA2GJV 857, WB2IJH 702, W2MTA 629, KA2ZNZ 248. Thanks to 44 stations for Dec traffic of 12,000 points: N2JAW, AA2CX, N2LTC, KA2GJV, WB2IJH, W2MTA, KB2JRT, ND2S, W2FR, WI2G, KB2DQ, KA2ZNZ, WB2OIX, K2YAI, KG2D, NY2V, KA2ZKM, AF2K, N2UIT, N2SAA, N2ULY, KB2ETO, K2DN, N2JOA, N2GUN, NU2U, N2JRS, WA2UKX, N2DLN, KF2MH, KA2DBD, N2WKT, N2VDT, KA2SJG, N8JSO, N2TOY, N2EVG, W2DBU, KB2KOJ, KA2JFU, WB3CUF, N2SSS, N2SRE, N2RYT. *Feb BPL:* N2JAW, N2LTC, PSHR: K2BCL, W4BNY, AA2CX, KG2D, N2DLN, K2DN, KB2DQ, AA2ED, KB2ETO, W2FR, WI2G, KA2GJV, N2GUN, WB2IJH, N2JAW, N2JOA, KB2JRT, N8JSO, AF2K, KB2KOJ, N2LTC, W2MTA, WB2QIX, N2RYT, ND2S, N2SAA, N2SSS, WA2UKX, N2ULY, N2UQE, N2VBM, N2VDT, N2WKT, K2YAI, KA2ZKM, KA2ZNZ. Appointments: (EC) N8JSO Wyoming; (PIO) WB2WNV; (OBS) KB2JRT; (OES) W4BNY Oneida-Madison (ARES) Emergency Net had 72 stations last year. OMEN recognition awards: KB2ACA, W4BNY, N3DXJ, WB2HLY, KB2KOJ, N2LWZ. KB2MAS, KA2RCF, N2SSS, WA2VCN, K2YAI and KA2ZNZ—KB2JRT EC. CLUBS: Champlain Valley ARC officers KB2LML, KF2GC, WA2WXG, N2VNF, KA2MOO with Awards Dinner recognizing support by many—City of Plattsburgh and WPTZ-TV; Loyal LeCuyer W2UXC Award to KD2AJ; other recognitions to LM KA2MOO, KA1FQR, NG1P, K2KZZ, WA2LRE, N2WXE and WA2WXG. CVARC reports HF rig gift from K2DFS to Petrova Middle School ARC-KF2GC.

Net Name	Time	QNI	QSP	IN	Net Name	Time	QNI	QSP	IN
EBN FM	0530	329	000	20	Blueline	1900	233	023	22
NYSEMOSB	0900	081	007	04	NYS/E*CW	1900	336	142	28
NYSR CW	0930	026	004	04	BroomeFM	1930	014	000	04
NYS/M*CW	1000	330	191	28	OMEN FM	1930	020	004	02
CHN SB	1100	265	270	28	JCRAC FM	2000	518	035	28
WDN/M*FM	1100	617	094	28	OARCN FM	2000	050	001	04
NYPHONE*	1300	296	314	28	TIGARDS	2000	025	004	04
NYPON*SB	1700	392	245	28	VHF THIN	2000	075	000	04
ESS CW	1800	354	107	28	BRVSN FM	2100	255	005	28
NYSPT&EN	1800	435	057	28	Oneonta	2100	018	000	04
LCARES	1800	027	000	04	CNYTN*FM	2115	364	070	28
OCTEN/E*	1830	1121	106	28	OCTEN/L*	2130	302	064	28
O Net FM	1830	581	001	28	WDN/L*FM	2130	618	169	28
STAR* FM	1830	346	037	28	NYS/L*CW	2200	235	155	28
WDN/E*FM	1830	732	286	28					

**NTS Net*

DIGILINK: N2JAW R = 1260, S = 1180. Hamfests: Owego May 7, Auburn May 14, Rochester May 20-22, Rome Jun 4, Lancaster Jun 12, Cortland Jun 18, Batavia Jul 10, Old Forge Traffic Handlers' Picnic Aug 6, Buffalo Sep 17, Elmira Sep 24, Syracuse Oct 15. Please check *QST* p 8 for correct address of SM W2MTA; changed to 5460 Rock Rd, no more rural delivery! Many club newsletters have wrong address. Membership renewals are at discount prices through your affiliated club. Save bucks or let club treasury grow as you renew ARRL membership. Got a friend who isn't a League Member? Sign 'em up! *Tfc (Feb):* N2JAW 1104, N2LTC 837, AA2CX 371, WI2G 337, KB2JRT 320, W2MTA 302, W2FR 262, KB2DQ 245, K2BCL 207, KA2GJV 200, WB2IJH 190, ND2S 134, KA2ZNZ 128, W4BNY 106, WB2QIX 83, N2ULY 80, N2SAA 79, K2YAI 70, AF2K 69, WA2UKX 66, N2GUN 57, KA2ZKM 57, N2JOA 56, N2UIT 53, N2UQE 53, K2DN 52, KG2D 51, AA2ED 48, N2VBM 35, N2WKT 34, N2DLN 22, N2VDT 21, WB3CUF 17, KA2DBD 17, N2SSS 16, KB2ETO 14, KB2KOJ 13, N2OOE 13, N2UIW 13, N2RYT 12, N8JSO 9, NU2U 8, KA2SJG 8. BPL: N2JAW 1104, N2LTC 837.

WESTERN PENNSYLVANIA: SM, Bernie Fuller, N3EFN (@ WA3ZCA)–Is your club affiliated? We have 48 affiliated clubs in WPA. The process of affiliation is simple—just a note to the Affiliated Club Program office at ARRL HQ will bring the info, or if you want to explore this valuable adjunct to your club's operations closer to home, call or write Stew Saylor, AK3J, the ACC for WPA Section, and he'll help. Benefits? To name a few: Quarterly distribution of *Field Forum*, a special newsletter for and about clubs and Amateur Radio; ARRL-sponsored liability and equipment insurance; discounts on new and renewal ARRL memberships; participation in the gavel categories in several national/international ARRL contests. Join the fun—and join a winning team–by affiliating. Field Day is just a month away—the SM will be making site visits again this year—send your schedule and location to be included. ATL Div Convention: Rochester, NY, May 20-22. A special seminar will be held Fri, May 20, for club representatives—join us for the latest info from the ARRL and the world of Amateur Radio in general. Silent Keys: W3YWL, K3NK, KA3BEI, N3HVB, WO3L...RIP. Special event: RA of Erie will operate aboard the historic brig USS *Niagara* on May 21 on HF and VHF. Club officers: Univ Pittsburgh Panther ARC: pres N3PPU, vp K3VOO, secy/newsltr KA3WCA, bus mgr N3NPY, station mgr N3JNN, advisor WA3TBL. Congrats: North Hills ARC and Butler County ARA on their participation with local schools in the SAREX on STS-60. This joint club effort paid dividends in successful contacts being established. Warren County ARES for going the extra mile and providing outstanding support to the sled dog races in Feb. I recently had the opportunity to use the mailing list program created by Bob, N3FAW, of Erie—another outstanding example of ham expertise. Landline BBS: Beaver Valley ARA BBS 412-775-7536, up to 9600 bauds (8-N-1), MNP 5, v42bis, using a CD-ROM with more than 1100 Amateur Radio programs. ARRL HQ BBS 203-666-0578. Internet: ARRL Technical Information Service tis@arrl.org, ARRL Educational Activities Dept ead@arrl.org. Use these services to increase your ham knowledge. Emergency: Ask your EC about the WPA Section Emergency Response Team—you could be qualified to participate. *WPA nets:* WPACW 3585 kHz, 1900 local; WPA Phone Tfc 3983 kHz, 1800 local. Check-in and get involved in the NTS.

CENTRAL DIVISION

ILLINOIS: SM, Sharon Harlan, WB9SFT–SEC: W9QBH. STM: K9CNP. OOC: KD9UL. BM: K9EUI. SGL: K9IDQ. PIO: N9EWA. ACC: KI9G. TC: N9RF. DEC: WD9EBQ.

Net	Freq	Time
ISN	3905	1800 Dy
ILN	3665	1830 & 2200 Dy
ITN	3680	1900 Dy
CTN	147.69/09	2100 Dy
ILARES	3905	1630 1st & 3rd Sun
IEN	3940	0900 Sun
ILPN	3855	1645 M-F; 0830 Sun
NCPN	3915	0700 M-Sat
NCPN	7270	1215 M-Sat

As the ranks of the amateur fraternity expand at a rapid rate, the need for good public relations becomes more important. The relationship clubs maintain with local news media is critical to getting the word out on where Amateur Radio fits into the social scheme of the community. Each club should have a person to handle the PR functions. If your club has a PIO, have him/her let me know what's being done in your area to spread the word about Amateur Radio. If you're participating in a public service event, let the news media and the SEC know. He's dedicated to helping you do the job better. "Tornado season" begins in Mar. In our Sec-

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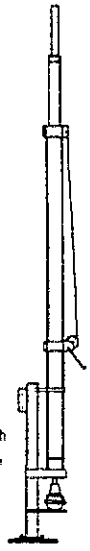

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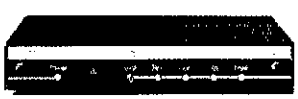

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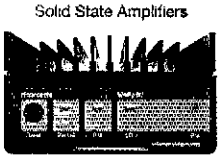

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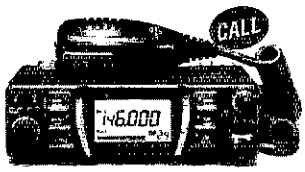

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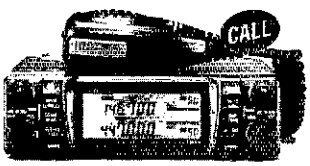

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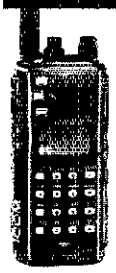

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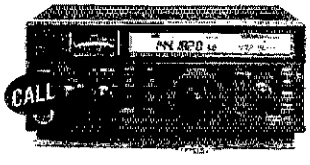

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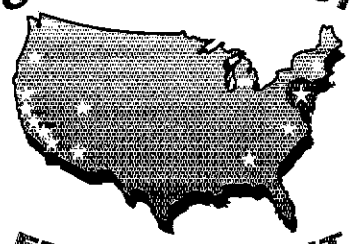

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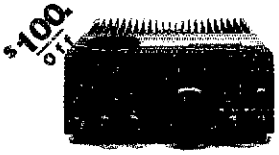

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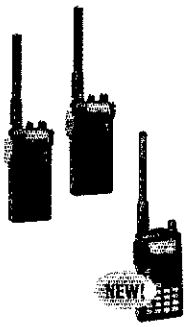

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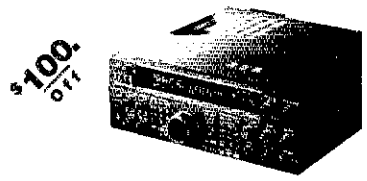

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NEW DSP on RX + TX • NEW CW Memory Keyer
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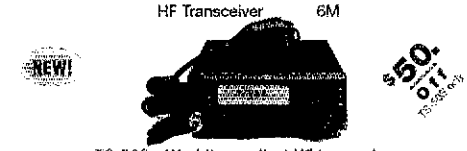
General Coverage RX • Built-In AC Supply

TS-50S/TS-60S

HF Transceiver 6M



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100W out, (90W TS-60S, 50MHz only) • SSB, CW, AM, FM,
12V Gen. Cov. RX, 6.4 lbs., 7.16 x 2.4 x 9.32"
105 db dynamic range, 100 Mems.
Optional external ant. tuners available (TS-50S only)

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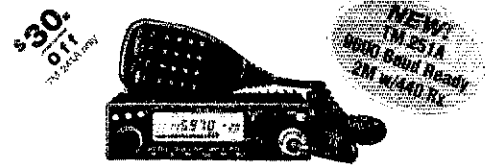
2 Mtr 220Mhz 70cm 1200Mhz
Aircraft RX



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2M 440 w/Extended RX

Dual Receive
Dual Display
Alpha-Numeric
Display, Too!
DTSS & Message Paging
250 Mem. w/optional
memory unit

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HANDHELDS

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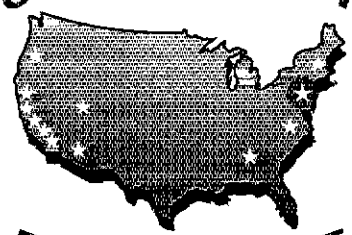
2M/2.5W DTSS
240 Mem.
w/optional mem. unit
UHF RX

TH-22AT

Ultra Compact
2M HT, 5W optional
40 memories
Encode Built-In

COAST TO COAST



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- 5W optional

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- 2.5W STD, 5W optional
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C188A
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C5718DA
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- 40 Mem. channels, 9600 Baud Ready
- CTCSS Enc/Dec Standard

CALL FOR SPECIALS ON C168A & C528A, C158A, & CCR708A!

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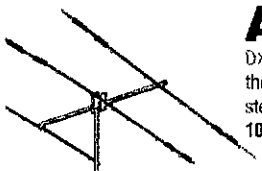

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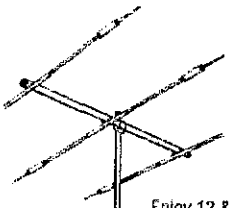
DX that stands out from the crowd. With stainless steel hardware
10, 15, 20 METERS

Mast not included

Whether busting pile-ups, rag chewing or hunting rare DX, the A3S stands out from the crowd with the perfect combination of easy assembly, the right size, rugged durability and great performance.

Boom Length 14 ft.
Weight 27 lbs.
Wind Surface Area - 4.36 ft.

REG. $445. ***SALE $379.95***



A3WS

New 12 & 17 Meters
DUO-BANDER

*Optional A103 30 Meter Add-on
REG. $140. ***SALE $109.95***

Enjoy 12 & 17 meter bands with full performance beam. Easy-to-use kit adds 30 meters. Mount on lightweight tower/ rotator or use with existing tribander. A3WS has all aluminum construction w/ stainless hardware.

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14, 18, 21,24,28 MHz Half Wave Vertical

Broadband impedance matching network/ all 5 bands
Fully automatic frequency selection
Four 48" long counterpoise rods/ excellent isolation
No radials required

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R7

7,10,14,18, 21,24,28 MHz
7 Band Half Wave Vertical

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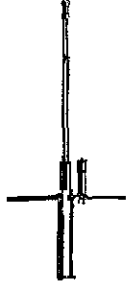
Fully automatic frequency selection, complete with stainless counterpoise.
No radials required. ***SALE $379.95***



AR-270

New Dual Band Ringo

The AR-270 has Ringo Ranger technology in a durable all aluminum antenna with stainless steel hardware. Instant assembly and 3 short radials make it easy to install anywhere. AR-270 features sealed phasing coil and base matching network with single 50 Ohm cable connection.

2 Meters (144-148 MHz)
70 CM (435-450 MHz)
Height: 3.75 feet

REG. $83.00 ***SALE $69.95***

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CALL NOW FOR SPECIAL PRICING!

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2M/440
Dual Band

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40 Mem Channels
DSQ, Dual Display
CTCSS Enc/Dec Built-in
Cross Band Full Duplex

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2M Mobile

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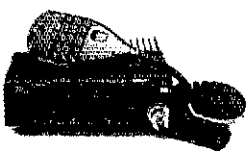

2M, 50W compact TCVR, Runs cool,
20 Memories, expandable to 100 Mems
with optional EJ-19U, CTCSS encode built in,
Tone SQL optional (EJ-20U)
Call Now For Special Low Price!

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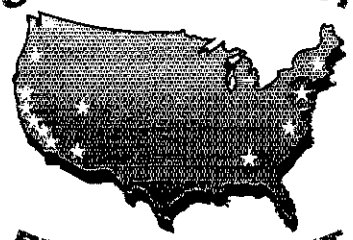

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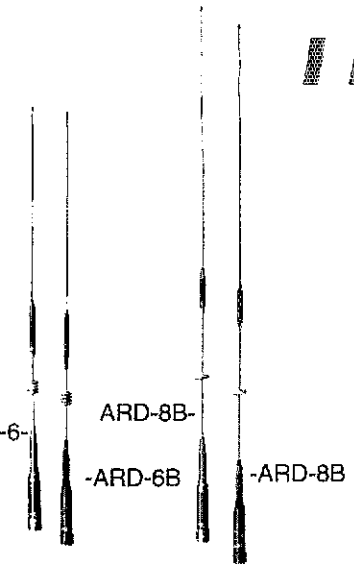

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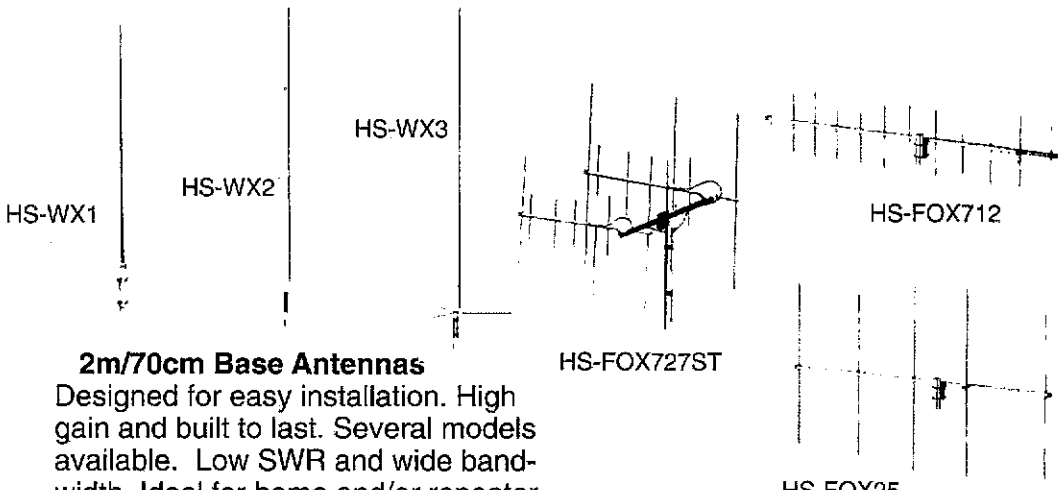

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Designed for easy installation. High gain and built to last. Several models available. Low SWR and wide bandwidth. Ideal for home and/or repeater use! Your communications edge.

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Everything you need for 2m/70cm fun, from lightweight 3 and 5 element yagis to interlaced 2m/70cm models. Stacked versions too! Also great for OSCAR satellites!

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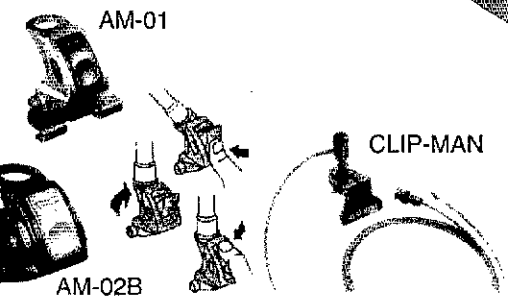

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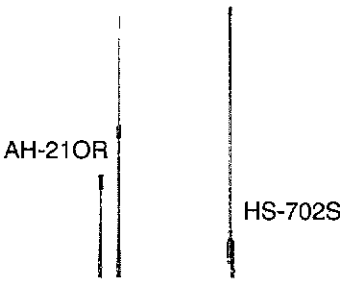

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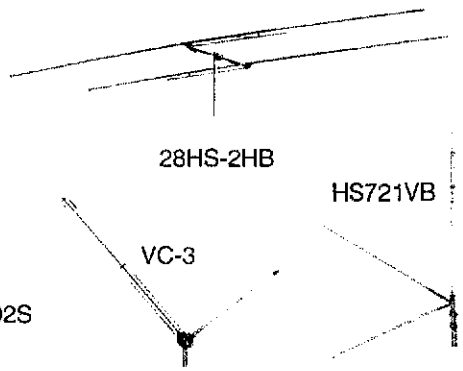

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tion, SKYWARN nets are an important part of ARES and are coordinated by SKYWARN ECs, who are responsible for the Amateur Radio SKYWARN activities for a specific NWS office. These activities include establishing the SKYWARN nets, liaison between the nets and the NWS, activation procedures, training NCSs and coordinating spotter training sessions at club meetings. The NWS offices value our assistance and have been a source of good publicity for Amateur Radio. Contact your local EC, or if you don't know who that person is, contact the SEC, W9QBH for info on how to get involved. Better yet, volunteer to be the EC for your county! The Feb W9VEY Memorial Net report: Check-ins 120, traffic passed 9, NCS WA9RUM. *Tfc:* K9CNP 201, NS9F 180, KF9ME 58, KA9IMX 56, W9HOT 50, W9HLX 40, WB9TVD 33, K9WMP 22, WA9RUM 6, KA9EGW 4.

INDIANA: SM, Peggy Coulter, W9JUJ—SEC: K9ZBM. ASEC: WA9ZCE. STM: KJ9J. OOC: KA9RNY. SGL: WA9VOO. PIC: KK9G. TC: KF9IQ. BM: WB9AHJ. No SKs reported this month. Decatur Co ARES/RACES was a primary sponsor of possibly the largest spotter class in the state. Shawn Harley of NWS presented the new spotter-certification course with outstanding support, with an estimated 120 people from fire, EMS, police, Amateur Radio and public in attendance. WB9AHJ appreciates reports from OBS W9EPT, N9FOZ, N9GAF, WA6OIZ, N9PSG, KA9QME and K9SBW. If you'd like to be an OBS, let WB9AHJ know. He'll gladly send you the bulletins to read on your local nets. DECs reporting: N9DTG, N9GSX, WB9VOK, KA9DZM and W9KGE. If your DEC isn't listed, get on him/her to send in their reports. There's much going on with the Southern IN Network for packet. Hopefully there will be a connection between north and south, which has always been a problem. There's also going to be a connection between east and west in the southern part of the state, which is badly needed. Congratulations to Kenneth Wezeman, N9OIL, new radio officer of St Joseph Co CD, and Jerry Wallis, N9KBV, communications officer, 2-meter NMs, please send a monthly report of activities (sessions, QNI, QTR, QTC) to KJ9J. NMs ITN/W9UMH, QIN/NR9K, ICN/AA9HN, WN/WA9OHX. VHF/KJ9J, PBBS/WJ9U.

Net	*Freq*	*Time/Dy/UTC*	*QNI*	*QTC*	*QTR*	*Sess*
ITN	3910	1330/2130/2300	2164	392	1350	84
OIN	3656	1430/0000	354	181	714	54
ICN	3705	2315	250	127	770	27
IWN	3910	1315	1712	-	280	28
IWN	VHF	Bloomington	418	-	420	26
IWN	VHF	Kokomo	595	-	140	28
IWN	VHF	Northeast	750	-	560	28
Hoosier VHF nets (8 nets)			1159	47	1086	52

9RN 353 QTC in 56 sessions represented 100% by K9PUI, NR9K, KJ9J, W9FC, WA9QCF, WB9UYU and N9HZ. Packet BBS reports, N5AAA/16,992 and WD9FVX/503. *Tfc:* NR9K 370, W9FC 255, W9UMH 132, KJ9J 124. AA9HN 81, K9GBR 79, W9EHY 67, K9PUI 61, KB9CMW 57, W9JUJ 49, WA9OHX 46, N9JAI 22, WA6OIZ 22, WB9IHR 19, K9DIY 15, W9EPT 14, WB9AHJ 14, W9CSJ 12, KA9QME 9, WD9CIV 6, K9KAL 5, N9PSG 4, WB9NCE 4, K9OUP 4.

WISCONSIN: SM, Richard R. Regent, K9GDF—ASM: K9FHI. SEC: WB9SMM. STM: K9KSA. OOC: N9CAP. BM: WB9JSW. SGL: W9RYA. PIO: K9ZZ. TC: K9GDF. ACC: K9FHI. Cedarburg Swapfest Circle-B Recreation Center, Hwy 60 and County I, May 7. Lakeshore Hamfest and Computerfest at Manitowoc County Expo May 7 with exams available nearby. Fox Cities ARC officer elections will be held at May 17 meeting. KA9LXK awarded WAC and WAS. Exams coming up this month: May 7 Manitowoc, Racine & Cedarburg; May 14 Madison & Medford; May 18 W Allis; May 28 Wauwatosa. Would you like to learn more about the Official Observer program or become an OO? Contact N9CAP of Milwaukee. WD9ADB, Technical Specialist, gave program on repeaters at the Rock River RC. W9YCV puts ham radio aside only when using his new garden rototiller. Remind your club to start plans for Field Day. WB9SMM, SEC, promotes packet radio and ATV for emergency communications. Sorry to report Silent Keys K9EVH and WA9UXL. Let me know if you'd like a tree list of 100 WI nets. Thought of the month: Never speculate on that which can be known for certain. *Tfc:* WB9YPY 1878, W9AYK 1060, W9IHW 565, W9CBE 494, KB9GFX 311, K9DHR 252, W9YCV 156, K9CKC 127, N9KHD 117, N9BDL 100, K9KSA 76, WB9JSW 69, KA9KLZ 69, AG9G 67, KE9VU 61, KA9FVX 51, W9NGP 36, KB9ENO 36, K9JPS 36, W9ODV 35, NS9Q 33, WB9ICH 31, K9FHI 31, K9GU 28, KA9BHL 28, KG9B 27, W9PVD 27, N9BCX 24, W9UW 19, N9JIY 14. *(Jan)* K9UTO 30.

DAKOTA DIVISION

MINNESOTA: SM, Randy Wendel, NØFKU—On Mar 10, a presentation was made at the annual meeting of the Gov's committee on disaster mgmt. Emergency mgrs from all MN counties attended this conference. We gave an overview and demo of Amateur Radio and its role as a valuable communication resource during times of emergencies. The opportunity to talk about Amateur Radio at this conference was (hopefully) a big step in Amateur Radio awareness in our state, in that almost every county Em Mgr now has a better understanding of our service. Though the demos were brief, I think it planted a seed for future awareness/opportunities, for you, in working more closely with your county govt. Why not make contact with your ARES EC/county, city EMs and develop/renew a working relationship through the resources we have to offer in communications? Perhaps it's perfect timing for a Field Day invitation! My heartfelt thanks go to the 2 main people who pushed for this event as part of the DEM conference: Bob Brown, NØRHD (Winona Co EM), Dave Carr, NØPGO (Olmstead Co EM). Thanks also to the following for their coordinating and presentation efforts: Frank Balak, NØSND, and Mike Mihelich, NØVFW (Waseca); Mark McCormick, KAØPEB (Albert Lea); Scott Williams, NØSVT (Richfield EM); Dayton Johnson, WØOZI (Medina); Willis Yule, KAØKEL (Steele Co EM). My thanks also to Sylvia Pentel, NØMRW, who went to fetch me a doughnut at the seminar and cheerfully returning with a plate full of food! Another all-day event was held Mar 19. This was the Metro Area ARES/RACES Basic Level Operator Training Seminar. This all-day event dealt with topics such as MN Incident Mgmt System, working with Red Cross, Mutual Aid procedures and other ARES/RACES-related items dealing with communications. Thanks to seminar chairperson Larry Nanikawa, NØOQA (Dakota Co EC) and the other area ECs in their efforts for this seminar. Counties involved were Dakota/Washington/Scott/ Ramsey/Carver/Anoka. We welcome aboard Scott Rasmussen, WBØRYD (Elk River) as a PIO in the Metro area. Field Day is closing in—are you ready? Don't forget your FD reports on the MN Section Phone Net, 3860 kHz on FD Sat. 73 de Randy "Max" Wendel, NØFKU. *Tfc:* WBØWNJ 2299, WAØTFC 261, WBØLES 247, KBØBXE 190, KAØARP 143, WØGRW 138, KFØFI 105, WDØGUF 74, KDERP 62, KAØPDM 59, W3FAF 46, KAØATT 36, KØWPK 32, AAØEV 20, NØTNK 18, WØKYG 12, KAØIZA 10, KN9U 10, NØJP 8, KØOGI 8.

NORTH DAKOTA: SM, Bill Kurtti, WCØM–Peace Garden Hamfest Jul 8-10. Ham equipment dealers, swap tables, dance, ladies' children's activities, transmitter hunts, testing & camping fun for the whole family in the Turtle Mts along the US-Canadian border. Minot-area hams led by WB8BZH were called out to help provide communications when a train carrying propane and hazardous chemicals derailed at Burlington, causing a propane tank car to explode and burn, causing serious injuries to several people in the area. WDØEMY came to the rescue again when a ham motorist got stuck on a stormy night near Woodworth. He called on the local repeaters for assistance but since it was 2 AM no one heard him, but when he got on the Superlink, he woke up Bill, 250 mi away in Dickinson. Bill called his wife, who arranged rescue for him. This isn't the 1st time WDØEMY has helped in emergency situations. Another time Bill called in assistance & an ambulance when a vehicle struck a stray buffalo on Interstate 94 between Bismarck & Dickinson. Congratulations to him for being chosen to the position of Asst Director for ND, with KØALL, by KØTO, the new Dakota Division Director. HF nets *(sess/QNI/QTC NM):* Goose River 4/40/0 KEØXT; DATA 25/598/13 NØIJR.

SOUTH DAKOTA: SM, R. L. Cory, WØYMB—Some SD hams traveled to Bismarck, ND, on Feb 26 to attend the ND Hamfest and all had a great time. Some who had long distances to travel had to cancel out because of the bad roads. Not much activity in Feb because of the bad WX and on the air it was poor conditions. Lake Area ARC at Watertown operated an HF station at the Watertown Winter Farm Show, giving it much exposure to the public. NOMEA reports the NE SD SKYWARN Net had 328 check-ins in 21 sessions and passed 279 pieces of traffic in Jan, however, the 80-meter Novice Net QNI was down. Word from Rapid City is that work on their clubhouse is coming along well. Pierre ARC has been working on rules for the club equipment room at its new clubhouse. Mon-Fri, a group of hams get together on 14310 kHz, 1530Z and are known as the Over the Hill Gang. Leader WØFKE is a former SD resident and the hams are from SD or have ties to SD. It's not considered a net, but a get-together. AAØF is working on linking the Wessington Springs Repeater to the Garden City Super Repeater and hopes to have it going when you read this. Total traffic reported to the STM for Feb was 377.

DELTA DIVISION

ARKANSAS: SM, Bob Ideker, WB5VUH— When crediting the hams that helped with the open mic problem in north Arkansas month before last, I inadvertently forgot to mention the work of Joe Puett, N5QYC, of Harrison. What's even more embarrassing, it was Joe who wrote and submitted the report to me. My apologizes, Joe, & tnx for your article. Many clubs have new officers for '94. Here is a list of those received:

CLUB	PRES	V-P	SECY	TREAS
Ar River Valley ARF	WB5VOX	W5HH	KB5RHH	KB5RHH
Batesville ARC	AA5GY	KB5FG	KJ5AU	KJ5AU
Benton AR Society	WB5VEV	KB5KCC	KD5HJC	KD5HJC
CAREN	KI5HA	AA5ZI	KB5SRF	W5EKM
Columbia Co ARC	N5YNU	KB5ROZ	AA5MC	AA5MC
Degray Radio Club	KB5KCC	AB5BU	KB5MDB	WB5VVV
Driven Elements ARG	N5VJZ	KB5FJX	AB5BC	KI5XV
Faulkner Co ARC	AA5YZ	N5QKH	N5RYG	N5RYG
Fort Smith ARC	KA5DGH	WB5IAC	AB5SE	N5VVY
Grant Co ARC	KB5ZES	KB5ZEV	N5WWC	N5WWC
Greers Ferry AR C	KB4JKQ	KJ5CA	KE5TT	W5ZJZ
Hempstead-Nevada Co ARC	N5NZB	N5OXP	KC5FFN	K5YSL
Hognet Packet Radio Assn	WC5I	W5SRZ	KA5BML	K5FXB
Hot Springs ARC	N5NMH	W5SRR	N5ZIV	N5ZIV
Hot Spring Co AREN	KA5OVQ	W5EKM	KA5YZR	KA5YZR
Jonesboro ARC	KB5FYN	NA5X	N5DSY	WB5AXX
Marion Co ARC	N5UYS	N5WJB	KB5PAT	KJ5IC
Metropolitan ARC	N5RLJ	N5XLX	NI5D	KG5VS
Mississippi Co ARC	W9GOW	N9BED	N5ZFM	K5JRB
No. Central Ar ARS	AB5QS	KB5RFE	KB5UPJ	AB5QT
No West ARC	NT9F	N5UYK	-	N5NXH
Ouachita AR Assn	N4EJZ	N5ZSB	KG5QO	KG5QO
Ozark ARC	W0NOV	N5EQO	K9DSJ	KA5EWH
Pine Bluff ARC	KJ5PE	KI5BV	KC5BVG	K5ECJ
QCWA Chap 158	N5BZB	W5YDP	K5SVS	K5SVS
Saline Co ARC	N5TKG	N5UZT	N5VPU	KB5MIR
Sharp Co ARC	KA5NMM	—	KE5HD	KE5HD
So West Ar Radio	N5PFD	KC5AIK	KC5DOR	KC5DOR
Stone Co ARC	KB5UCL	KB5UNN	N5WQP	N5WQO
Small Town AR Svc	KB5YUA	KB5WHA	K7ZQR	N5QIH
So East Ar ARC	WB5YJI	N5XUZ	KB5VHC	-
SPAAR Assn	KC5QY	AB5EC	AB5ES	N5OBW
Twin Lakes ARC	N5FOY	KG5MD	KB5SIV	KA5POE
Village ARC	W9YCE	W9DTZ	W0GY	N5ZOC

Tfc: W5OFU 111, N5EL 64, WA5QMQ 23, KI5FY 18, W9YCE 16, K7ZQR 12, W5RJJ 9, WB5GWU 8, KO5E 8, W5HDN 6, N5UQO 5, W0QIZ 4.

LOUISIANA: SM Lionel A. "Al" Oubre, K5DPG—ASM: KB5CX. ACC: KA5IJU. STM: WB4FDT. BM: K5AHH. TC: KE5FZ. SEC: KA5YDJ. SGL: KD5SL. OOC: WB9VTN, NM LTN, KG5GE. If your club hasn't begun planning for FD 94, it's not too late to get organized. Submit your FD reports to ARRL HQ and to the SM for the LA Section Mgr's FD Award. All rules and submission dates published in *QST* will be followed for the Section award. Remember that FD is a time to not only prepare for emergencies, but a good opportunity

to do a little PR in our communities. New club officers for Jefferson ARC: pres WB9VTN, vp N5UXT, treas W5RMX, secy WA5TRX; Acadiana ARA pres KA5IJU, vp N5KNX, treas K5ARH, secy K5DPG. Coming hamfests are Baton Rouge May 21-22 & Slidell Jul 23.

LA Section Net Schedule

LTN	6:30 PM Local	3910 kHz	Nightly	KG5GE Mgr
LEN	7:30 PM Local	3915 kHz	Mon	KI5TI Mgr

Net reports for Feb 1994: LTN QNI 386 QTC 93 in Sessions. DRN5 for Feb 1994: 1017 messages in 56 sessions. LA represented 95% by K5WOD, KG5GE, KI5TI, N5YZM, WB4FDT, KD5UY, and K5DPG. PSHR: K5DPG 163, KG5GE 129, KA5YDJ 90, KD5UY 117, N5YZM 103. *Tfc*: KG5GE 180, KD5UY 100, K5DPG 46, N5YZM 45, KA5YDJ 2.

MISSISSIPPI: SM, Richard L. Redd, KA5WRX—W5NCB has been the catalyst in getting Sen Cochran and Rep Whitten to agree to sponsor the joint resolution recognizing Amateur Radio as a national resource. Walker, you're to be commended—thanks. Thu, Feb 10, Mississippi suffered the worst ice storm in recent memory. At one time as many as 500,000 people were without electricity, substations and utility poles by the thousands were damaged and transmission towers were severely damaged. Many hams assisted with emergency communications. The MS Section Phone Net was activated under emergency conditions for 7 days and handled more than 300 messages during this time. All of the many times we've practiced emergency communications during Field Days, SET's morning and evening net sessions have again paid off. Thanks to the numerous hams who invested their time, equipment and expertise for their neighbors and community. N5ZDF, EC of Copiah County, hosted a SET demo for the county CD officials. Larry, KB5ZNY, credits Amateur Radio with saving his life: When sailing in the Gulf of Mexico on Mar 2, he confronted gale-force winds and swells to 25 ft. His boat was in danger of sinking. MSPN members kept in touch with him and summoned help from the Mobile Coast Guard.

TENNESSEE: SM, O.D. Keaton, WA4GLS—ASM: WB4DYJ. PIC: W4TYU. SEC: WD4EKA. STM: WA4HKU. ACC: WA4GLS. SGL: AC4JI. OOC: N4PUQ. TC: N4MW. The final report from the CARC Hamfest in Chattanooga showed a financial success—everyone, plan to attend this year. BARC thanks WD4PIW, WD4EKA, KB4ZVA, KC4FXO, KE4FEQ, KA4GMC, KC4YQL, N4PKJ, KM4OE, WB4RAV, KD4JYR, N4DW, KD4IVL, KD4DWB, N4PQM, KC4WIY, KD4IOP, & KC4LSA for helping move to new facilities, lots of help makes moving easy. DARC chooses Boyd Webb, N4SSF, as W4BS repeater trustee. Listen nightly at 8 PM on W4BS repeaters 146.82, 224.42 & 443.2 for info concerning local activities. UARC's activity started off '94 with a bang with a VHF contest at Carvers Gap on Roan Mtn. JCARA appoints committees for upcoming events. Looks like a busy year for these people. In *RACK Panels*, Ray Adams, N4BAQ, reported 46 successful participants from the Jan 22 test session; RACK members participated in Strawberry Plains Half Marathon, thanks to N4OQJ, KD4VYK, ND4F, KC4FGE, KD4LDL, KD4JGU & KC4YDR. WTARA is planning a hamfest this summer in Jackson; looking forward to this event. NARC installed '94 officers a month late because of ice and snow at the scheduled time: pres Bob Malone, WB5ZDS; vp Murray Jones, K4ANH; treas Howard Jackson, K4HRE; secy Steve Pompora, KE4DFF. MARC honored Hal Greene, W4CUQ, by awarding him a plaque for his 13 years of dedicated service as club secy/treas. The RN5-CW report for Jan: 58 Sess and the encouraging report that TN rep increased from 18% to 73% by W4SQE, N4LA, WA4MCC & W4OGG. DRN5 Feb. report 1017 Msgs., 56 Sess. TN Rep. 92% by K4WWQ, WI3B & WA4MCC. *Nets: (Net Sess/QTC/QNI/NM)*: TMPN 28/44/2214/WA4GZZ, TNCWN 18/10143/WB4DYJ; TEMPN 20/22/658/WD4BHD; TEPN 24/68/2651 WA4HKU. *Tfc*: WA4FMR 123, WA4MCC 75, WA4HKU 56, WI3B 45, WB4DYJ 21, WA4GLS 19, N4LA 16, WD4EKA 14, W4SQE 10, W4TYU 7, KI4KR 6, W4IKK 4, W4PSN 2, WA4UCE 2.

GREAT LAKES DIVISION

KENTUCKY: SM, Steve Morgan, WB4NHO @ KK4XE—SEC: Bill Uschan, KC4MIS @ K4KJQ. ASM: Tom Lykins, WD4RWU. ACC: Bob Hardin, N4PNG. STM: John Farler, K4AVX @ KC4PHR. SGL: Ron Landrum, KM4DX. ASM: Rusty Smith, KD4GLC. Areas 2 and 4 have been active during Feb when a heavy ice storm left the area without commercial power for almost a week. Barren County amateurs had more than 180 manhours involved in helping move interagency traffic. Christian County was without power for several days because of the 3-4 inches of ice that fell in the area. Bowling Green ARES was involved for a couple of days during the storm aftermath. The past 2 months have proven that ARES & RACES served the Commonwealth of KY in a professional manner. It's with regret that I announce the retirement of EC Jake McHendrix, WD4PBF, of Boone County. I welcome the following new ECs KO4BI, Stu Kratz, Bullitt Co, KD4OYM, Roy Rowlett, Fayette Co, KH4AF, Bruce Adams, of Garrard Co. Paducah Hamfest is May 21.

Net	*Freq*	*Time/UTC*	*QNI*	*QTC*	*Sess*	*NM*
KRN	3.960 MHz	1230z	694	27	19	N4AFP
MKPN	3.960 MHz	1330z	1589	75	26	WD4RWU
KTN	3.960 MHz	0000z	1492	47	28	WD4RWU
KYN-E L	3.600 MHz	0100z	257	64	28	K4AVX
KEN	3.960 MHz		110	1	4	KC4MIS
TSTMN			612	79	28	KB8GWL
4ARES			329	17	24	KN4TP

Tfc: K4AVX 46, N4GD 10, N4PEK 42, WB4NHO 5, K4VHF 69, WA4SWF 31, KC4ZSV 28, WB4ZDU 8, KB4UJA 45.

MICHIGAN: SM, Dale R. Williams, WA8EFK–ASMs: Skip Wallace, WD8KQC; Larry Camp, WB8R; Keith Allen, N8QNA; and Dick Mondro, WA4FOT. STM: Jeff Breitner, KA8NCR. SEC: Doug Burke, WB8CFV. SGL: Dave Wise, N8CNY. TC: Dave Smith, W8YZ. BM: Dale Konyha, N8IWS. ACC: Mike Pearsall, KA8YNJ. OOC: Joe Haefner, WD8PSX. PIC: Greg Ozimek, WB8FNQ. VHF NM: Mike Karmol, N8KUF. With May upon us, the summertime public service activities begin. Time to check out the emergency gear as well, so all is ready if our services are needed for a major disaster, or next month's FD. For many years, MI hams have enjoyed the benefits of what has become known as the "MI Scanner Law." This state law provides for the

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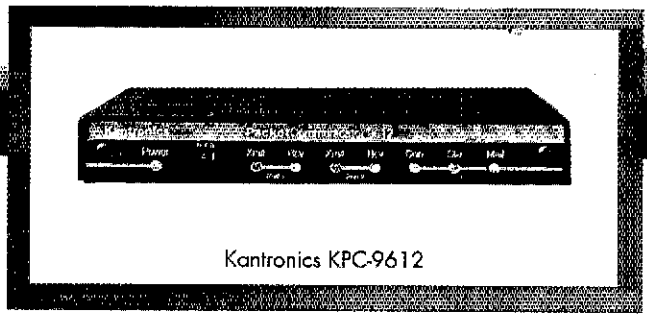

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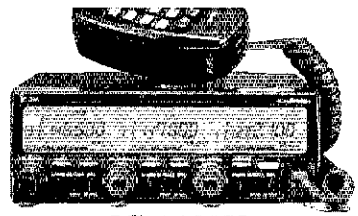

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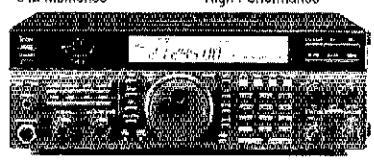

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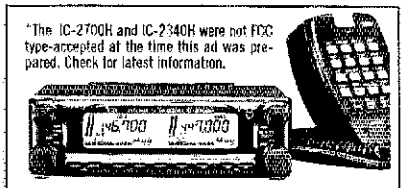

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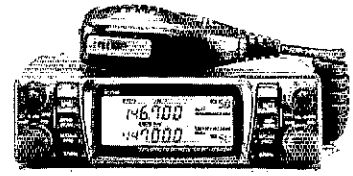

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operation of a receiver capable of monitoring police frequencies inside a motor vehicle, if the person equipping the vehicle is a holder of an amateur license other than a Novice. Occasionally, a police officer is unaware of this provision and trouble prevails for the amateur. The law is Section 750.508, and I suggest that those of us who have mobile equipment capable of receiving outside an amateur band carry a copy of that provision at all times. Certainly one should use the utmost tact when challenging a peace officer on the issue. It should be noted that this MI law is different from the FCC Declaratory Ruling 93-410 permitting Amateur Radios capable of incidental reception of police frequencies. This MI law allows for a completely separate receiver unit. Congratulations to W8HZF and N8BQN, 1994 "SVARA Hall of Fame" inductees due to their unselfish donation of time and talent to their local club. All Section appointees should be aware of their important responsibility in reporting their monthly activity. This includes ALL who hold a position such as EC, OES, ORS, OO, etc. Please keep your Section leadership apprised of your activity on a regular basis. Here is a good opportunity to use the NTS, packet or the US mail, but please do your best: keep us up to date on your activities.

Net	Freq	Time/Day	QNI	Tfc	Sess	NM
OMN*	3663	6PM Dy	697	168	83	WB8SYA
MITN	3953	7PM Dy	418	168	28	WD8EIB
UPN*	3921	5PM Dy	1175	64	32	WA8DHB
GLETN	3932	9PM Dy	823	32	28	KE8TJ
MACS*	3953	11AM M-Sa	303	38	28	K8OCP
SEMTN	145.33	1015PM Dy	406	135	28	WI8K
WSSN	3935	7PM Dy	648	43	28	K8GOU
VHF	-	-	942	12	61	N8KUF

*QMN Early—6 PM Dy; QMN Late—10 PM Dy; MACS 1 PM Sun. UPN 12 PM Sun.

Tfc (Feb): N8FPN 196, W7LVB 149, WB8SYA 126, N8HSC 101, K3UWO 83, AA8JN 74, KA8CPS 69, K8GXV 68, WA8DHB 46, KB8RBF 44, WA8EFK 44, W8YIQ 42, WI8K 37, NY8W 36, K8OCP 35, K8UPE 33, KA9EIZ 26, W8EOI 26, N8CNY 23, N8OSC 16, N8JGS 14, WD8EIB 10, K8ZJU 9, N8KUF 9, W8RNQ 9, K8RDN 8, N8YNY 8, KI8Q 7, WB8BGY 7.

OHIO: SM, David Kersten, N8AUH @ NO8M (see p 8)—ASM: John Haungs, WA8STX @ KC8TW, 513-563-7973 ASM (Packet): Steve Wolf, NO8M @ NO8M. SEC: Larry Solak, WD8MPV, 216-274-8240. STM: Joyce Judy, KD8HB @ W8CQK. ACC: JoAnne Solak, KJ3O/8. BM: Doug Horner, W8PH @ KC8TW. TC: John Fakan, KB8MU. SGL: Paul Krugh, N2NS. PIC: Joe Phillips, KB0QE. OOC: Paul LaFollette Jr, WB8ONA @ W8CQK. We're once again pleased to announce a few ARRL Special Service Clubs who have recently been renewed: Portage ARC (Portage County); North Coast ARC (N Olmsted) and Milford ARC. Thanks, all, for your continued work and dedication. I just learned that HQ recently awarded a 60-year membership plaque to Corwin Miller, W8RZG, a few months back. Congratulations! Everyone, please note: As you and your group schedule events for 1994, remember to advise Joanne, KJ3O, and N8AUH of your group's hamfest plans so we can try to prevent date conflicts and keep Section members apprised of upcoming events. If your group wishes ARRL representation at your hamfest, let one of us know that! Upcoming hamfests include: Dayton's HamVention, Apr 29-May 1; Triangle ARC (E Liverpool), May 7, M2M Group (Medina), May 8; Lorain ARC, May 15; Triple States ARC, May 15; 20/9 (Canfield), May 22; Goodyear (Akron) Jun 12; Milford (Cincinnati) Jun 18; Cuyahoga ARS (Macedonia), Jun 19. Watch the packet network for updates. Appearing regularly on the packet radio network is the K3RC/8 listing of Amateur Radio examination sites in OH. If you're not receiving the *Ohio Section Journal*, contact N8AUH & we'll see how that can be rectified. The Cincinnati Buckeye Netters were presented a 25-year affiliation charter. Pres, N8XX Cinti Repeater Assn VE team, lead by WA8PBW is having great success with monthly exams. GCARA (Cinti) Code & Theory class conducted by KA8GRH, KB8ANY & AA8MT, after several years of being dormant, is the result of GCARA 2000 Committee objective, spearheaded by K8JE. Great Lakes Div ARRL Convention in Cinti was a success and was great having the ARRL Pres W4OYI and other Div and Section officials attend. Net and station activity reports for Feb 1994 are as follows:

Net	QNI	OTC	QTR	Sess	Time	Freq	NM
BN(E)	237	160	454	26	1845	3.677	WD8KFN
BN(L)	269	117	417	28	2200	3.677	NY8V
OSN	218	80	642	28	1810	3.708	WB8KQJ
OSSBN	2129	690	2769	84	1030,1615,1845	3.9725	WB8MZZ
OSSN	241	71	856	28	0645 S/S0800	3.577	WB8FSV
BNR	169	47		28	1800	3.605	W8FK

Tfc: W8PMJ 300, W8BO 269, KD8HB 266, WD8KFN 256, WA8HED 211, KB8HD 175, N8TNV 158, W8ZOL 128, W8RRB 109, WA8SSI 109, KA8HBN 102, N8POV 97, W8PBX 93, KB8DJE 86, N8RBE 85, W8EK 84, W8QZK 81, K8JDI 80, KE8CV 68, W8NO 67, N8LSG 65, K8OUA 65, KB8HJJ 64, W8LDU 61, N8FWA 56, N8TPW 51, KD9K 51, N8LZV 50, NY8V 47, KA8MPD 46, WD8KBW 45, N1IXF 41, W8JLW 41, WB8KQJ 40, KA8SON 40, KA8ZZI 36, KF8DO 35, N8WCE 35, WD8IKC 34, N8WRG 33, N8HJB 33, N8GOB 31, WA8MJP 31, W8MBY 31, KB8DV 30, N2NS 30, WB8FSV 29, WB8JGW 27, N8TFD 27, N8YXL 26, WB8JYE 25, W8GDQ 24, KA8YIT 24, NS8C 23, W8KB 22, K8IOW 21, N8OSI 19, KC8JV 17, NW8E 16, W8RG 16, KD8XL 16, WA8STX 15, AA8DK 15, KC8UR 14, N8ZZW 13, WA8HED 13, WB8HHZ 12, N8AJU 12, W8LDQ 12, KA8RTG 11, KB8MUB 11, KB8QAE 10, KF5HT 10, N8RRB 9, N8VRR 8, KB8JXF 7, KB8QIX 7, WB8YTQ 7, WB8KWC 6, N8DZA 4, KA8OOP 4, N8MJY 4, WA8JLE 4, KD8TE 3, N8WLY 2, N8JRV 2, WB8NHV 1. *Total* 4494.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul Vydareny, WB2VUK—STM: WE2G. SEC: WB2BEJ. ACC: KV2A. SGL: KB2HQ. BM: WB2IXR. OOC: N2DVQ. PIC: WA3RKB. ASM/Public Info: N2FTR. ASM/Education: WK6R. ASM/Interclub Relations: WB2NHC. *Net Reports (Feb '94) QNI/QSP:* AESN: 47/0 CDN: 593/45 CESN: 61/2. ESS: 354/107. HVN: 519/93. NYP: 296/314. NYPON. 392/245. NYSE: 336/142. NYSL: 235/155 NYSM:330/191. SDN: 416/73. New Ham Night with a variety of topics including repeater use, low bands, etc, was the Mar meeting topic at Albany ARA. N2HIG outlined procedures for QSLing successfully at Crystal ARC's Mar meeting. Mt Beacon's hamfest is scheduled for May 15 in LaGrange. Rensselaer Cty ARES/RACES is working on solving some repeater problems and reports Silent Key KB2YX. Saratoga RACES welcomes new members WB2FLX KD2AB KD2AC and held its annual swapfest on Mar 14. Schenectady ARA held a Who's Who in SARA to acquaint everyone with the club's officers, workers and committees. They regret to report K2YGI a Silent Key. KN2X presented a program on introduction to digital circuits at Westchester ARA's March meeting. N2QCA made a presentation on global positioning system at Westchester ECA. Yonkers ARC welcomes new members N2OWG N2JAD N2CXJ N2XNI. With regret I report the passing of Art Stangel, W2JZH, and Paul Cunningham, W2DPV. Now's the time of year for many public service opportunities, especially with the warmer weather on its way. Get involved. Help your local club by volunteering to participate in one or more events. Field Day is just around the corner and many clubs will be participating. Hope to see you on the bands during Field Day. Feb PSHR: KB2EPU WB2VUK WE2G N2JBA WA2YBM NM2M. *Feb tfc:* WB2VUK 121, K2LYE 104, KB2EPU 102, WE2G 60, WA2YBM 50, N2JBA 44, N2JNG 35, WV2V 28, K2HNW 24, NM2M 24, N2AWI 19, KE2WO 13, N2CJN 10, N2FTR 10, WF2M 6, WA2IWW 1.

NEW YORK CITY/LONG ISLAND: SM, Rick Ramhap, N2GQR (CIS 75570,2557; Internet rramhap@aol.com)—ASM/Emerg Svcs: WF2T. ASM/Technical: WB2WAK. ACC: N2IMF. SEC: KA2RGI. STM: KA2VZX. OOC: NB2T. PIC: KA2JMA. TC: W2OUV. BM: KC2FD. LGL: N2FF. VE sess, Grumman AHC (W5YI) 2nd Tue 5 PM, Grumman Rec Ctr, Plant 28, 950 S Oyster Bay Rd, Hicksville, Bob Wexelbaum, W2ILP, 516-499-2214; LIMARC, 2nd Sat 9 AM, NY Inst of Tech, 300 Bldg, Rm 308-310, Northern Blvd, Old Westbury, Al Bender, W2QZ, 516-623-6449; Suffolk Co VE Team, 2nd Sat 9 AM, Suffolk Co Comm College, Islip Arts Bldg, Rm 104, Selden, George Sintchak, WA2VNV, 516-751-0265; Great South Bay ARC, 4th Sun, noon, Babylon Town Hall, ARES/RACES Rm, 200 E Sunrise Hwy, N Lindenhurst, Tom Tiniski, KA2CIW, 516-888-5576 or Walter Wenzel, 516-957-5726; Staten Is ARA, 4th Sun noon, College of SI, Sunnyside Campus, Rm B144, 715 Ocean Terr, Staten Is, Richard Dyrack, 718-351-5764; Suffolk Co VHF/UHF Assn, 4th Sat 10 AM, H. Acampora Rec Ctr, 39 Montauk Hwy, Blue Point, Leonard Buonaulto, KE2LE, 516-581-4595; Islip ARES, Islip Town Hall Annex, 401 Main St, Islip, Addison Levi, 516-234-0589. Report changes to testing schedules to N2GQR. The following are traffic/ARES nets in and around the Section:

Net	Freq	Time	Day	NM
Big Apple VHF BAVHF	146.43R	2000	Dy	KB2KLH
Empire Slow Speed ESS	3.590	1800	Dy	W2WSS
Nassau Co ARES NCARES	146.805R	2030	Wed	WA2WKV
Nassau Co VHF NCVHF	147.330R	1930	M-F	N2PIF
Nassau Co VHF NCVHF	146.805R	1930	Sat-Sun	N2PIF
NYC ARES NYCARES	145.35-R	2000	Mon	WB2DWC
NYS Phone & Emerg NYP	3.925	1300	Dy	N2LTC
NYS Phone, Tfc & Emerg NYSPTEN	3.925	1800	Dy	WB2IIV
NYS Public Ops NYPON	3.913	1700	Dy	K2LYE
NYS CW/Morning NYS/M	3.677	1400	Dy	KA2GJV
NYS CW/Early NYS/E	3.677	1900	Dy	WI2G
NYS CW/Late NYS/L	3.677	2200	Dy	WI2YGW
Suffolk Co ARES SCARES	145.33/R	2100	Mon	N2HII
Suffolk Co VHF SCVHF	145.21/R	2000	Dy	KA2JMA
Southern District SDN	147.06/R	2130	Dy	KB2EPU

ARES nets are now listed above, please check-in! Field Day is just around the corner! Include plans for public participation. Public Info Coord Bill Frisch, KA2JMA, and his staff have ideas for Field Day publicity. Contact Bill at 516-467-7510. N2GQR is starting to plan this year's Field Day Road Show. To put your club on the list, drop a note or e-mail to N2GQR. Include the location of your operation and directions to the site...perhaps the NLI road show will visit. 10 sites visited in 1993. *Feb traffic:* KA2VZX 737, KB2KLH 211, N2AKZ 184, N2PIF 152, KF2ER 86, KB2MQP 67, N2TQN 60, AA2NX 59, NB2D 50, W2GKZ 36, WA2ZIE 35, KA2JMA 34, KB2GEK 9, N2RCC 28. PSHR: KA2VZX, KB2KLH, N2PIF, AA2NX, KB2MQP, WB2ZIE, N2AKZ, KB2GEK, KF2ER, KA2JMA, N2TQN, NB2D. NTS stats for Feb (Net, Sess, QTC): NCVHF, 28, 192; SCVHF, 28, 47; BAVHF, 28, 133.

NORTHERN NEW JERSEY: SM, Richard S. Moseson, NW2L (@WA2JVM)—ASMs: Education/KB2WI, Emerg Prep, WB2HBZ. Spec Proj/N2IGO, Volunteer Counsel/N2IOB, Youth/N2MCV, SE/KY2S, SW/KE2HG, NW/NW2S. ACC: WA2QYX. BM: K2ULR. OO/AAC: KA2BZS. PIC: WX2R. SEC: N2DSY. STM: WB2FTX. TC: WG2W. Ham Radio Info Line 201-680-1585. It is with deep regret that I pass along the sad news that Charlie Gspann, W2ZEE, is a Silent Key. Charlie was Monmouth County's longtime District Emergency Coordinator (DEC), and was very active in a variety of other community service activities. He will be missed. As of this writing, no new DEC for Monmouth has been appointed. I hope to have done that by the time you read this. We have a new Public Info Coordinator (PIC) for the Section. Charlie Zusman, WE2R, stepped down because of an increased workload. He'll be succeeded by Ed Efchak, WX2R. Ed works at the *Bergen Record* and has many good contacts in the news media in NNJ. Thanks, Charlie, for your more than 4 years of help in this critical area; and thank you, Ed, for stepping in to fill Charlie's shoes. We'd like to have a Public Info Officer (PIO) in each club in the Section. If your club has a public relations chairman who isn't a PIO, please have him/her contact Ed. If your club doesn't have a PR person, please try to find a volunteer. Ed and ARRL HQ will help with training and advice. Editors: Please add WX2R to your newsletter mailing lists so Ed can keep up on what's happening in the Section and can spot stories with news potential beyond your club and perhaps beyond ham radio. Mail to his *Callbook* address. Thanks. ARRL & the FCC have signed a new agreement that should help assure that the Commission follows up on requests for enforcement received from

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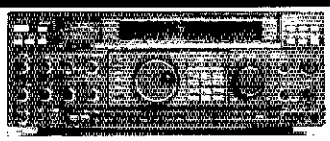
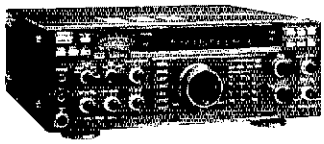
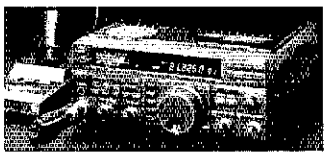


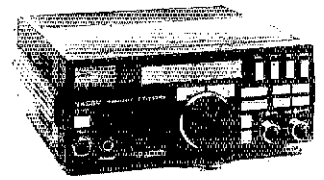
YAESU FT-1000 • 200W - 9-band, all-mode HF transceiver with 100kHz-30MHz receive, 99 memories, built-in antenna tuner with memories. Built-in AC ps. 6"h x 16"w x 15"d, 58 lbs..... **SPECIAL** ☎
YAESU FT-1000D • Deluxe version with dual bandpass filter for crossband receive, temperature compensated crystal oscillator, 2.4kHz/2KHz SSB filters and 500Hz CW xtal filter..... **SPECIAL** ☎



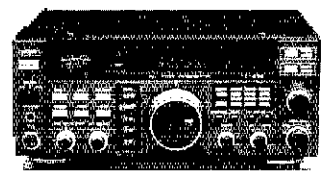
YAESU FT-990 • 100W – all mode 160-10M HF transceiver with 100kHz-30MHz receiver, 99 memories. Built-in antenna tuner and AC power supply. 12¾"w x 4⅛"h x 11½"d, 30 lbs..... **SPECIAL** ☎
FT-990DC • No AC ps or CW filter..... **SPECIAL** ☎



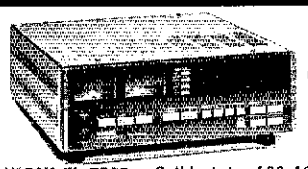
YAESU FT-890 • 100W 160-10m all mode transceiver with 100kHz-30MHz receiver. Optional internal automatic antenna tuner. 13.5VDC @ 20A. 9⅜"w x 3⅜" x 9½"d, 12.3 lbs..... ☎
YAESU FT-890/AT • HF transceiver w/ant tuner.... ☎
YAESU FT-840 • HF transceiver..... ☎



YAESU FT-747GX • Compact 100W, 160-10M SSB/CW base or mobile transceiver with 100kHz-30MHz receiver, and optional FM transmit/receive. 12V DC @ 20A. 3¼"h x 9½"w x 9½"d, 7 lbs..... ☎

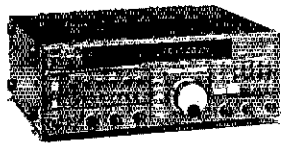


YAESU FT-650 • 100W – 6, 10 and 12 meter all mode with 24.5–56.0 MHz receive. 105 memories: 99 for channels, 4 programmable scan memories and 2 priority channels. Built-in AC supply or 12V DC.@ 18A. 5¼"h x 11¼"w x 11¼"d, 18 lbs..... ☎



Due to foreign currency fluctuations, please Call for Prices.

YAESU FL-7000 • Solid-state, 160-12M, linear with built-in automatic antenna tuner and power supply. 70W drive for 600W output. Full break-in for CW, HF Packet and AMTOR. Auto. selection of 4 antennas with opt. unit. 5"h x 15"w x 15"d, 66 lbs..... ☎



YAESU FT-736R • All-mode, 2M/430 multi-band VHF/UHF. Optional. modules for 50MHz, 220MHz, and 1.2GHz. 10W on 50MHz and 1.2GHz, 25W. on 2m and 440 MHz. Built-in AC ps, or 12V DC w/optional power cord. 5¼"h x 14⅛"w x 11½"d, 19.8 lbs..... ☎

MK II's 2½W, FM, SSB/CW portables. Require 12V DC @ 1.1A, or opt. battery case with 9 (C) cells or nicads. DTMF mic with up/down tuning, dual VFOs, 10 memories, scanning. LCD display. 2⅛"h 6¼"w x 7⅛"d, 2.6 lbs.
FT-290R MK II • 2 meters, 25W..... ☎
FT-690R Mk II • 6m, 50-54MHz, 10W..... ☎
FT-790R Mk II • 430-450MHz, 25W..... ☎

YAESU FT-5200 • 50/35w 2m/440MHz FM mobile with 140-174/430-450MHz receive. 32 memories, CTCSS encoder. Cross band full duplex. DTMF mic., detachable front panel . 5½"w x 1⅝"h x 6"d, 2 lbs..... **SPECIAL** ☎
FT-5100 • Like 5200 w/o remote feature....**SPECIAL** ☎
FT-6200 • 35/10w, 440MHz/1.2GHz..... ☎
FT-2200 • 50w 2m FM xcvr w/TTP mic..... ☎
FT-7200 • 35W 440MHz FM/TTP..... ☎
FT-912RH • 1.2GHz, 10W, 12VDC @ 4A..... ☎
YAESU FT-2400H • 50w 2m FM mobile with 140-174MHz receive. 31 memories, CTCSS encoder, 5 scan functions. Call channel, auto. offset, backlit DTMF microphone. 6"w x 1⅝"h x 7"d, 1½ lbs .....**SPECIAL** ☎
YAESU FT-7400H • 35W 440MHz FM..... ☎
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DVS-1 • Memory module for 712. **CLOSEOUT** 49⁹⁵

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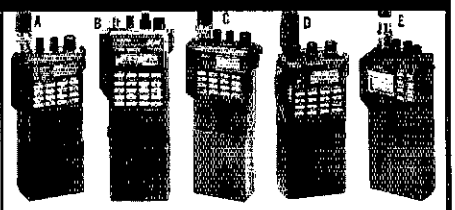
Coupons good through May 5, 1994



YAESU FT-411E (C) • 2.5w 2m FM HT..... ☎
YAESU FT-811 (A) • 2w, 430-450.....**CLOSEOUT** $259⁹⁵
YAESU FT-911 (A) • 1w, 1.2GHz..... ☎
YAESU FT-416 • 2m HT/batt/chgr, black.....**SPECIAL** ☎
YAESU FT-816 • 440 MHz HT/batt/chgr, black..... ☎
YAESU FT-470 (B) • 2m/440 FM HT ...**CLOSEOUT** $354⁹⁵
FT-470–$25 Coupon until sold out (Net $329⁹⁵)
YAESU FT-815 (D) • 440MHz FM HT. **CLOSEOUT** $329⁹⁵
Following are similar to FT-815 but without TTP
FT-26/25 • 2w 2 meter FM HT..... ☎
FT-26/27 • 5w 2meter FM HT..... ☎
FT-76/25 • 2w 440 MHZ FM HT..... ☎
YAESU FT-23R-17 (E) • 2.5w 2 meter FM HT ..... ☎
FT-23R-12 • as above but 2meters, 5w..... ☎
FT-33R • 5w 220 MHz FM HT..... ☎
FT-530 • 2m/440 FM HT w/TTP ..... **SPECIAL** ☎
FT-11R • 2 meter FM HT ..... ☎
FT-41R • 440MHz FM HT..... ☎

FRG-100B • Shortwave receiver..... ☎

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members of the Amateur Auxiliary (Official Observers) & that names of OOs gathering evidence will be kept confidential whenever possible. Contact KA2BZS for details. Welcome new ORSs N1OTL & KB2GXR. *Feb nets (QTC = no. messages handled/QNI = no. check-ins):*

Net	*NM*	*Freq*	*Sess*	*QNI*	*QTC*
NJM	W2RRX	3695	28	186	87
NJPN	W2CC	3950	32	416	139
NJSN	AA2HJ	3715	24	178	15
NJN/E	N2GJ	3695	28	258	90
NJN/L	WA2PCS	3695	28	143	35
OBTTN	W2OD	147.12	28	720	73
NJTTTN	N2DXP	223.88	28	225	70
NJVN/E	WB2FTX	146.895	28	490	60
NJVN/L	W2PTZ	146.49	28	287	39

Feb traffic (Call sign/total messages/PSHR): KE2JX/284/164, W2ONL/255/119, N2XJ/137/134, W2MTO/ 120114, K2VX/112/129, WB2FTX/93/140, N2DXP/64/169, W2RRX/62/168, N2RPI/60/115, N2GJ/46/145, KF2KN/45/129, K2PBP/44/168, N2OWN/37/120, N2HTC/33/118, WA2EPI/27/-, W2OD/26/97, N2OPJ/22/124, W2CC/20/83, N2UHD/20/94, W2PTZ/11/115, N2SU/11/106, WB2CZW/10/73, N2OFB/10/52, N1OTL/-/75. 73 de NW2L.

MIDWEST DIVISION

IOWA: SM, Jim Lasley, NØJL @ KEØBX—SEC: KADLZU @ KØCNM, STM: WØCON @ KØCNM, ACC: WØFZO @ NFØN, BM: KØIIR @ WAØRJT, SGL: WRØG, PIC: WØZPM. I regret to announce that Jack, KØCNM, has found it necessary to resign as your SM because of his health. I thank Jack for his service to the Section in the past year. I've been appointed to fill the remainder of the term and hope to serve as well as Jack. I'll need your help and cooperation. Looks like good things are happening for the CVARC. They note lots of classes, new hams and upgrades in their newsletter. The Central IA Radio Amateur Society net is each Sat at 8 PM on the 146.88 repeater. Ottumwa ARC had a visit from the Ottumwa Fire Chief for a program. Sorry I couldn't make it. HABET-3 from CITS is Mar 29. SEITS is making progress toward its 9600-baud backbone in eastern IA and linked voice repeaters from MO to IL to CR. I'm sorry to note that Margaret Bierman, WDØGHQ, of Des Moines, became a Silent Key in Dec. WØGSH, WØBTY and WØGGN became Silent Keys in Mar. Hey! Let me know about your hamfests. Marshalltown's is May 15 from 8 to 4 with talk-in on 147.135. Hamboree 16 is May 13-14 at the Marina Inn in S Sioux City, NE. Ottumwa is having one the end of Aug. WAØAUU reports the wiring almost complete and some radios ready for their comm van. Coax and *doors* soon! If you hold an appointment, have you reported to your proper official? If you haven't, please do. That's the only way I find out what's happening away from my brush! Newsletters received from Ottumwa ARC, Cedar Valley ARC, CITS, SEITS, Ft Madison ARC. *Traffic:* WØSS 118, KØCNM 95, KAØADF 93, WBØAVW 34, NØJL 30.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: KØBIX, STM: WØOYH, ACC/OOC: KØBXF, SGL: AAØGL. Record-keeping has always been a hassle for some people and others love to keep track of almost everything they do. Congratulations to Gary, NZØM, for his excellent job of keeping track of the number of check-ins in all the nets he's an NCS. Number 35,000 QNI was reached on Feb 9. NCSs are always needed by the NMs. Anyone like to try and break Gary's record? Don't forget, after Mar 1, you must use the *new* FCC Form 610 for everything. NØLL reports the Jan VHF-SS was the best ever. Net reports for Jan indicate totals as shown. KSBN 1544 QNI 113 QTC. KPN 412/23. KMWN 847/723. KWN 1194/771. CSTN 2318/75. QKS QNI 333 QTC 99 and QKS-SS 301. How about recruiting a new member for the KS Slow-Speed Net? Send them to 3710 on M, W and F at 7:30 PM local time. Anyone interested in being a DX reporter for KS? Contact your SM for details. Thanks again to KEØDK, KFØTK, WØNBT, KØBXF, KBØAMY and N5PPB; we had 100% representation on dTEN cycles 1& 2 this past month. We received 2 new newsletters this past month from the Newton ARC and the US Center ARC. We've been in contact with several members of ex Amateur Radio Clubs, trying to get revived if possible. Does your club publish a newsletter? Check & see if your SM is on the mailing list. *Tfc:* WØOYH 404, KØBXF 269, NZØM 259, KGØIW 186, KFØTK 126, WØNBT 112, AAØM 72, WBØZNY 65, WØFT 59, ACØE 38, NBØZ 26, WAØSXR 23, WØQBK 23, WTØE 9.

MISSOURI: SM, Roger Volk, KØGOB—Many clubs in the Section have joined the ARRL Affiliated Clubs program. In addition to newsletters and helpful hints that have a good track record of working at other clubs, the club gets to keep $2 for each ARRL membership renewed through the club. The club gets $5 for every new ARRL membership submitted. If at least 51% of the individuals in your club are Members of the ARRL, your club can qualify for the program. Have your club secretary drop me a line about applying. The 1st 10-year licenses are beginning to expire. Check yours. Use only the new Form 610. Congratulations to the MO-KAN Council of ARC on its 25th anniversary. Check *QST* for a number of special-event stations operating this summer from the MO Section. SCARC has established a 2-meter repeater in the St Charles CO area for use by the ARES organization. The St Charles CO ARES organization has become the most active and well-equipped in the state. The bylaws of the Suburban RC contains a provision for hams to become Life Members after 20 years of membership. Nice touch. Why would normally sane individuals stand outside in 10° WX while the wind blew at 30 mi/h? The answer is to dedicate a new bridge over the Mississippi River at Alton. And, as usual, hams from both sides of the river assisted in providing communications as the motorcade and buses moved people from shopping mall parking lots to the center of the new bridge. *Nets:* MOSSB 28/842/90 KFØHW; MON1 28/102/60 WØOUD; MON 2 28/92/59 WØOUD; MEOW 28/567/63 KEØAH; HAMBUTCHER 20/460/37 KØDSQ; HOLLABB 28/408/15 NAØV; TRULAKARES 4/106/2 WAØLHZ; QCWA35 4/69/0 WØWHK; STLRPTR 4/183/3 KØWEX; AUDRAINARC 4/47/0 WBØSEN; CARL 3/36/0 KCØMV; MIDMOARC 4/35/0 NØMNV; MIDMOYL 4/50/0 NØMNV; RAYCLAYARC 4/76/0 WJØR; WJACOARES 4/47/0 KØUAA; SEDALIARPT 4/83/0 WØENW; KCABARC 4/17104 NØIWA; SWMOSKYWARN 4/84/8 KEØPQ; PAULREVERE 4/591/0 WBØEJJ. *Tfc:* WBØPLY 102, WAØYJX 37, WØOUD 36, KEØAH 26.

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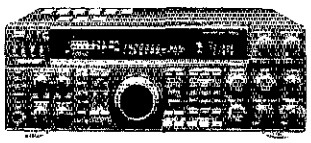

HF EQUIPMENT

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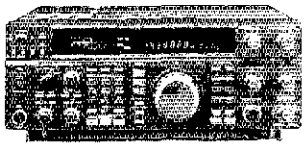
YK-88SN-1 1.8 KHz SSB filter (1st IF) ... ☎



TS-850S 9-band xcvr w/mic..... **SPECIAL** ☎
AT-850 Internal auto antenna tuner ..... ☎
TS-850S/AT 9-band xcvr w/tuner..**SPECIAL** ☎
PS-52 Heavy duty power supply..... ☎
RM-1 Remote control unit ..... ☎
SO-2 TCXO unit ..... ☎
SP-31 External speaker ..... ☎
YG-455C-1 500 Hz CW filter (2nd IF)..... ☎
YG-455CN-1 250 Hz CW filter (2nd IF).... ☎
YK-88C-1 500 Hz CW filter (1st IF)..... ☎
YK-88CN-1 270 Hz CW filter (1st IF) ..... ☎
YK-88SN-1 1.8 KHz SSB filter (1st IF).... ☎
TS-450S 9-band xcvr/SW rcvr .... **SPECIAL** ☎
TS-690S 9-band xcvr w/6m/mic ..... ☎
AT-450 Internal 80-10m auto tuner..... ☎
TS-450S/AT 9-band xcvr/tuner... **SPECIAL** ☎
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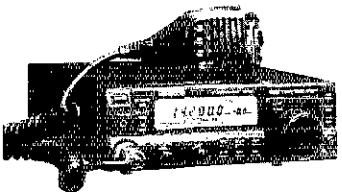
PS-33 Light duty 20.5A ps ..... ☎
PS-53 Heavy duty 22.5A supply..... ☎
SO-2 TCXO unit..... ☎
SP-23 External speaker ..... ☎
TU-8 CTCSS tone unit ..... ☎
YG-455C-1 500 Hz CW filter (2nd IF)..... ☎
YG-455CN-1 250 Hz CW filter (2nd IF).... ☎
YK-88C-1 500 Hz CW filter (1st IF)..... ☎
YK-88CN-1 270 Hz CW filter (1st IF)..... ☎
YK-88S-1 2.4 KHz SSB filter (1st IF)..... ☎
YK-88SN-1 1.8 KHz SSB filter (1st IF)... ☎



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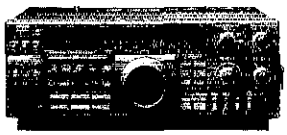
AT-50 Deluxe automatic external tuner..... ☎
MB-13 Deluxe quick release bracket..... ☎
PS-33 Light duty 20.5A power supply.... ☎
PS-53 Heavy duty 22.5Asupply..... ☎
YK-107C 500 Hz CW filter ..... ☎
TS-140S 9-band HF transceiver w/mic ..... ☎
IF-10C Computer interface unit ..... ☎
IF-232C Level translator ..... ☎
MB-430 Mobile mounting bracket ..... ☎

COMMON ACCESSORIES

TL-922A 2KW PEP HF linear (3-500Zs) ..... ☎
SM-230 Sta. monitor w/pan; 950/850 ..... ☎
AT-300 Ext. auto tuner; 850/450/50 ..... ☎
DRU-2 Digital record unit; 850/950..... ☎
DSP-100 Digital signal proc. 450/850..... ☎
HS-5 Deluxe headphones ..... ☎
HS-6 Lightweight headphones ..... ☎
IF-232C Level translator ..... ☎
LF-30A 1kw PEP low pass filter ..... ☎
MA-5 5-band HF mobile antenna..... ☎
VP-1 HD spring, bpr mt for MA-5 ..... ☎
MC-60A Ampl. desk mic w/up-down..... ☎
MC-80 Electret desk mic w/up-down..... ☎
MC-85 Multi-funct. electret desk mic..... ☎
MC-90 2-head DSP desk microphone ..... ☎
PC-1A 8-pin phone patch..... ☎
SP-41 Compact external speaker ..... ☎
SP-50B External mobile speaker ..... ☎
SW-2100 1.8-30MHz SWR/pwr meter ..... ☎
VS-1 Voice synthesizer; 5000/751A ..... ☎
VS-2 Voice synthesizer; 950/850/450 ..... ☎

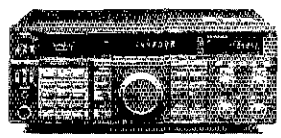


SHORTWAVE RECEIVERS

R-5000 100 KHz-30 MHz receiver ..... ☎
DCK-2 DC cable kit w/cig plug ..... ☎
IC-10 IC kit for computer control ..... ☎
MB-430 Mobile mounting bracket ..... ☎
SP-23 External speaker ..... ☎
VC-20 108-174 MHz VHF converter..... ☎
YK-88A-1 AM filter ..... ☎
YK-88C 500 Hz CW filter ..... ☎
YK-88CN 270 Hz CW filter ..... ☎
YK-88SN 1.8 KHz SSB filter ..... ☎
R-2000 150 KHz-30 MHz digital Rcvr ..... ☎
VC-10 118-174 MHz VHF converter..... ☎
YG-455C 500 Hz CW filter ..... ☎

***New!...* VHF/UHF TRANSCEIVERS**

TM-255A 40W 2M SSB/FM xcvr/9600 baud ☎
TM-455A 35W 430MHz SSB/FM xcvr/9600 ☎

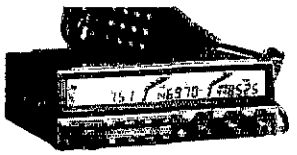


TS-790A 45w 2m/40w 440 SSB/FM xcvr..... ☎
PS-31 Power supply ..... **SPECIAL** ☎
SP-31 External speaker ..... ☎
TSU-5 Programmable CTCSS decoder ... ☎
UT-10 10w 1.2 GHz module ..... ☎
VS-2 Voice synthesizer..... ☎

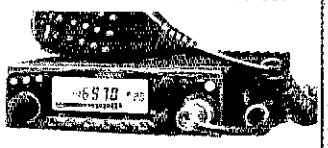
New!...

TM-251A 2m FM xcvr w/9600 baud ..... ☎
TM-451A 440MHz FM xcvr w/9600 baud..... ☎
TM-642A 2m/220MHz FM xcvr w/TTP..... ☎
TM-733A 50/35W 2m/440 FM xcvr/TTP ..... ☎
TS-60S Compact 6m xcvr w/mic., mount.... ☎

UT-28S 50w 10 meter unit..... ☎
UT-50S 50w 6 meter unit ..... ☎
UT-220S 25w 220 MHz unit ..... ☎
UT-1200 10w 1.2 GHz unit..... ☎



TM-742A 50/35w 2m/440 FM xcvr. **SPECIAL** ☎
TM-942A 2m/440/1.2 FM xcvr ..... **SPECIAL** ☎
TM-732A 50/35w 2m/440 FM ....**CLOSEOUT** ☎



TM-241A 50w 2mxcvr w/TTP mic..**SPECIAL** ☎
TM-331A 25w 220 xcvr w/TTP mic ..... ☎
TM-441A 35w 440 xcvr w/TTP mic ..... ☎
TM-541A 10w 1.2GHz xcvr w/TTP mic ..... ☎

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TH-47A 2W 440 FM HT..... **CLOSEOUT** 249.95
TH-48A 2W 440 FM HT/batt/cgr/TTP ..... ☎
TH-78A 2.5W 2m/440 FM HT ..... **SPECIAL** ☎

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TS-950SDX	$100	TH-42AT	$20
TS-50S	$50	TH-78A	$30
TS-450S & AT	$50	TM-742A/942A	$40
TH-22AT	$20	TM-241A	$30

Our KENWOOD *Closeouts of the Month*

BC-2 Wall charger	$ 9.95	**PB-3** 800MA 7.2V battery	$ 19.95
BC-7 Desktop rapid charger	49.95	**PB-5** 200MA 7.2V battery	9.95
CD-10 Call Sign Display	49.95	**RA-9B** 220 BNC stubby duck	2.95
DC-1 DC adapter	9.95	**SC-22** Soft case; TH-75A w/PB-6	2.95
DC-4 Mobile cgr for PB-10	6.95	**SC-26** Case; PB-7/8/9 w/26AT	2.95
DC-21 DC adapter; TH-A/B	6.95	**SC-27** Case; PB-12/225A	6.95
DC-26 DC adapter; TR-2600A	19.95	**VB-50** 1/10W 1.2GHz FM amp	199.95
DSP-10 Digital signal processor	299.95	**YG-455CN** 250Hz CW filter	19.95
IF-20 Interface for 4 transceivers	69.95	**YG-455S-1** 2.4kHz SSB filter	9.95
MC-55 (6P) Mob. boom mic, 6-pin	29.95	**YK-88A** AM filter; 430S	9.95
MJ-46 4-pin mic to 6-pin xcvr adapt	9.95	**YK-88S** 2.4kHz SSB filter	29.95
MJ-68 6-pin mic to 8-pin xcvr adapt	4.95		
MJ-86 8-pin mic – 6-pin xcvr adapt	9.95		

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NEBRASKA: SM, Vern Wirka, WB0GQM–Congratulations to the Elkhorn Valley ARC and the Lincoln ARC for being renewed as ARRL Special Service Clubs. The Blue Valley ARC is running a weekly net on the 444.20 MHz repeater. The net meets Sun at 8:30 PM local time. The new Sarpy County EC is Ronald Clark, N0POM, of Plattsmouth. Thank you to Tom Huber, WD0BFC, of Bellevue who's been serving in the position of Sarpy County EC. The Buzzards Roost Repeater Club in northeast NE is running code practice on the 146.79 MHz repeater. The practice sessions of 5-15 wpm run Tue-Fri at 7 PM local time. The Pioneer ARC of Fremont has voted Tom Brackett, K0JFN, of Fremont as its newest Life Member. K0JFN was recognized for his years of dedication to the hobby of Amateur Radio. Tom remains active on several modes and is the owner/operator of the 146.67 MHz repeater system which serves the E central NE area. The Ak-Sar-Ben ARC is collecting recipes for a commemorative cookbook, which will be available at the '94 ARRL Midwest Division Convention in Omaha, Oct 14-16. For info about the cookbook and other convention-related inquiries, write to ARRL Midwest Convention, PO Box 24551, Omaha, NE 68124-0551. *Tfc:* KE0XQ 29, WD0EWH 5.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Betsey Doane, K1EIC—ASMs: KB1H, W1EFW, KZ1Z, W1WCG. ACC: NK1J. BM: N1API. OOC: W1FAI. PIC: W1FXQ. SEC: NI1U. SGL: K1AH. STM: W1EFW. TC: W1HAD. Congratulations to the following QCWA members who received certificates at their Feb meeting in recognition of their many years in Amateur Radio: W1EA 55 years; W1EJI, W1FNY, W1FSF 60; W1SHW, W1WG 65 years! Congrats to former member NVTN Mike, KD1DS, just appointed SM SC Section. I talked with Mike on 75 meters right after CPN recently. In fact, several former CT ops stop by to say hello. NY1V and NM1Q are happily settled in Indiana in their 7-room home with HF antennas finally up. We often hear Corinne, WK1B, ON1 CPN from her boat in FL. Delighted to have our ops come back and visit by radio. Ladies should note the date of the WRONE luncheon—May 7 in Windsor Locks–contact Henrietta, KA1JVN. WRONE members are invited to operate W1AW on Fri, May 6, 1-4 PM. Many thanks to Dot, KA1LDS, for having arranged that activity. Traffic handlers should be sure and get reservations for dinner Apr 30 to Milt, W1EFW. Ask for info if you haven't heard about that date. The BEARS of Manchester ARC elected Bill, N1MQR, pres and Bill, K1AH, vp—congrats. Club members will be participating in providing communications for the river canoe race in Hockanum near Hartford, I think. MARS/CARES held its latest open house Mar 22, which gives the public a chance to hear about Amateur Radio. The Shoreline ARC held its annual auction—N4GAA was auctioneer for the 1st time, I believe. ICRC and Southington ARA held their flea markets. Your SM and TC were delighted to say hello to so many of you at the ICRC flea market and at this writing, we sure plan to see many of you in Southington. Clark, NI1U, SEC held an ARES meeting at the Southington flea market. OU on the air! *(Net Sess/QNI/QTC/NM/Liaison)* CN 56/283/116/N1AEH/1RN; CPN 28/276/118/KY1F/FRN; WCN 28/393/147/KA1GWE/CPN; NVTN 28/442/49/K1HEJ/CN; RTN 28/297/56/WA1FCA/CPN. *Tfc:* W1WCG 2069, NM1K 1908, KA1VEC 554, KA1GWE 395, W1EFW 360, KY1F 72, KD1JT 57, K1HEJ 32, N2LTK 25, N1BOW 23, KA1WVM 17, N1OUK 15, N1ONI 6, W1YOL 2, KA1WIF 1.

MAINE: SM, Michelle Mann WM1C—ASMs: WA1YNZ KA1TKS. STM: KA1ODT. BM: W1JTH. TC: KF1H. SEC: KA1LPW. OOC: W3EZ. SGL: WA1N. ACC: NX1A. Congratulations to Ron Levere, KA1FI, on receiving PAWA's Ham of the Year Award. Ron is head of the committee that organizes the Portland Hamfest and secretary of PAWA, among other ham activities. The ME Hamfest Assn elected new officers and decided to put on the Union Hamfest again. New officers: pres N1HWN, vp N1NFK, secy KA1LPW, treas NX1A, directors KC1OC & N1HKZ. MHA consists of representatives from ME's ham clubs. If your club doesn't send a rep, contact an officer for details today. They need your participation! New officers for Bagley ARC are pres N1GOI, vp N1LGX, treas WA1JGO, secy N1JRR. Upcoming ME hamfests: Bangor (PSARC) Jun 11 at Hermon Elementary School. Hope to see you there! ARES and RACES members recently participated in a simulated flood exercise in conjunction with the state EMA. Now that we have a signed emergency communications plan in effect, we'll be invited to join in with more of these exercises. Hope a lot of you will join in. *Feb tfc:* W9KLS 248, WM1C 110, NR1F 99, NX1A 96, WA1YNZ 92, KA1ODT 88, W1CE 78, NR1W 50, W1KX 46, AF1L 33, W1JTH 30, N1NFK 26, WA1WPR 18, N1HYF 14. 73, Michelle.

NEW HAMPSHIRE: SM, Al Shuman, N1FIK (@ WA1WOK)–STM: KB4N, ASM: WB1ASL. SEC: N3CLZ. TC: W1JY. BM: KH6GR. Wow! New ATV group called ATOM (Amateur Television of Manchester). Contact Dick, N1FIL, for particulars. I have a copy of the new ARRL video public service announcements. If you have an "in" at a TV or cable outlet, call me for a copy. Good news! NH House bill 1380-L prohibiting cities & towns from taxing towers, antennas as real estate has made it through the general court. The bill now awaits scheduling in the NH Senate. Thanks to Dick, W1FEW, for donating a copier to the '95 Div Convention Committee. The 1st annual North Country/LARK flea mkt was held in the Twin Mtn town hall. This has all the makings of a great yearly event. If you want ARRL support for your club event, You might try inviting someone from the NH Field Organization. Received continued requests for my '93 Field Day Film as a way to spark interest for FD '94. The film played for a packed house for the IRS and is scheduled for CVARC in May. Try joining in on the IRS 10-meter sprint. Contact John, KA1FYB, for details. I'll be at Rochester Hosstraders; come by and visit the ARRL Booth. 73, Al. *Nets:* GSPN 104, VTNH 100, GSFM 47. *Tfc:* W1FYR 1356, W1PEX 897, K1TQY 272, WA1JVV 218, N1CPX 131, KB4N 63, W1ALE 57, KD1GJ 51, N1IZZ N1KPT 28, WB1GXM 24, KA1OTN 7, AE1T 6, KA1GOZ 3, K1PDY 1. BPL: W1FYR, W1PEX, PSHR: W1PEX, WA1JVV, W1ALE.

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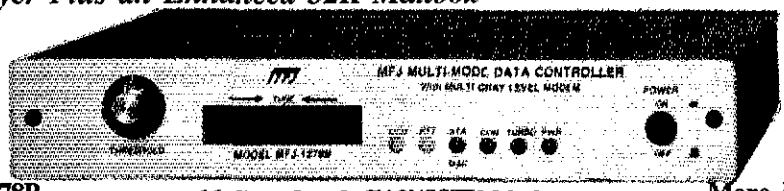

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External reset, optional scope tuning output
Selectable 19,200 baud terminal operation

ransmit and Receive Color SSTV

Robot Color: 36, 72 Seconds
Robot B/W: 8, 12, 24, 36 Seconds
Scotty Color: 1 and 2
Martin Color: 1 and 2

16 Gray Levels FAX/SSTV Modem

- 16 Gray Levels Weather/AP Wire FAX

Real-Time Packet Pictures

- SVGA, VGA, EGA, CGA Color Packet Pictures

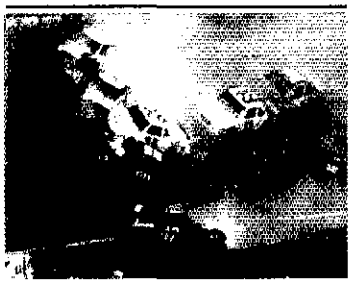
Standard Features

- *Auto* terminal baud rate: 300, 1200, 2400, 9600, 19,200
- Built-in 300 and 1200 baud packet modem
- Two software selectable radio ports
- *Threshold control*
- KISS interface for TCP/IP, MSYS compatible
- Anti-collision technology gets packets through faster, Host mode
- True DCD circuit designed for HF
- Normal or reverse FSK output
- RS-232 and TTL serial ports
- Fast-Start™ Manual

More *Exclusive* Features

- Automatic Signal Analysis™ for HF packet and AMTOR as well as RTTY and ASCII
- Built-in printer port
- Built-in sidetone amplifier with volume control
- TAPR internal modem header for high speed modem–2400 or 9600 baud
- 20-LED precision tuning indicator
- Automatic Digipeater™ Routing
- QSO and transfer files simultaneously
- Dedicated MARS mode
- *Individual* radio port level control
- *Stored* parameters for each mode
- CW iambic paddle input
- 10-user programmable message memory buffers
- Call Alert Beeper™
- Built-in packet connect bell
- IC sockets used throughout
- A/C power supply included
- One year *unconditional* guarantee

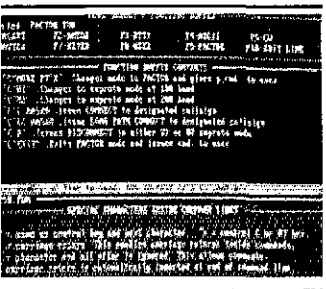
Gray Levels WeFax map received on .410 MHz. MFJ-1278B & MultiCom™ nsmit and receive 16 Gray Levels FAX.



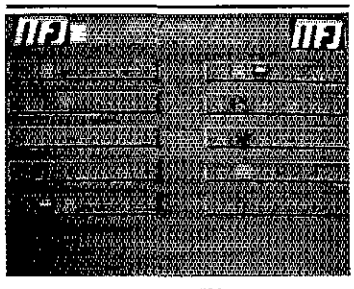
16 Gray Levels AP Wire Photo FAX received on 20.738 MHz. See tomorrow's news today.

Full Color SSTV pictures received on 14.230 MHz. Robot 72-Second format. Transmit and receive color and B/W SSTV.

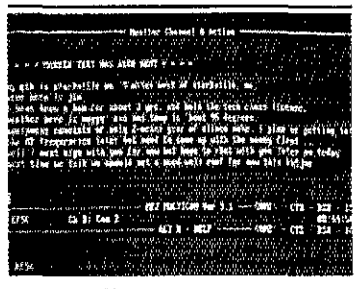
256 Color VGA Packet Picture received in real-time packet. Only MFJ-1278B and MultiCom™ has this feature.



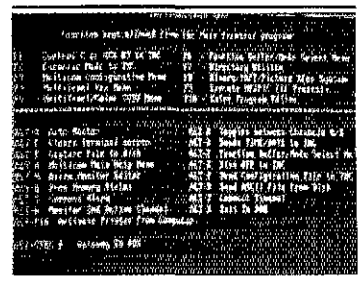
sy and simple . . . MultiCom™ perating menu--each mode gives you 10 ogrammable function buffers.



Dedicated MultiCom™ FAX menu. Getting on FAX and SSTV is as simple as pressing one or two keys.

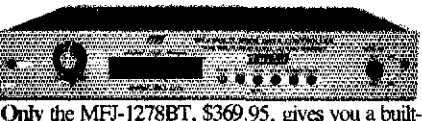


MultiCom™ lets you carry on two digital QSO's *simultaneously* using two multi-modes or TNC's and two comm ports.



Need help? *Alt-H* brings up the on-line Help Menu that makes the MFJ-1278B very easy to use.

New MFJ-1278BT Turbo *with fast 2400 baud modem*



Only the MFJ-1278BT, $369.95, gives you a built-in 00 baud modem. Runs high speed packet without odifying your radio. Get the MFJ-1278BT and perate 300, 1200 and 2400 baud packet. The 2400 baud odem is also available separately. Order MFJ-2400, 89.95, for any MFJ TNCs and MFJ multi-modes.

MFJ-1278 and Multicom Upgrade*

Upgrade *your* MFJ-1278 to include PACTOR and the enhance mailbox--MFJ-56A (32K), $69.95; MFJ-56B (128K), $89.95; MFJ-56C (512K), $229.95.

New MultiCom™ upgrade Release 3.1. New features: Simultaneous dual multi-mode or TNC operation for DOS. New FAX module with auto receive, color FAX, PCX format compatible. YAPP binary file compatible. Order MFJ-49B for MultiCom™ 3.1 upgrade, $29.95. *Upgrade available for current MFJ-1278 and MultiCom user with proof of purchase.

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- Plug-in Scope tuning adapter, MFJ-44 $29.95
- 2400 baud internal modem, MFJ-2400 $89.95
- 9600 baud internal modem MFJ-9600 $109.95

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VERMONT: SM, Mitch Stern, WB2JSJ (@ KD2AJ) (802-879-6589)—Our heavy public service communications season is here! Diabetes Tour de Cure bicycle ride takes place in Burlington on May 15 and in Bennington on May 22. Vermont City Marathon takes place May 29 in Burlington. Many ham radio volunteers are needed to staff these events. If interested, contact your DEC or phone me. Milton Hamfest was very crowded with virtually everyone taking the opportunity to beat mid-winter cabin fever. Everyone tells me they had a great time! And the added bonus, WCAX channel 3 sent a crew over to the fest and we were treated to 90 seconds of great footage on the 6:00 news, masterfully narrated by Tom, N1EXY! A few days later, *Vermont Times*, a Burlington weekly, interviewed KA1NRR, N1MJD and me, which resulted in a nice page-long article on who amateurs are and what we do. New repeater—WB1GQR, 145.15 MHz—primarily serving the the Burlington-Montpelier corridor and reachable from most of Northern VT. I regret to report the passing of Tom Forbes, K1LQO, of Warren. Tom was an active amateur operator and a former SEC. He will be missed by us all. Vermonters on the move: Lanny, K1LEC, formerly of Springfield, has checked in from a new QTH in Greely, CO! Hosstraders, VT's favorite out-of-state hamfest, is May 6-7 at the Rochester, NH, fairgrounds. See you there!

WESTERN MASSACHUSETTS: SM, Dan Senie, N1JEB (@ KA1SRD.MA) Internet: n1jeb@world.std.com—Spring will hopefully have arrived when this is printed. Flea market season is in full swing. Take a new ham under your wing at a hamfest. Newer hams who want to buy gear on a budget can do well buying used equipment. The help of an Elmer can make the process easier. Explorer Post 73 continues its active schedule. The explorers demonstrated ham radio for Scout Pack 114 in Shrewsbury. The Ol' Joe's Net is the meeting place for the senior scouts. Join them every evening at 7:30 PM on the 146.97 Paxton repeater. Thanks to the NoBARC club for the great ARRL night meeting. It gave us the chance to get most of the Section leadership together in one place. The Mt Tom group did its usual excellent job on its flea market. Dayton and the Hosstraders are coming up soon. Hope to see lots of people from the Section at those events. If you aren't an active traffic handler, consider giving it a try. NTS is a fun and important service. It's useful training for emergency communications. More CW operators are needed for the WMA Net on 3.562 at 7 PM daily. Please check into the WMA Phone Net on 3.937 at 6 PM. Thanks to Joy, KA1EXJ, for taking on the NM position for WMPN. *Tfc:* NX1K 292, KA1EXJ 198, W1KK 153, N1NOZ 30, N1ISB 23, KA4FRH 22, KA1OFV 22, W1SJV 21, N1JEB 12, KD1SM 9

NORTHWESTERN DIVISION

ALASKA: SM, Larry Flanagan, NL7XG—Thanks to Merle, AL7LD, our outgoing SM, for all his excellent work on behalf of AK amateurs. 73 to Merle.

Net	*Freq*	*Time*	*QNI*	*QTC*	*Sess*	*NM*
ABN	7.087	0500	865	27	28	AL7LX
APN	14.292	1730	907	33	19	KL7IPJ
MG	3.933	0600	1407	51	28	KL7GID
SN	3.920	0300	1008	64	28	KL7GG

EASTERN WASHINGTON: SM, Kyle Pugh, KA7CSP—STM: W7GB. SEC: WA5ZAY. RM: W7EQU. ACC: WV7Y. OOC: WB7AUK. PIC: N7DWD. SGL: KD7AC. TC: N7IRM. ASM: KC7FJ. The operations mgr for the NE WA Region of the DNR wants the hams and county ARES groups in Spokane, Stevens, Pend O'Reille, Ferry and Okanogan to be a backup communication resource in the event of a major emergency, mainly forest fires. The hams in the Davenport area are considering starting an ARES group. STM Don, W7GB, reports the Central WA ARC Field Day crew will be looking for other FD groups on the RS-12 satellite on CW and SSB. PDT starts on Easter Sunday and all of the state traffic nets will stay at the same local times, so note the changes in Zulu net times.

Net	*Freq*	*Time*	*QNI*	*Tfc*	*Sess*
WSN	3590	0245/0545Z	546	161	56
WARTS	3970	0200Z	2946	138	28
Noontime	3970/7270	2000Z	2929	452	28

Tfc: W7GB 394, K7GXZ 320, KK7T 58, KA7EKL 47, W7LBK 46, W6UVP 4. PSHR: W7GB 138, K7GXZ 108, W7LBK 78, W6UVP 62.

MONTANA: SM, Darrell Thomas, N7KOR—Members of several ARCs in MT banded together on Feb 12 to provide support for the annual Race to the Sky dogsled race. The 500-mi event has been a project of hams in MT for years, providing communication between checkpoints to assure participant safety. This year, 35 hams representing 6 clubs were represented. Communication was provided 24 hours a day from noon on the 12th until the last team crossed the line 7 days later. Included in this effort were several new hams who gained fine operating and traffic handling experience. *Tfc:* KA7YYR 316. *PSHR:* KA7YYR 114. *Nat/QNI/QTC/NM:* MSN/83/0/KF7H; MTN/1374/27/N7AIK; IMN/283/9/7/KB7GZU.

OREGON: SM, Randy Stimson, KZ7T—ASMs: W7FBP, KF7KE, KG7OK, KI6PL, WA7EES. STM: W7VSE. SEC: WB7NML. PIC: KC7YN. SGL: KA7KSK. ACC: AA7OA. STC: N7HMV. OOC: NB7J. We have 2 hamfests coming in the next 2 months. The 1st is the KENO ARC on May 7, 1994, in Klamath Falls at the National Guard Armory. Make this one, as they are the greatest bunch of people. The next would be the Northwest Division Ham Convention, better known as SEA-PAC, Jun 4-5, 1994, in Seaside, OR. This is the largest ham convention in the NW. All of the major manufacturers will be there. A little story on Jim, KB7ADH: Jim's been my co-net on Cycle OR for the past 4 years and we've always had a little friendly one-upmanship going on. Like radios, scanners, PA systems, flashing lights, even umbrellas, etc. Well, the new Director wants Jim for staff communication. When I told Jim, the 1st thing he said was, "What in the devil am I going to do with all of my toys?" You see, he has to ride in the Director's car. He's started to build a box that will hold 2 radios and 1 scanner. Let's see what else he'll come up with. I bet, at least, he won't be able to use his car umbrella. I'd like to welcome 2 new Emergency Coordinators: Ames, N7NPD, EC for Deschutes County, and Ken, N7QQU, for Lane County. Paul, KI7PL, is the new District Emergency Coordinator for District 2. Welcome,

MFJ Super CW Keyboard with Perpetual Memory™

. . . two line LCD display . . . includes RFI suppressed keyboard . . . eight 250 character nonvolatile message memories . . . 200 character type-ahead buffer . . . iambic keyer . . . powerful Morse Code Trainer . . .

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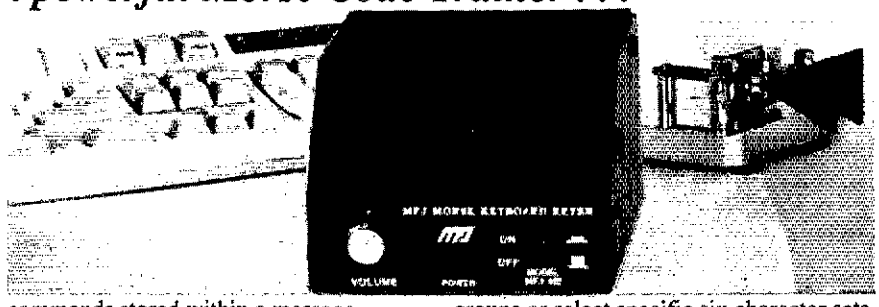
Includes Keyboard!



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Eight 250 character message memories let you store often used messages.

MFJ's unique nonvolatile *Perpetual Memory*™ saves your messages and settings up to 20 years without power or batteries.

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LCD Display

Only MFJ gives you an easy-to-read LCD display that *simultaneously* shows what you're typing in on one line and what you're sending out on another line.

You can review stored messages, keyboard settings and spot typing errors that you can quickly correct by backspacing.

LCD display is mounted on a sloped front panel and has a contrast control.

MFJ *AutoCommand*™

MFJ *AutoCommand*™ lets you execute commands stored within a message.

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Keyboard *included* -- you won't have to supply your own keyboard.

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No complex keystrokes! MFJ's *SingleTouch*™ function keys make it simple to store and recall messages, set speed, weight and tone, setup serial numbering, turn on/off transmitter tune, keying and handkey mode.

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For fast break-in, plug in an iambic paddle and use it as a *full featured* keyer.

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You can practice or teach Morse code in Farnsworth or normal mode.

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Has speaker, sidetone, volume control and jack for external speaker or earphones.

You can vary speed from 5 to 100 WPM, weight from 5 to 95%, sidetone from 300 to 3300 Hz and serial number from 0 to 9999.

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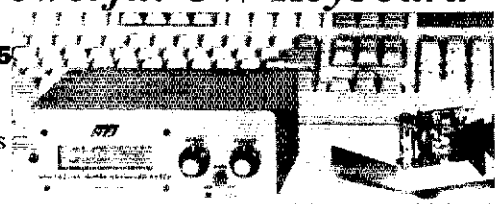

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gentlemen, to the ARES Group. New officers for the Willamette Valley DX Club: pres Al, WA2TMP; vp Rod, AA7AJ; secy Bob, W7YAQ; treas Russ, W7LXR. New officers for the Central OR Radio Amateurs: pres Jim, N7RDN; secy Nancy, N7RPE; treas Grover, W6AYQ. Hoodview ARC's new officers: pres Cory, KA7IUG; vp Linda, KB7OMA; secy Todd, KB7RQQ. *Traffic (P = packet):* W7VSE 538 and BPL, N7UOF 320, AA7GM 316 and BPL, WA7EES 293, W0RLI 266P and BPL, N7SUB 219, K6AGD 134, K7IOI 97P, K7NLM 59, N7UCA 42, N7ODN 38P, KB7PPP 24, N7THH 20, KA7AID 12. *Tfc (Jan):* KA7AGD 132. *(Dec):* N7SUB 452.

WESTERN WASHINGTON: SM, Harry Lewis, W7JWJ—SEC: KC7FA. OOC: W7DNY. BM: N7CAK. STM & NLM: KD7ME. ACC: W7QGP. SGL: KD7AC. The Mike & Key annual flea market has grown throughout the years from an attendance of a few hundred people huddling in a small grange hall to a happening and gathering of several thousand. The bldg now required is one of the largest on the Puyallup fair grounds. Truly the event is becoming "The Little Dayton of the West." After the event, the club members celebrate by going to a fine restaurant for dinner. To the uninformed, the after-flea market dinner must truly be a depressing sight. The club members, close to exhaustion, dirty and rumpled, looking like an over-the-hill mutual support group, but adorned in the finest rags Goodwill has to offer, and after spending hours cleaning the flea market area, assemble for a Chinese dinner and to begin planning next year's event. Soon they stumble out the restaurant door carrying doggy bags of uneaten food and hoping they can stay awake during the long drive home. Club officers assist the walking wounded or those who have already gone to sleep. It one has to ask, "Why?" then they truly don't understand ham radio. Why would anyone operate with only 5 W or less? The only way to find out is to talk to other QRPers by checking into the NW QRP Club net 0300 UTC on 1012s kHz Mon eves or Sat mornings on 3561 kHz at 7:30 PST. *QNI/QTC/QNS/NM/Liaison:* NTN 2929/252/28/W7TVA/NTS-LN. NWSSBN 573/39/28/N7MGQ/RN7, PSTS 73/41/43/KA7TTY/WARTS-WSN, WARTS 2946/138/28/W7GB/RN7, WSN 546/161/56/W7AZU/RN7. *PSHR:* W7AZU 122, KB7JQM 116, KD7ME 142, KA7TTY 89, W7NWP 99, W7PFD 84. *Tfc:* W7AZU 73, K7CLL 4, KB7JQM 218, W7LG 74, KD7NE 280, W7NWP 23, W7PFD 73, KA7TTY 36.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, WB3FCV. DECs: W6CPO, N4OGL. STM: K6APW. ACC: Vacant. TS: KF6NY. The Alameda City Emgy Svcs (ACES) Net is held Tue at 8 PM on 147.24, 444.20 (CTCSS 107.2), 147.12, 224.74, 441.125 (CTCSS 100.0) & 145.43 (CTCSS 100.0). All are linked for the net and those interested in Emergency Comms are welcome to check in. New SIRARC officers: pres KB6DW, 1vp WB6PQL, 2vp WA6RJI, secy WA5HOJ, treas AB6SG, membership N6FER. & B/D KA6OFR, K6IGJ, WA6TJJ, WB6RHV, WB6LMY & AA6HJ. EBARC welcomes new members AB6YM & Norton Perlman. BARC's *Logbook* features an article on the HAZMAT and MODS data bases available on the KJ6FY-1 PBBS on 144.93 MHz. Both are available to packet BBS users worldwide. VVRC's Novice class is running again, with K6HIH & N6WVF doing the honors. The club has started a monthly foxhunt, with W6ROY as chair and KK6SV as the fox. Member W6TWK becomes Solano County RACES Radio Officer on May 1. MDARC awarded its annual $1000 scholarship to KE6BSY. The club welcomes new members KE6DYT, WA2WAE, KD6ZTP, Carol Mann, KE6DRO, W6IDW, W1WUH, N6CPG, KE6EGG, KE6DEQ, KE6DQT, Bud Wasson, Kathy Wasson & KE6DHB. SBARA is supporting the annual Baker-to-Vegas run for public safety officers. Contact W6QWK for info. GSARC welcomes new members KE6DIN, KE6CQR, KD6WCH & Dennis Jereza, and congratulate upgrades to Extra Class by KN6UP & KN6MA; and to Adv by KN6XB. LARK's VE team, AD6X, KF6VU, KA6DXY, W6OA & W6GPM, are holding monthly sessions at Granada HS in Livermore. Contact one of them for info. *Feb tfc:* WB6DOB/691, W6VOM/80, K6APW/71, WB6ETY/28, WB6UZX/20. PSHR: WB6DOB, W6VOM, WB6ETY. *BPL:* WB6DOB. *Tfc nets:* NCN1/3630/7 PM, NCN2/3705/9 PM, NCN-VHF/145.41/8:30 PM; RN6/3655/7:45 PM & 9:30 PM; PAN/3652/7052/8:30 PM. Your check-ins are always welcome.

NEVADA: SM, Curly Silva, K7HRW—TC: NW7O. SEC: K7HRW. ACC: N7FFP. STM & SGL: N7CPP. We're still looking for info and activity articles from all areas in NV. Give me a hand telling about individual and group activities in our fine state. Hats off to our Elko group for its important fire training for hams. Training is a must for all good communication. The new 147.21+ machine should be running by now and will give good coverage in E NV (including Eureka). From our S NV ACC N7FFP, the new amateur call sign license plate "Prestige" fee-waiver requirement (this could apply statewide); if you're a member of ARES, RACES, VIP or a recognized *bona fide* emergency response Amateur Radio group, request a signed letter from the administrator of that group and send copies of your ID cards with your registration renewal to DMV (or take it in person). Contact the president, chairman, secretary or official of your group for a form to complete for DMV. This is an interim procedure until DMV gets the actual waiver form. (If your club doesn't have the form, ask them to contact me.) Congrats to the gang in Boulder City for forming their new ARES/RACES emergency communications group. Team meets 1st Mon/month on 145.11 at 6:30 P. *Tfc:* W4JLS 14, K7OK 12, N7CPP 11.

PACIFIC: SM Bob Schneider, AH6J—The BIARC auction Feb 19 had a standing room only crowd. On Feb 24, I attended The EARC meeting with Director Brad Wyatt, K6WR. The speaker was Bob Jones, KH6O, who gave an excellent talk on moonbounce. Brad & I had breakfast that morning with the Columbia Inn group & later paid a courtesy call to the FCC field office in Waipahu. Brad also went to gatherings of the Kalawao ARC, Maui ARC, W HI ARS & Big Island ARC during this quarterly visit. On Mar 8 Dennis Carvalho, KH2M, came to the BIARC meeting. He talked about how the county of Hawaii helicopter took WHARS members to "Sulfur Cone" and relocated the repeater to Macadamia Nut farms in Kau. The goal is to tie into the

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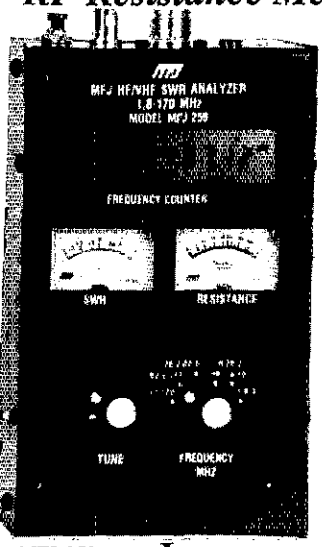
Read your antenna SWR from 1.8-170 MHz . . . 10-digit LCD frequency counter . . . RF Resistance Meter™ . . . smooth reduction-drive tuning . . . simple-to-use . . .



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Now you can measure RF resistance up to 500 ohms at minimum SWR -- instantly -- on MFJ's *exclusive* side-by-side RF Resistance and SWR Meters!

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Watch the effects of spacing on radiation resistance as you adjust your antenna.

Here's What You Can Do . . .

Find your antenna's true resonant frequency from the shack.

Tune the antennas on your tower and watch SWR change instantly as you make each adjustment. You'll know exactly what to do by simply watching the display.

Tune critical HF mobile antennas in seconds -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on a single band, or analyze multiband performance over the entire spectrum from 1.8 to 170 MHz!

Measure inductance, capacitance, resonant frequency of tuned circuits, transmission line velocity factor/impedance/loss. Test RF chokes, transformers, baluns.

Adjust your tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259 is really *four* test instruments in one: an accurate RF signal generator, a high resolution 170 MHz frequency counter, *RF Resistance Meter*™ and an *SWR Analyzer*™.

Free Manual

MFJ comprehensive 18 page instruction manual is packed with useful applications -- all explained in simple language you can understand! **For** free manual write or call MFJ.

Take It Anywhere

The MFJ-259 is fully portable, powered internally by 8 AA batteries or 110 VAC with MFJ-1312B, $12.95. It's in a rugged all metal cabinet that's a compact 4x2½x6¾ inches. Take it to remote sites, up towers, on DX-peditions -- anywhere your antennas are located.

For rough service, pick up a convenient **MFJ-29**, $19.95, padded carrying pouch to keep your MFJ-259 close at hand and looking like new.

How Good is the MFJ-259?

MFJ SWR Analyzers™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Professional installer and technicians use them worldwide.

Get More by Paying Less

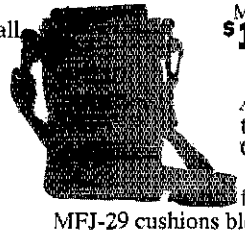
With the MFJ-259, you get full 1.8 to 170 MHz coverage, simple operation, instantaneous readings, a high accuracy frequency counter and MFJ's exclusive *RF Resistance Meter*™-- all for a low $219.95.

1.8-170 MHz *SWR Analyzers*™

MFJ-249 **$199.95** **MFJ-249** *HF/VHF SWR Analyzer*™ has all the features of MFJ-259 but less RF resistance meter. Includes 1.8-170 MHz *continuous* coverage, 10-digit LCD frequency counter and smooth vernier tuning.

MFJ-209 **$109.95** **MFJ-209** *HF/VHF SWR Analyzer*™ is same as MFJ-259 without LCD frequency counter and RF resistance meter. Has jack for external frequency counter. MFJ-249/MFJ-209 are 4x2½x6¾ inches and uses 8 AA cells or 110 VAC with MFJ-1312B, $12.95.

Carrying Pouch



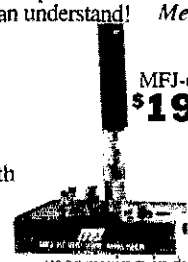
MFJ-29 **$19.95** **Tote** your MFJ-249, MFJ-259 or MFJ-209 *SWR Analyzer*™ anywhere with the MFJ-29 custom Carrying Pouch.

Made with a special foam-filled fabric, the MFJ-29 cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

Wear it around your waist, over your shoulder, or clip it onto the tower while you work--the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends.

Protect your investment and keep your analyzer safe and looking like new!

Dip Meter Adapter



MFJ-66 **$19.95** **Plug** a dip meter coupling coil into your *MFJ SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter.

With a dip meter you'll save time and take the guesswork out of winding coils, measuring inductance and capacitance, measuring velocity factor and electrical lengths of coax. Determine resonant frequency of tuned circuits and measure Q of coils. Set of two coils cover 1.8-170 MHz depending on your *MFJ SWR Analyzer*™.

Free MFJ Catalog
Write or call . . . 800-647-1800

10-160M *SWR Analyzer*™

MFJ-207 **$79.95** If you're an HF man, this compact MFJ-207 *HF SWR Analyzer*™ will help you build 10-160 Meters antennas that'll make working DX almost routine.

Just plug in your coax to find the SWR of any HF antenna on any ham band 10-160 Meters. Has jack for external frequency counter. 7½x2½x2¼ inches.

2 Meter *SWR Analyzer*™

MFJ-208 **$79.95** **MFJ-208** 2 Meter *VHF SWR Analyzer*™ finds the SWR of any antenna from 138-156 MHz. Jack for external frequency counter. 7½x2½x2¼ inches.

For Commercial VHF Radio

Same as MFJ-208 but for commercial VHF. **MFJ-217**, $79.95, covers 30-50 MHz and **MFJ-218**, $79.95, covers 150-170 MHz.

440 MHz *SWR Analyzer*™

MFJ-219 **$89.95** The New MFJ-219 *UHF SWR Analyzer*™ lets you read SWR of any antenna 420 to 450 MHz--just plug in the coax of your antenna, set the frequency and read SWR. Uses latest high-tech microwave integrated circuits and microstrip technology. Jack for external frequency counter. 7½x2½x2¼ inches.

MFJ-219/218/217/208/207/203 uses 9 volt battery or 110 VAC with MFJ-1312B, $12.95.

Bandswitch Dip Meter™

MFJ-203 **$99.95** **The** MFJ-203 is a sensitive *Bandswitched Dip Meter*™ that covers all hams bands from 160-10 Meters. There are no plug-in tuning coils to keep up with or break.

Has detachable coupling coil, dual FET oscillator, op-amp meter amplifier and jack for external frequency counter. 7½x2½x2¼ in.

MFJ Antenna Bridge

MFJ-204B **$79.95** **Great** for determining feedpoint resistance of antennas and for designing impedance matching networks. Measure RF resistance up to 500 ohm. Covers all ham bands 160-10 Meters. Built-in resistance bridge, null meter, tunable oscillator-driver, frequency counter jack. 7½x2½x2¼ inches. Use 9 volt battery or 110 VAC with MFJ-1312, $12.95

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MFJ . . . making quality affordable

Hualalai repeater to get coverage to the south end of HI. Chris Stewart, AH6GG, showed the new Mauna Loa packet node that will be installed soon. On Feb 12-13, Kauai ARC activated an emergency weather net with Kevin Devitt, WH6GK, as NCS. Some parts of the island got 11+ inches. *Feb Ific:* KH6S 17.

SACRAMENTO VALLEY: SM: Jettie Hill, W6RFF–STM: WA6WJZ. ACC: KB6COH. SEC: KE6EP. OOC: AB6GQ. TC: WB6RBE. PIC: WA6OWH. BM: WB6FIX. SGL: N6IG. DECs: N6MSZ, WO6H, N6SNO, WA6SLA. NM: K9JM. N6MSZ has asked to be replaced as DEC for Northern Counties. SEC, KE6EP, is looking for a replacement. As mentioned last month, WY6O resigned as OOC. I've appointed Fred Sober, AB6GQ, as OOC. He'll be in contact with all OOs. Other appts: David Thorne, KC6HOY, as OES and Peter Herborn, KA5KWM as OO. For info on ARRL Field Appointments, send me a SASE. North Hills RC's annual Hamswap is May 21, 8 AM-3 PM, at Carmichael Elks Lodge, Carmichael. talk-in 145.19; info Tim at 722-7037. Pac Div Vice Dir W6CF spoke on DXing to River City ARCS. Jim has made several trips to SV to present talks. WB6JOT received DXCC for SSB. KD6GBV won a new Buick in a contest! Initial DXCC cards can be checked by authorized Field Checkers. A list of checkers is in the ARRL *DXCC Countries List*, or for a SASE to me. PACIFICON is Oct 21-23 in Concord; WA6CIE for info. Exams: RCARCS May 21. Nevada City ARC Jun 4, Aug 6, Oct 1, Dec 3. New club members, RCARCS: KE6FCJ, KD6MXL, KC5TSZ, KE6DQE, K6KY, KE6DQB, KE6DPZ, KE6DQC, KE6BGT, KE6FCF, KC6WPW, KD6WBG, KE6BLL, KD6QCZ, N5LYU, KD6QED, KD6VNJ, KC6WPT, KD6TTE, KE6DPQ. SCARS: N6HDC, N6CNY, W6JEX, KD6SNI, KD6SNJ. GEARS: WA6PUV, KD6TRR, KA6FAW. SFARC: K6SKQ, KE6DJA, KE6DJB, KE6CFT. Send traffic reports to WA6WJZ by 5th of month. Section Net 145.085+ 8 PM 1st Sun/mo. *Tfc:* KK1A 146, K9JM 129, WA6WJZ 60, N6LUY 50, W6RFF 15.

SAN FRANCISCO: SM, John Wallack, W6TLK—ASMs: WX3K, N6KM. OOC: KK6JJ. SEC: WB6TMS. STM: AB6EU. TC: N1AL. The following hams from Humboldt County are SKs: W6RLY and WB6LOR. Thanks to the members of the Mendocino County ARC and the Redwood ARC for their warm hospitality during my recent visits. K6HY, PIO. Del Norte ARC, reports all is well in the far north with KA6SPQ, DEC, and KD6KYC. EC, meeting regularly with County OES. Del Norte High School has 8 Novices in need of CW QSOs with other students from their school club station. Contact K6HY for info. Job well done for KE6BEL of Lake County ARS who, with only 24 hours' notice, served as a Shelter Mgr for the Red Cross in LA for 120 earthquake victims. WA6TVQ reports 12 Humboldt County ARES members had a good disaster training exercise, coordinated with the County Health Dept. KD6IKA of the Amateur Comm Society reports the 146.70 repeater on Mt Tam has a new antenna, thanks to WB6KSS, WD6BKB and WB6QPR. WB6QVU of Lambda ARC reports all 9 students from their recent ham class passed their Tech exams, congrats to all. KE6BYQ of Anchor Bay ARC reports an excellent turnout by hams and the general public at the recent Community Disaster Preparedness Meeting, which was attended by WB6TMS, SEC, and N6PTM, DEC. *Tfc:* N6FWG 357, AB6EU 181, N6KM 14, N6GHG 11.

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W—ASM: AB4S. ASM: KE4ML. SEC: WB4SGA. STM: K4IWW. ASTM: W4EAT. ACC: WC4T. TC: KM4OX. SGL: KI4AN. OOC: W4ZRA. PIO: KN4AQ. I appreciate the confidence of those who supported me in my reelection to a 4th term as SM. We can be proud of what's been accomplished for Amateur Radio & the ARRL in our Section. By continuing to work together we can do even more! I want to continue increasing cooperation between NC & the adjoining Sections. The SMs from SC, GA, TN, VA & WV all agree & we're working toward this broader approach to ARES response. Disasters don't stop at the state line! In Feb in NC, SC & GA, SKYWARN nets held a successful joint Tornado Awareness Week exercise with liaison on HF and via *PacketCluster*. I believe that increasing public awareness of Amateur Radio as an essential emergency communication resource is critical to our future. This should be a high priority for all of us. I hope we can work toward legislation exempting amateur antennas from zoning and covenant restrictions (GA is already working on this) and try to reduce the current $10 additional fee for Amateur Radio license plates. If you re still getting the plates (I'm waiting for the fee to be reduced before I get them again), you're entitled to a *new* plate every year. Request a new plate when you renew. You'll get a sticker & later they'll mail you a new plate. It's okay to keep the old plate, but don't put it on a vehicle with the valid sticker on it. We hope to make NC Amateur Radio and ARRL info more readily available through BBS-based files now being developed. ARES, NTS & ARRL forums at the Charlotte Hamfest were well attended and informative. Same scheduled for Raleigh Hamfest. Every Mon at 7:30 PM on 3.923 kHz the TarHeel Emergency Net has an ARES meeting—all are welcome to participate. Tue is a training and discussion night. N4TIE has been appointed SKYWARN EC for the new Morehead City NWS office. KM4LB, Area 8 DEC, reports that Wake Co Emergency Mgmt held an unannounced exercise on Mar 13. Tom, who served on the planning group and was as evaluator, gave ARES high marks. *Feb Ific:* KD4BJ 475, K4IWW 194, KI4YV 169, W4EAT 147, N9CGD 132, WD4LOO 98, K4AIF 94, N4SMS 87, AC4DV 81, WD4MRD, 54, KC4MWT, 47, AA2AB 46, NT4K 46, N4UE 46, KR4LS 42, N4LST 38, KD4VJH, 31, KC4PGN 31, AB4W 30, WA4SRD 24, N4WZH 24, WA4MNR 22, AK1E 20, W4DYW 17, KD4UAI 17, KD4UJC 13, N4BJX 5, K4MPJ 4, KE4AHC 2.

SOUTH CAROLINA: SM, Mike Epstein, KD1DS—STM: W4DRF. AIRS: W4DRF. BM: KQ4OU. OOC: W4NTO. PIC: KA4LRM. It is with deep sorrow that I report the passing of Ned Moeller, N4FVU, and Arnold Jordan, WB4BZA. Ned was recently honored with the Sidebander of the Year award from the SC SSB Net. A memorial net was held for Arnold on Fri, Mar 4. Both men have inspired us. We are grateful to Amateur Radio for allowing us to know them. They will be missed. W4DRF is our new STM. I can think of

10 Bands -- 1 MFJ Antenna!

Full size performance . . . No ground or radials

Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna
Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters -- with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

Full size performance gives you high efficiency for more power radiated. The result? Stronger signals and more Q-5 QSOs.

Full size performance also gives you exceptionally wide bandwidths so you can use more of your hard earned frequencies.

Full size performance is achieved by using separate full size radiators for 2 through 20 Meters and highly efficient end loading for 30, 40 and 75 /80 Meters.

You get very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR and it handles 1500 watts PEP SSB.

MFJ's unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

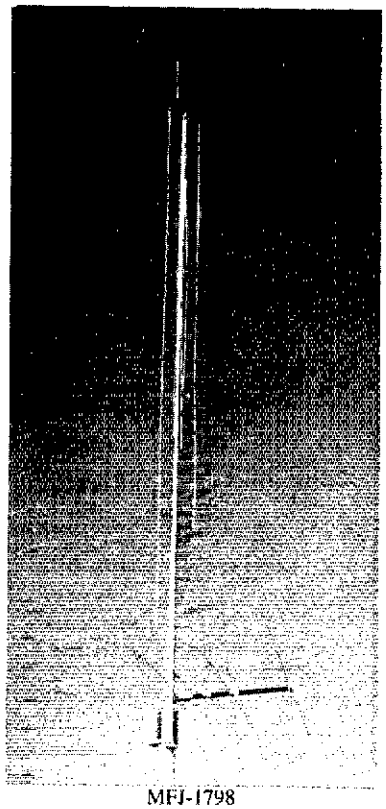
It's easy to tune because adjusting one band has minimum effect on the resonant frequency of other bands.

Self-supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- on small lots, backyards, apartments, condos, roof tops, tower mounts.

Separate *Full Size* Radiators

Separate full size quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

The active radiator works as a stub to decouple everything beyond it. *In phase* antenna current flows in all parallel radiators.



MFJ-1798
$269.95

This forms a very large equivalent radiator and gives you incredible bandwidths.

These radiator stubs provide automatic bandswitching -- there is absolutely *no loss* due to loading coils or traps.

End Loading

On 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands.

Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

No Ground or Radials Needed

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation.

You can mount it from ground level to roof top and get awesome performance.

No Feedline Radiation to Waste Power

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with Teflon® coax and *can't* saturate, no matter how high your power.

Built to Last

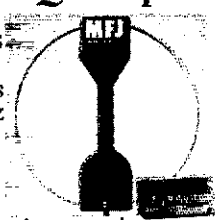
Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is used in the main structure.

Efficient high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant Teflon® covered wire.

Teflon® is registered trademark of Dupont

MFJ *Super Hi-Q Loop*™

MFJ-1786
$299.95



MFJ's *tiny* 36 inch diameter *high efficiency* loop antenna lets you operate 10 to 30 MHz *continuously* -- including the WARC bands!

It's ideal where space is limited -- apartments, small lots, mobile homes, attics, motor homes.

Enjoy both DX and local contacts when you mount it vertically. You get *both* low angle radiation for excellent DX *and* high angle radiation for local close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ-1786 *Super* Remote Control has *Auto Band Selection*™. It auto-tunes to your desired band, then beeps to let you know. No control cable is needed.

Fast/slow tune push buttons and built-in two range *Cross-Needle* SWR/Wattmeter lets you quickly tune to your exact frequency.

All *welded* construction, no mechanical joints, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter *round* radiator -- not a lossy thin flat-strip -- gives you highest possible efficiency.

Each plate in MFJ's *superb* tuning capacitor is welded for low loss and *polished* to prevent high voltage arcing. It's welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches and a continuous *no-step* DC motor for *smooth precision* tuning.

A heavy duty 1/8 inch thick ABS plastic housing with ultraviolet inhibitors protects it.

MFJ-1782 , $269.95. Same as MFJ-1786 but remote control has only fast/slow tune buttons.

Super 80/40M Vertical

MFJ-1792
$159.95

Designed as a *high performance* antenna for 80 and 40 Meters, the MFJ-1792 features a *full size* quarter wave radiator for 40 Meters - - that's a full 33 feet of ruthless radiating power.

End loading -- the most efficient form of loading -- is used for 80 Meters. It's accomplished by a virtually lossless 4½ foot capacitance hat and a high-Q coil wound with Teflon® wire on a *low-loss* fiberglass form.

The *entire length* radiates power.

High strength 6061-T6 aluminum tubing, super strong solid fiberglass insulator, *Frequency Adaptive L-Network*™, heavy duty *swing* mount. Handles 1500 watts PEP. Requires guying and radials, counterpoises or ground screen.

MFJ-1793, $179.95. Same as MFJ-1792 but includes *full size* 20 Meter quarter wave radiator.

Box Fan Portable Loop

MFJ-1780
$229.95

No, it's not a fan -- it's a high efficiency portable loop antenna that's about the same size and shape as a 2x2 foot box fan, complete with carrying handle.

Carry it like a suitcase, tuck it in a corner of your car or check it as baggage on a plane.

When you get there, set it on a table or desk and enjoy ragchewing or DXing.

All welded construction, covers 14-30 MHz *continuously* including WARC bands, handles 150 watts. Remote control has fast/slow tune buttons. Separate control cable not needed.

MFJ *halfwave* Vertical

6 bands: 40, 20, 15, 10, 6, 2 Meters . . .
No radials or ground needed!

MFJ-1796
$199.95

Operate 6 bands -- 40, 20, 15, 10, 6 and 2 Meters -- with this MFJ-1796 *ground independent halfwave* vertical antenna! No radials or ground ever needed!

It's only 12 feet high and has a *tiny* 24 inch footprint! Mount it anywhere from ground level to tower top -- on apartments, condos, small lots, even motor homes. Perfect for vacations, field day, DX-pedition, camping.

Efficient *end loading*, no lossy traps. *Entire length* is always radiating. *Full size* halfwave on 2 and 6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting one band has minimum effect on other bands.

Automatic bandswitching, low radiation angle, omni-directional, handles 1500 watts PEP. Goes together in an afternoon.

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no better way to honor the memory of WB4BZA than to send traffic and encourage the use of the NTS on 2 meters and HF. Send your station activity reports to Lee at the end of the month. We'd like to help you publicize your efforts in this column and elsewhere in QST. Please send your club newsletters and other publicity to our PIC, KA4LRM, or send messages via the NTS. Any schools with club stations or interested in starting one are encouraged to contact me. If you're in the upstate you can support the efforts of James Kennemore KD4RAP of Greenwood by checking into his Young Amateurs' Net on the Mt Pisgah repeater (146.76) every Tue at 6 PM. I hope to see everyone at the Greenville Hamfest Apr 30-May 1 at the Anderson Fairgrounds and at the Anderson Hamfest May 21-22 at scenic Sadler's Creek State Park on Lake Hartwell. *Tfc:* AD4IF 82, KA4UIV 69, W4DRF 54, N4PNE 45, KA4LRM 38, WD4BUH 24, K4GLT 19, K4SLQ 16, KO4XE 15, KQ4SY 14, KD1DS 13, K8BZH 9, K4GDL 9, WB4PAB 8, KD4ZCN 8, NB4Q 8, AJ4G 6, WA4SJS 5, KD4WUU 5, W4CQB 2, WA4HNA 1

VIRGINIA: SM, Ted Dingler, N4KSO—SEC: N4SCK @ KF4TE, STM: N4GHI @ WA3TAI, OOC: W8IR1, TC: N4UA @ WA4RTS, BM: W3ATQ, ACC: KA4YUY, SGL: W4UMC. It is with deep regret that I report the passing of KC4AUO and KQ4OP from our ranks. KC4AUO was a member of the Mtn Empire ARS and KQ4OP was a member of the Tidewater ARC. They will be missed. Congratulations to W8CM on his appointment as HF Awards Mgr for the Lynchburg ARC. Your assuming this important task will be appreciated by all in the Lynchburg area. The NTS nets in the VA Section need more ORSs. The nets meet each day and you only spend about 15-20 min on them. They aren't time-consuming and you'll get good training in traffic handling. The nets are as follows:

VA Tfc Net (VTN)	1 PM	3907 kHz	K4BGZ
VA Sideband Net (VSBN)	6 PM	3947 kHz	W7UQO
VA Net Early (VNE)	7 PM	3680 kHz	N4GHI
VA Slow Net (VSN)	7:30 PM	3680 kHz	N4KSO
VA Net Late (VNL)	10 PM	3680 kHz	WD4MIS
VA Late Net (VLN)	10:15 PM	3947 kHz	KN4US

Speaking of tfc nets, one of the obligations a tfc handler has is that if you take a piece of tfc, you have an obligation to see that it's delivered or relayed to a station that can deliver it. If you take a piece of tfc and then find that you can't deliver it, send a service msg back to the originating station to that effect. Please don't let the msg die on the vine. If you take it off a net, please see that it's delivered. I've been informed that some msgs haven't been delivered in the VA Section. Let's maintain the fine tradition of tfc handlers. There's some dissension in the clubs in the Section. These problems are going to happen. Let's not let this cause a major split among the amateur community. We're all in this together and we all need to work together. Thanks to the affiliated and ARRL Special Service Clubs that have renewed their affiliation with the League. Your support is appreciated. If your club would like to become affiliated with the ARRL, contact the ACC. There are many benefits that will assist your club. Did your club hold a Novice/Tech class? If so, drop me a line and let me know the outcome. The future of Amateur Radio lies in the Novice/Tech classes. If we don't get new blood into the hobby, our hobby will slowly fade away. Let me remind you that if you have any concerns, get in touch with me or one of the other Section leadership officials. Hope to see you at one of the upcoming hamfests. 73. *Tfc:* N4GHI 1065, K4DOR 794, KD4JMA 326, WA9FGH 244, KD4NFY 204, K4MTX 203, W3ATQ 193, N4GHI 160, WA8AHV 156, AA4GL 132, WD4MIS 127, K4BGZ 108, N6OD 106, WB4FLT 104, KQ4ET 99, WD4MIS 78, WB4EDB 51, N4ABM 50, N4DCC 33, N4FZA 33, K4YVX 32, W4TZC 32, KD4DDI 30, KA6UXX 28, N4KSO 28, WB4KIT 28, KN4US 26, KE4GEG 23, KD4TWR 18, N4VJK 15, KE4HFX 15, WB4UHC 14, KO4AG 14, WA4TVS 14, N2NMH 13, K4JM 12, K4IX 12, KE4RAY 12, K4MLC 11, KB4CAU 11, AB4UM 8, KD4NFY 6, W4HU 6, K4VWK 4, K8EI 4, KD4UFS 4, NJ4EO 3, KC4JGC 3, KC4YIW 3, KE4DRB 2, KC4YIX 2, KE4DXA 2, N4FNT 2, KD4ZSC 2

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW, STM: N8FXH, SGL: K8BS, TC: K8LG, ACC: WA8FLF. George, K8QEW, is doing fine after his recent eye surgery. Good going, George. Regret to report that Jim Lingan, AC8K, of Charleston has become a Silent Key. Jim was very active in the local VE activities and will be greatly missed. I was unable to attend the Fayetteville HF, but all reports indicate it was another banner year with lots of good bargains and exceptionally good music, thanks to W8YP and others. Remember the Jacksons Mill HF and Convention on Jul 2-3. It's important that you mark your calendar because fliers won't be sent this year. The Kanawha ARC has acquired a 2-meter repeater and it will soon be operating on 145.35 under the club call sign, W8GK. Thanks to N8AJC, W8NR and all the others who helped. I enjoyed my visit with WB8GDY and XYL in late Feb. We had a great visit with Karl and WB8FER and WA8YKM. Also enjoyed the Orlando HF.

Net	*Freq*	*Time*	*QNI*	*QTC*	*Sess*	*NM*
WVFN	3865	6:00	1610	323	28	WD8V
WVMD	7235	11:45	1079	97	28	W8KBM
WVN-E	3567	7:00	249	80	28	W8IMX
WVN-L	3567	10:00	148	72	28	W8IMX
Hillbilly	14290	Noon Sun	156	8	4	W8YP

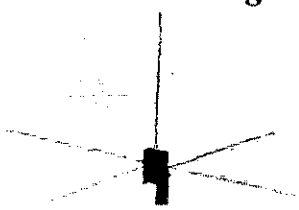
Tfc: W8YP 364, KA8WNO 251, N8IXF 151, W8IMX 86, K8QEW 86, W8JWX 45, K8KT 29, N8FXH 20, WD8DHC 19, KA8OGF 8.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Tim Armagost, WBØTUB–Vacation! As I sit here at the keyboard, it's with light heart, as I'm leaving tomorrow for a week's holiday! This past week was terrific! I traveled to Grand Junction and had a nice visit and an ARES presentation for the Western CO ARC. Thanks to Larry Ball, WØIOL, for the invitation, which came via Ernie, NØOEQ, and Jim, WA6UZP. The meeting agenda for the WCARC starts an hour early with a swap table being opened, a short business meeting, the entertainment and then swap and/or socializing after. It worked out nicely! I enjoyed my presentation and I hope you people on the sunny side of the mountains had as much fun as I did! The last swap was the Aurora Repeater Assn at the Adams

MFJ 5/8 Wave Ground Plane

For an incredible $19.95, you get a 300 watt 5/8 wave ground plane 2 Meter base antenna. Other 5/8 wave ground planes can't work any better — no matter how much they cost . . .



MFJ-1750
$19.95

For an incredibly low $19.95, you get a complete 2 Meter 300 watt PEP 5/8 wave ground plane home station antenna. It gives you the maximum possible theoretical gain of any single element antenna.

Competitive 5/8 wave ground planes can't work any better — no matter how much they cost.

You get . . . shunt fed matching that bleeds off unwanted static and gives you lowest possible SWR . . . strong lightweight aluminum construction that's protected by MFJ's Permanent Molecular Bonding Technology™ . . . low loss ceramic antenna insulator for maximum radiated power . . . MFJ's Fast Tune Radiator™ for quick accurate tuning . . . super easy installation to any 1" to 1 1/2" inch mast with single U-bolt (included) . . . and it's Made in USA.

Also available for 220 MHz, MFJ-1752, $19.95.

MFJ Pocket Roll-Up™

2 Meter Halfwave J antenna

MFJ-1730
$14.95

Roll up this half-wave 2 Meter J-antenna and stick it in your pocket!

This new MFJ Pocket Roll-Up™ is the perfect gain antenna for traveling.

Get home station performance on the go. Just hang your Pocket Roll-Up in the clear, plug the handy BNC connector into your handheld and enjoy some great QSOs.

It's omni-directional and has significant gain over a 1/4 wave. It doesn't need a cumbersome ground plane so it's convenient for indoors and works great with handhelds.

1/4 Wave Ground Plane

MFJ-1740
$12.95

The MFJ-1740 is the most inexpensive way to put out a potent FM signal on 2 Meters. It'll bring up repeaters as well or better than *any* 1/4 wave ground plane — even if it cost twice as much.

The *improved* MFJ-1740 1/4 wave ground plane minimizes feedline radiation for more useful radiated power, reduced TVI and noise pickup by the coax shield.

It's made of strong lightweight aluminum parts protected from corrosion by MFJ's Permanent Molecular Bonding Technology™.

You get MFJ's Rapid-Tune-Radiator™ for easy tuning and low loss ceramic antenna insulator for maximum radiated power. Single included U-bolt mounting for 1 to 1 1/2 inch mast. Cutting chart included for 220/440 MHz. Made in USA.

"Shorty" Duck for HTs

MFJ-1718
$12.95 NEW

Add this strong, flexible "Shorty" 4¼ inch rubber duck to your 2 Meter handheld and enjoy an outstanding signal! Its super efficient, high-Q helical wound radiator is specially impedance matched to handhelds for maximum gain.

No Matter What Guarantee

Your MFJ antenna comes with MFJ's famous *No Matter What™* One Year *Unconditional* Guarantee. That means we will repair or replace your MFJ antenna (at our option) *no matter what* for a full year.

MFJ Permanent Molecular Bonding Technology™

MFJ's *exclusive* Permanent Molecular Bonding Technology™ protects aluminum. This super durable finish actually bonds itself to aluminum molecules — it won't come off unless metal comes off!

5/8 Wave 2 Meter Mobile Antenna

MFJ-1728 **$24.95**

For *maximum range* while mobile, use MFJ's *Maximum Gain™* 5/8 Wave 2 Meter Mobile Antenna. You'll get the maximum possible theoretical gain of any single element mobile antenna!

Competitive 5/8 wave mobile antennas can't work any better — no matter how much more they cost.

You get low SWR so your rig can safely deliver maximum power into your antenna. It's rated at 300 watts PEP so you can use any mobile rig plus a mobile amplifier.

You get a heavy-duty magnet mount that holds your antenna tight at highway speed and a chrome plated magnet base that keeps it looking good for years.

You get has a stainless steel radiator that'll endure years of harsh mobile use and 12 feet of coax cable with connector.

You get MFJ's famous one full year *No Matter What™ Unconditional* Guarantee.

The MFJ-1728 *Maximum Gain™* 5/8 Wave Mobile Antenna gives you *maximum* mobile range *and* the most for your money. Get yours today.

MFJ Dual 5/8 Wave Super Gain™

2-Meter Antenna . . . ***direct feed gives you irrefutable real gain.***

MFJ-1764 **$34.95**

This new MFJ Super Gain™ 2-Meter antenna *directly feeds* two full size 5/8 wave radiators *and makes both elements strongly radiate*. You get *irrefutable* real gain.

Plus, *you get additional gain* for FM and Packet because your mast doubles as a reflector. There's plenty of antenna gain to work stations off the sides and back, it's just stronger in the direction the MFJ-1764 faces.

The result? You get more range to reach distant repeaters and much better local coverage on direct channels and Packet.

You get an extremely wide 10 MHz 2:1 SWR bandwidth . . . excellent ferrite choke balun feedline decoupling to eliminate wasted power due to field pattern distortion . . . shunt choke for bleeding off unwanted static . . . strong lightweight aluminum construction protected by MFJ's Permanent Molecular Bonding Technology™. . . Made in USA.

It's fully assembled — simply attach radiators — no tuning required. Mounts vertically for FM and Packet or horizontally for SSB. Easy-to-install with single U-bolt (supplied) on any 1 to 1 1/2 inch mast or tower leg. Weighs 1 1/2 pounds, two 47 inch radiators, 23 inch boom. **Also** works as excellent *6 Meter* full halfwave centerfed antenna. Has low SWR across entire band.

Double your Gain with direct feed!

You can double the gain of one MFJ-1764 5/8 Wave Super Gain™ 2-Meter Antenna by mounting two MFJ-1764s one above the other on the same mast and *directly feeding* both. Order MFJ-1766, $89.95, includes 2 MFJ-1764 Super Gain™ 2-Meter Antennas and a *Direct Feed* Power Splitter/Cable Harness. Also double gain on 6 meters.

If you already have two MFJ-1764s, order MFJ-1765, $29.95, *Direct Feed* Power Splitter/Cable Harness to feed your two MFJ-1764s.

Portable 3 element Yagi for 2 M

MFJ-1763 **$39.95**

You can set up or take down MFJ's new *portable* 3 element 2 Meter Yagi in seconds! Elements simply screw into the boom.

You can take it with you wherever you go and have the "oomph" and directivity of a beam.

It's easy to store and sturdy enough to use as your home station antenna.

You can mount it vertically for FM or horizontally for SSB. You can easily *center* mount it on a mast or *end* mount it on a tower leg with a single U-bolt (included). It's great for packet and PacketCluster™.

Its compact 2 3/4 foot boom gives you a calculated gain within 1 dB of a four element Yagi with a boom nearly twice as long.

Extra thick elements maintain high gain and directivity over virtually the whole 2 Meter band. A ferrite choke balun gives you excellent feedline decoupling. Coax coupling is further reduced by mounting the SO-239 connector behind the reflector.

Elements and boom are made from strong lightweight aluminum and protected by MFJ's Permanent Molecular Bonding Technology™.

Weighs just 2 pounds. Boom is 30½ inches. Made in USA.

Dual Band Mobile

Mobile Antenna for 144/440 MHz

MFJ-1724B
$14.95 NEW

For $14.95, you get an MFJ *dual band* magnet mount mobile antenna for 2 Meters *and* 440 MHz! Plus, it's covered by MFJ's famous One Year *unconditional* **No Matter What™ Guarantee.**

The MFJ-1724B is a 1/4 wave on 2 Meters and a gain antenna on 440 MHz — it's perfect for dual band radios.

Low SWR across both bands lets your rig safely deliver full power into your antenna.

The stainless steel radiator will withstand the toughest mobile service. It's only 19 inches tall so you can park in your garage without knocking over your antenna.

The MFJ-1724B handles 300 watts PEP, has 15 feet of coax and has an extra powerful magnet to hold it steady — even at highway speeds.

HT Range Extenders

Telescoping antennas for handhelds

A. B. C.

A. The Long Ranger™ 2 Meter Halfwave. MFJ-1714, $16.95. For really long range this MFJ endfed halfwave is hard to beat. It outperforms a 5/8 wave on a handheld because the 5/8 wave needs a ground plane. The MFJ halfwave doesn't. It's shorter, lighter, has more gain and places less stress on your antenna connector than a 5/8 wave antenna. When collapsed, it performs like a rubber duck. 40" extended, 10 1/2" collapsed.

B. The Dual Bander™ for 2 Meters and 440 MHz. MFJ-1712, $14.95. Got a new dual band handheld or separate units? One antenna fits all. It's a 1/4 wave for 2 Meters and a 5/8 wave with gain for 440 MHz. 7 1/4" collapsed, 19" extended.

C. The Pocket Linear™ 3/8 Wave, 2 Meters. MFJ-1710, $9.95. Carry this pen size antenna in your pocket like a ballpoint pen. When you're using your rubber duck, on the fringe and noisy, put on The Pocket Linear™, extend it to 24 1/2" and carry on your QSO. Has pocket clip. 5 1/4" collapsed.

Nearest Dealer/Orders: 800-647-1800
Technical Help: 800-647-TECH(8324)

• 1 year unconditional guarantee • 30 day money back guarantee (less s/h) on orders from MFJ • Free catalog

MFJ *MFJ ENTERPRISES, INC.*
Box 494, Miss. State, MS 39762
(601) 323-5869; 8-4:30 CST, Mon.-Fri.
FAX: (601) 323-6551; Add $6 s/h.

MFJ . . . making quality affordable

County Fairground—nice job, you guys! David Richendifer, WD0HNQ, told me that Feb 20 is the longest day of the year...yeah...only for swapfest coordinators! Nice facility at Adams County FG. Judith Richendifer, WD0HNP, is the pres of ARA (only for the past 8 years or so!) and is doing a great job! Next time you talk to her on the air, say Hi and Thanks! Now for the downside: It's becoming more apparent that we *really* need to keep our collective houses in order; we Amateur Radio operators, that is. It seems that more interference is dropping up from commercial people as well as we hams, and we *must* keep it in check! The FCC is sympathetic about the problem, but it has a manpower and funding problem that keeps it operating in the background. With things working in this manner, if we let the interference go until it "bothers us," it will be a *huge* job to try to get things under control again. We *must* get on it as soon as it happens and correct it. If we get on the commercial users, they jump right on the problem and correct it. We amateurs are less rapid in our response, and we *must* get better! More on this subject as time goes on; it's a problem that can't be allowed to persist! *Tfc:* K9DCX 547, KG0AO 577, K0YFK 316, N0BQP 675, N0JUS 319, W0ACH 181, N0DKK 501, KB0HPH 70, W0LVI 340, 73! Tim, WB0TUB.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K6YEJ. STM: ND5T. NMs: WA5UNO & WB5ZME. TC: W8GY. ACC: KA5BEM. NM Roadrunner Net meets daily, 3939 at 0100 UTC, handled 83 msgs with 1214 check-ins. NM Breakfast Club meets daily, 3939 at 6:30 AM, handled 143 msgs with 975 check-ins. Yucca 2-mtr Net 7/8/18, handled 14 msgs with 422 check-ins. Caravan Club 2-mtr Net, 66/06, handled 14 msgs with 117 check-ins. SCAT Net, 66/06, handled 19 msgs with 724 check-ins. Four Corners Net handled 17 msgs with 474 check-ins. Lots of activity coming up. Missed Littlefield, TX, swapfest Feb 20. The Midland, TX, swapfest Mar 19-20 & I'll miss that. Mesilla Valley ARC will have a Chili & Bean Feed Apr 24 & ABQ sponsors a swapfest Apr 30 at Foothills Shopping Ctr. May 17-19 is the ISE Show at ABQ Convention Center. The ARRL National Convention is at HAMCOM in Arlington, TX (D/FW) Jun 10-12; hope to see you there. Then the Ruidoso Hamfest is Jun 18-19; I plan to be there. Don't forget Field Day Jun 25-26. I believe Ft Tuthill (Flagstaff, AZ) is Jul 22-24. I hope to see you there. Then comes the Alamogordo Hamfest Sep 3-4 & the Northern NM Hamfest at Glorieta Sep 17. The Hamfiesta in El Paso follows on Oct 8-9. I believe, with joint sponsorship by the Mesilla Valley ARC, the El Paso Clubs & the Juarez Clubs. *Tfc:* NC5R 2, 73, Joe.

UTAH: SM, Rich Fisher, NS7K—STM: Jim Brown, NA7G. SEC: Mike Collett, K7DOU. PIO: Lon Stuart, WM7E. OOC: Ron Johnson, WE7H. BM: Dallas Barrett, WA7MEL. UT Hamfest '94 is Sat, May 21, at the Weber State University student union bldg. WA7PIB is working F band. Sounds like he's having a lot of fun. N7SFI only needs DE for WAS on AO-21. If someone can help, please let him know. Good luck. Contacts for VE exam into SLC Gordon Smith, K7HFV, 582-2438. Alos; Eugene, N7OVT, 484-6355; Farmington Brent Thomas, AC7H 292-8110; Ogden Mike Fullmer, KZ7O, 731-7573; Provo Steve Whitehead, NV7V, 465-3983. KD7NX PBBS activity report private messages 911, traffic 55, bulletins 136, users 47. *APLink* report KD7UM NTS messages received 50, NTS messages relayed 48, NTS messages delivered 2, bulletins 80. 73, Rich.

WYOMING: SM, Rev Morton, WS7W—That weekend we've been looking forward to is finally upon us, the WY State Hamfest May 28-29. The Cedar Mtn ARC has done a tremendous job putting together an eventful weekend for all of us. So join the fun in Cody, you'll never forgive yourself if you don't. On Feb 5, the state RACES meeting was held in Cheyenne, with ham representatives from many counties. Larry, KD7BN, said, "The 12-16 hour course provided one with the organizational knowledge needed to go into an emergency situation and be effective." Thanks to all of you who attended this meeting; we'll all benefit from it. Net totals for Aug to Nov '93: Pony Exp 18/744/3, Cowboy 88/3,179/36, Albany 18/226/0, WY ARES/RACES 18/540/0, Casper, 15/162/0, 5th Area 18/306/0, WY Wx 43/667/257. If your net isn't listed, it means we didn't get any reports from you and if you don't already know, the net numbers above are Sessions/QNI/QTC. Look forward to seeing you in Cody. *Tfc:* W7SQT 19.

SOUTHEASTERN DIVISION

ALABAMA: SM, Ken McGlaughn, KM4JD—ASMs: KC4RNF, W4XI, KL7Q, KC4TFF, AA4CW, KL7P. SEC: KB4JHU. STM: W4DGH. PIC/BM: KL7Q. SGL: KC4YAU. OOC: KC4TFF. TC: N4MOK. AAC: AD4DB. Congratulations to the Golden Gabber's Net on its 18th birthday. This may be the oldest longest consecutive running net in the state. Anybody know for sure? Congrats to Albertville and Talladega hams for putting on 2 great hamfests; and to the Mobile ARC on its successful special-event station aboard the USS *Drum*. Looking forward to seeing you in Birmingham this month! Ham of the Quarter Award will be presented at Birmingham May 14-15. Congrats are due Anniston and 5 county area hams who responded to and performed extremely well in support of FEMA's Chemical exercise. Great job, folks, we're proud of you! Watch for the Central AL QSO party May 28-29, put on by the Montgomery ARC. Special thanks to Tom DeVelice, WG4F, for his outstanding article on contesting. Harris, WA4JDH, continues his outstanding participation on traffic nets by racking up another 8PL with a month's total of 544 points. In fact, overall participation and message count is up with more individual and net input. Thanks to all and keep up the good work! *Tfc:* WA4JDH 544, W4CKS 301, KL7Q 288, W4PIM 125, KC4RNF 108, KE4IJB 74, W4ZBA 69, W4DGH 55, WA4LXP 49, N4YYZ 33, W4QAT 20, W4NTI 16, W4XI 14, N4ZNO 13, KQ4QV 12, WB4TVY 10. PSHRs: KL7Q 175, WA4LXP 133, KC4RNF 130, W4DGH 120, WA4JDH 120, WB4TVY 112, W4CKS 109, N4YYQ 104, W4ZBA 99, W4PIM 95, W4XI 93, W4NTI 89, N4ZNO 75, KE4IJB 74, W4QAT 70. *Net Reports (Net/QNI/QTC):* ADN 669/313, AENW 221/0, AENZ 202/5, AFTN 81/4, ASN 368/116, ATN 280/101, ATNM 3153/106, MARANAL 34/0, SCCN 100/5, TRACN 157/4, WAEN 90/4.

MFJ's world famous 3 KW Antenna Tuner

If you won't settle for less . . . here is the finest 3 KW tuner money can buy!

The MFJ-989C is not for everyone. **However**, if you make the investment, you'll get the finest 3 KW antenna tuner money can buy.

Here's why . . .

Massive Transmitting Capacitors

You get two *massive* 250 pf transmitting variable capacitors with detailed logging scales. They can handle *amps* of RF current and withstand 6000 RF volts because the plates are smoothed and polished and have extra wide spacing.

Precision Roller Inductor

A precision roller inductor lets you tune your SWR down to the absolute minimum. A 3-digit turns counter plus a spinner knob gives you exact inductance control.

Ball bearings on front and back shafts give you a velvet smooth vernier feel. Steel end plates and shafts give you lifetime durability.

You won't have arcing problems with this roller inductor. That's because firm springs put considerable pressure on a plated contact wheel for excellent electrical contact.

Wide, low inductance straps are used for high current connections and a new core gives you excellent RF properties for minimum loss.

MFJ-989C **$349.95**

Cross-Needle Meter

You get a lighted *peak* and average reading Cross-Needle SWR/Wattmeter with 200 and 2000 watt ranges. Its new directional coupler gives you accurate SWR and power readings over the entire 1.8 to 30 MHz range.

Super Heavy Duty Balun

You get a super heavy duty current balun for balanced lines. It's made with two giant 2½ inch powder iron toroid cores and wound with *Teflon®* wire connected to high voltage ceramic feedthru insulators. It lets you operate high power into balanced feedlines without core saturation or voltage breakdown.

Ceramic Antenna Switch

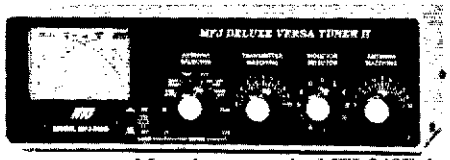
You get a two wafer 6 position *ceramic* antenna switch with extra large contacts for trouble free switching.

Plus much, much more

You also get a *built-in 300 watt dummy load*, full one year *unconditional* guarantee, flip stand, all aluminum cabinet, tough baked on paint, locking compound on all nuts and bolts. 3 KW PEP. Meter lamp needs 12 volts. Compact 10¾x4½x15 in. Made in the USA. Add $13 s/h.

Don't settle for less--get yours today!

MFJ's *deluxe* 300 Watt Tuner



MFJ-949E **$149.95**

More hams use the MFJ-949E than any other antenna tuner in the world!

Why? Because you get proven reliability, the ability to match just about anything and a one year *unconditional* guarantee.

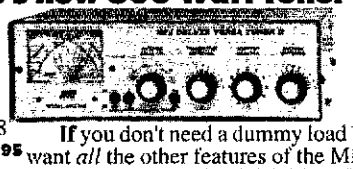
You get a lighted *peak* and average reading Cross-Needle SWR/wattmeter, antenna switch, 4:1 balun for balanced lines, 1.8-30 MHz coverage and a *full size* dummy load that easily handles 300 watts of abusive tune-up power.

New 8 position antenna switch lets you *pre-tune* into dummy load to minimize QRM.

The inductor switch is designed to withstand extreme voltages and currents--it's not an underrated off-the-shelf switch that can put you off-the-air.

Each MFJ-949E aluminum cabinet is chemically etched to strongly bond MFJ's tough *baked-on* paint. You won't find a tougher, longer lasting finish anywhere.

MFJ's *new* 300 Watt Tuner



MFJ-948 **$129.95**

If you don't need a dummy load but want *all* the other features of the MFJ-949E, choose the MFJ-948 for $129.95. The MFJ-948 features a *peak* reading *lighted* Cross-Needle meter with a built-in lamp switch, one year *unconditional* guarantee and is made here in the USA.

MFJ's *smallest* Versa Tuner

MFJ-901B **$59.95**

The MFJ-901B is our smallest --5x2x6 inches --(and most affordable) 200 watt PEP tuner -- when both your space *and* your budget is limited. Great for matching solid state rigs to linear amps.

MFJ's *artificial* RF Ground

MFJ-931 **$79.95**

Creates *artificial* RF ground. Eliminates or reduces RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Also electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire.

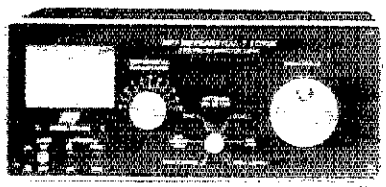
MFJ's *super value* Tuner

MFJ-941E **$109.95**

The new MFJ-941E gives you a 300 watt PEP tuner that covers everything from 1.8-30 MHz -- plus you get a lighted cross-needle meter, antenna switch and balun . . . for an incredible $109.95.

Antenna switch selects 2 coax lines (direct or through tuner), random wire, balanced line or external dummy load. 4:1 balun. 1000 volt capacitors. Measures 10⅝x2⅞x7 inches.

2 Knob Differential-T™ Tuner



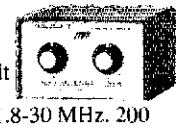
MFJ-986 **$289.95**

The MFJ-986 *Differential-T™* 2 knob tuner uses a differential capacitor to make tuning foolproof and easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only *one* best setting. Handles 3 KW PEP.

Roller inductor makes tuning smooth and easy. Turns counter lets you quickly re-tune to frequency.

MFJ's lighted *peak* and average reading Cross-Needle meter reads forward and reflected power in 2 ranges. Current balun reduces feedline radiation and forces equal currents into antenna halves that are not perfectly balanced. Covers 1.8-30 MHz. $13 s/h.

MFJ's *random wire* Tuner



MFJ-16010 **$39.95**

Operate all bands anywhere with any transceiver with the MFJ-16010. It lets you turn a random wire into a transmitting antenna. 1.8-30 MHz. 200 watts PEP. Ultra small 2x3x4 inches

Antenna Tuner/*Artificial* Ground

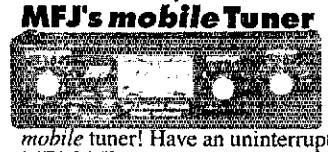
New!

MFJ-934 **$169.95**

Artificial ground *and* full feature 300 watt 1.8-30 MHz antenna tuner. Has lighted Cross-Needle Meter, 4:1 balun for balanced lines.

An artificial ground can turn a random wire into an effective antenna that really works.

MFJ's *mobile* Tuner



MFJ-945D **$89.95**

Don't leave home without this *mobile* tuner! Have an uninterrupted trip as the MFJ-945D extends your antenna bandwidth so you don't have to stop, go outside and adjust your mobile whip.

Small 8x2x6 inches uses little room. *Lighted Cross-Needle* SWR/Wattmeter makes tuning easy while in motion. Has lamp switch. 1.8-30 MHz. 300 watts PEP. **Mobile mount**, MFJ-20, $4.95.

MFJ's *versatile* 1.5 KW Tuner

MFJ-962C **$229.95**

MFJ-962C lets you use your barefoot rig now and have the capacity to add a 1.5 KW PEP amplifier later.

You get MFJ's lighted *peak* and average reading Cross-Needle SWR/Wattmeter. It reads forward and reflected power in 2 ranges. Covers 1.8-30 MHz.

Plus . . . 6-position antenna switch and Teflon® wound balun with ceramic feedthru insulators for balanced lines. 10¾x4½x14⅞ in. Add $13 s/h.

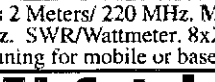
MFJ's *portable/QRP* Tuner

MFJ-971 **$89.95**

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle SWR/Wattmeter has two switchable ranges: 30 and 300 or *6 watt QRP range*. 6x6½x2½ in.

MFJ's *VHF or UHF* Tuners

MFJ-921 or MFJ-924 **$69.95**



MFJ-921 covers 2 Meters/ 220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x2½x3 in. Simple 2-knob tuning for mobile or base.

Free MFJ Catalog

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GEORGIA: SM, Jim Altman, N4UCK—ASMs: K4JNL, N4LLX, W8BLA. SEC: KA4HHE. OOC: W8BLA. STM: KM4QQ. SGL: WB4UVW. PIC: K4MZW. ACC: KB4TJO. TC: KI4XO. BM: N4CYC. A few changes this month, Richard, KC4BHX and Jim, AA4UA, have been a great help the past couple years and I thank them greatly for the assistance each has given me, and to you, Ed, KM4QQ, is assuming the STM position and Jay, N4LLX the ASM. The SciTrek station is on the air and signing W4NT, the club call sign of SEDXC. Everyone has great hopes based on the experience of similar stations in Charlotte and Philadelphia. Volunteers are needed to cover noon hours. Call SciTrek, N Fulton, SEDXC and Atl RC has a joint meeting May 3 to host ON4UN, who will speak on antennas; call W8BLA, K2UFT or KD4ABB for info, space is limited. Calling in an auto accident with injuries on the autopatch is one of our "finer" moments, but consider: Operator asks if anyone is trapped in the car. Answer. There are several people outside of the car and one of them is looking inside the car. Operator repeats question. It seems to me the answer to the question is Yes, No or I don't know. Listen to the question and give the specific info requested. Add your additional info, but clearly answer the specific question asked. We'll perform our service better and will be considered more professional by the 911 operators. I owe thanks to the BGMRC for inviting me down a month ago; had a real nice time. *Tfc:* W4AET 260, WB4GGS 109, KM4QQ 91, WD4DSS 72, KA4HHE 68, K4KIC 33, N5UZ 32, N9TN 23, W4AMX 19, K4JNL 6, K4BAI 4. (Jan) W4AET 130, AD5KA 76, KA4FOM 70, KM4QQ 58, WB4GGS 55, KA4HHE 51, WD4DSS 50, K4KIC 41, N4UZ 30, K4BAI 15.

NORTHERN FLORIDA: Rudy Hubbard, WA4PUP, ASM: NADI. ACC: KI4BI. BM: N4GMU. OOC: WB4GHU. PIC: W4SME. SEC: W4MLE. SGL: KC4N. STM: WX4J. TC: WØRAO. PACKET: N4GMU. Congrats to new officers of Daytona Beach ARA: pres WB4OMM, vp KA4VPM, secy KD4JFA, treas WB4NGZ. 2 major hamfests during Feb, namely, Orlando Hamcation and Pensacola Hamfest. Attendance at the forums in Orlando was small as expected because of the distance from the fairgrounds. Attendance at PNS forums was well attended. Much interest was shown at the ARES meetings because of the state of FL implementing new procedure for using Amateur Radio to provide emergency communication during disasters. Discussions were started in Orlando and continued in Pensacola to having digital capabilities during emergencies with a gateway station in Tallahassee. This mode will be used in parallel with the phone mode. Thanks to WX4J, W4MLE and N4SS for getting the details worked out. At the time of writing this, I received a message from WX4J that the test was ready to be tried. Knowing the capabilities of these 3, I'm confident it will work. KM4AE has accepted the position as Asst SEC, and NR2F has accepted a position as Asst STM. They're highly recognized for their service and dedication to Amateur Radio and we're pleased to have them as part of the Section team. You'll be hearing and seeing in the near future their efforts concerning training aids especially dealing with net procedures, traffic and good operating practices. Each club should review its membership rolls and recommend a person for the position of PIO, if they don't presently have one. Please contact W4SME or me for an application. We need to get info to the general public and tell them about our hobby and, in particular, what we do in emergencies. All stations should submit their monthly activity to the STM. Let's start reporting what we do so that we can show how we use the radio spectrum. 73, Rudy. *Tfc:* WX4H 1477, NR2F 443, N4SS 364, WA4NDA 340, WD4IIO 261, AD4CN 207, WA4QXT 207, KM4DY 164, KD4OBQ 136, WC4D 104, WA4EYU 101, AD4BL 88, KI4CO 78, WX4J 75, KC4DR 74, KE4DNO 72, W1UKR 68, N4JAO 59, KD4OBN 57, WB2IMO 53, AD4DO 46, N4ADI 44, W4SME 42, N4GMU 42, N4WMS 39, W4KIX 39, W8IM 35, KD4RZP 33, AA4FG 31, N5XUJ 26, N4NKI 20, N4YHE 16, KB4OLY 16, KD4WDB 12, WB4WOO 10, KB4WCX 4, *(Jan)* KC4FL 72.

PUERTO RICO: SM, Tele Figueroa, KP4P—PIC/SGL: KP4PQ. STM: KP4DJ. ACC: KP4JZ. TC/BM: KP4RF. There was an ARES presentation in the San Juan Metro area. KP4QL & WP4AOH, both ex-presidents of PRARC attended. WP4AOH elected ARES Director. Thanks KP4PQ & KP4RF for excellent presentation. PRARL to provide a commemorative QSL card to all who worked the special-event station at Teodoro Moscoso bridge inauguration. Send SASE to PO Box 191917, S Juan, PR 00919. KP4DDB taking big steps toward WP4K's *PacketCluster* upgrade. Call Guillo for details. The Morse CW group is active with KP4AWI (PRARC pres), KP4TK, KP4DJ, KP4U, KP4CKY, KP4QL, WP4IIW, WP4AOH, WP4LKK, & WP4KZI who, by the way, upgraded to General. KP4U, East ARES coord reported 14 stations at 146.57 as of 2/28/94. New net freq 146.65. Renato is QRV at 160 mtrs with new ant. PRA working actively on radio seminars. Congs to WP4IZI, WP4ERP, KP4QI, among others. 73 de Tele.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK @ KD4GR-STM/ASM: K4ZK @ KB4VOL. ASM for Youth Activities: KA4FZI @ KE2IX. SEC: W4SS. ASST SECs: WB4WDK @ WA4EAA, WB2WPA @ WB2WPA, KD4GR @ KD4GR. TC: KI4T @ N4UTO. BM: WD4KBW @ WD8IBY. PIC: WA4ATF. OOC: WB4GHU @ WD8IBY. ACC: NY1H @ W4DPH. SGL: KC4N @ W1FJI. PKT MGR: KB4VOL @ KB4VOL. KA4FZI was named Teacher of the Month at Caloosa Middle School, presented a plaque and had her name displayed on the informational sign in front of the school. Newsletters received this month included: Pinellas Cty ARES/RACES, Martin Cty ARA, Hillsborough Emerg Planning Operations, Manatee ARC, Palm Beach Packet Group, Martin Cty ARES/RACES, Englewood ARS, the Collier ARES/RACES newsletter reports that WB2QLP has assumed NCS duties for the 2-Meter SSB ARES Net, which has been promoted by WB2WPA, ARA of SW FL, the QCWA Gator Chapt reported a donation was sent to Headquarters for the scholarship fund in memory of K4EUK, Motorola ARC, SFL FM Assn, Broward ARC, Everglades ARC, SW FL Tfc Net, Charlotte ARS, Sarasota ERC, the Ft Myers ARC reported that the Ham of the Year award was presented to Lucille. KI4ZW, KB4VOL reported 1671 NTS messages handled on packet by: AB4RB, KØZXF, KB4GBS, KB4OAM, KB4VOL, KB4WUA, KD4MJV, KE2IX, KP4EDL, N4HHP, N4UTO, N4EXO, N4ZIQ, W4DPH, W4MWP, W8OUV, WA2LKI, WB2WPA, WB4MOZ,

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Here's a Compact *Speaker/Mic that fits comfortably in your hand and has a* full *size speaker for crystal clear audio.*

No need to remove your handheld from your belt to talk or monitor calls. Clip it near your ears so you can easily hear every call with the volume turned down.

First-rate electret mic element and full size speaker gives superb audio on transmit *and* recieve. Earphone jack, PTT, lightweight retractable cord. Gray. 1¼x2x3 in.

MFJ-284 fits Icom and Yaesu. **MFJ-286** fits Kenwood.

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These tiny *MFJ Speaker/Mics are so small and so lightweight you'll forget they're there -- until you get a call.*

Excellent audio from electret mic element and speaker. Has swiveling lapel /pocket clip, PTT button with transmit LED, earphone jack, lightweight retractable cord. Available with L or regular connector. *Tiny* 2x1¼x¼ in.

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L Connector also available - order L model.

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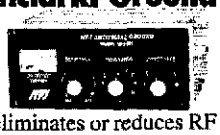
MFJ-931 **$79.95**



Creates artifical RF ground that eliminates or reduces RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding.

Greatly improves your signal if you're using a random wire or longwire antenna with an ineffective ground.

Electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire.

20 Meter CW Transceiver

MFJ-9020 **$179.95**

Throw this *tiny* MFJ 20 Meter CW Transceiver in a corner of your briefcase and enjoy DXing and ragchewing wherever you go. You get a high performance superhet receiver, crystal filter, RIT, AGC, vernier tuning, sidetone, speaker, up to 5 watts output, semi/full break-in, much more. *Free* manual. See *free* MFJ catalog for 40, 30, 17, 15 Meter versions, keyer, audio filter, power pack, tuner, antennas.

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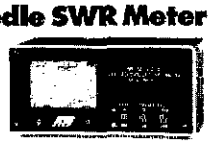
Mount it outdoors away from electrical noise for maximum signal, minimum noise. Covers 50 KHz - 30 MHz.

Receives strong, clear signals from all over the world. 20 dB attenuator, gain control, ON LED. Switch two receivers and aux. or active antenna. 6x3x5 in. Remote has 54 inch whip, 50 ft. coax. 3x2x4 in. 12 VDC or 110 VAC with MFJ-1312, $12.95.

129.95 MFJ-1024

Cross-Needle SWR Meter

MFJ-815B **$69.95**



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Mechanical zero. SO-239 connectors. Lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

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$21.95 MFJ-1702B

$59.95 MFJ-1704

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MFJ-1701, $34.95. 6 position antenna switch. SO-239 connectors. 50-75 ohm loads. 2 KW PEP, 1 KW CW. 10x3x1½ in. DC-60 MHz.

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$59.95 MFJ-264

MFJ-260B, $29.95. VHF/ HF. Air cooled, non-inductive 50 ohm resistor. SO-239 connector. 300 Watts for 30 seconds, derating curve. SWR less than 1.3:1 to 30 MHz, 1.5:1 to 150 MHz. 2½x2½x7 in. *MFJ-260BN, $34.95, N connectors.*

MFJ-264, $59.95. Versatile UHF/VHF/HF 1.5 KW load. Low SWR to 650 MHz, usable to 750 MHz. 100 watts/10 minutes, 1500 watts/10 seconds. SWR is 1.1:1 to 30 MHz, below 1.3:1 to 650 MHz. 3x3x7 in. *MFJ-264N, $69.95, N connector. MFJ-5803, $4.95, 3 ft. coax/ PL-259.*

MFJ Low Pass Filter

Suppress TVI, RFI, telephone and other interference by reducing unwanted harmonics going to your antenna. 9 poles, MFJ's exclusive *Teflon® Dielectric Technology™* capacitors, hi-Q inductors, ground plane shielding, RF tight cabinet gives excellent TVI/ RFI protection. Full legal power 1.8-30 MHz. Mounting tabs.

MFJ-704 **$39.95**

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Use your computer and transceiver to receive, display and transmit *brilliant full color* news photos and incredible WeFAX weather maps with all 16 gray levels. Also receive/transmit RTTY, ASCII and CW.

MFJ-1214PC **$149.95**

Animate weather maps. Display 10 global pictures simultaneously. Zoom any part of picture or map. Manager lists over 900 FAX stations. Automatic picture capture and save.

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MFJ-564 **$49.95**

MFJ/Bencher Keyer

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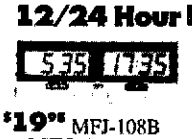
Iambic keying, speed (8-50 wpm), weight, tone, volume controls. Automatic keyer or semi-automatic ("bug")/tune mode. RF proof. 4⅛x2⅝x5½ in.

MFJ-422BX, $79.95, keyer only for mounting on your Bencher paddle.

12/24 Hour LCD Clocks



$19.95 MFJ-108B

$24.95 MFJ-112

MFJ-108B dual clock has separate UTC and local time displays. Huge 5/8 inch LCD digits are easy-to -see. Brushed aluminum frame.

MFJ-112 shows hour/minute/ second, day, month, date, year at any QTH on *world map*. 12 or 24 hour display. Daylight saving time feature.

VHF SWR/Wattmeter

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Covers 2 Meters and 220 MHz. 30 and 300 Watt scales. Relative field strength 1-250 MHz, SWR above 14 MHz. 4½x2¼x3 in.

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2 pairs of 30 amp 5-way binding posts separately fused for rigs. 6 switched, fused pairs for accessories. DC voltmeter, "on" LED, RF bypassed, 6 ft. of 8 guage power cable. See *free* MFJ catalog for more DC outlets.

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WB4TEM, and WB9JTK. This was a considerable volume of traffic, but KB4VOL reports that only about 50% of the PBBSs reported this month. Let him know if you need help. WB4WDK received reports from ECs in the following counties: Brevard, Broward, Charlotte, Dade, DeSoto, Hardee, Hendry, Glades, Highlands, Hillsborough, Indian River, Lee, Martin, Okeechobee, Palm Beach, Pinellas, Polk and Sarasota. This represents 78% reporting. Will certainly look forward to hearing from Collier, Manatee, Monroe, Osceola and St Lucie next month. KD4GR reported an emergency operations training session was held at Heritage Park. The purpose of the training session was to provide info about equipment needed, planning and setting up a station in the field under emergency conditions. Several good demos were given by: KB4TCS on setting up an emergency shelter, WB4YUC on how to construct a field antenna for 40 and 80 meters, WA2DXQ on setting up a generator, AC4UV showed the operation of an HF radio using the power provided by WA2DXQ, and using a mobile antenna and also the WB4YUC antenna. KC4KME had a good session on what personal items you might need if you respond to an emergency situation. The ARRL Info Net meets at 7:30 AM Sat on 3940 kHz and is followed by the SFL ARES Net at 8 AM on the same freq. 73 de WA4PFK. *Tfc:* W3CUL 3364, KB6ECH 1233, W3VR 1162, K4FQU 914, K4SCL 697, WA9VND 664, NY1H 661, KB4WBY 526, AA4HT 439, AB4EA 364, N4ZAW 344, WA4EIC 315, WA4PFK 312, AB4XK 253, K4ZK 218, AA4BN 153, KC4ZHF 148, KD4GR 136, KA4FZI 124, K4RBR 119, KD4JMV 111, WB4WYG 100, KD4LOG 86, KD4QXF 83, W1NJM 76, KD4NPC 75, KI4ZW 73, KD4ELI 67, K2GNZ 62, KC4ZHN 59, KI4VT 50, WB4PAM 45, WA8EXA 42, KB4MON 40, WB9SHT 27, WB4GCK 26, W4DWN 26, N2WX 25, WT4F 24, W1KAM 18, KC4VTH 15, W3IJR 11, K4IA 10, KD4HGU 10, WB4TOV 10, W4NSY 9, K4OVC 8, W4WYR 6, WA4PIL 5, KE4BOH 5, KA0RUL 5, KQ4DF 3, KA0GYF 3, K4ENA 2. *Tfc (Jan):* W4DWN 20.

VIRGIN ISLANDS: SM, Ron Hall, KP2N—ASM: KV4JC. SEC: NP2B. STM: NP2E. TC: NP2R, SGL: NP2I, PIO: NP2DI. NM: VP2VI. It was nice to visit with Joe, KP2AE, and Dave, WP2AAT, former St Thomas residents who were visiting. Dave is recuperating from a broken leg suffered in a motorcycle accident in LA. At the last VEC session on St Thomas, NP2DI, made Extra Class; NP2DJ and NP2GQ made Adv; NP2GD to Gen and 4 others made Tech. Classes are in full swing on St Thomas with final VE test May 14. NP2R and NP2EU received their building permit and have broken ground for the new QTH on St Croix. Recent visitors to my QTH were WB9W, N9HVL, K8OHC and KE5BK. VI ARC, CAP and CB clubs are planning a public info booth at Tutu Mall for Ham Radio Week. *Tfc (Feb):* K6UYK/KP2: Orig 193, Rcvd 4 for 201. Don't forget to check in with the ARES Net at 2230Z Tue, 147.25 on STX and 146.63 on STT. Vine meets daily 1984 kHz at 0001Z. Please join in. 73 de Paradise de KP2N.

SOUTHWESTERN DIVISION

ARIZONA: SM, Clifford E. Hauser, KD6XH—AZ has already gained more than 250 new Amateur Radio operators since Jan 1. Has your club increased its membership? We need to nurture each new person and help them become proficient in radio procedures and proper language. Lately there's been an increase in the number of complaints of autopatch misuse. So far, this state has a good reputation on using proper procedures and policing ourselves when an abuse occurs. But when an incident occurs that requires FCC involvement, then John High of the FCC at the Douglas office is willing to help. We must have written or recorded documentation of a violation before he can become involved. I hope we'll continue to be good stewards of our frequencies. Always use your license per the FCC policies and procedures. Visiting clubs throughout this state has shown that we can be counted on as a team to help communities in times of emergency. Training is important and the public service events each of us participate with sharpen our skills. Activity on HF has increased with daylight being longer. It's fun and educational to talk with people of different countries and obtain information on their lifestyles. Remember that we, as ambassadors of the US, must be courteous at all times. Have you contacted 100 countries yet? If not, give it a try: you might find it fun and challenging. If your class of license won't allow you HF-band privileges, then why not upgrade? Consider this a challenge: I'd like to see more than 50% of this state's Amateur Radio community with a General or higher class of license. Sierra Vista Hamfest is May 7 and Ft Tuthill is Jul 29-29. 73, KD6XH. *Nets (Net ON/QTC/Sess/Liaison):* ATEN 833/183/28/ TWN: AGN (2M) 158/72/28/ ATEN. *Tfc:* WA7PHU 145, W7EP 132, WB6OTS 65, WA7JCK 27, WA7OGM 14, W7DQS 6. (Jan) WA7OGM 5.

LOS ANGELES: SM, Phineas J. Icenbice Jr, W6BF—The 5 seasons of CA are very distinguishable, not just incantations: Fire, Flood, Drought, Mudslides and Earthquake. Planning for an earthquake is one thing; carrying out the plan is another. One of our friends practiced good earthquake planning by having shoes next to the bed, but just after the jolt she ran to retrieve her baby and cut her feet on the broken glass. My new appreciation of a disaster is now different after being near the epicenter. We now have self-latching door restraints to prevent broken glass. My neighbor now has large bolts to hold mirrors and cabinets to the wall, and wall brackets for his water heater and built-in refrigerator. Freeway construction will be improved and multistory parking structures will be redesigned and rebuilt. Our elected officials are already changing the rules (after the facts) so that new designs and new safety rules will be employed. Our local malls and university buildings were destroyed. Chimneys and block walls were found for the most part to be inadequate for a 6.8 earthquake. (It's reported that 150 or more earthquakes of 6.8 or so occur every year someplace on this earth.) Now that we understand the problem a little better, we can do more to mitigate a future disaster. It just happened, here, in a densely populated area of CA. It can and will happen many places. When it happens to you, it's a disaster, when it happens to others far away, it's just another news report. N6AHU, Joe, demonstrated the W6EL *Miniprop Plus* computer program last week. This new program is great. W6EL has done a super job on this latest version. It's easy to use and provides maps with good, medium and poor propagation for frequen-

MFJ TNCs for VHF/HF Packet

MFJ-1270C* super *TAPR TNC clone has a world wide reputation as* the most reliable packet TNC in the world! *Thousands used as digipeaters, nodes, BBS and in all kinds of commerical applications working 24 hours a day -- many work for years without a single failure . . .

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You get high performance VHF *and* HF modems as standard equipment -- for double fun.

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You get a *free* 110 VAC power suppy at no extra cost. With other brands, the AC power supply could cost you an extra $20.95.

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The *enhanced* Easy Mail™ personal mailbox lets you use a dedicated call-sign for your mailbox. Your mailbox can stay on while you operate packet. It will also auto forward or reverse forward mail to and from other BBSs. A *check mail* LED blinks when you have mail. More features: remote sysop access, sysop paging, mailbox C-text, chat mode and many other features not available in other TNCs. The mailbox memory is expandable to 32K, 128K and 512K.

WeFAX gives you Weather Maps

You get a WeFAX mode that lets you print full fledged weather maps from your HF radio to screen or printer or save to disk using an MFJ Starter Pack.

Plug-in Modem - - 2400 or 9600 Baud

You can add MFJ's optional *internal* 2400 baud or 9600 baud modem just by *plugging it in* and making a few simple connections.

KISS interface and MFJ Host Mode

You get a KISS interface that lets you run TCP /IP and MYSYS and MFJ's Host Mode that makes it easy to write efficient application programs.

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You get MFJ's *Anti-Collision*™ technology that prevents packet collisions and improves performance on busy channels.

Plus more . . .

You also get 32K RAM, IC sockets for easy service, 256K ROM, speaker jack, lithium battery backup, RS-232 *and* TTL serial ports, radio cable (you have to add a connector for *your* radio), Fast-Start™ Manual plus much more. Use 12 VDC or 110 VAC. 9½x1½x7½ in.

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You get MFJ's famous *No Matter What*™ one year *unconditional* guarantee.

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If you want a TNC that'll work 24 hours a day without failure -- *one that has more features than any other* -- get the ultra reliable MFJ-1270C today and enjoy packet for a long, long time.

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An MFJ Starter Pack, $24.95, gets you on the air instantly. You get interface cable, software on disk and instructions -- just plug it all in and start enjoying packet. Order **MFJ-1284** for IBM or compatibles, **MFJ-1282** for Commodore 64/128 or **MFJ-1287** for Macintosh. For VIC-20 or C64/128 with tape drive use **MFJ-1283**, $24.95.

2400 and 9600 Baud Modems

MFJ-2400, $89.95, operates 300, 1200 and 2400 baud packet and works with any radio. **MFJ-9600**, $109.95, G3RUH compatible 9600 baud modem. Not all radios compatible with 9600 baud. Both plug into MFJ TNCs for easy installation.

Mailbox Memory

For MFJ-1270C/1274C. Plugs into RAM socket for extra *mailbox* memory. **MFJ-45A** (32K), $14.95, **MFJ-45B**(128K), $34.95, **MFJ-45C** (512K), $219.95.

Real Time Clock

MFJ-43, $29.95, ends re-setting TNC clock everytime you turn it on. Maintains correct time even when TNC is off. Plugs into RAM socket. Works with MFJ TNCs and TAPR TNC clones.

Firmware Upgrade 1.2.9

MFJ- 40C, $19.95, gives you enhanced mailbox and supports expandable mailbox up to 512K.

Mailbox Memory Expansion Board

For older MFJ TNCs. **MFJ-47A**, $49.95, 32K RAM; **MFJ-47B**, $69.95, 128K RAM; **MFJ-47C**, $239.95, 512K RAM. Complete with firmware.

FM Deviation Meter

MFJ-52, $29.95, plug this board into your TNC configured as TheNet X-1J Node and users can check their transceiver packet FM deviation. Requires X-1J or later nodeware. See *CQ Magazine*, Nov. 1993 .

FREE MFJ Catalog

Write or call . . . 800-647-1800

MFJ's new TNC/Mic Switch

Switch between your TNC or Mic by pushing a button!

Switch between your microphone and TNC by pushing a button!

MFJ-1272B **$34.95**

You won't have to unplug your microphone and plug in your TNC *everytime* you want to work packet or other digital modes.

Just plug these pre-wired cables into your rig's microphone connector and into your TNC and you're ready to go -- no more hunting for hard-to-find connectors and wiring up complicated cables.

Works with HF, VHF and UHF radios with 8 pin mic connectors -- including Kenwood, ICOM, Yaesu, Alinco and others. For radios with 8-pin RJ-45 modular telephone jack, select the *new* "M" models.

Plug-in jumpers let you quickly set-up for virtually any radio. Factory set for Kenwood and Alinco. Includes easy-to-follow instructions. Has audio-in and speaker jacks. 3¼x1¼x4 inches.

MFJ-1272B/1272M, $34.95, for MFJ TNC/multimodes,TAPR TNC-2 clones.
MFJ-1272BX/1272MX, $39.95, for PK-232.
MFJ-1272BYV/1272MYV, $39.95, for KAM VHF/KPC3.
MFJ-1272BYH/1272MYH, $39.95, for KAM HF Port.
MFJ-1272BZ/1272MZ, $39.95, for PK-88.

Pre-wired Radio-to-TNC cables . . . $14.95

	All MFJ	PK-232™	PK-88™	KAM™/KPC3
Icom/Yaesu HTs	MFJ-5024	MFJ-5024X	MFJ-5024Z	MFJ-5024YV
Kenwood HTs	MFJ-5026	MFJ-5026X	MFJ-5026Z	MFJ-5026YV
Yaesu 8 pin radios	MFJ-5080	MFJ-5080X	MFJ-5080Z	MFJ-5080YV MFJ-5080YH
Icom 8 pin radios	MFJ-5084	MFJ-5084X	MFJ-5084Z	MFJ-5084YV MFJ-5084YH
Kenwood/Alinco 8 pin radios	MFJ-5086	MFJ-5086X	MFJ-5086Z	MFJ-5086YV MFJ-5086YH

1 does not include IC-W2A 2 does not include 2500 3 does not include 25A & 255A
4 YV models connect VHF port KAM KPC3. YH models connect HF port of KAM

Cables with connector pre-wired for your radio

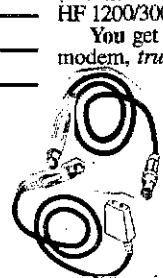
MFJ-5082, $9.95, open end cable with 8-pin mic connector
MFJ-5224, $9.95, open end cable for Icom/Yaesu handhelds
MFJ-5226, $9.95, open end cable for Kenwood handhelds
MFJ-5268, $7.95, open end cable with 8-pin modular phone plug
for Yaesu FT-2400H, Kenwood TM641A, TM714A, TM732A

Turn your Commodore 64/128 into a packet TNC!

Just plug in this MFJ-1271 modem and boot up the public domain Digicom/64 software (not included) to enjoy VHF or HF 1200/300 baud packet.

MFJ-1271 **$49.95**

You get a high performance modem, *true* DCD circuit and adjustable threshold. LED tells you when you have a good signal. Plugs into cassette port. Uses 12 VDC or 110 VAC with MFJ-1312, $12.95.



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cies between 3-30 MHz. You'll be impressed! (see *QST* ad on p 196 Mar '94). Just try Shell's latest propagation program! Many of you remember my good friend and coworker, "Woody" Woodrow W. Smith, W6BCX, Editor-in-Chief of *Radio Magazine* and the *Radio Handbook*. Woody invented many useful antennas and published more than 100 technical articles about circuits in popular radio magazines. He was an exceptional and capable technical writer. Woody was the chief engineer or supervisory engineer at Radioplane, Gonset and Babcock for years. He was the chief technical critic for 147.54, mostly to keep AA6TN, Terry and the boys on the straight and narrow. Woody discovered radar almost before it was invented and the Marine Corps gave him a direct captain's commission because of his superior insight and high intelligence score. We will all miss Woody; he became a Silent Key in Feb '94 (Woody was 81 yrs of age). 73 de W6BF.

ORANGE: SM, Joe H. Brown, W6UBQ—ASMs: Riv Co-Bob, W6LKN, 909-686-3823; Org Co—Art, W6XD, 714-556-4396; SB Co—Ken, WA6ZEF, 909-883-1272. PIC & ASM for Section news: Jerry, AD0A, 909-689-1923, fax 909-689-3902. New OOC appointee is Harry, N6YKF, phone 909-822-9814. Good luck, Harry. Hospital Disaster Support Comm System reports 45 members available after the Northridge 'quake, which is the best response ever of a HDSCS core team activation. The aftershocks are continuing! Your local Red Cross Chapter office has excellent material on earthquake preparation! The Fullerton RC received a nice letter from the mayor of Fullerton for its communications services to the Fullerton First Night celebration in Jan. W6XD was guest speaker at the Corona/Norco RC and presented a slide show on his DXpedition to Lord Howe Is off the coast of Australia. The Riverside ARA/C-BAR-C (KN6ST) now conduct a T-hunt every 2nd Sat of the month at Riverside Plaza parking structure top-level at 4:30 PM; hunt starts at 5 PM on 145.565. Editor of the Lee DeForest ARC, N6QPM, reminds us to keep our club newsletters alive by submitting articles—the editor can't put out a good paper without your contributions so QSO with the editor! Thanks for this Ray. N7IOV of Lancaster area helped in the arrest of 2 robbers of McDonald's by having his handheld with him when the robbery took place. He's a reserve deputy and radioed the robbery to another ham who contacted sheriff's deputies who apprehended the robbers later that evening. Nice going, Chris! Field Day is almost upon us. If you haven't already, contact your club and get involved in FD planning. This is *the* club-operating event of the year—don't miss it! STM WF6O has resigned and submits his last report. Thanks to Dan for his 7 years of service as our STM. W6UBQ has appointed Glenn, N6GIW, of Joshua Tree, as our new STM, who is active as DRN6 NM and operates all phases of NTS: CW, voice and digital. Congrats, Glenn! *STM Feb report:* SCNV 28 Sess, QNI 234, QTC 279; SCN/CW 28 sess, QNI 97, QTC 64. *PSHR:* N6GIW, WF6O, KD6CCF, KC6YRH, KA6TND. PBBS Tfc: WF6O 267. *Tfc:* KD6CCF 581, KA6HMS 156, N6GIW 120, KC6SKK 112, KA6TND 81, AD0A 72, KC6YRH 71, WF6O 56. Congrats to KD6CCF who made BPL for the 4th month in a row. 73!

SAN DIEGO: SM, Patrick C. Bunsold, WA6MHZ, 619-561-0052—ASM/SEC: Rich Medhurst, KD6BFO. ASM/MARS Coordinator: Harry Hodges, WA6YOO. ASM: John Cline, KI4EX. ASM for Youth: Frank Forester, KI6YG. ACC/PIC: Tuck Miller, KC6ZEC. STM: Warren Dilley, KT6A. TC/OOC: Del Radant, N6JZE. BM: Bill Calderwood, K1CT. Massive crowds enjoy El Cajon ARC Swapmeet on 1st/3rd Sat at Santee Drive-In at 6 AM. Palomar ARC has Novice through Advanced license classes for 1994. South Bay ARS (SOBARS) has been added to the list of ARRL Special Service Clubs. SD Repeater Assn (SANDRA) membership tops 1000. North Shores ARC added autopatch to its repeater. USAF MARS commits to ARRL SW Div Convention allowing a Tri-Service MARS Forum. Vendor spaces nearing sellout for this convention. Attendee registration forms available at most southern CA radio and electronic stores. SDCTN: Sess 29, QNI 187, QTC 171; ARESP: Sess 4, QNI 41, QTC 4; ARESN: Sess 4, QNI 16, QTC 0. *PSHR:* KT6A 148, KC6ZEC 136, KR6K 133. *Tfc:* KT6A 749, KR6K 471, KC6ZEC 214, KB6YJB 132, KI6MP 122, WA1ZEN 20, N6WOR 16. Ham activity in Imperial County? Call me.

WEST GULF DIVISION

NORTH TEXAS: SM, Bob Adler, NZ2T—The NTX ARRL staff meets on the last Sat each month, 2-4 PM. These meetings are open to all interested parties and new ideas are encouraged and welcomed. Locations of these meetings may vary from month to month, but the "default" is a private area in Fuddrucker's Restaurant at the Irving Mall, at 183 and Beltline in Irving. For info on these meetings, please contact a member of our staff, who will be happy to answer any questions you have. Welcome Linda Aderholt, N5WOY, our newest ASM. Linda has, for several years, been hard at work behind the scenes of several important projects. We felt her efforts deserved recognition and that these efforts had earned her a place in our leadership team and we're delighted that she's accepted the job as an "at-large" ASM for NTX. We need volunteers to participate in the Ham-Com Special Event, which will operate W1AW/5 during the National Convention in Arlington Jun 10-12. Control operators are needed for this event, which requires a minimum of a 2-hour shift per volunteer. To make matters simple, we're requesting volunteers who hold valid amateur Extra Class licenses to contact me at 817-329-0820 or via packet @ NZ2T. DFW, TX., if you'd like to help out. Volunteers are needed for security and other functions during the convention. If you'd like to volunteer time with any of these, please contact Connie Dunn at 214-219-2855, or your local club's Ham-Com Steering Committee liaison, Bill Revis, KF5BL, will conduct exams Fri and Larry Herring, WB3J, will be testing with his group on Sat-Sun during the convention. These dedicated guys need more help; get in touch with these gentlemen. NTX ARES net meets Mon after N5TC's Director's Net on 3873 kHz (which starts after TTN—see list below). SEC, Joe Brown, K5UPN, reports 1349 ARES members, with 49 nets operating and 22 DECs/ECs reporting in. The Mon night net had 4 sessions with 42 check-ins for Feb. You don't need to be an ARES member to check-in and you don't need to be an ARRL leadership official to check into the ARES net or N5TC's net: all are welcome! Welcome new appointees KB5TWW, EC Gregg

County and AB5RO, EC Haltom City. Welcome AA5DQ, new OO. KJ5GE/STM reports new ORSs: AB5RO, KA5FJA, KC5EJV, and KC5CBY.

Net	Freq	Time	QNI/QTC/SSN	NM
OTTN	7273	0830	541/238/28	K5UPN
TTN	3873	1830	1040/265/28	ND5C
TEX	3643	1900/2200	373/248/56	KS5V
7290	7290	10 AM/1 PM	3628/647/NA	N5OWQ
TSN	3721	0200Z	209/100/28	KI5LQ
OFWE	146.88	1830 Local	383/144/28	KI5NL
OFWL	146.72	2230 Local	324/206/28	KB5SFE
NTXD	-----	24 hrs	QTC 3827	W5YQZ
TNNN	7115	Noon CT	127/82/24	KQ5TL

ORNR Mgr WB5YDD reports NTX represented 100% Feb by W5VMP, K5UPN, W5YQZ, KD5RC, W5AYX, NZ2T, KF5BL, WB5NCM, W5VTZ, NF5T and KA5QYV. *BPL Feb:* NZ2T, KJ5GE, K5UPN. God Bless and 73 till next time de NZ2T. *Tfc:* W5YQZ 484, KF5BL 297, W9OYL 203, WB5NCM 201, KB5SFE 198, N5KCL 109, KI5NL 82, N5TTU 75, N5UOA 74, KB5WEE 71, N7NEB 66, KB5GLV 61, WB5SDD 58, KC5EVI 51, AB5RO 51, WA5EZY 44, W5AYX 44, N8QVT 42, N5WOY 34, N5TFB 31, KB5YAM 25, N5HBV 20, K8LUY 19, N5GHT 17, W5VMP 10, NT5R 8, N5WOX 6, N5REL 2, KB5YBP 2.

OKLAHOMA: SM, Joe Lynch, N6CL—The Elk City Hamfest was well attended and successful. Congratulations to the organizers for doing such an outstanding job. Al, K5CXP, STM, covered for your SM at the Tulsa WX seminar on the same day. Al gave an excellent presentation on the NTS. This month the Green Country Hamfest is scheduled for May 21-22. It has been designated as the West Gulf Division convention. Rosalie White, WA1STO, from the Educational Activities Dept and Luck Hurder, KY1T, from Field Services Dept will represent the League HQ. Additionally, Tom Comstock, N5TC, the Division Director and your SM plan to be in attendance. Members of the OK Repeater Society adopted a policy for shared nonprotected repeater freqs for 2-meters at its meeting in Feb. The 2 shared freqs are to be 145.25 and 146.70 MHz, with minus offsets on both. The repeaters won't be allowed to operate at a HAAT of greater than 100 ft. No system will use more than 75 W ERP. All systems must use CTCSS encode and decode. All systems must be coordinated by ORSI. Only individuals may apply for coordination. The number of repeaters to be coordinated on these freqs shall be limited to the number of CTCSS tones available. Because of the temporary nature of these repeaters, info on them won't be released for publication. *This is all the room for the news. Until next* month..73 de Joe Lynch, N6CL. *Tfc:* WB5NKC 1434, WB5NKD 978, KI5LQ 204, N5IKN 166, KE5JE 126, K5CXP 94, KG7CW 83, WA5OUV 56, W5REC 55, WA5OGC 32, KC5OU 26, WA5ZOO 24, K5G8N 24, KC5EMH 16, KC5CSC 13.

SOUTH TEXAS: SM, Alan W. Cross, WA5UZB—BM: N5LYG, ACC: KB5AWM, OOC: K5SBU, PIC: N5FIX, SEC: K5DG, STM: WD5GKH, TC: WA5WCY, ASMs: NV5L, KS5V, WA2VJL, K5PFE, WA5TUM, KA5QAP, N5OLU, WA5JYK, KB5JON. There are real people associated with the call signs and position abbreviations listed. I'm elected, the rest are volunteers. We all work for you. The SM and all Section-level staff are available for your meetings, swaptests, hamfests, conventions to present a program or just to be there. Call me or any of the staff to make arrangements. I received great news from League Headquarters; the Jefferson County ARC and San Antonio ARC have been designated as ARRL Special Service Clubs. *This designation means that these clubs are doing more than what's* required to be a top-notch organization. But remember people, clubs are just names and a place to meet; it's the people who make the club work, who give it life and give back to the community. I've received more good news from Jim, KB5AWM, the Section ACC, about numerous organizations seeking affiliation with the League. When your club is affiliated it becomes "known" to Headquarters. Division and Section staff; and thereby gets info and data that might otherwise not be available. If your organization is considering affiliation, it's easy. Call me or Jim and we'll get you started. As you read this column the 1994 Field Day will be just around the corner. I'm hoping that each Field Day group will take the time to send the SM the Field Day message for the bonus points; and besides, I'd like to hear from you! This event usually brings out several shortcomings that can be remedied right now, with little effort and almost no pain. Jim, N5FIX, the Public Info Coordinator, and his staff are ready to help you with publicity needs. Headquarters has material that's suitable for the event. Amateur Radio needs publicity to continue its growth and FD '94 is a great way to get the message out. In your preparations for Field Day, canvass your group and find who is (or isn't) a station-level appointee as an Official Emergency Station or an Official Relay Station. Tom, K5DG, and Charlie, WD5GKH, would like to have your time in volunteer work in emergency communication and traffic handling. Besides helping the Section, you'll become more of an asset to your community and club. Call me if you have any question about the station-level appointments. Attention NMs and DECs: You should have received a letter from me with info on emergency communications and possible changes. Please discuss this info with everyone in your net/area and send comments to me for forwarding to HQ. If you don't have said letter, call me. Thanks. *For Mar '94 (net name/QTC/sess)* 7290/447/44; CTTN/307/66; TEX/248/56, TSN/100/24; TTN/228/28; TCAN/99; THNN/82/24, DRN5/1017/62. *Tfc:* W5TFB 528, W5KLV 293, N5NAV 244, W5CTZ 219, N5OWQ 125, WD5GKH 107, WB7YDD 106, WA5FXO 64, N5UAP 56, KD5GM 33, N5JUU 32, KB5GST 29, AK5M 27, W5RZV 27, N5OUJ 25, W5BGE 20, KB5RUG 17, KA5QWN 10, KG5CX 8

WEST TEXAS: SM, Milly Wise, W5OVH—The Worked All El Paso Contest was held in Nov and the Awards Banquet was held in Jan. The winner was Bob, N5WAX. There were many plaques, certificates and ribbons awarded (too many to list here). Every Sun there are operators at the W5ES club station to give operators around the country the opportunity to make the 15 contacts to get the certificate. Coleman Wingate, WA4NXI, received 2 awards from the Panhandle ARC of Amarillo; an ARRL Elmer Award and the Ham of the Year for 1993; congratulations, Coleman. I hope many WTX amateurs attend the WTX Conv Apr 23-24. Wish to thank Ralord Dunagan, WD5EFJ, ASM and EC of Dist 3

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MFJ 1278B • 1270B

of ARES in WTX, for giving such a complete rundown on happenings in his district. JL, N5INC, led the way in the Cactus and Crude 150 Bike Tour with the help of John, KB5ECT; J. C., KB5ECU; Bucky, KB5DRZ; Jose, KB5GIW; Charles, KB5AAX; Weldon, WB5OVA; Jerry, KB5ZZX; Bill, KB5ZZY; Paul, KC5ALH; Bill, W5TOC; WD5EFJ. I'm happy that there are foxhunts (hidden-transmitter hunts) starting up again in this Section. On Mar 6, K5WPH sponsored a foxhunt; 7 teams participated. Hams participating were N5ZRF, KB5YT, K5KKO, DG3BY, N5LZB, WB5FKC, N5UYZ, WA5KKY, KB5PHS, KC5DAU, KC5DAT, KC5FII, N5BDQ, WB5LJO and N5FAZ. I wish to report Joe, W5PDY, of Albuquerque, the SM of NM, is home and doing better after a bout with viral pneumonia. 73, Milly Wise, W5OVH.

We've kept up with electronic ac

The p

AEA PK232MBX $299

Multi-Mode Controller

With over 50,000 units sold worldwide, the PK-232MBX is the world's leading multi-mode data controller. Combining all amateur data communication modes in one comprehensive unit, the PK-232MBX offers Morse code, Baudot, ASCII, AMTOR/SITOR 476 and 625, HF and VHF Packet, WEFAX receive and transmit, as well as commercial standard NAVTEX/AMTEX automated marine/ARRL information services. The PK-232MBX provides any RS-232 compatible computer or terminal with complete amateur digital operating capabilities. All decoding, signal processing and protocol software is on ROM in the PK-232MBX. Only a simple terminal program is required to interface the PK-232MBX to your computer. The PK-232MBX package includes an RS-232 interface cable that connects the unit directly to the RS-232 port of the computer.

Heil Pro-Set

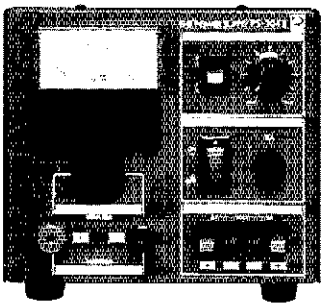
Professional Quality Boomset

$119

This new Heil boomset has been hailed by the leading amateur radio publications as a "giant step forward" in boomset design. The main emphasis behind its three year development is the use by multi-op contest and DX-peditions. The vinyl earpad ring mount snaps into the headpiece for easy removal for washing or replacement. The headband is fully padded with detent stops for each side. The unit is light, yet extremely rugged and the microphone boom is flexible and can be placed in just about any location as well as folding up for traveling and storage. Comes with the HC-4 DX mic element. Specify either Icom, Yaesu or Kenwood rig when ordering.

Daiwa PS304

1 to 15 VDC, 30 A Variable Power Supply



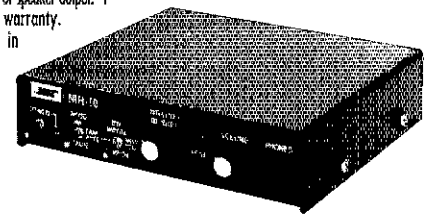
$149

Power your HF transceiver or use as a bench supply. This supply comes complete with a meter, cigarette lighter socket and multiple connectors. Designed for compactness and efficiency. 24 A continuos. 7" x 6" x 9", 16 lbs.

JPS NIR-10 $329

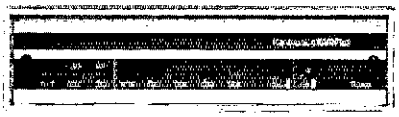
Noise/Interference Reduction Unit

The NIR-10 noise reduction unit gives you real effective reduction of band noise, power line noise, ignition noise, computer noise, steady static, etc. from your received audio without reducing the audio bandwidth! Listening on the ham bands is pleasurable through the reduction of noise and interference. New software version 3.0 offers enhanced notch performance and a peaking function to improve the white noise reduction without surging. Digital Signal Processing separates the NIR-10 from other noise/interference filters. Powered by 12 VDC, built in speaker and headphone or speaker output. 1 year warranty. Made in USA



Kantronics KAM PLUS $299

All Mode Controller

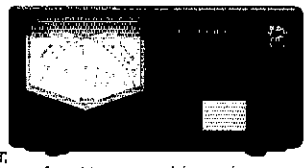


With two radio ports, the KAM Plus supports CW, RTTY, ASCII, NAVTEX/AMTEX, AMTOR (ARQ, FEC, SELFEC, CCIR 476 AND 625), Pactor and Packet on HF While running Packet on VHF at the same time. KAM Plus runs in terminal, KISS and HOST modes. Simultaneous multi-mode operation, such as RTTY on HF and packet on VHF is also supported. Comes complete with RS232/TTL serial interface, compatible with a PC or C-64. 1 3/4" x 6" x 9" and requires 12 VDC @ <200 mA.

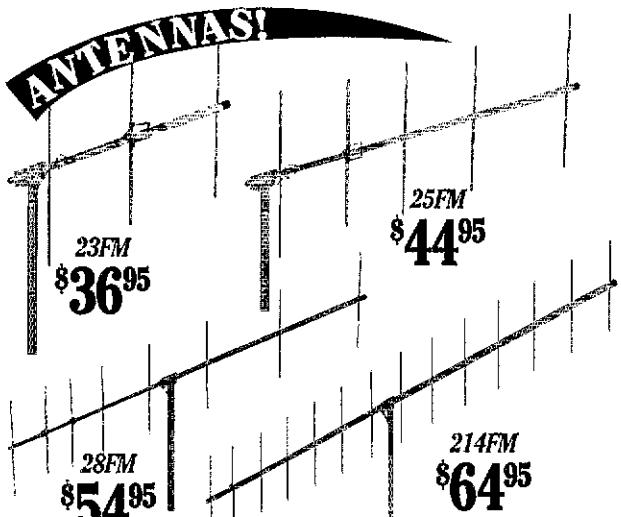
Daiwa CN101

HF Cross-Needle SWR/PWR Meter

$79



World famous Daiwa cross-needle meters eliminate the major headache of using your antenna tuner; the constant recalibration of your VSWR meter- and throwing the FWD/REV switch back and forth as you change bands, modes and power levels. With cross-needle metering, you get hassle-free, full time power, reflected power and VSWR readings simultaneously at a glance. The CN-101 covers 1.8 to 150 MHz with up to 1.5 kW power-handling capability. It has 3 scales: 15/150/1.5 kW and comes standard with PL-259 connectors. Backlit display (requires 12 V).



Hy-Gain 23FM, 25FM, 28FM, 214FM

VHF Beams and Ground Planes

These antenna include Hy-Gain's exclusive Beta Match to provide excellent F/B ratio and maximum obtainable gains.

Accepts up to 2" mast.

Model#	23FM	25FM	28FM	214FM
Price	$36.95	$44.95	$54.95	$64.95
Number of Elements	3	5	8	14
Bandwidth @ 2:1 VSWR	4	4	4	4
Longest Element (ft/m)	3.35/1	3.3/1	3.3/1	3.3/1
Boom Length (ft/m)	3.6/1.1	6.25/1.9	12.3/3.4	15.5/4.7
Boom Diameter (in/mm)	1.25/31.8	1.25/31.8	1.25/31.8	1.25/31.8
Turning Radius (ft/m)	3.6/1.1	6.1/1.9	6.25/1.9	8/2.4
Max. Mast Diameter Accepted (in/mm)	2/50.8	2/50.8	2/50.8	2/50.8
Bands	2	2	2	2
Wind Load @ 80 mph (129 km/hr) (lbs/kg)	12.7/5.8	18.9/8.6	32.3/14.6	42.2/19.1
Max. Wind Survival (mph/km-hr)	80/128.7	80/128.7	80/128.7	80/128.7
Surface Area (sq ft/m²)	.5/.05	.74/.07	1.3/.12	1.7/.16
Shipping Weight (lbs/kg)	2/1.4	5/2.2	5.6/2.3	7.5/3.4

*These Hy-Gain antennas are realistically gain-rated against a standard dipole antenna (dBd) instead of a theoretical isotropic source.

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$1359

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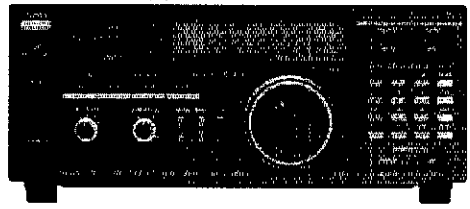

Alinco DR600T

High Power Remoteable VHF/UHF Mobile

~~$609~~ Coupon Special **$579**

Alinco invented the remote control transceiver in 1990 and now re-defines it with the DR600T. Standard features include FULL remote control with or without a security code. The user can exercise control over BOTH BANDS from one control channel. This means that a single band HT is all that is required to take full advantage of this feature. Also included is DSQ for private paging, auto dialer channels, direct frequency input from microphone, CTCSS encode and odd splits on every memory channel. This rig also features state of the art sensitivity and selectivity, including Air band reception capability with a simple modification. For security and convenience, the head can be mounted separately from the main unit with the optional separation kit. Measures 5 7/8" x 2" x 7".

Icom IC-3230H

Dual Band Mobile (2m/440 MHz)

Was **$699** Now **$639**

While hiking, fishing, shopping or any remote activity, you can transmit/receive with your handheld through the IC-3230H in your vehicle. All of the power and features of the IC-3230H are in your hand! This revolutionary dual band mobile is fully remotable with the optional UT-55 from its mic or any handheld with DTMF. The UT-66 option will announce the frequency back over the HT! Cross band repeat enables you to receive a signal on one band and re-transmit on the other. This allows your mono-band handheld to operate on another band, while extending your range. The IC-3230H also has full duplex, 36 memory channels and 14 auto dialing memories. 5.5" x 1.6" x 6.5".

Alinco DJ-F1T

2m FM Mini HT

~~$299~~ Coupon Special **$279**

You won't believe the features packed into this handheld that is smaller than your hand! It has 40 memory channels , 138 to 174 MHz coverage , pager and code squelch, priority function (dual watch) and triple stage selective power setting (up to 5 W with 12 V battery). All this plus the heralded Alinco battery saving functions make this the best choice on the market in a mini-HT. Measures 4.3" x 2.1" x 1.5"

Icom IC-T21A

2m Handheld w/440 MHz Receive

$329

The ultimate in 2m handhelds! 2m transceive and 440 MHz receive permit full duplex operation. The exclusive whisper mode allows telephone-like conversations while in duplex mode. The large display and backlit keypad provide ease of use. The new SC-1257 power module delivers a powerful 6 W of output power with 13.5 VDC- another Icom first! Up to 6 hours of operation time is possible with its power-saving features. Tone scan automatically selects subaudible repeater tones, 114 memory channels store all necessary repeater settings and 5 DTMF memories allow for easy dialing of your favorite phone numbers from an autopatch. This radio even scans 3 to 4 times faster than most other handhelds! Step up to the new Icom T21A today! Also available: T41A, 440 MHz version. Call for price and availability.

Alinco DJ580T

Dual Band (2m/440) HT

~~$409~~ Coupon Special **$379**

A super-compact handheld, the tiny DJ-580T is a powerful, feature-packed twin bander. This HT is the smallest you'll find, and literally fits in the palm of your hand. Ergonomic design, combined with excellent sensitivity and unbelievable great sound, sets a new standard for miniature HT's. Features include: 40 memories, 8 scanning modes, independent VHF and UHF controls, and full duplex function. Power output 2 W (5 W with optional battery). 6 1/2" X 2 1/4" X 1 1/4".

Icom IC-2GXAT

2m Handheld

~~$299~~ Coupon Special Good Thru 3/31/94 **$289**

The new IC-2GXAT offers surprisingly simple operation with the features and performance amateurs have come to expect from Icom products. 7 W of output power make hitting those repeaters a breeze. The display can be set to indicate memory channel numbers only. This keeps frequencies secret, restricts operating frequencies or simplifies operation for an unfamiliar user. The auto repeater operation automatically activates the correct duplex direction when the receiver frequency tuned is within the repeater output frequency range. 40 memory channels, 5 DTMF auto dial memories, power saver features and a die-cast aluminum rear case with a splash-resistant body round out this outstanding new offering.

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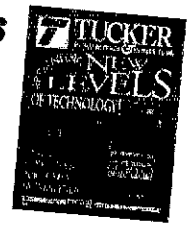

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DR-600T (144 MHz/440 MHz)

The outstanding abilities of the DR-600T set it apart from every other radio. Features like Wide Frequency Coverage, Excellent Intermod Rejection, Direct Frequency Entry from the microphone, Three Output Power Selections, Autopatch Memories, and 6 Scanning Modes make the DR-600T the radio of choice for demanding users. The Remote Mount Head allows for custom installation in most any vehicle, and also helps to deter theft.

This road-ready rig can also be remote controlled by any radio that transmits DTMF tones. This remarkable feature allows the DR-600T to act as a full-featured Cross-Band Repeater. For added control, a security code can be programmed that will allow control only by the control operator (you).

DJ-G1T

The DJ-G1T 2m HI from ALINCO scores anothe "First" for Amateur Radio technology. Our ne "Channel Scope" feature opens new doors for Ha operators. Now it is possible to visually monitor u to 7 memory channels at once with just a glance a the display.

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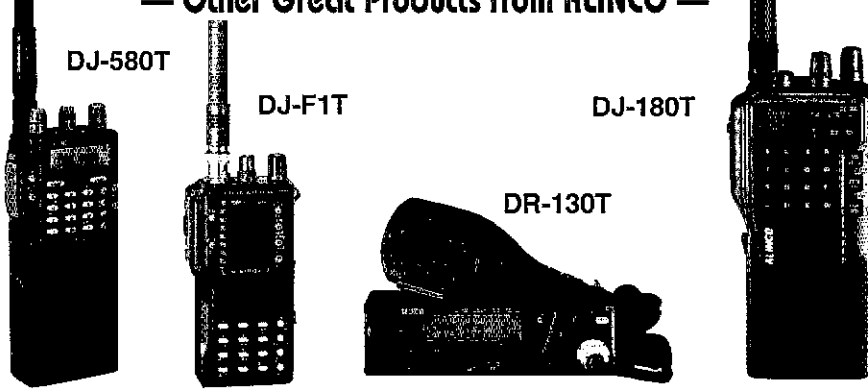

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DR-130T

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ALINCO's newest 2-Meter mobile, the DR-130T, packs a big punch. This compact radio delivers 50 Watts of cool running power, and offers the durability and reliability that Hams have come to expect from ALINCO.

Standard features include 50 CTCSS Tones, Programmed Memory scan, Programmable "Time-Out" Timer, CTCSS Encode, and others. With the optional EJ-19U plug-in module, 100 memory channels are available. All memory channels can store "odd-split" frequencies, and also store CTCSS Encode/Decode status.

DJ-180T

Clearly Superior

Ergonomic, rugged design, combined with excellent sensitivity and great sound make this the radio of choice for demanding operators.

This rig comes standard with CTCSS encode and decode. Ten memory channels come standard, and the unit can be upgraded to 50, or even 200 Memory Channels with optional plug-in chips.

Odd Splits! This radio can store repeater offsets from 0 to 15.995 MHz. A different offset can be stored in each memory channel, and most other functions can also be stored independently in each memory channel.

DR-430T 70 cm Mobile available now!

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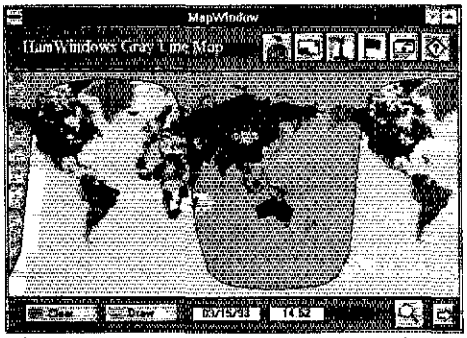

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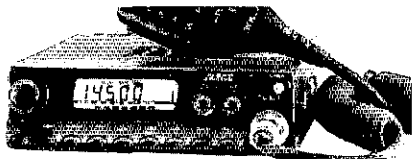

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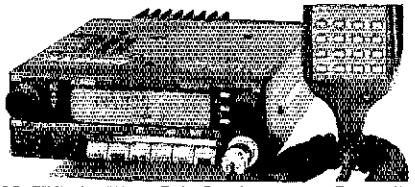

DR-570T 2m/70cm Twin Band mobile • *Two radios into one!* Covers 2m/440MHz transmit with broadband receive including 130-170, 340-470 and 870-890MHz with user MARS/CAP modification. 45W out on 2m, 35W on 70cm. Full duplex cross band operation. Big, dual digital LCD display, illuminated front panel controls. Volume, squelch and tuning controls for each band. 20 memory channels, 4 scanning modes, priority. CTCSS encode/decode, internal duplexer. 16-key DTMF microphone with UP/DOWN key. 5⅛"w x 2"h x 6¼"d, 3¾ lbs..... $

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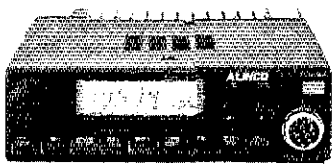

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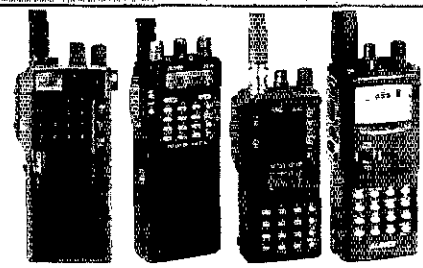

DJ-180T DJ-580T DJ-F1T DJ-G1T

ALINCO DJ-180T 2m FM HT • Superior receive audio and tough construction with simple intuitive operation. Designed so you won't have to spend hours studying the manual. Covers 144-148MHz transmit and 130-174 MHz receive. 2.0W, 5W with opt.12V battery. Illuminated LCD display, 16 digit DTMF, 10 memories. 5½"h x 2¼"w x 1¾"d.. **$CALL**

***DJ-180T* – $20 Coupon**

ALINCO DJ-180TH • Same as 180T but 5W ..... $

***DJ-180TH* – $10 Coupon**

ALINCO DJ-580T 2m/70cm Twin Band HT Super Audio! 2m/440MHz tx, rx 130-174 and 410-470MHz. Mod. for MARS/CAP tx, + 118-136MHz & 800MHz rx. 40 memories, CTCSS encode/decode, DTMF encode, DSQ. Full duplex cross band repeat, 8 scan modes, autodialer, back-lit keypad. Simultaneous receive on both bands with separate squelch and volume controls. 2.5W; 5W with 12VDC or optional battery. 6½"h x 2¼ "w x 1¼ "d, 0.97 lbs..... **SPECIAL**

***DJ-580T* – $30 Coupon**

ALINCO DJ-F1T 2m Mini HT • Wideband receive 130-174MHz and 118-136MHz and MARS/CAP transmit with modification. 8 scanning modes, autodialer, back lit keypad, 40 memories, call channel. CTCSS, DTMF encode and DSQ paging. 2.5W; 5W opt. 4⅛ "h x 2¼ "w x 1⅛ "d, 14 oz..... $

***DJ-F1T* – $20 Coupon**

DJ-F1T/HP • Same as DJ-1FT but 5W with 12V 600mah nicad battery, standard..... $

***DJ-F1T/HP* – $20 Coupon**

New **DJ-G1T 2m HT** • Features 440MHz receive, "Channel Scope" spectrum analyzer, more! ..... $

***DJ-G1T* – $30 Coupon**

All Alinco Coupons expire May 1, 1994

CLOSEOUTS...

DJ-162TD • 2.5w 2m HT/nicad & alk. case .. **$199.95**
DR-592T • 45w/35W 2m/440 FM mobile ... **499.95**

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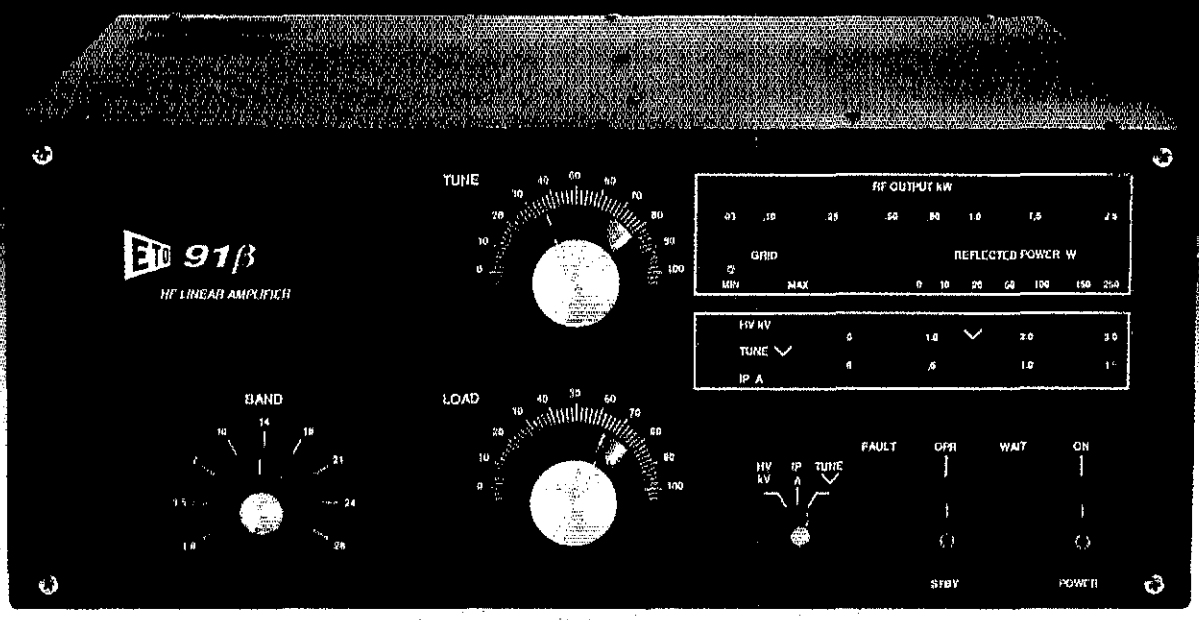
The ETO 91β HF Amplifier



Traditional *ETO* Power and Ruggedness *at a "Brand X" price!*

WE COULD SELL IT ON PRICE ALONE...

The new ETO 91β is an unequalled value. Average or PEP, *the 91β delivers more honest, heavy-duty watts per dollar than any other brand* of HF linear amplifier. Just look at the basic specifications.

...*OR* ON QUALITY AND PERFORMANCE

Our ETO 91β delivers the same *brick-on-the-key,* no time limit, conservative maximum legal power that's made ALPHA POWER the leaders' choice for 24 years. It's backed by the famous ETO/ALPHA buyer's protection plan – warranty†, service, and money-back guarantee†.

A few features of the NEW ETO 91β

- Cool 1.5 kW RF output on all bands & modes with no time limit
- Full HF band coverage*
- Proven metal-ceramic tubes with low replacement cost
- Heavy duty transformer with tape-wound Hipersil®-type core

COMPARE THE 91β WITH OTHER AMPLIFIERS

Try the 91β in your own station. Compare it with the best amplifiers offered by Ameritron, Command, Henry, Icom, Kenwood, Ten-Tec, and Yaesu. If you don't agree that the ETO 91β *is far and away the best in performance and value,* return it for a full refund†!

Why would you buy an amplifier from anyone but ETO?

†Call Ray Heaton for full details and a copy of the warranty and guarantee.

Pending receipt of FCC type acceptance, the ETO 91β may not be, and is not, offered for sale or lease.

**10 & 12M coverage easily activated by qualified owners.*

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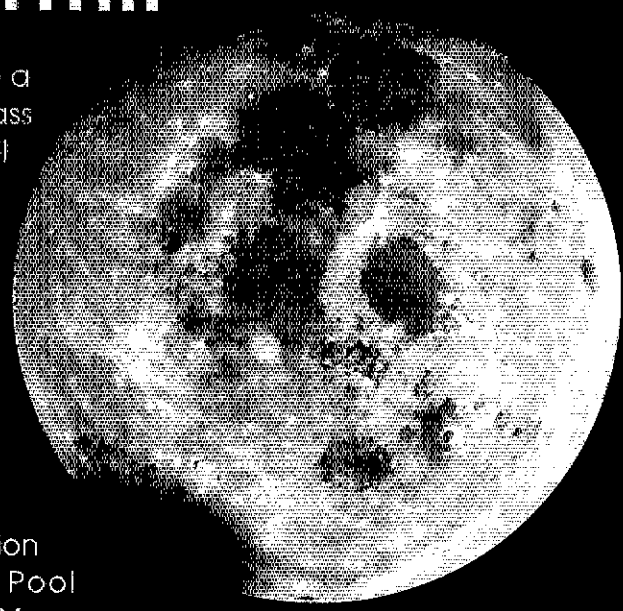
AFTER MIDNIGHT...



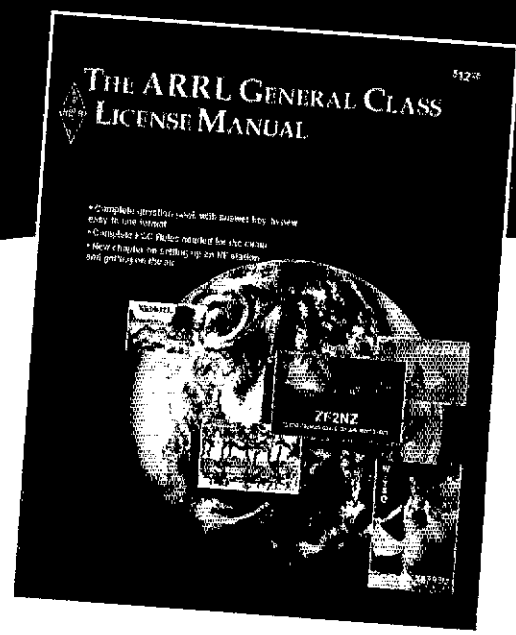
On June 30, 1994 at midnight, you'll see a new question pool for the General class (Element 3B) license go into effect. You'll see something else much sooner — a transformed ARRL General Class License Manual. We've taken the manual back to bare bones and revamped it to make exam preparation easier and more enjoyable than ever before.

Here's what you'll find:

- The complete and up-to-date question pool as released by the Question Pool Committee for use beginning July 1, 1994.
- A question-pool answer key printed next to the questions for easy reference.
- All the FCC Rules you'll need to know for the exam, along with clear explanations.
- An entire chapter dedicated to information about selecting your equipment, setting up your HF station and using your new privileges on the air.
- A paper-back lay-flat binding for hassle-free use.

Use the new ARRL General Class License Manual and your study efforts will meet with howling success. Find a copy before the sun goes down — after midnight could be too late.

For ordering information see the ARRL Publications Catalog elsewhere in this issue.
ARRL Order No. 4688 Retail $12



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MODERN, MULTI-BAND ANTENNA SYSTEMS

MOBILE ANTENNA PRODUCTS

Modern, high-performance stations use COMET Antennas, Duplexers, Triplexers and Accessories! COMET products are designed to provide an exceptional level of signal quality and coverage area. Whether operating mobile or from your base station, COMET products make you sound good. No other product line has the selection, convenience, quality and performance!

DUAL-BAND MOBILE ANTENNAS

FL-67S Dual-Band 146/446MHz w/Fold-Over, No Ground Plane Required

Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz ⅝ wave 446MHz ⅝ wave x 3	1.5:1 or less	150 watts	4' 11"	Gold Plated PL-259

FL-62S Dual-Band 146/446MHz w/Fold-Over, No Ground Plane Required

Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz ½ wave 446MHz ⅝ wave x 2	1.5:1 or less	150 watts	3' 5"	Gold Plated PL-259

NEW!

SB-7/SB-7NMO Dual-Band 146/446MHz w/Fold-Over, No Ground Plane Required

Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz ⅝ wave center-loaded 446MHz ⅝ wave x 3	1.5:1 or less	70W FM	4' 7"	PL-259 or NMO style

NEW!

SB-5/SB-5NMO Dual-Band 146/446MHz w/Fold-Over, No Ground Plane Required

Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz ½ wave 446MHz ⅝ wave x 2	1.5:1 or less	120W FM	38"	PL-259 or NMO style

NEW!

SB-2/SB-2NMO Dual-Band 146/446MHz

Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz ¼ wave 446MHz ⅝ wave	1.5:1 or less	60W FM	18"	PL-259 or NMO style

NEW!

B-10/B-10NMO Dual-Band 146/446MHz, Cellular Look-a-like

Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz ¼ wave 446MHz ½ wave	1.5:1 or less	50W FM	12"	PL-259 or NMO style

B-20/B-20NMO Dual-Band 146/446MHz, Cellular Appearance, No Ground Plane Required

Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz ½ wave 446MHz ⅝ wave x2	1.5:1 or less	50 watts	30"	PL-259 or NMO style

NEW!

SB-25/SB-25NMO Mono-Band 146MHz w/Fold-Over, No Ground Plane Required

Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz ⅝ wave center loaded	1.5:1 or less	100W FM	4' 9"	PL-259 or NMO style

COMET products are available from most major dealers. For customer service, or a complete catalog, please call us at 800/962-2611. We're confident COMET products and accessories will enable you to enjoy Amateur Radio to its fullest!

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MINI SPEAKER/MIC

HM-P2K/F
Mini spkr/mic featuring full TX/RX quality!
Light weight, extremely small: 1"x2" with collar pocket clip.
HM-P2K: Kenwood Version
HM-P2F: Icom/Yaesu Standard/Alinco/etc

TRI-BAND MOBILE ANTENNAS

CX-224/224NMO Tri-Band 146/220/446MHz, w/Fold-Over, No Ground Plane Required

Wave:	VSWR:	Max Power:	Length:	Connector:
146MHz ½ wave 220MHz ⅝ wave 446MHz ⅝ wave x 2	1.5:1 or less	100 watts	3"	PL-259 or NMO style

FJ-15S Tri-Band 52/146/446MHz w/Fold-Over

Wave:	VSWR:	Max Power:	Length:	Connector:
52MHz ¼ wave 146MHz ⅝ wave 446MHz ⅝ wave x 3	1.5:1 or less	120 W FM	4' 10"	PL-259

HF MOBILE AND HT ANTENNAS

HA-4S Quad-Band HF 40/* (20)/15/12/10 Meters w/Fold-Over

Wave:	VSWR:	Weight:	Length:	Max Power:	Connector:
¼ wave	2:1 or less	1 lb. 14 oz.	4' 4"	120W SSB (200W SSB 28MHz)	PL-259

*L-14HS Optional 20 Meter Coil

NEW!

SH-55 Super Flexible 146/446MHz HT Antenna

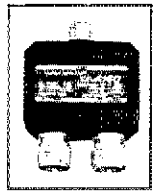
Wave:	Max Power:	Length:	Connector:
146MHz ¼ wave 446MHz ⅝ wave x 2	10 watts	15.5"	BNC

NEW!

CH-722SA High Gain HT Antenna
Wave: 146MHz ½ wave
446MHz ⅝ wave x 2
Max Power: 50 watts
Length: 35", 2 sections, 18" each
Connector: BNC

CH-32 Miracle Baby 146/446MHz HT Antenna
Gain & Wave: 0dB ¼ wave
Max Power: 10 watts
Length: 1.75"
Connector: BNC

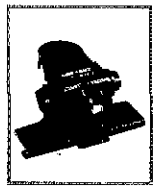
DUPLEXERS AND MOBILE MOUNTS



CF-4106K, I, J,
146/446MHz
Band Pass, Ins Loss, Max Pwr.
1.3-150MHz, 0.1dB, 800w PEP
400-540MHz, 0.2dB, 500w PEP
Isolation: 60dB
CONNECTORS:

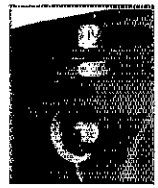
	4160K	4160I	4160J
Output:	SO-239	SO-239	SO-239
Low In.	PL-259	PL-259	SO-239
High In	PL-259	N-Male	SO-239

RS-21
Trunk, hatchback, rear door (van, blazer, etc.) mount. Adjustable to virtually ANY angle. Rubber-coated base protects vehicle paint.



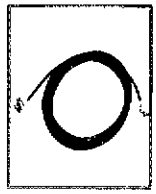
NEW!

RS-820
Heavy-Duty, Low Profile Trunk Lip or Hatch Back Mount. Rubber-coated base protects vehicle paint.



WS-1M
Multi-Adjustable Window Clip Mount.
11.5 feet of high quality coax. Gold-plated UHF Conns. for Antennas up to 40" in height.

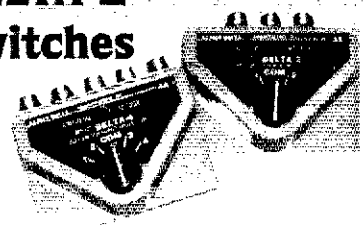
NEW!



3D4M Standard Cable Assembly
13.5 feet of low loss coax. Gold plated UHF (PL-259/SO-239) connectors.
3D5M Standard Cable Assembly
Same as 3D4M, but 17 feet of coax

CK-5M Deluxe Cable Assembly
13 feet double shielded very low loss coax + 12" RG-188 teflon coax. Gold plated UHF (PL-259/SO-239) connectors.
CK-5M5 Deluxe Cable Assembly
Same as CK-5M, but 17 feet of coax

Alpha Delta Model DELTA-2 and DELTA-4 Coax Switches



Setting "first in the industry" standards for lightning surge protection, precision low-loss switching and master antenna ground functions—all in a single, cost effective product.

- Arc-Plug® cartridge surge protection system—replaceable element provides continuous protection of the active antenna circuit. Unused circuits are automatically grounded. Easy access through front panel.
- Master antenna ground function—internally disconnects and grounds all circuits when in center "off" position.
- Efficient low-loss cavity design—uses constant impedance micro-strip construction for outstanding low-loss performance and state-of-the-art co-channel isolation. No lossy wafer switches are used.
- All connectors are across rear for best "out of the way" cable installation. Other brands use front-mounted "common" connectors which cause unsightly cable loops.
- Positive detent roller bearing drive for "no question" switch positioning.
- The Delta Series handles full legal power.
- Cheaper switches typically don't have N-type connectors because poor, non-constant impedance designs become obvious when using precision N connectors. One look inside cheaper switches will tell you they are still overpriced.
- Designed and produced in the U.S.A. by Alpha Delta.

Model Delta-2 (2-position, UHF connectors, 500 MHz) $49.95
Model Delta-2/N (2-position, N connectors, 1.3 GHz) $64.95
Model Delta-4 (4-position, UHF connectors, 500 MHz) $74.95
Model Delta-4/N (4-position, N connectors, 1.3 GHz) $89.95

At your Alpha Delta Dealer or add $5.00 for direct U.S. orders. Exports quoted.

See Data Sheet for surge limitations.

PROVEN RELIABILITY. AFFORDABLE PRICE

LM-354
WAS ~~$1,865~~ NOW! $1,300

	Was	Now
WT-51	$1,245	$1,050
LM-470	$3,945	$3,658

The LM-354 is supplied with a hand winch brake system. The LM-470 is motorized.

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All towers are complete with rigid concrete base mount and rotator mounting plate. Tri-Ex prints and calculations provided with tower are compliant with 1991 Uniform Building Code (U.B.C.) Engineering designed to 1991 U.B.C. - 70 MPH

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TOWER CORPORATION
7182 Rasmussen Ave. • Visalia, CA 93291
Unsurpassed Quality since 1954

Wire Antenna Parts

PL-259	Silver-Teflon, USA	$1.29 or $25/25
PL-259	Gold-Teflon, USA	$1.49 or $30/25
N/9913	'N' Connector for 9913, 9086, Flexi	$3.25
Connectors	Type-N, UHF, BNC, Adapters	Stock
CQ RG-8X	95% Type IIA, Non-contaminating	23¢
CQ-8XMM	95%, Solid Dielectric, Type IIA	27¢
CQ RG-213	Certified Quality, 96% ++ Braid	40¢
9086	International (a better 9913)	48¢
CQ-FLEXI	Flexible 9913-type, very low loss	62¢
R1 Rotator	8 conductor (2x18 + 6x24)	20¢
R2 Rotator	8 conductor (2x16 + 6x18)	37¢
R4 Rotator	8 conductor (2x14 + 6x16)	48¢
#16 Silky	19-strand, Cu-clad strong, flexible	8¢
#14 Stranded	Hard-drawn (7x22) antenna wire	8¢
#14 Stranded	Copper-Clad (7x22)	9¢
#14 Silky	19-strand, Cu-clad flexible & strong	11¢
#13 Insulated	19-strand Cu-clad, tough jacket	15¢
450 Ladder	#18 Cu-clad, poly, window	13¢
450 Ladder	#16 stranded Cu-clad, poly, window	18¢
300 Ladder	New! Heavy-duty, #18 cond.	13¢
300 Twin Lead	#18 stranded, sim. to orig. Belden	13¢

Wire & Cable SALE prices are in 50 foot increments.

RG-8X 95%, Premium 16¢

RG-213 Mil-type, 95% 34¢

Antenna Support Line

MilSpec Dacron®, solid, single braid, sun resistant line.
3/16" 700# test 100' hank $ 8.00

PRO-AM Through-the-Glass Antenna

1/2 wave, no ground planes, low SWR. Tested @ 110 MPH. Excellent mobile performance. Installation is quick and easy.

GM-144	2 m	$36.95
GM-270	2 m & 440	$47.95

Mention this ad for SALE prices. Prices and specifications are subject to change without notice.

Add shipping (10%, $5 min). VISA & Master Charge Welcome. Give Card #, Expiration date, Signature.

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Current-Baluns

What's So Different?

- 19 Models fit every application
- Oversized, Saturation Resistant, Ferrite Cores = HIGH POWER!
- Excellent Output Balance
- Outstanding Load Tolerance
- Maximum Isolation
- Stainless Steel Eyebolts
- Laboratory Specifications Given
- Internal wires brought outside of case, for direct connection to your antenna.

1:1, 50 Ohm, 'Current-Type Baluns

B1-2K	2 kW, High Isolation, 80-10m, Coax in, Wire Out	$18.95
B1-4K	4 kW, High Isolation, 80-10m, Coax in, Wire Out	$22.95
B1-5K	5 kW, Precision, 160-10m, Coax in, Wire Out	$29.95
Y1-4K	4 kW, Yagi-Balun, 160-10m, PL-259 in, Wire Out	$24.95
Y1-5K	5 kW, Yagi-Balun, 160-10, PL-259 in, Wire Out	$29.95
C1-2K	2 kW, Precision, 160-10m, PL-259 in, PL-259 Out	$12.95
C75-4K	4 kW, 75 Ohm Balun for Loop Matching Systems	$29.95

4:1 BALUNS

B4-1.5K	1.5 kW, 80-10m, SO-239 in, Wire out	$19.95
B4-2K	2 kW, Precision, 80-10m, SO-239 in, Wire out	$29.95
B4-2KX	2 kW+, Current-type, 160-10, SO-239 in/Wire out	$39.95
RemoteBalun	1 kW, Coax-to-Openwire Interface - NEW	Call

LINE ISOLATORS

4K-LI	4 kW, 50 Ohm, SO-239 in, SO-239 out	$19.95
4KV-LI	4 kW for Vertical Antenna, SO-239 in, PL-259 out	$26.95
4KRF-LI	4 W, Max Isolation, SO-239 in, PL-259 out	$25.95

REFERENCE CATALOG

128 pages of hard-to-find parts, reference charts on baluns, antenna support line, wire, cable, and coax. It reads like a magazine. Articles on ground systems, "Budget DXing©", high performance wire antennas, and much more. Order both the Reference and the General Catalog. Send cash or check.

Order your copy today, $4, postage paid.

ANTENNA FEVER

1/2 wave, off-center fed, horizontal element (132')
← Matching Transformer - No Traps

CAROLINA WINDOM
A RADIO WORKS ORIGINAL

← 22' Vertical Radiator

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6 Product Reviews Say So;
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The Original "Controlled Feedline Radiation" Antenna. Its SECRET is the GROUND INDEPENDENT Low-angle, Inverted, Vertical Radiator

One Simple Antenna = All Bands, 80-10 + WARC
Outperforms Dipoles, Trap Antennas, Verticals.
LOW SWR with your transmatch
Unique Dedicated Matching Unit and Line Isolator

← Line Isolator
Feed with 50 ohm coax

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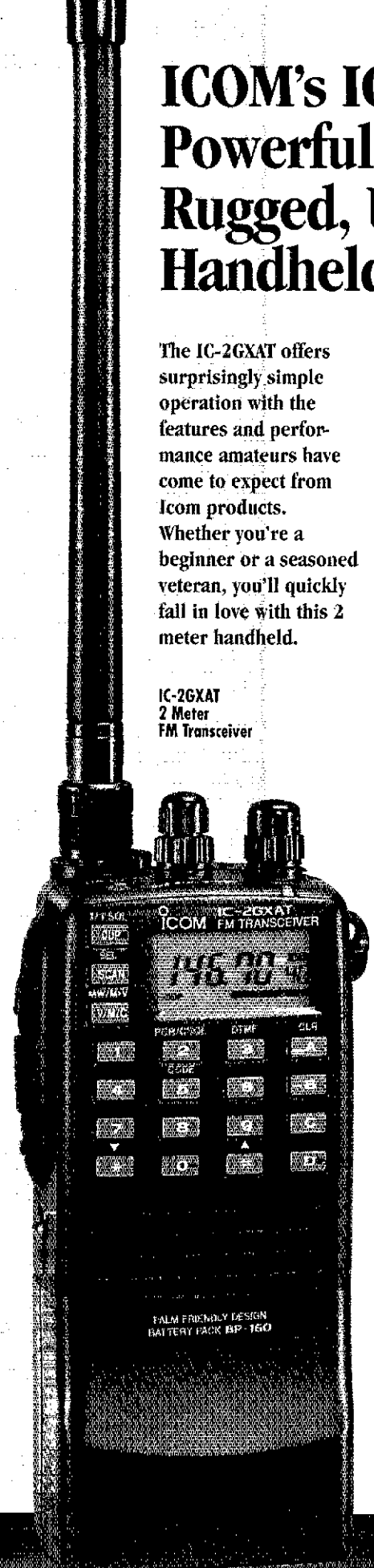
ICOM's IC-2GXAT . . . Powerful Versatility In A Rugged, User-Friendly Handheld.

The IC-2GXAT offers surprisingly simple operation with the features and performance amateurs have come to expect from Icom products. Whether you're a beginner or a seasoned veteran, you'll quickly fall in love with this 2 meter handheld.

IC-2GXAT
2 Meter
FM Transceiver



SIMPLE OPERATION

Channel Operation – display can be set to indicate memory channel numbers only. This keeps frequencies secret, restricts operating frequencies or simplifies operation for an unfamiliar user.

Auto Repeater Operation – automatically activates the correct duplex direction when the receiver frequency tuned is within the repeater output frequency range.

Tone Scan – scans for, detects and sets the subaudible tone frequency to enable communication with another station that is using subaudible tones.

DTMF Redial– for quick and easy access to autopatches.

User Friendly Keyboard – uncluttered, user-friendly design for ease of operation.

ADVANCED FEATURES

Power Saver – reduces the current drain to 35 mA (avg. Rx) for battery conservation and extended operating time.

Low Power Option – switch to 1 W output power to extend your operating time when high power isn't required.

40 Memory Channels – store all repeater information independently.

Memory Transfer – the contents of a memory channel are transferred into VFO, **and the VFO mode is automatically selected,** to assure quick and easy QSY'ing.

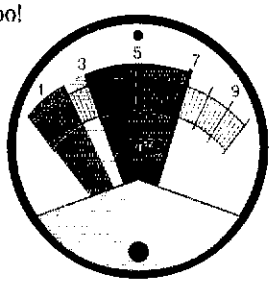
5 DTMF Auto Dial Memories – for quick and easy autopatching to frequently used telephone numbers.

Selectable DTMF Autodial Digit Duration– adjust your DTMF speed to the decode capabilities of the repeater.

Need more information?
Call our brochure hotline:
(206) 450-6088

MAXIMUM POWER

7 W Output Power – one of the highest powers available in a handheld (nominal with 13.5 V DC or the optional BP-132A battery pack). The BP-132A battery pack provides more than enough power to reach those fringe areas, and a long lasting 600 mAh too!



DURABLE CONSTRUCTION

Die-cast Aluminum Rear Case – will withstand the demands of rugged outdoor use.

Splash Resistant Body – maintains performance in harsh outdoor environments.

Rated JIS II for splash resistance, the IC-2GXAT is built to withstand rugged outdoor use.

OTHER GREAT FEATURES

- High Sensitivity, 0.18 µV for 12 dB SINAD
- Multiple Scan Modes
- Monitor Function
- SET mode to customize transceiver operation
- Display lighting with 5 second timer
- Subaudible tone encoder, tone squelch and pocket beep
- Optional pager and code squelch
- BP-160 (4 W, 700 mAh) battery pack, wall charger, belt clip and hand strap come standard
- 8 tuning steps (5, 10, 12.5, 15, 20, 25, 30 or 50 kHz)
- Call Channel
- Icom compatible accessories

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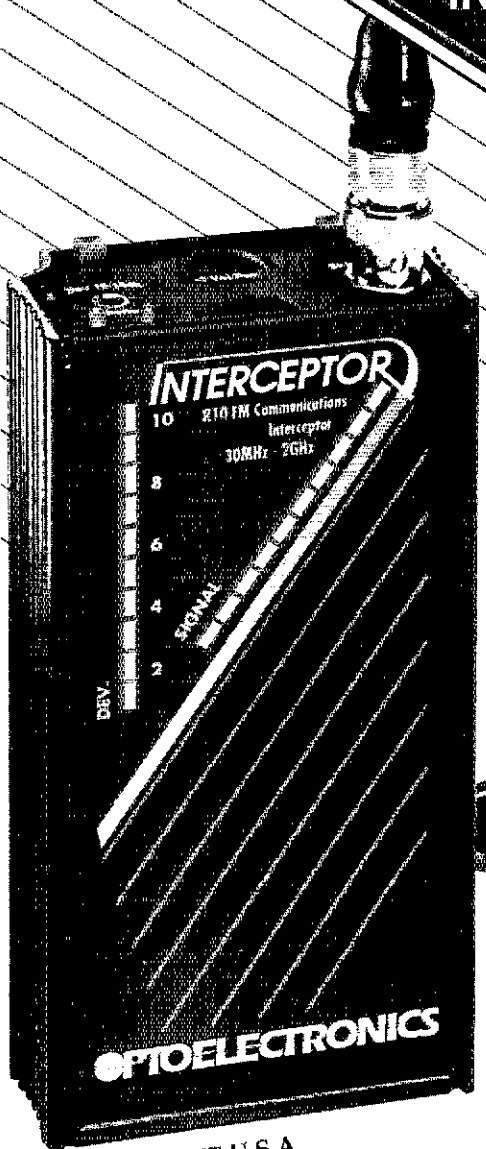
ELIMINATES SEARCHING, SCANNING, TUNING

INTERCEPTOR™

INTERCEPT, DETECT & CAPTURE Near Field Transmissions with Optoelectronics' New INTERCEPTOR™



MADE IN THE U.S.A.

NEW TECHNOLOGY

- Follows & Locks on even when frequency changes.
- Intercepts *ALL* FM Two-Way Transmissions without gaps in coverage.
- *Does Not* have to tune through RF Spectrum to find signals.

FCC Classified as Communication Test Instrument for:

- Deviation, FM, FMN
- Relative Signal Strength
- Signaling Tones (CTCSS)
- Modulation Monitor
- Great for testing VHF, UHF & Cellular transmitters

A New Dimension in Recreational Monitoring – Intercept the Two-Way Communication that Surrounds You.

Increase Your RF Security.

Hand Held/Shirt Pocket Size

Interceptor™ R10 FM Communications Interceptor (Includes NiCads, AC/Charger Adapter, Antenna, Earphone)

OPTIONS

Headphones (Lightweight personal headphones)	$ 15
Antenna Pak 2 (Five assorted rubber duck antennas – save $32.)	$ 99
TC200 Tone Counter (CTCSS signalling tones)	$ 179
APS-104 (Extends RF detection distance 10x)	$ 995
CF800 Cellular Band Pass Filter/Amplifier	$ 149

SPECIAL PRICE $299.00

OPTOELECTRONICS

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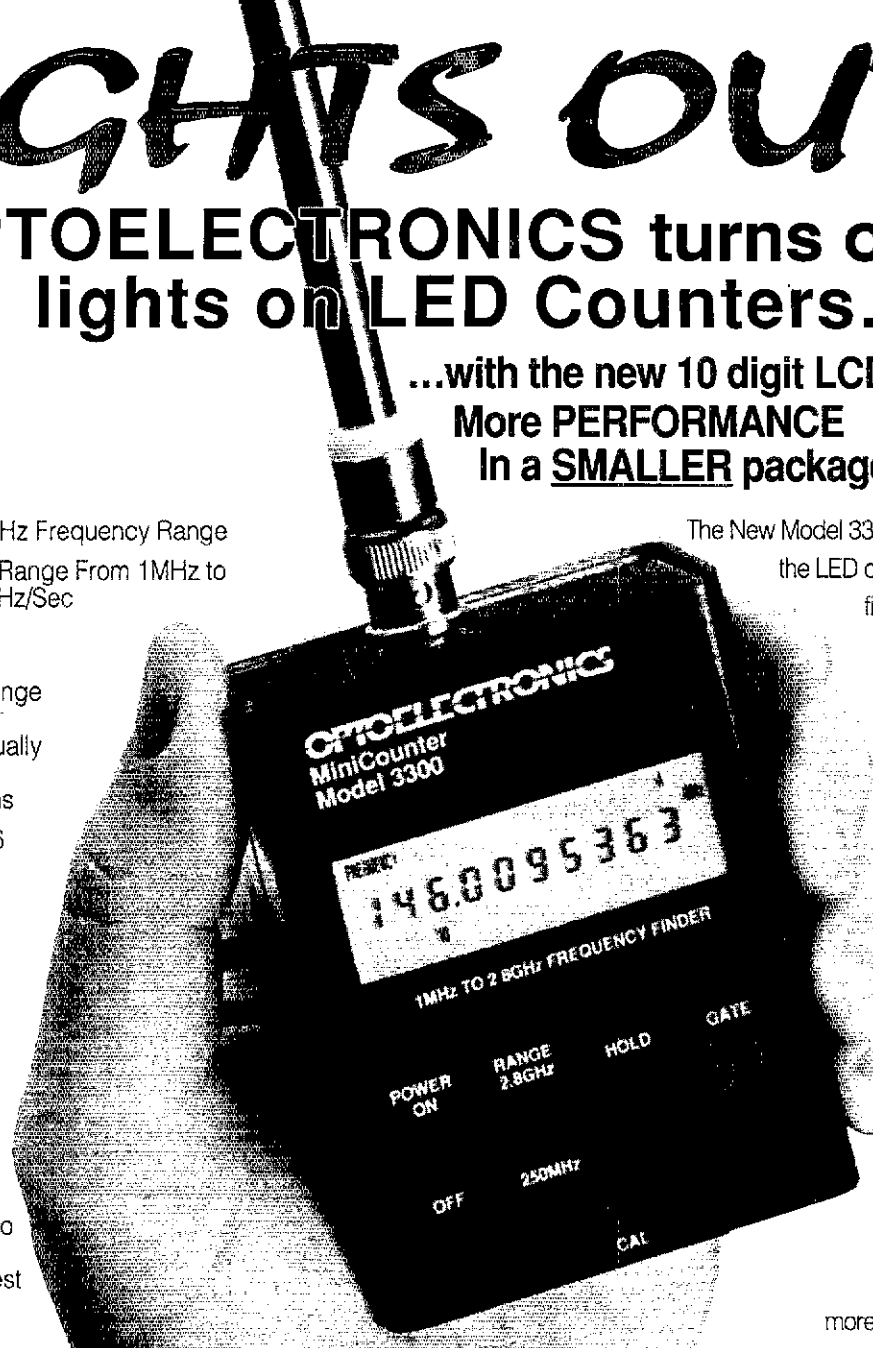
LIGHTS OUT!!

OPTOELECTRONICS turns out the lights on LED Counters...

...with the new 10 digit LCD MiniCounter.
More PERFORMANCE In a SMALLER package

- 1 MHz - 2.8GHz Frequency Range
- Direct Count Range From 1MHz to 250MHz with 1Hz/Sec high resolution display.
- Prescaled Range from 10MHz to 2.8GHz for virtually all two way communications
- Select up to 6 Gate/Measurement Periods
- 10MHz Industry Standard Time Base
- Ultra Compact – true pocket size
- Maximized sensitivity for picking up radio transmissions from the greatest distance
- Display Hold Switch Locks current Measurement



The New Model 3300 MiniCounter breaks the LED counter tradition. From our first Model FC50 (1976) to our latest Model 2300, we have always had quality LED counters. But LEDs are power hungry, failure prone and unreadable in sun light. So the LED counter has now gone the way of the LED wristwatch—replaced by LCD. The LCD advantages include lower power, better reliability, smaller package, more information displayed and better viewing characteristics.

ACTUAL SIZE!
(Actual Size Hand!)

Introductory Price
$129.00
MADE IN THE USA

Model M1 & 3000A Hottest on the Market with:
Digital Filtering for the fastest method to reduce false counts-no loss of sensitivity & **Digital Auto Capture** that auto holds and stores - working even near strong RF fields!

- **3000A-Multifunction HandiCounter®**
  - 15 gate times selectable • 7 hrs. Batt. life
- **M1-Full Range HandiCounter®**
  - 10 Gate times • 6 hrs. Battery life

Both offer:
- OE10 Ultra Fast & Reliable Counter IC
- Standard Backlit 10 digit LCD Display
- 16 Segment Signal Strength Bargraph
- 3 Data Storage Registers
- 1.3% of a second Measurement Rate
- 1Hz Resolution in 1 Sec. up to 250MHz
- 2 Wire Serial Output for Data Logging

3000A ..... **$329.**
M1 ..... **$229.**

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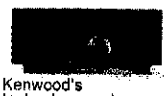
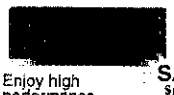
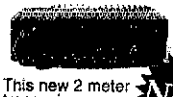
KENWOOD

TS-950SDX

Swift performance and surgical precision are second nature to the TS-950SDX. Features include dual frequency receive, 100 memories, DSP, MOS FET final section and much much more.
SAVE $100 MORE
$3917.95

TS-850S/AT

Kenwood's technology endows the TS-850S/AT with specs that place it at the top of amateur radio equipment. Automatic antenna tuner, 100 memories, three scan modes, DDS, digital PLL system plus more.
$1695.95

TS-50S

Enjoy high performance communications plus go-anywhere convenience with the world's smallest 100w mobile HF transceiver. All modes and all bands complete this package. Limited supplies.
SAVE $50 MORE
$969.95

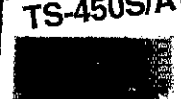
TM-251A

This new 2 meter transceiver provides dual band receive and gives you a data port that's 9600 baud ready. CTCSS encode, 41 memories are expandable, cross band repeat, time out timer, DTSS and much more.
NEW
$439.95

TM-742A

New VHF/UHF tri-bander with a third band optional includes many enhancements such as, direct frequency entry, CTCSS encode, DTMF remote control and much, much more. Also availabe in a tri-band model TM-942A.
SAVE $40 MORE
$695.36

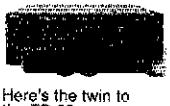
TH-78A

Compact and confident, this dual band HT sets exciting new standards for portable communications by combining simplicity of operation with a multiplicity of features.
SAVE $30 MORE
$417.64

TS-450S/AT

A compact, lightweight radio with 100w transmission capabilities on all nine amateur bands. Rugged reliability is matched with leading-edge electronics, automatic antenna tuner, AIP system, and DDS for fine tuning.
SAVE $50 MORE
$1279.95

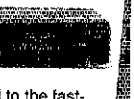
TM-241A

This 2 meter FM mobile comes complete with extra-large display, DTMF microphone, wide band receive and illuminated switches.
SAVE $30 MORE
$339.95

TS-60

Here's the twin to the TS-50. Engineered for 90 watts of fun on 6 meters. Features include 100 memories, compact size, DDS, L.C.D. panel and more.
$997.95

TM-255A

This new all mode mobile will provide new fun for Satellite, Packet and DXing. Features include a 9600/1200 baud data port, 40 watts, DDS circuitry,CTCSS encode and much much more.*
NEW
***TBA**
*FCC Approval Pending

TM-732A

Attuned to the fast-moving world of mobile communications, this dual-band transceiver offers many features includung a detachable front panel in a compact design.
$569.95

TH-22AT

Small just got smaller. Kenwood's new TH-22AT is in a category all its own. This new FM transceiver features long battery life, DTMF keypad, user-friendly menu system, scan functions, 41 memories, CTCSS encode, DTSS, and much more.
SAVE $20 MORE
$248.04

ICOM

IC-728

The IC-728 is a full featured transceiver providing pleasurable HF operation with features such as passband tuning and speech compression. Perfect for mobile operation too. **Also available IC-729 with 6 meters**
SAVE $100 MORE
$899.95

IC-3230A

Get ahead with dual band superiority. Even though it is loaded with many attractive functions for complete dual band capability, it is compact. Like a mono-band transceiver, it fits anywhere, in any vehicle. 36 memories, DTMF microphone, and 3 power levels.
$499.95

IC-Δ1A

The IC-D1A and IC-D1E are the first VHF/UHF triband handhelds in the amateur world. 144 MHz, 430(440) MHz and 1200 MHz band units are included in one compact body. Triple band operation in the palm of your hand.
SAVE $100 MORE
$849.95

YAESU

FT-890/AT

A blend of high performance features borrowed from the FT-1000 family are combined in this affordable transceiver. IF shift, variable notch filter, variable noise blanker,VOX and antenna tuner are included.
SAVE $100 MORE
$1319.95

FT-5100

This dual band mobile features 100 memories, cross band repeat, lighted keypad, built-in duplexer and a small footprint. Dual watch capability rounds out this 50/35 watt VHF/UHF transceiver. Packet ready.
SAVE $25 MORE
PRICE MATCH

FT-2400H

This rugged military-grade 2 meter mobile provides wide band receive, 3 power output levels, a lighted keypad and 26 memories. Join the fun! **FT-7400** Has the same great features as the FT-2400 but is designed for the 440 band.
SAVE $50 MORE
$343.44

YAESU Coupons Expire 5/8/94

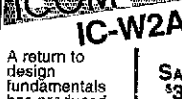
ICOM

IC-736

Here's the H.F. rig you've been holding out for! It features a full 100 watts output from 160 meters, 100 watts through 6 meters with a built in antenna tuner and power supply, VOX, PBT, RF Gain, 101 memories and more provides you with the latest features and fun.
NEW
$1869.95

IC-281

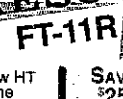
This new IC-281 mobile radio packs a triple punch with its many features. It hosts bonus band 440 MHz receive and a 9600 baud data radio port all for a price that's hard to beat.
NEW
$379.95

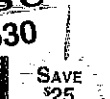
IC-W2A

A return to design fundamentals has produced something truly unique in dual-band FM transceivers. Even though it is the smallest in its class, it is packed to the limit with features to expand your fun out-of-doors, on the road, or at home.
SAVE $30 MORE
$479.95

YAESU

FT-990

The new FT-990 combines the basic technical features of that top-of-the-line model with several new advances in both transmitter and receiver circuitry. Digital filter, 90 memories, wide dynamic range and much more!
SAVE $100 MORE
$1995.95

FT-11R

This new HT packs the features you want in a small size. It features a new alphanumeric display, super small profile, new square "D" battery design, lit keypad, AM air craft receive, DSQ & CTCSS encode.
SAVE $25 MORE
$295.95

FT-530

The newest member of the dual band family. This handheld sports auto tone search, 82 memory channels, automatic power off, built-in VOX, dual in-band receive feature, built-in cross band repeat function and much more.
SAVE $25 MORE
PRICE MATCH

*This device has not been approved by the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased until the approval of the FCC has been obtained

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We offer factory authorized warranty service for Icom, Kenwood and Yaesu. We service all makes and models. Our customers may send any product requiring service to us, and we will handle it for them. This is a one-stop service that keeps our customers having more fun than hassle in this hobby. If you need a custom cable for packet and don't have time to make it, let us do it for you. C.A.P. & M.A.R.S. mods are also available at reasonable rates to authorized hams only.

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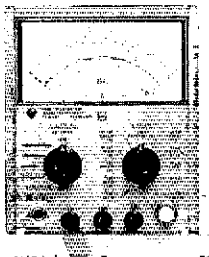


700 MHz Operation

HP 410C

Multifunction Meter

HP Price $2080

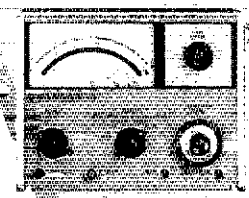
$299

Solid-state version of famous 410B Voltmeter. Frequency range is 20 Hz to 700 MHz. Measurement ranges are: DC Volts from ±1.5 mV to ±1500 V in 11 ranges, ±2%; AC Volts from 0.5 to 300 V in 7 ranges; DC Current from ±1.5 µA to ±150 mA in 11 ranges, ±3% accuracy; Resistance measurements from 10 Ω to 10 MΩ in 7 ranges; Amplifier Voltage Gain of x100. Includes HP 11036A Detachable AC Probe for AC measurements from 50 mV to 300 V at 20 Hz to 700 MHz.

HP 415E

SWR Meter

HP Price $2695



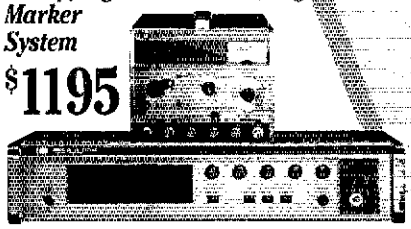
$395

A low noise, 1000 Hz tuned amplifier and voltmeter, calibrated in dB and SWR. Designed for use with square law detectors, it measures SWR attenuation, and gain directly from metered scales. The 415E has two outputs located on the rear-panel: a recorder output with 0 to 1 VDC into an open circuit and an AC amplifier output of 0 to 0.3 V rms (NORMAL) mode and 0 to 0.8 V rms in the (EXPAND) mode. The 415E has an internal precision 60 dB attenuator allowing it to operate over a 70 dB range in 2 or 10 dB steps. The sensitivity is 0.35 µV rms for full scale deflection at maximum bandwidth (1 µV rms on high impedance crystal input). The bandwidth is continuously adjustable from 15 Hz for maximum sensitivity to 130 Hz.

HP 8601A/8600A

Sweep/Signal Generator/Digital Marker System

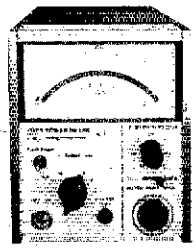
$1195



The 8601A has a frequency of 100 kHz to 110 MHz and an output of +20 dBm to -110 dBm. It also comes with an internal 1 kHz modulation for AM or FM. Sweeps are from 100 kHz to 11 MHz or 1 MHz to 110 MHz which makes this generator perfect for evaluating filters, crystals, attenuator, antennas and other loads. Aligns FM & AM receivers and supplies ramp output which, when used with an oscilloscope, can check frequency response & VSWR. The HP 8600A provides five independent continuously variable markers over 0.1 to 110 MHz frequency range. High resolution controls and 6-digit readout permit 0.05% frequency settability. The frequency of any marker may be read while sweeping, simply by pushing a button within the marker control. Marker accuracy of ± (0.05% of sweep width + sweeper stability). With the quality of Hewlett Packard, you'll never find another AM/FM Signal/Sweep Generator at a lower price. Hurry While Supplies Last!

HP 432A/478A

Power Meter with Thermistor & Cable

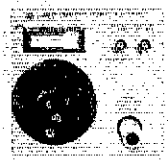


$795

Power Meter and Thermistor Mount covering the frequency range of 10 MHz to 10 GHz. Power ranges from 10 µW to 10 mW in seven ranges, accuracy of ±0.2% ±0.5 µW can be obtained. Features automatic fine zero, impedance of 600 Ω, plus meter features include taut-band suspension, individually calibrated, & mirror backed scales. Comes complete with cable, thermistor mount, and manual.

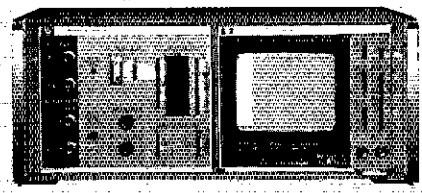
HP 5255A

Frequency Converter Plug-In



$300

The HP 5255A Frequency Converter extends the range of the 5245L and 5246L counters from 3 to 12.4 GHz and can also be used as a direct counting prescaler from 1 to 200 MHz. The input voltage range is 100 mV to 0.7 V with an input impedance of 50 Ω with a type N (F) input connector.



HP 8407A/8412A

Network Analyzer & Phase/Magnitude Display

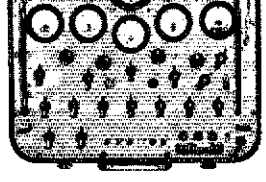
$1495

This system measures phase and amplitude ratio of RF signals and displays relative amplitude in dB or relative phase in degrees between reference and test channel inputs vs. frequency. The frequency range is from 0.1 to 110 MHz. The two-input tracking receiver uses both inputs to form their magnitude ratio and phase difference before routing to the display. Test input signal range is from -10 to -90 dBm, Reference input: -10 to -60 dBm, both with impedance of 50 Ω and VSWR < 1.08. The basic accuracy is ±2° over any 10 MHz portion (reference level of -10 dBm).

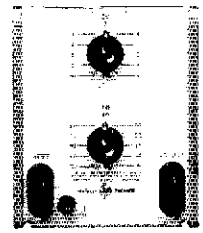
Military TV2C/U

Tube Tester

$350



Performs complete tests, measures performance capabilities and determines rejection limits for electron tubes, all to handbook specifications. Separate meters for percent quality, filament, grid bias, plate, screen and signal. Built in circuitry to help eliminate tube oscillations. Portable, designed to meet military specifications.



HP 350D

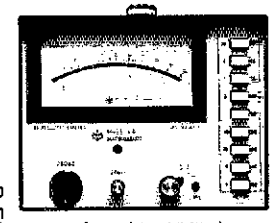
Attenuator Set

$95

0 to 110 dB attenuation in 1 dB and 10 dB steps. DC to 1 MHz response, 600 Ω impedance, 5 watts power rating. Banana jacks.

Millivac MV-823A-1

RF Millivoltmeter



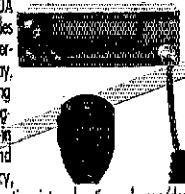
$249

The MV-823A-1 is an easy-to-use RF Millivolt Meter designed to measure both voltage and dBm accurately. While covering the frequency range from 10 kHz to 1.5 GHz, this meter measures voltage from 1 mV to 10 V full scale and dBm from -50 dBm to +30 dBm full scale. Overall Accuracy of ±1.5%. Features include rear-panel DC output: 0 to 3 V (at full scale), 0 to 1 mA; front panel zero adjust; linear scale, large easy to read mirrored meter. Includes probe. Input voltage: 115 or 230 VAC nominal, 50 to 450 Hz.

HP 5300A/5302A

Measurement System

$199



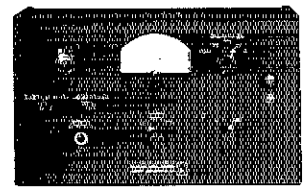
The HP 5300A Mainframe unit provides the system power, reference frequency, display, counting logic and timing control required for plug-ins. The 5302A plug-in has two channels and measures frequency, period, period average, time interval, ratio, and open/close (totalizing). Channel A counter range is from 10 Hz to 50 MHz and Channel B counter range is 10 Hz to 10 MHz. System features include: 6-digit dot matrix display, overflow indicator, standard timebase, external timebase input and BCD output as a standard rear-panel output. The crystal frequency is 10 MHz with a typical stability of <±2 parts in 10⁶. Oscillator output is 10 MHz, approximately 1 V rms at rear-panel BNC, 100 Ω source impedance.

General Radio 1390B

Random-Noise Generator

$249

This useful instrument generates a broad band noise signal which can be used in a variety of applications. The 5 Hz to 5 MHz noise has a uniform spectrum level, especially useful in noise and vibration testing of mechanical and electrical systems. A switchable low pass filter allows the upper frequency cutoff to be set at 20 kHz, 500 kHz, or 5 MHz. Output level is controlled by a 4-step attenuator with 20 dB steps and a continuously variable control providing a calibrated, metered output from less than 30 µV to 3 V (depending on filter setting). Audio spectrum level uniformity is rated at ±1 dB. In addition, a pink noise filter can be attached to the front output terminals when the 1390B is to be used with a constant percentage bandwidth analyzer.



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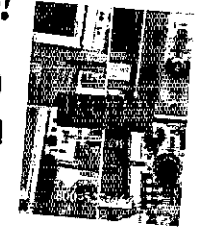

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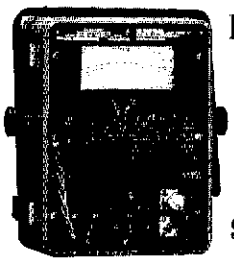
ars? We Make Sense!"

All Instruments Come With Manuals and Are Pre-owned & Completely Operational Unless Otherwise Stated.



Ballantine 9601M (Military USM413)

True RMS AC Meter

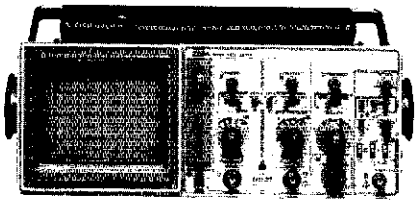
$89

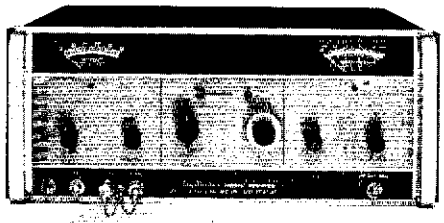
This True RMS Analog AC Meter was manufactured for the U.S. Air Force in the 1980's for $2,250.00. 500 µV to 500 V ranges with 10 Hz to 1 MHz frequency response and 10 MΩ input impedance. Other features include AC amp output and linear dB mirrored scale. Conforms to OSHA and UL requirements. Comes equipped with ruggedized case and probe. Can optionally be operated with an internal battery pack (11 C cells) for 8 hours, but will work standard on 110 VAC.

Logimetrics 925/S125 $695

RF Signal Generator

The Logimetrics 925/S125 is a solid-state RF Signal Generator providing outstanding performance at an economical price. The RF generator supplies -127 dB to +23 dB from 50 kHz to 80 MHz (7 bands) and also has a vernier fine tuning, capable of controlling the frequency to 1 ppm! Frequency readout is provided on a 6-digit visual display with selectable resolutions of 10 kHz, 1 kHz, and 100 Hz on all ranges. RF amplitude output is monitored on three different scales, 0 to 1 V rms, 0 to 3 V rms, and -15 to +3 dB (referenced to 0 dBm, 50 Ω). This is a superb unit, quite capable of handling a wide range of applications.





TV SYNC

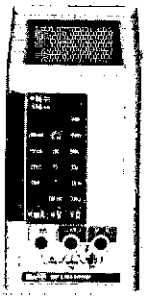
Tektronix 2213A $750

60 MHz Dual Trace Oscilloscope

The 2213A's single time base delay provides the user with the performance of intensified and delayed sweep operations at a low price. Lightweight, 60 MHz bandwidth. Provides advanced triggering capabilities, sensitivity to 2 mV/div, and sweep speeds to 50 nS/div (plus X10 magnification). Triggering features include variable trigger holdoff, TV line, & TV field at any sweep speed, and peak to peak auto mode; will trigger alternately even with unrelated signals. Features also include Z-axis input, X-Y operation, and large, bright CRT.

Fluke 8022B $99

Digital Multimeter



The 8022B is a pocket-size digital multimeter that is ideally suited for application in the field, lab, shop or home. This meter offers all standard VOM measurement functions including AC & DC Volts, Alternating and Direct current, and resistance. Features include a high contrast 3 1/2-digit LCD display, that can be easily read from across the room, no need to worry about bent needles, parralax, etc. Each range has full auto-polarity operation, overrange indication, and effective protection from overloads and transients. Long term calibration stability.

Wavetek DM15XL

Digital Multimeter

$59

Hand-held, measures DC and AC Volts, DC & AC Current to 10 Amps, and Resistance. 3 1/2-digit LCD display, Auto Polarity, Over-Range indicators, Auto Zero, Diode Tester, and an Audible Continuity Tester. Also makes Logic measurements. Safety feature warns operator if test leads are plugged-in incorrectly! Comes complete with one pair of test leads, one spare fuse, battery, and operator's manual. 6.1" x 2.8" x 1.3".

Universal 1001S

100 MHz X1/X10 Oscilloscope Probe

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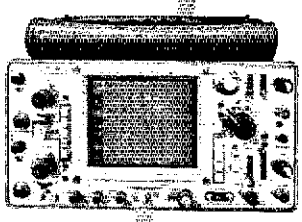
Factory new passive probe offering X1 and X10 attenuation ranges plus adjustable compensation, all at a fantastic price! Bandwidth: 100 MHz (X10), 6 MHz (X1). Rise time: 3.5 nS (X10), 50 nS (X1). Input Impedance: 10 MΩ (X10), 1 MΩ (X1). Input Capacitance: ~15 pF (adjustable from 15 to 35 pF) (X10), 100 pF (X1). Includes all probe accessories and data sheet.

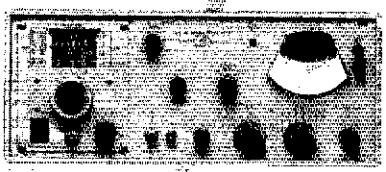
TEK 475

Portable Oscilloscope

$1250



The Tektronix 475 is a dual trace portable oscilloscope with a proven track record of reliability, both in lab and field environments. This 200 MHz scope weighs in at less than 23 lbs. yet offers features such as dual time base/delayed sweep, trigger view, and other features of the popular Tek 465. Sweep rates to 1 nS/div are possible, using the x10 sweep magnifier. Calibrated vertical deflection factors on the 475 are 2 mV/div to 5 V/div. When channels A and B are cascaded, sensitivity is increased to approximately 400 µV/div. Call and order one today!



HP 141A/1415A

Storage Mainframe With TDR Plug-In

$350

Broadband system for testing cables, transmission lines, strip lines, connectors, and other types of high frequency devices. HP 141A supplies power and display capabilities for versatile 1400 series plug-ins, wide range of writing speeds and storage capabilities. HP 1415A TDR is quick and easy to operate, determines location, magnitude and nature of each discontinuity. Risetime: <150 pS (reflectometer); ~110 pS (signal channel); ~50 pS (step generator). Other features include: 50 Ω input & output impedances; 20 to 200 nS/cm time scale; x1 to x200 (1, 2, 5 sequence) magnification.

Marconi TF 2300A $695

FM/AM Modulation Meter

The TF 2300A basically comprises a low-sensitive superheterodyne receiver having very linear (switch selectable) FM and AM demodulators. The demodulated signal is amplified, rectified, and applied to a panel meter which is calibrated directly in kHz peak deviation and % modulation depth as appropriate. Measures FM deviation up to 500 kHz. Carrier frequency range: 4 to 1 GHz, usable up to 1.6 GHz with internal oscillator. Measures AM depth up to 95% at carrier frequencies up to 350 MHz. Modular construction with all solid-state active elements giving maximum reliability.

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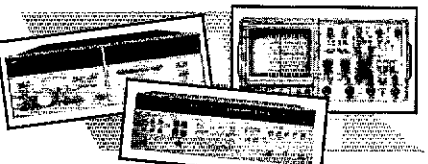

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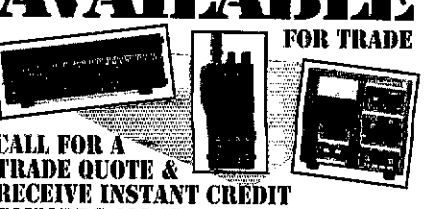

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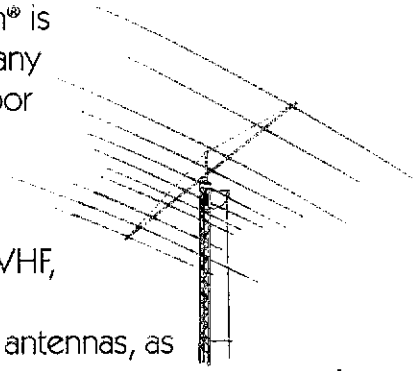

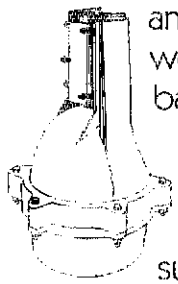

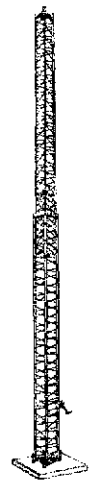

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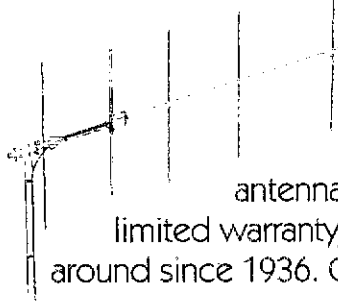

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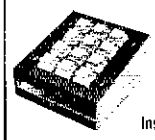

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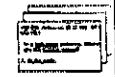

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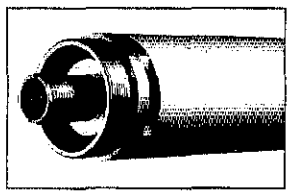
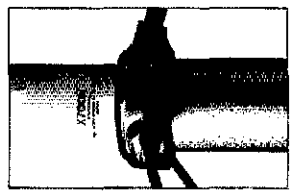


COAX CONNECTION AT BASE END



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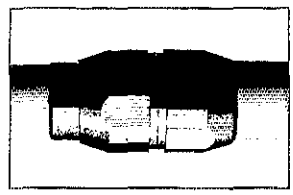

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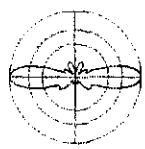
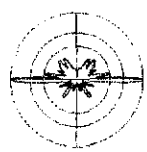
MODEL	BAND(MHz)		WATTS	CON.	HT. FT.	RATED WIND MPH
X-50A	144/440		200	UHF	5.6	135
X-200A	144/440		200	UHF	8.3	112
X-300A	144/440		200	UHF	10.2	112
X-510NA	144/440		200	N	17.2	90
X-510MA	144/440		200	UHF	17.0	90
X-500HNA	144/440		200	N	17.8	90+
X-700HA	144/440		200	UHF	24.0	90
X-2200A	144/222		150	UHF	11.5	112
X-3200A	144/222/440		100/200	N	10.5	112
X-6000A	144/440/1240		100/100/60	N	10.5	112



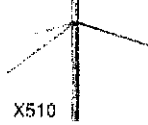
147MHz



445MHz

RADIATION PATTERNS FOR X-500HNA/X-500MA/X-510NA

BAND: 144=144 - 148MHz. 222=222 - 225MHz. 420=420 - 430MHz.
430=430 - 440MHz. 440=440 - 450MHz. 1240=1240 - 1300MHz.
* X510NJ :144 - 147 / 430 -440MHz

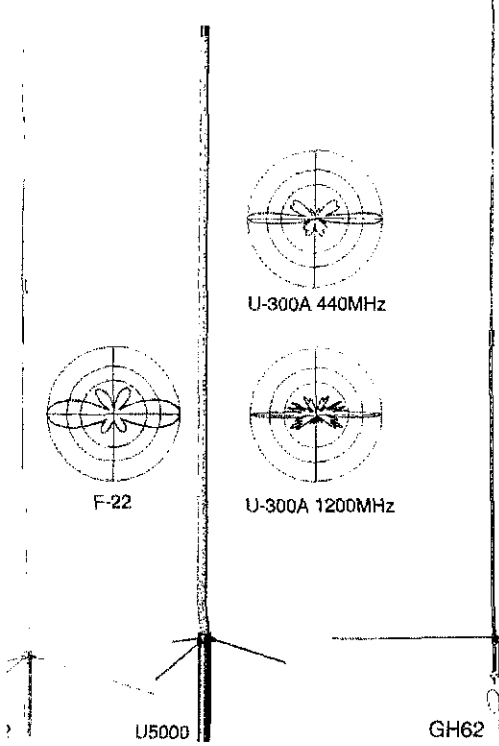


X510

U-300A 440MHz

F-22

U-300A 1200MHz



U5000

GH62

GH/F/U&V series

MODEL	BAND(MHz)		WATTS	CON. N	HT. FT.	RATED WIND MPH
DP-GH62	50		200	UHF	21.0	78
F-22A	144		200	UHF	10.5	112
F-23A	144		200	UHF	15.0	90
F-142A	222		200	UHF	6.0	110
F-718A*	440		250	N	15.0	110
F-1230A	1240		100	N	10.5	90
U-200A	440/1240		100	N	5.9	135
U-300A	440/1240		100	N	8.3	110
U-5000A	144/440/1240		100	N	5.9	135
V-2000A	50/144/440		150	UHF	8.3	110

*F-718A:440 - 450MHz, F-718J:430 - 440MHz, F-718L:420 - 430MHz

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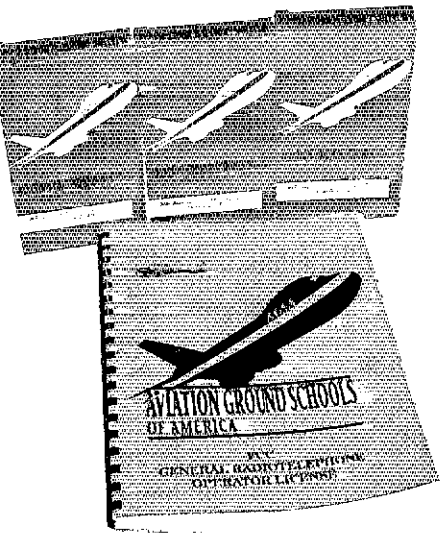

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Tucson, AZ	May 28	Pittsburg, PA	July 30
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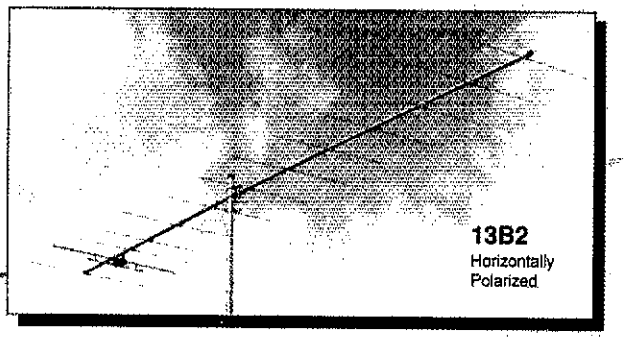

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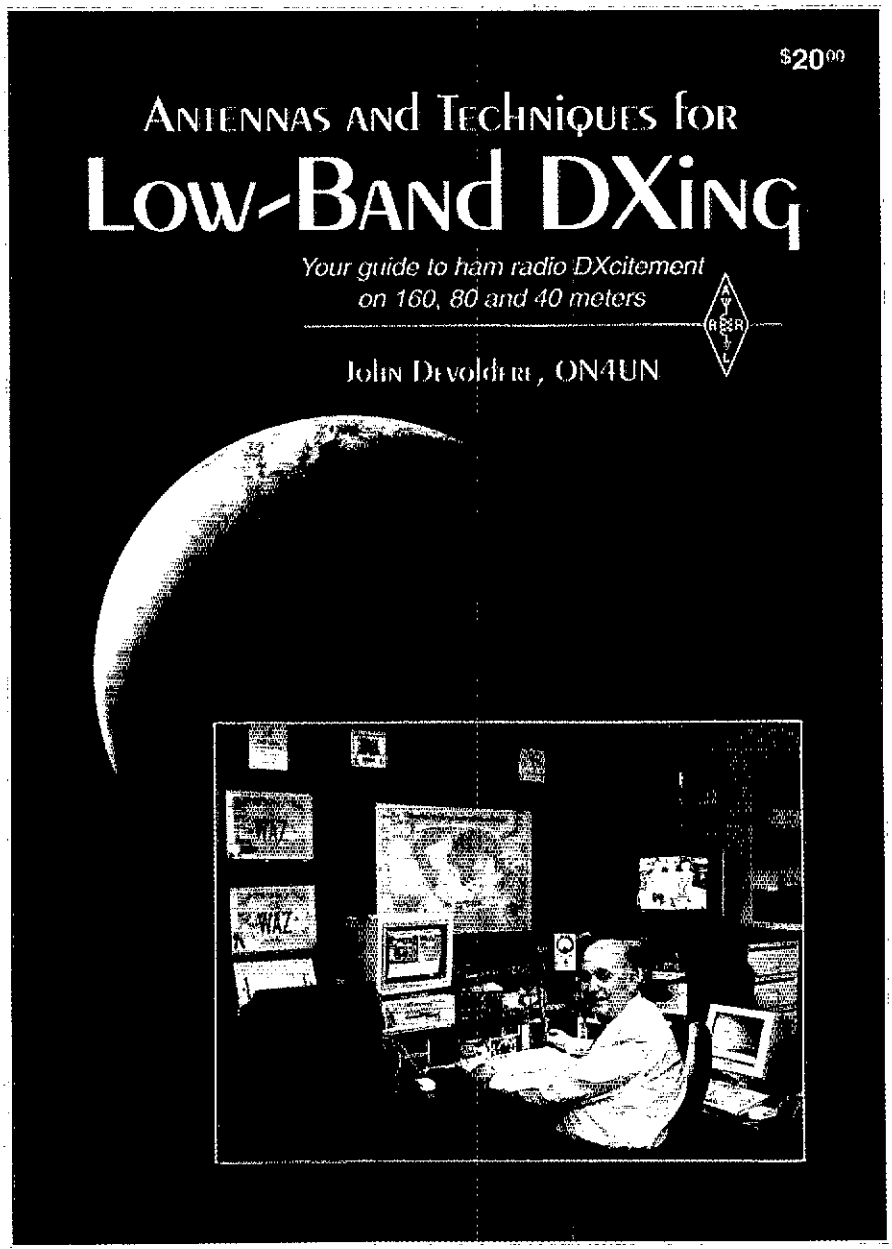

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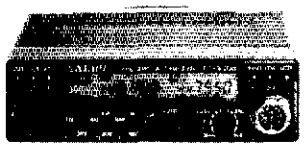
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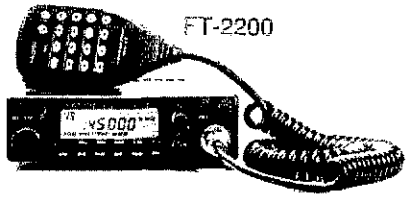
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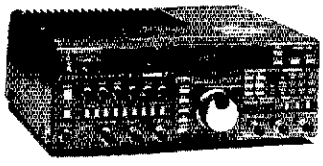
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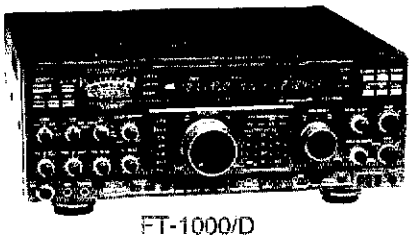
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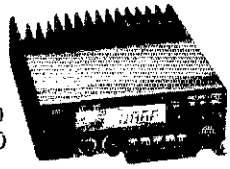
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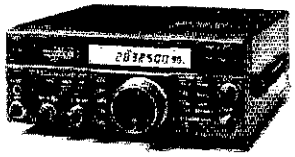
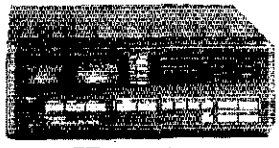

FT-840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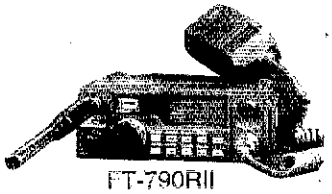
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FRG-100B

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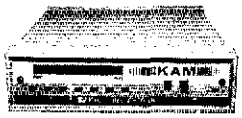
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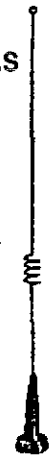

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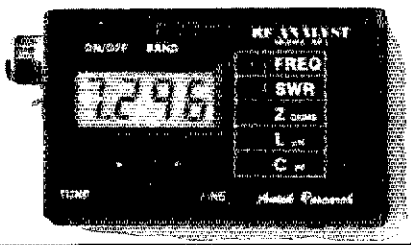

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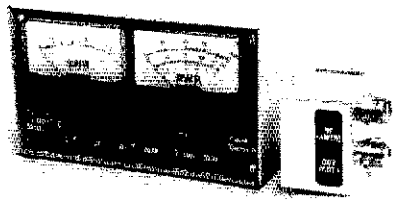

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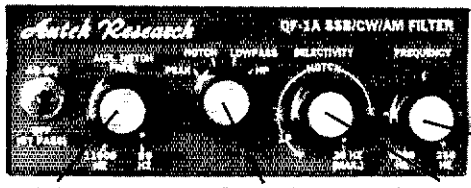

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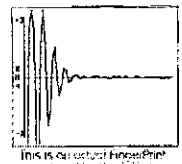

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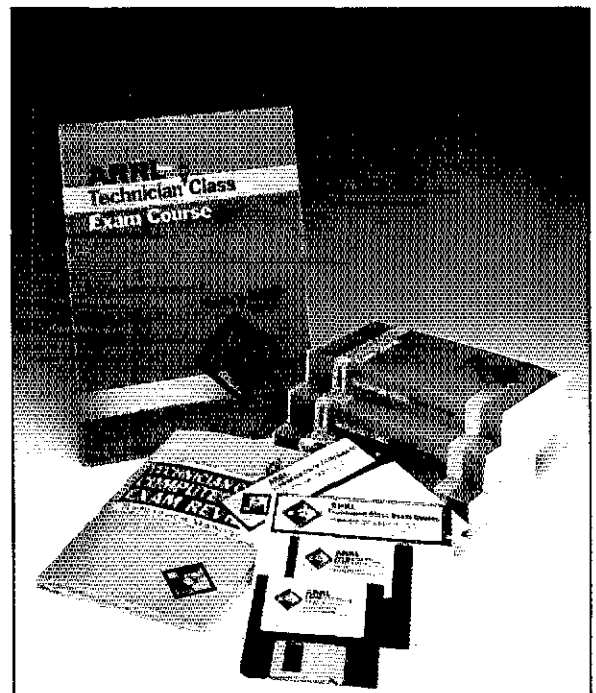

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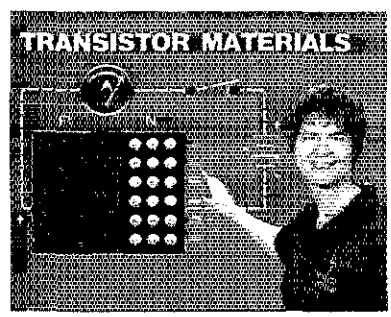

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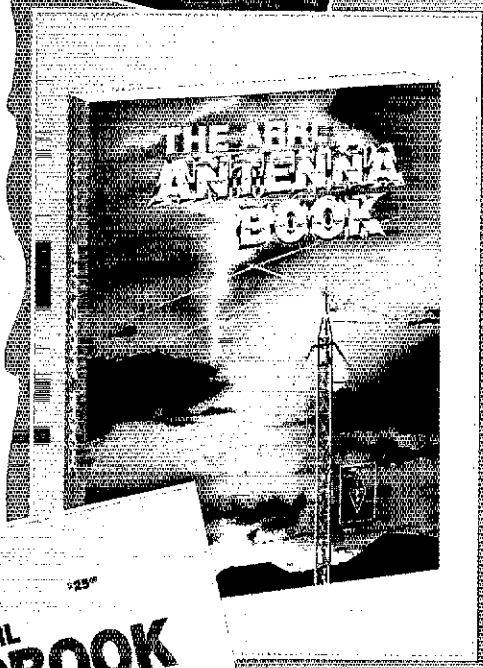

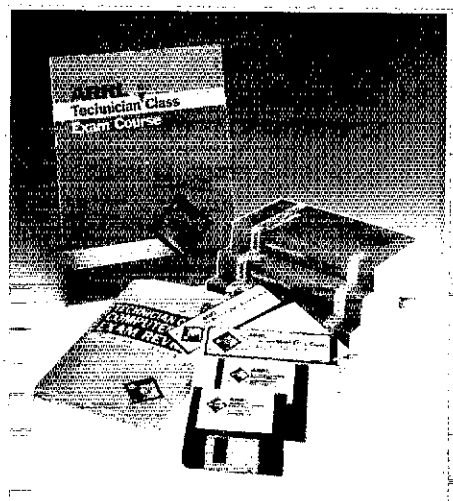

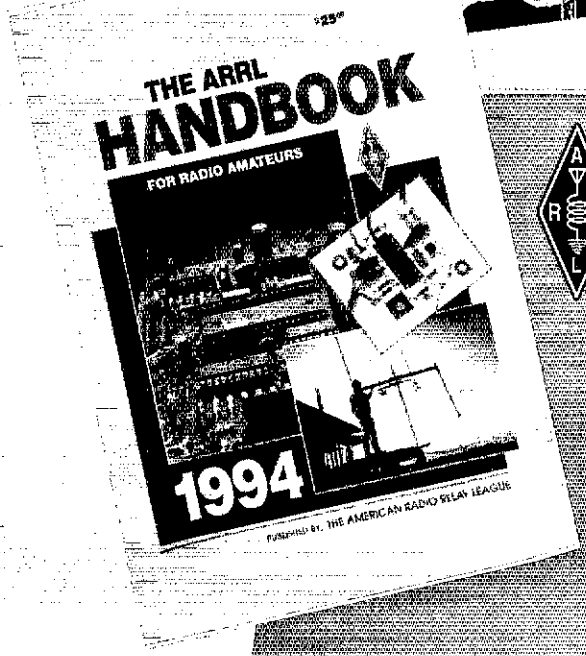

Now You're Talking!: All You Need to Get Your First Ham Radio License is a complete study guide for the Technician exam and the Novice written exam. But it's far more! It will help you select—and set up—radios, accessories and antennas for your ham radio station. It will also guide you through your first contacts on all the popular operating modes, including FM repeaters and packet radio. Practical information every beginning ham needs is presented clearly and simply, in small doses. Whether you start with the Technician or the Novice license, ***Now You're Talking!*** shows you how to enjoy ham radio to the fullest.

If you're starting with the Novice license you should also purchase audio cassettes or computer software to learn Morse code (described below).

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Produced in association with King Schools, a world leader in video training courses, the ARRL Technician Class Video Course comes with the assurance of a money-back guarantee: You pass your test, or you don't pay! Call for details.

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Upgrade Your License the Easy Way!

After you receive your license and get on the air, you'll probably want to explore additional operating privileges. The ***ARRL License Manual Series*** represents the best study material for the Technician, General, Advanced and Extra Class Amateur Radio exams. Each book is carefully revised and updated as new exam questions are released by the VEC Question Pool Committee. The appropriate examination question pool, complete with an answer key, is included for easy reference. The answer key contains page references so you can locate appropriate text explanations as you review the questions before your exam. Our ***FCC Rule Book*** should be used along with each publication in the series.

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Help for Beginners

W1FB's Help for New Hams, by Doug DeMaw, offers sound advice on getting started in Amateur Radio after you get your license. Covers how to select equipment, station layout and accessories, building and using antennas, and operating. Whether you're into HF or VHF, this book will get you on the air. (Available June 1994) 2nd ed, ©1994 .....#4432 **$10**

Ham Radio Horizons: The Book, *What Ham Radio is All About and How to Get Started* introduces nonhams to the exciting world of amateur radio. You'll find tips from expert hams on DXing, Contesting, Serving the Public, Ham Radio in Space, Experimenting, Digital Communications and more. 1st ed, © 1993 .....#1234 **$12.95**

Novice Notes: The Book is a selection of articles for the beginner from the popular ***QST*** series. It's filled with useful information: What you should do before your license arrives; how to buy used gear; and much more. 1st ed, ©1989 .....#2561 **$6**

Written in an easy-to-understand style for electronics beginners, ***Understanding Basic Electronics*** is also for those who want to brush up on electronics principles. Loaded with illustrations, the book starts with math skills and progresses to dc and ac electronics principles. It concludes with clear, simple explanations of how components like diodes, transistors and integrated circuits work. 1st ed, ©1992 ..... #3983 **$17**

First Steps in Radio by Doug DeMaw, W1FB, is a tutorial on electronics principles tailored to the beginner. Reprinted from the popular ***QST*** series, this book will help you learn the electronics theory helpful for licensing exams and to gain some insight into how radio equipment works.
1st ed, ©1985 ..... #2286 **$6**

Operating an Amateur Radio Station. This booklet answers the basic Amateur Radio questions often posed by newcomers: How do I decide what equipment to buy? What kind of antenna do I need? and many others.
65th ed, ©1991 ..... #226X **$2**

Handy References

The 1994 ARRL Handbook

We're proud of the 71st edition of the ***ARRL Handbook for Radio Amateurs.*** That's right–the 71st edition! ***The Handbook*** has been the "ham's bible" since 1926, and each new edition brings you the latest on what's new in Amateur Radio state of the art. ***The Handbook*** is many things:

- **a reference guide**, with updated lists of parts and equipment suppliers and other indispensable data on solid-state components and transmitting tubes
- **a guide to radio theory every ham should know**, including the latest digital modes and hundreds of explanatory and practical circuits
- **a goldmine of construction projects** that will allow all hams—beginners, old-timers and everyone in between—to build useful amateur gear for their stations.

What's new in the 1994 edition? Plenty! Here's some of what you'll find:

- Added coverage of Digital Signal Processing (DSP).
- Improved treatment of Pi and Pi-L matching networks for high-power amplifiers.
- A new all-digital-logic ID-timer section improves the operation of the repeater CW IDer.
- The "Ugly Transceiver" is a simple and enjoyable introduction to RF construction!
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An indispensable reference for hams and engineers alike, ***The ARRL Handbook***, with its 1184 pages and 2100 charts and illustrations, is an exceptional value. ©1993 ..... #1719 **$25**

Every chapter of the 4th edition of ***The ARRL Operating Manual*** has been updated to include the latest information about every aspect of our dynamic hobby. It's simply the best book available covering on-the-air amateur operating practices. How do I operate on a repeater or on *PacketCluster?* How can I snare a contact through a DXpedition pileup? What satellites are available and how can I use them? You'll find the answers to all of these questions and many more in ***The ARRL Operating Manual!***

One impressive and colorful section features dozens of US and overseas operating awards, and a handy reference section includes an ARRL DXCC Countries List, beam-heading information, a series of maps, US counties, sunrise/sunset tables, and much, much more. No shack is complete without this valuable reference. ©1991 ..... #1086 **$18**

The ARRL Radio Buyer's Sourcebooks are for anyone who buys, sells or owns Amateur Radio equipment. Two volumes are available: ***The ARRL Radio Buyer's Sourcebook*** covers selected ***QST*** Product Reviews from 1981 through 1991 and a few "golden oldies." ***The ARRL Radio Buyer's Sourcebook Volume 2*** contains *all* ***QST*** Product Reviews published in 1991 and 1992.

Both books explain what radios do, how well they do it, where to get them serviced and where to find articles about modifications. Handy comparative feature and performance charts cover equipment reviewed in the books. Each contains a history of Amateur Radio technology and a glossary of radio features and terms. Heading for a hamfest or ham dealer? Don't leave home without both ***Radio Buyer's Sourcebooks.***

The ARRL Radio Buyer's Sourcebook
1st ed, ©1991 ..... #3452 **$15**

The ARRL Radio Buyer's Sourcebook Volume 2
1st ed, ©1993 ..... #4211 **$15**

The ARRL Electronics Data Book is a valuable aid to the radio amateur, RF design engineer, technician and experimenter. All those commonly used tables, charts, and those hard-to-remember formulas and semiconductor pin-out diagrams are found in one handy source. You'll also find hundreds of popular circuits and "building blocks," including oscillators, mixers, amplifiers, other devices and their operating parameters. By Doug DeMaw, W1FB.
2nd ed, ©1988 ..... #2197 **$15**

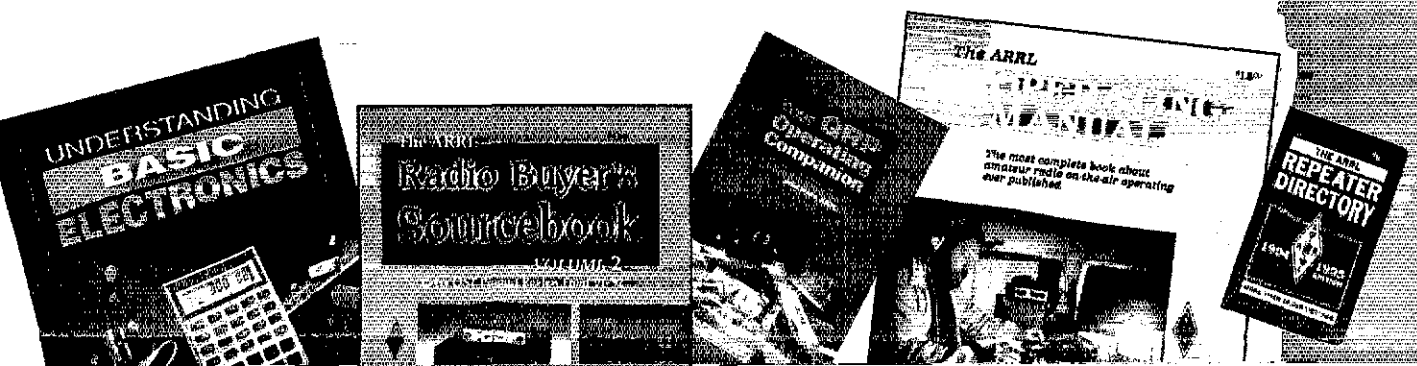
The 13th edition of ***Hints and Kinks for the Radio Amateur*** has the best tips, suggestions and projects from the popular ***QST*** column (covering the years 1987-91). It's loaded with helpful techniques and easy projects that will enhance your operating enjoyment. ©1992 ..... #3851 **$9**

The 1994-1995 ARRL Repeater Directory includes more than 20,000 listings for voice and digital repeaters and propagation beacons located in North, Central and South America. This edition also lists more than 500 beacons from 14 MHz to 24 GHz. You'll also find band plans, a CTCSS tone chart, a list of frequency coordinators, ARRL Spectrum Committee, Digital Committee and Future Systems Committee, and a user-friendly list of ARRL Special Service Clubs. The ***Repeater Directory*** comes in a handy pocket size for your operating convenience. 23rd ed, ©1994 ..... #4718 **$6**

The ARRL DXCC Countries List is the ideal way to record the DXCC countries you've worked and QSLed. The latest printing includes DXCC Advisory Committee members, an expanded cross reference for prefixes and exotic countries and more. (Free shipping). Feb 1994 ed, ©1994 ... #0291 **$2**

The ARRL Net Directory lists hundreds of Amateur Radio nets of interest to North American hams—DX, ragchew, special-interest, fun and public service nets—they're all here. Updated annually. (Free shipping).
1993-1994 ed, ©1993 ..... #4262 **$2**

Your QRP Operating Companion shows that you don't need special rigs or expensive equipment to enjoy the excitement and challenge of low-power operating. Ragchewing, DXing, contesting—all are more enjoyable with QRP. Includes operating tips, lists of QRP clubs and organizations, net and calling frequencies, and much more.
1st ed, ©1992 ..... #3762 **$6**



Passport to World Band Radio is the "TV Guide" of shortwave listening. Updated annually, ***Passport*** contains comprehensive schedules for hundreds of international shortwave broadcast stations—when they're on, who they're targeting and what languages they're using—in an easy-to-understand format.

Also included are useful reviews of nearly every shortwave radio currently available, and excellent articles describing the best shows to be found on the international shortwave bands.

Increase your knowledge of today's changing world with ***Passport to World Band Radio*** and make the most of your listening. 1994 ed, ©1993 ..... #4459 **$18**

Ferrell's Confidential Frequency List is recognized throughout the world as the most comprehensive list of shortwave utility stations available. What ***Passport to World Band Radio*** is to shortwave broadcasting, ***Ferrell's*** is to utility DXing. This 8th edition has been considerably expanded and now contains well over 30,000 CW, SSB, RTTY and fax frequencies from 4-28 MHz—military, maritime, aeronautical and more—they're all here. ©1992 ..... #2206 **$20**

The RSGB Amateur Radio Awards Booklet gives details of major Amateur Radio awards throughout the world. Each award is listed in an easy-to-use format that includes all the information on how to earn it. This edition even includes a checklist so you can track your progress. 3rd ed, ©1988 ..... #R819 **$15**

World Radio TV Handbook is your personal 24-hour guide to the world's broadcasters and their services. Information is listed by country and in an hour-by-hour guide to English language shortwave broadcasts. Comprehensive station information includes call signs, station locations, frequencies, transmitter power, operating times, languages and much more. Join the many who have discovered the world of the international listener. 1994 ed, ©1994 ..... #4696 **$20**

The RSGB Operating Manual is filled with information on setting up your station, operating practices and procedures, DX, contests, mobile, portable and repeater operation, amateur satellites, RTTY, slow-scan television and much more—all with a European twist! 3rd ed, ©1989 ..... #R69X **$14**

VHF/UHF/Microwave Communications

Your VHF Companion lets you explore the fascinating activities on the VHF bands: FM and repeaters, packet, CW and SSB, satellites, amateur television, transmitter hunting, and more. A handy reference section helps you locate equipment, books, magazines and software. A must for all new hams—and all "veterans" as well! 1st ed, ©1992 ..... #3878 **$8**

The ARRL UHF/Microwave Experimenter's Manual is written for the growing number of radio amateurs who are discovering that there is life on our frequencies above 420 MHz. Technicians and engineers will find this book particularly useful. You'll find information on design and fabrication techniques, propagation, antennas and feed lines, transmission media and much more. Companion software is available for IBM PCs and compatibles.

Book, 1st ed, ©1990 ..... #3126 **$20**
Software (5.25-inch) ..... #3134 **$10**

The ARRL UHF/Microwave Projects Manual contains dozens of construction articles for transverters, preamplifiers, power amplifiers, antennas, and test and measurement equipment. Some articles are previously unpublished; others are reprinted from conference proceedings, *QST* and *QEX*. If your interest lies in the bands above 432 MHz, you'll find this book to be invaluable.

1st ed, ©1994 (Available May 1994) ..... #4491 **$20**

If you're tired of hunting for bits and pieces of information on spread spectrum, the ***ARRL Spread Spectrum Sourcebook*** is for you. You'll find reprints of most spread spectrum articles from ***QST*** and ***QEX***, as well as articles and news items from the ***AMRAD Newsletter*** that show how SS developed from theory to a viable communications system. 1st ed, ©1991 ..... #3177 **$20**

Beyond Line of Sight: A History of VHF Propagation from the Pages of QST explores the ways hams helped discover and exploit the propagation modes that allow VHF signals to travel hundreds and even thousands of miles. It's a subject all hams will find fascinating. 1st ed, © 1992 ..... #4025 **$12**

Radio Auroras by Charlie Newton, G2FKZ, from the RSGB, details the interesting and unpredictable world of Amateur Radio communications via auroral propagation. Presented with a European twist is information on what causes auroras, how they are forecast and how to best use them to work DX. You'll find an abundance of tables and charts. ©1991 ..... #3568 **$18**

VHF/UHF Manual, from RSGB, is must reading for the VHF and UHF enthusiast. You'll find information on the history of VHF/UHF communications, propagation, tuned circuits, receivers, transmitters, integrated equipment, filters, antennas, microwaves, space communications, and test equipment. 4th ed, ©1983 ..... #R630 **$30**

Microwave Handbook, Volume 1, from RSGB, covers operating techniques, system analysis and propagation, microwave antennas, transmission lines and components, microwave semiconductors and tubes. ©1989 ..... #2901 **$35**

Microwave Handbook, Volume 2, from RSGB, continues where Volume 1 leaves off with construction techniques, common equipment, microwave beacons and repeaters, test equipment, safety, filters and additional circuit data. ©1991 ..... #3606 **$35**

Microwave Handbook, Volume 3, from RSGB, contains a review of microwave theory and practice, reference information, practical designs, hints and tips. Covers 1.3-24 GHz. ©1992 ..... #3975 **$35**

Satellites/Space

The Satellite Experimenter's Handbook has the information you need to communicate through or receive signals from a growing "fleet" of orbiting satellites. Whether your interest is in Amateur Radio, weather, TV-broadcast or other spacecraft, you'll find an immense store of valuable data—everything from satellite design to ground station equipment and antennas. Written by Martin Davidoff, K2UBC.

2nd ed, ©1990 ..... #3185 **$20**

Weather Satellite Handbook by Ralph Taggart, WB8DQT, is a popular and easy-to-use reference for anyone interested in viewing our world from space. The revised and expanded 5th edition features an interface project that allows you to capture fascinating images from various weather

satellites and HF WEFAX broadcasts (a kit is available). You'll learn how weather satellites function, how to build or modify your own receiving equipment and how to buy or build the right antennas. Companion software (revised for the 5th edition of the book) is available for IBM PCs and compatibles.
Book, 5th ed, ©1994 ..... #4483 **$20**
Software (3.5-inch, requires high-density drive) ..... #4653 **$10**

ARRL Satellite Anthology contains the best *QST* satellite articles from 1986 through 1993. You'll find valuable information on all amateur spacecraft from OSCAR 10 through OSCAR 27, including: how to work DX via OSCARs 10 and 13, and how to get on the Pacsats and the Russian "Easysats." There's even a glimpse into the future with two articles about the advanced Phase 3D satellite.
3rd ed, ©1994 ..... #4645 **$10**

Antennas and Transmission Lines

The ARRL Antenna Book is the definitive source for information on state-of-the-art antenna and transmission line theory and construction. The 16th edition presents the best and most highly regarded information on antenna fundamentals, propagation, transmission lines, Yagis and quads, as well as all popular wire antenna designs. You'll find antennas for limited space, portable, mobile, VHF, UHF and microwave and space communications. Contains more than 700 pages and nearly 1000 illustrations. Edited by Jerry Hall, K1TD. ©1991 ..... #2065 **$20**

Three volumes are available in ***The ARRL Antenna Compendium series***, and each is packed with previously unpublished articles on all the popular types of HF/VHF/UHF antennas and some you've never heard of! In ***Volume 1*** you'll find articles on a multiband portable, quads and loops, baluns and the Smith Chart. ***Volume 2*** features several verticals, an attic tri-bander, antenna modeling and propagation. Among the 40 articles in ***Volume 3*** you'll discover a 12-meter quad, a discone, modeling with MININEC and VHF/UHF ray tracing.

All three volumes are a feast for the antenna enthusiast! Companion software is available separately for Volumes 2 and 3.
Volume 1, 1st ed, ©1985 ..... #0194 **$10**
Volume 2, 1st ed, ©1989 ..... #2545 **$12**
Companion software (5.25-inch) ..... #2626 **$10**
Volume 3, 1st ed, ©1992 ..... #4017 **$14**
Companion software (5.25-inch) ..... #4033 **$10**
Companion software (3.5-inch) ..... #4041 **$10**

Antennas and Techniques for Low Band DXing, by noted DXer John Devoldere, ON4UN, is an in-depth treatment of the antennas and operating strategies you'll need to span the continents on 40, 80 and 160 meters. You'll find operating tips, antenna designs and software culled both from the author's many years of experience and those of other active DXers, contesters and antenna experimenters.
Revised and expanded 2nd ed, ©1994 ..... #4661 **$20**

Reflections: Transmission Lines and Antennas is written by Walt Maxwell, W2DU, to clear the air of the half-truths and outright myths you hear these days about transmission lines, standing waves, antenna matching, reflected power and antenna tuners. This book has a wealth of information on matching networks, antennas and use of the Smith Chart. Companion software is available for IBM PCs and compatibles.
Book, 1st ed, ©1990 ..... #2995 **$20**
Software (5.25-inch) ..... #3118 **$10**
Software (3.5-inch) ..... #3924 **$10**

Yagi Antenna Design by Dr James L. Lawson, W2PV, presents 210 pages covering performance calculations, simple Yagis, performance optimization, ground effects, stacking, practical designs for 7-28 MHz. Hardcover. 1st ed, ©1986 ..... #0410 **$15**

W1FB's Antenna Notebook Not everyone has the room or the budget to put up a forest of aluminum. Doug DeMaw tells you how to get the best performance out of unobtrusive wire and vertical antennas, and how to build simple antenna tuners and SWR bridges. 1st ed, ©1987 ..... #2618 **$10**

Transmission Line Transformers is a source of practical design data covering the use of these devices for both commercial and amateur applications. Written by Dr Jerry Sevick, W2FMI, this book covers types of windings, core materials, fractional-ratio windings, efficiencies, multiwinding and series transformers, baluns, limitations at high impedance levels and test equipment. Hardcover. 2nd ed, ©1990 ..... #2960 **$20**

Physical Design of Yagi Antennas, by Dr David B. Leeson, W6QHS, is packed with information on how to design or reinforce Yagi antennas so they can survive in the most adverse weather conditions—like 120-mile-per-hour winds! Covers the structural design of elements, booms and masts, plus the electrical design of Yagi antennas. Hardcover. 1st ed, ©1992 ..... #3819 **$20**
5.25-inch spreadsheet diskette for IBM or compatible ..... #3827 **$10**
3.5-inch spreadsheet diskette for IBM or compatible ..... #3835 **$10**
3.5-inch spreadsheet diskette for Macintosh ..... #3843 **$10**

Antenna Impedance Matching shows you how to use the Smith Chart to develop even the most complex matching network to maximize antenna effectiveness by minimizing feed line losses. With more than 200 pages, this book is a must for the antenna designer and serious amateur. Written by Wilfred Caron. Hardcover. 1st ed, ©1989 ..... #2200 **$20**

Low-Profile Amateur Radio is for the ham who lives where antennas are frowned upon. You'll see that you don't need a house with acreage to enjoy your favorite hobby. One practical solution: hide your antennas. Another: operate with low power. This book tells you how to get on the air using these techniques—and others—without calling attention to yourself. 1st ed, ©1993 ..... #4114 **$8**

ARRL MicroSmith V2.00, by Wes Hayward, W7ZOI. ***ARRL MicroSmith*** is a Smith Chart simulation program for the IBM PC and compatibles. You don't need detailed knowledge of the Smith Chart. Use ***MicroSmith*** to design matching networks with fixed or variable L-C components, stub-matching sections with transmission lines, and more. It's all done graphically on your computer screen. It's also useful for a variety of network analysis problems. Includes a 48-page user's guide with numerous illustrations.
5.25-inch diskette ..... #4076 **$39**
3.50-inch diskette ..... #4084 **$39**

Practical Wire Antennas, by John D. Heys, G3BDQ, is an RSGB book that delves into the practical aspects of HF wire antennas: how the various types work, and how to buy or build one that's right for you. Marconis, Windoms, loops, dipoles and even underground antennas—they're all covered! The final chapter covers matching systems. ©1989 ..... #R878 **$14**

HF Antennas for All Locations, written by L.A. Moxon,

G6XN, for the RSGB, details the design and construction of hundreds of amateur antennas—including some unusual designs. Don't let a lack of real estate keep you off the air. Whether you're in a downtown apartment or on top of a mountain, you'll find at least one antenna that'll work for you! 2nd ed, ©1993 ..... #4300 **$20**

HF Antenna Collection contains outstanding articles from RSGB's *Radio Communication*. It covers single- and multielement horizontal and vertical antennas, very small transmitting and receiving antennas, feeders, tuners and more. ©1991 ..... #3770 **$18**

Interference/Direction Finding

Radio Frequency Interference: How to Find It and Fix It is a new approach to an old Amateur Radio problem. Written by RFI experts, it's filled with proven ways to solve common—and not-so-common—RFI or EMI problems, whatever their cause. In addition, you'll learn how to build a cooperative environment with neighbors and how to contact skilled volunteers who can assist with those tricky situations. 1st ed, ©1991 ..... #3754 **$15**

Interference Handbook, by William Nelson, WA6FQG, will help you locate and resolve interference problems of every type. Sources of interference are described along with the methods used to locate them. Suppression circuits for interfering devices are discussed in detail, as are protection techniques for home entertainment equipment. 2nd ed, ©1981 ..... #6015 **$12**

Transmitter Hunting: Radio Direction Finding Simplified, by Joseph Moell, K0OV, and Thomas Curlee, WB6UZZ, is all the information you need about equipment and techniques for HF and VHF radio direction finding. Transmitter hunting is both practical and fun. Using the information in this book, you can not only locate jammers and other sources of malicious interference, but you can also locate downed aircraft, engage in "sport hunting," even help search-and-rescue groups save lives! 1st ed, ©1987 ..... #2701 **$19**

Practical Circuits

W1FB's QRP Notebook by Doug DeMaw is packed with construction projects for QRP transmitters, receivers and accessories. This second edition is the completely rewritten successor to Doug's popular ***QRP Notebook***, and features totally new circuits. Learn the inside secrets from this veteran builder, writer and former ***QST*** Technical Editor. Most of the projects feature printed circuit boards that are available from a commercial source. Gain understanding of circuits. Experience firsthand the thrill of making contacts using equipment that you built. 2nd ed, ©1991 ..... #3657 **$10**

W1FB's Design Notebook: Practical Circuits for Experimenters is just the book for the avid builder of Amateur Radio equipment. This plain-language book is filled with simple, practical projects that can be built using readily available components and common hand tools. There are explanations of how the various circuits work—without heavy mathematical analysis. 1st ed, ©1990 ..... #3207 **$10**

QRP Classics is a collection of projects for low-power enthusiasts taken from ARRL publications over the past 15 years. The equipment is generally simple and easy to build. You'll find projects for receivers, transmitters, transceivers and accessories. 1st ed, ©1990 ..... #3169 **$12**

Solid State Design for the Radio Amateur is packed with information on Amateur Radio circuit design and applications, descriptions of receivers, transmitters, power supplies and test equipment. Much of the data cannot be found elsewhere. Essential for every technical library. ©1986 ..... #0402 **$12**

Radio Communication Handbook, from RSGB, is packed with technical information and practical circuits on semiconductors, HF receivers, VHF/UHF transmitters, modulation systems, RTTY, propagation, HF and VHF/UHF antennas power supplies and more. ©1982 ..... #R584 **$35**

Packet Radio/Computers/RTTY

Your Packet Companion, by Steve Ford, WB8IMY, perfect for the packet newcomer, covers everything—from assembling a station to sending mail, from packet satellites to the latest networking systems. Its straightforward writing style and clear drawings will get you on the cutting edge of digital ham radio in no time. 1st ed. ©1992 ..... #3959 **$8**

Your RTTY/AMTOR Companion: Explore HF Digital Communications with Your Multimode Controller, by Steve Ford, WB8IMY, is your introduction to the exciting world of HF digital communications. Learn how to assemble your own RTTY/AMTOR station and communicate effectively on the air. You'll also learn the basics of new HF digital modes such as CLOVER and PacTOR. 1st ed, ©1993 ..... #4092 **$8**

Your Gateway to Packet Radio explores one of the most fascinating areas of Amateur Radio today. Packet radio has found its way into thousands of shacks and continues to grow in popularity. If you've never tried it, find out what you're missing. If you're a packet veteran, you'll still learn something new. Written by Stan Horzepa, WA1LOU. 2nd ed, ©1989 ..... #2030 **$12**

In ***NOSintro: TCP/IP over Packet Radio*** you'll find a wealth of practical information, hints and tips for setting up and using the KA9Q Network Operating System (NOS) in a packet radio environment. The emphasis is on hands-on practicalities. You'll see exactly: how to install NOS on a PC, how to set up the control files, how to check out basic operations off-air, and how to use NOS commands for transferring files, logging in to remote systems, sending mail, etc (356 pages) ..... #4319 **$23**

AX.25 Amateur Packet-Radio Link-Layer Protocol represents the culmination of several years of work by amateurs to develop a standard data-transfer protocol for global use. Packet stations and networks can easily talk to one another if common standards are used. The link layer is level 2 of the International Organization for Standardization (ISO) seven-layered reference model of Open Systems Interconnection (OSI). ©1984 ..... #0119 **$8**

DX/Callbooks

The 1994 North American Callbook lists call signs, names and address information for more than 500,000 licensed radio amateurs in North America, including Greenland, Bermuda and the Caribbean Islands, Hawaii and US possessions ..... #C094 **$30**

The 1994 International Callbook lists call signs, names and address information for more than 500,000 licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia and the Pacific

(excluding Hawaii and US possessions) ..... #C194 **$30**

The Complete DX'er is a book by Master DXer Bob Locher, W9KNI, that shows what is going through the DXer's mind as he cracks pileups and snags rare DX stations using tried and true techniques. You'll learn how to hunt DX and how to obtain hard-to-get QSL cards. 2nd ed, ©1989 ..... #2083 **$12**

The DXCC Companion: How to Work Your First Hundred Countries, by Jim Kearman, KR1S, is filled with practical, easy-to-understand information for the beginning DXer. Follow the advice given by KR1S and you'll have your first hundred countries confirmed in no time. You'll learn about equipment, antennas, propagation and the rights and wrongs of QSLing. 1st ed, ©1990 ..... #3398 **$8**

For Instructors

In addition to ham radio study guides for students, we also produce instructor's guides to help you teach license courses. These are for use with ***Now You're Talking!*** and ***ARRL License Manuals***. The ***Instructor's Manual*** is a valuable aid for those teaching Amateur Radio classes at any level.

Proceedings of the ARRL National Educational Workshop presents ideas from top instructors to help you motivate your students and increase their enjoyment. Proceedings from the 1989 through 1993 workshops are available.

ARRL Novice/Technician Class Instructor's Guide
2nd ed, ©1993 ..... #4394 **$8**
ARRL General Class Instructor's Guide
2nd ed, ©1989 ..... #2669 **$8**
ARRL Instructor's Manual, 2nd ed, ©1992 ..... #2448 **$8**
Proceedings of the ARRL National Educational Workshop 1993, 1st ed, ©1993 ..... #4408 **$12**

Amateur Radio Adventure/History

The ARRL offers three adventure titles by Cindy Wall, KA7ITT. In ***Night Signals***, Amateur Radio performs a life-saving feat for Marc Lawrence, snow-bound and injured in the rugged Cascade Mountains. In the electrifying sequel, ***Hostage in the Woods***, what starts out as a hospital Christmas party for children turns into a nightmare of terror for Kim Stafford, KA7SJP, and ham radio is her only hope. Join Kim and Marc in their latest ham radio adventure, ***Firewatch!***, as they're faced with fires everywhere in Oregon's tinder-dry Cascade Mountains. All three are great for hams and nonhams alike.

Night Signals. 1st ed, ©1989 ..... #4289 **$6**
Hostage in the Woods. 1st ed, ©1990 ..... #3428 **$6**
Firewatch! 1st ed, ©1993 ..... #4106 **$6**

Tommy Rockford adventure series by the late Walker Tompkins:
SOS at Midnight. 3rd ed, ©1985 ..... #5005 **$5**
CQ Ghost Ship. 3rd ed, ©1985 ..... #5013 **$5**
DX Brings Danger. 3rd ed, ©1985 ..... #5021 **$5**
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Grand Canyon QSO. 1st ed, ©1987 ..... #5048 **$5**
Murder by QRM. 1st ed, ©1988 ..... #5064 **$5**
Set of 6 Tompkins books ..... #1490 **$25**

Morse Code: The Essential Language by Peter Carron, W3DKV, covers both the code's fascinating history and its up-to-date applications. You'll learn how to receive and send, and for the proficient operator there's a chapter on high-speed operation. Learn how to handle distress calls heard not only on the ham bands but on maritime and aircraft frequencies as well. Finally, there is a look into the future and "super CW." Expanded 2nd ed, ©1991 ..... #0356 **$6**

200 Meters & Down by Clinton B. DeSoto chronicles the exciting evolution of Amateur Radio from the pioneers who perfected the "wireless art" through the technical advances of the mid-1930s. ©1936 (reprinted in 1981) ..... #0011 **$8**

From Spark to Space Join us on a journey through 75 years of Amateur Radio with this handsome book.
1st ed, ©1989 ..... #2596 **$10**

QST—ARRL's Monthly Membership Journal

Simply put, ***QST*** is the best source of news and practical information from the world of Amateur Radio. Hams and others interested in Amateur Radio from North America and around the world find it indispensable. ***QST*** comes with your ARRL membership. Here's some of what you'll find in each issue:

Technical Articles provide fascinating theory and practical designs that will expand your Amateur Radio horizons.

Product Reviews present comprehensive yet readable reports on the latest transceivers and accessories; only ***QST*** product reviews are based on careful and comprehensive testing done in the ARRL Lab and painstaking field testing.

Hints & Kinks are clever and useful tips sent in by ***QST*** readers who have found a better way to accomplish a task or solve a problem. You never know what you'll find each month, but you can be sure you'll find something practical and imaginative.

DXing/Contesting, two of the most popular on-the-air activities, are covered in detail in each issue. The How's DX? column provides profiles of well-known DXers and hints on getting more out of your station. ARRL-sponsored contests are fun ways of seeing how your station stacks up against others.

Feature articles cover all the fascinating aspects of ham radio, from a colorful DXpedition to a rare atoll, to a personal story of how a ham introduced her family to the wonders of her favorite hobby.

Ham Ads and display ads are the best way to find a piece of Amateur Radio gear, new or used, top shelf or barebones. Whether it's a new 20-meter beam or a computer program that teaches the Morse code, you'll find it advertised in ***QST***.

Useful and Timely News, from the FCC or the international scene, is included in articles and columns like League Lines and Happenings. If it's happening, you'll learn about it by reading ***QST***.

Single issue price is $3. Contact ARRL for complete membership information.

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Amateur Radio Emergency Service

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Membership Pin	#1180	$3.00
Replacement Pin for Life Membership	#1190	$3.00
Life Membership Plaque	#1240	$25.00
ARRL License Plate	#1095	$5.00

Spark to Space

Hat	#1092	$7.00
Patch	#1091	$3.00

Member Stationery

50 pieces of stationery and envelopes	#1460	$9.00
50 pieces of stationery	#1465	$5.00
50 envelopes	#1470	$5.00

Log Books

8½" x 11" Spiral	#1250	$3.50
3-hole Loose Leaf, 96 8½" x 11" sheets	#1265	$4.00

Maps and Atlases

US Call Area	#1270	$3.00
*World Map—full-color Great Circle map centered on the United States	#1280	$12.00
Grid Locator (US Grid Squares)	#1290	$1.00
ARRL World Grid Locator Atlas	#2944	$5.00
Polar Map (for OSCAR)	#1300	$1.00

For Traffic Handlers:

Message Delivery Cards per package of 20	#1310	$2.00
Message Pad with 70 sheets	#1320	$2.00
Message Pad with 70 sheets (package of 3)	#1330	$5.00

Antenna and Transmission Line Design Aids

Standard Smith Charts (package of 5 sheets)	#1340	$2.00
Expanded Smith Charts (package of 5 sheets)	#1350	$2.00
Smith Charts—50-ohm center (package of 5 sheets)	#1341	$2.00
Antenna Pattern Worksheets 100 8½" x 11" sheets	#1360	$3.00

***QST* Binders**

8½" x 11" for QST 1976 and after	#1380	$12.00
8½" x 9¼" for QST 1975 and before	#1370	$11.00

Video Tapes-VHS

SAREX-W0ORE/Challenge	#1420	$25.00
Amateur Radio's Newest Frontier	#1440	$25.00
New World of Amateur Radio	#WAR1	$20.00
Ham Radio in Space	#3681	$10.00

*Shipping and handling charges apply to any supply item marked with an asterisk.

All prices subject to change without notice.

Ham Ads

1) Advertising must pertain to products and services which are related to Amateur Radio.

2) The Ham-Ad rate is $1.00 per word. This includes firms or individuals offering products or services for sale. A special rate of 30 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8½" x 11" sheet of paper.

4) Closing date for Ham-Ads is the 13th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received April 14th through May 13th will appear in July *QST*. If the 13th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

6) New firms or individuals offering products or services for sale must check with us to determine if a production sample (which will be returned) should be submitted for examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must stand by and support all claims and specifications mentioned in your advertising.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

The League reserves the right to decline or discontinue advertising for any reason.

CLUBS/HAMFESTS/NETS

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically-oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information write: MARCO, Box 73, Acme, PA 15610.

JOIN TAPR-Tucson Amateur Packet Radio (non-profit developers on the TNC). Membership benefits include: supporting the development of new communications technology, quarterly newsletter, low-price software/shareware, 10% discount on kits and publications. $15/year (foreign higher). Visa/MC accepted. When joining, mention *QST* receive TAPR Packet Radio Info Booklet ($7 value)! 817-383-0000. Mail: 8987-309 E. Tanque Verde Rd. #337, Tucson, AZ 85749-9399.

GREAT HAGERSTOWN, MD HAMFEST returns May 22, 1994. Amateur Radio dealers, computer dealers, manufacturers, and other vendors interested in table rental in HJC's giant athletic and recreation center may write: Antietam Radio Association, P.O. Box 52, Hagerstown, MD 21741 (or call Page Pyne, WA3EOP, daytime weekdays at 301-714-0688).

NORTH HILLS RADIO CLUB will sponsor its annual Hamswap on May 21(Saturday) from 8am to 3pm at the Carmichael Elks Lodge in Carmichael. Features include food and refreshments, free parking, door prizes, commercial vendors. Outdoor (tailgate) and indoor (table) spaces $10. Talk-in K6IS 145.19 (-) Info contact NHRC, PO Box 41653, Sacramento, CA 95814-0635.

NOVEMBER is still beach weather in Tampa! Include our Hamfest in your late "Indian Summer" vacation plans! Over 500 tailgate spaces this year! Suncoast Amateur Radio and Computer Convention, November 19, 20, 1994. Clearwater, FL 34617-2423.

IMRA—International Mission Radio Association helps missionaries by supplying equipment and running a net for them daily exept Sunday, 14.280 MHz, 1:00-3:00pm Eastern time. Sr. Noreen Perelli, KE2LT, 2755 Woodhull Avenue, Bronx, NY 10469.

JOIN FAIRS — The Foundation for Amateur International Radio Service. Hams who are dedicated to building international friendships by providing technical assistance, training, exchange visits, and equipment donations on a global basis. Donations tax deductible with 501(c)(3) IRS status of FAIRS. Free information toll free 1-800-FB-KK4WW or 703-763-3311, P.O. Box 341, Floyd, VA 24091.

QSL CARDS/RUBBER STAMPS/ENGRAVING

QSL CARDS!!! Customize one of 26 standard formats, or create your own design. FREE info-packet (75¢ stamp appreciated). CHESTER QSLs, Dept. B, 2 South Commercial, Emporia, KS 66801. 316-342-8792, Fax 316-342-4705.

FULL-COLOR QSLs: lowest prices anywhere! Free Customizing, front, back. Color photos, cartoons. Samples $1. K2MK QSLs, 551 Norwood Road, Mt Laurel, NJ 08054.

QSLs SASE for samples and prices. WD5ADH, 4209 McConnell, El Paso, TX 79904-6224.

COLORFUL QSLs by WA7LNW - Improve your QSL returns! Revolutionary printing process combines brilliant rainbow colors and sparkling metalic inks. The ultimate QSLs! Samples $1 (refundable). Colorful QSLs, PO Box 5358, Glendale, AZ 85312-5358.

PHOTOS, Postcards — Become QSLs. Clear stick on labels. New! "Kall Kards". Stamp brings details. K-K-L, Box 412, Troy, NY 12181-0412.QSL SALE! 300/$14, 500/$20, 1000/$28, 1500/$38, 2000/$48. Many designs. Free shipping. Phone or write for free samples or ordering. Shell Printing, KD9KW, Box 50, Rockton, IL 61072. 815-629-2193, anytime.

QUALITY PRINTING with fast personal service and 100% satisfaction guarantee is our program. SASE for free samples. QSLs by W4MPY, 682 Mt. Pleasent Rd., Monetta, SC 29105.

SELF INKING STAMPS, send layout and #10 SASE for quote or brochure. K8NUJ. Louis Craycraft. 1502 53rd Ave. W., Bradenton, FL 34207. Phone or Fax 813-758-9758.

QUALITY QSLs By WX9X. From $28.95 per thousand. See our display ad on this page.

AMATEUR RADIO CALLING CARDS. Your Amateur call sign, name, address and tel# (if desired). Give out to your friends at your next meeting or hamfest. 100 cards for only $13.95. For free samples send SASE to Creative Imprinting Company, WB4FIH, 6522 Chesterfield Avenue, McLean, VA 22101.

QSL's — Quality for less is back! See our display ad in this issue of *QST*. Harry A. Hamlen, P.O. Box 1, Stewartsville, NJ 08886.

QSL CARDS — Standard and custom. Your ideas or ours. Excellent quality. Foil stamping available. Many designs and type styles. Catalog and samples $1 refundable. Wilkins, Dept. C, Box 787, Atascadero, CA 93423.

QSLS—OVER FIFTY DESIGNS! Custom cards. "Eyeball" cards. Samples $1 (refundable). Charlie Hansen, NØTT, RR 1, Box 108-B, Napoleon, MO 64074.

QSL SAMPLES: 50 cents. Samcards, 48 Monte Carlo Drive, Pittsburg, PA 15239.

QSL CARDS. Fast quality service. Samples $1 (refundable with order). WorldWise Services, 107 Giles Court, Newark, DE 19702.

QUALITY QSLs. Samples $.50. Olde Press, WB9MPP, Box 1252, Kankakee, IL 60901.

RADIO RUBBER STAMPS free brochure Reid Associates 6680 Mellow Wood West Bloomfield, MI 48322.

DON'T Buy QSL Cards until you see my free samples. Also I specialize in custom cards and custom cards and QSL business cards. Write or call for free samples and custom card ordering information. Little Print Shop, Box 1160, Pflugerville, TX 78660, 512-990-1192.

ENGRAVING: Callsign/Name Badges by WØLQV. SASE for price sheet. Box 4133 Overland Park, KS 66204.

BROWNIES QSL CARDS. Free catalog of samples (stamps appreciated). 3035 Lehigh Street, Allentown, PA 18103

QSL Samples $1 refundable. Bud Smith, Box 1948, Blaine, WA 98231.

CANADIAN QSLs. Samples $1 (refundable). M. Smith, VE7FI, 18610 62nd Avenue, Surrey, BC CANADA V3S 7P1.

QSL CARDBOXES & INDEX DIVIDERS. Send SASE, 7-Mike Hamstuff, PO Box 11445, Scottsdale, AZ 85267-4455.

ANTIQUE-VINTAGE-CLASSIC

WANTED: Western Electric vaccum tubes, speakers, Amps. will pay much better! Sumner McDaniel, 800-251-5454.

WANTED: Old Callbooks: Amateur, Commercial, Military, Govt and Broadcast for the years 1900-1930. Bob, W4JNN, P.O. Box 166, Annadale, VA 22003 or call collect 703-560-7161.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify model numbers desired. Ardco Electronics, P.O. Box 95, Dept. Q, Berwyn, IL 60402.

W7FG Vintage Manuals - Most manuals in stock. SASE for catalog or call, VISA/Mastercard accepted. 3300 Wayside Dr., Bartlesville, Oklahoma 74006. (918) 333-7893.

RECEIVERS WANTED: National NC-300, NC-303, Hallicrafters SX-101A, SX-115, Hammarlund HQ-170A, HQ-215, Heath RX-1 Mohawk. Contact: G. Hawrysko, K2AWA, PO Box 568, Boro Hall, Jamaica, NY 11424.

COLLECTOR: Looking for Pre-1942 communications receivers, commericial, amateur, government, kit, homemade, etc. Anything considered. Wayne, NØTE, 1212 17th Road NW, Burlington, KS 66839. 319-364-5353.

WANTED: FB7 National Detector and oscillator coils - Front panel mount with pull grips. Claude L. Pennington, M.D., PO Box 1916, Macon, GA 31202. 912-746-1231

VIBROPLEX BUGS with NY address wanted for private collection, especially keys with 2.5" or 3" wide base, keys with S/N under 100,000, and WW2 deluxe models with gray base and red knobs. Randy Cole, KN6W, 1216 S. Alvira, Los Angeles, CA 90035, 213-939-9847.

NEWS BULLETIN

Burghardt INC. AMATEUR CENTER

182 North Maple
P.O. Box 73
Watertown, SD 57201
(State of Mount Rushmore)

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HOURS: MON. - FRI. 9-5 p.m.;
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WE SELL-TRADE NEW & RECONDITIONED HAM EQUIPMENT!

Proud to be "AMERICA'S MOST RELIABLE AMATEUR RADIO DEALER"
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Dear Ham Friends,

Now that Spring has finally arrived here in South Dakota after a long cold winter, we at Burghardt's are loaded with specials on New and Used Equipment and are willing and ready to meet your HAM RADIO NEEDS. Our Service Department deals quickly & efficiently with the problems that can occur with your ham rigs. Above all Else, your full and "COMPLETE SATISFACTION" is our primary goal and we will go a Long - Long way to PLEASE YOU! We want to help you enjoy your hobby and we take great pride in doing the job **RIGHT**!! *You and Your Confidence are well worth any effort we can muster. It's not so much "what" we sell but "how" we sell that makes the difference. 73 and have a Happy and prosperous Spring!!*

73 from all of US!!

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ooking for a rare bird? Call bout our used equipment. All lly re-conditioned!

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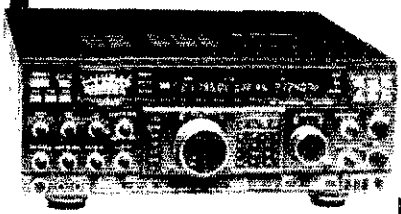

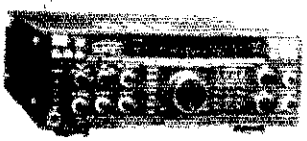

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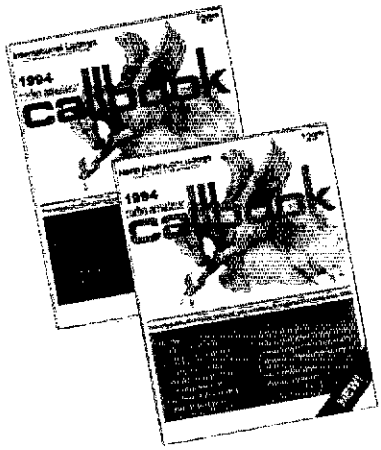

THE QSL BOOK!

Continuing over a 70 year tradition, we bring you two new Callbooks for 1994 with more features than ever before.

The 1994 North American Callbook
lists the calls, names, and addresses for more than 500,000 licensed amateurs in all countries of North America, from Panama through Canada, including Greenland, Bermuda, and the Caribbean Islands, plus Hawaii and the U.S. possessions. 1,592 pages. Item # 087158 (paper) $29.95

The 1994 International Callbook
lists more than 500,000 licensed 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). 1,720 pages. Item # 087190 (paper) $29.95

Every active amateur needs the Callbook! Fully updated and loaded with extra features, the 1994 Callbooks will be published in December 1993. Order now from your dealer or send in the coupon below.

Please send me _____ copy(ies) of ***The 1994 North American Callbook*** (Item # 087158, $29.95) and _____ copy(ies) of ***The 1994 International Callbook*** (Item # 087190, $29.95).

I have enclosed my check/money order for $_____. (Please add sales tax in CA, DC, IL, MA, NJ, NY, OH, PA, TN, VA & Canada, and $3.00 per book for postage and handling for U.S. shipments and $7.00 for all shipments outside the U.S.)

Or call and charge on your credit card. MasterCard, VISA and American Express cards accepted. Please be sure to include shipping instructions. Prepayment required and must be in U.S. funds.

DRAI 1193

RADIO AMATEUR **callbook**
P.O. Box 2013 Lakewood, NJ 08701
1-908-905-2951 (Phone) 1-908-363-0338 (Fax)

THE McELROY COLLECTOR: seeks Mac Keys by the "World's Champion Radio Telegrapher." Tom French, W1IMQ, 120 Great Road, Maynard, MA 01754.

T. R. McELROY: biography by W1IMQ, softcover, 150 pages. $21.95 ppd. Artifax, Box 88-Q, Maynard, MA 01754.

ANTIQUE RADIO CLASSIFIED: Free sample copy! Antique radio's largest-circulation monthly magazine. Old radios, TVs, ham equip., 40s & 50s radios, telegraph, books & more. Ads & articles. Free 20 word ad monthly. Subscribe today. Six month trial: $16.95. Yearly rates: $31.95. ($47.95 by 1st class). Foreign: write. ARC, PO Box 802-B13, Carlisle, MA 01741. 508-371-0512.

CRYPTOGRAPHY machines wanted: M-94, M-209, others WB2EZK, 17 Alfred Road West, Merrick, NY 11566 516-378-0263 WANTED: Radio, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond, Glendale, CA 91201, 818-242-8961.

BUY, Sell, Collect and Restore early tube equipment? Early receivers, transmitters and telegraph gear? Join the Antique Wireless Association which sponsors old-time "meets", flea markets, museum and journal with technical articles and free want ads. Membership and annual dues only $12. Write for information and Museum hours: Bruce Kelley, W2ICE, Route 3, Holcomb, NY 14469.

WANTED: WWII Military Radios and Accessories. Need ATD Tuning Units, DY43 Dynamotor, BC 222/223 Manuals, ART-13 Connectors, ARR/41/MT-1518 Mount, ATB, GRC 106 Receiver, Hallicrafters HT20. Charlie, 501 Mystic Valley Pkwy., Medford, MA 02155.

WANTED By Collector: Old Radios, Parts, Microphones, Advertising Signs, and TVs. Jerry Finamore, 1374 Stafore Drive, Bethlaham, PA 18017, 215-861-4660.

BROADCAST MICROPHONES And Accessories (Call Letter Plates, Stands) Wanted. Early carbon, condenser, ribbon, dynamic models used in broadcasting. James Steele, WK8X (FM), Box 2525, Kingsland, GA 31548, 912-729-6106.

CODE/CIPHER Machines Wanted! Historian buys code/cipher devices, manuals, books, etc.! All periods! Melton, Box 5755, Bossier City, LA 71171, 318-798-7319.

MANUALS for most ham-gear made 1935/1970, plus Kenwood. No quotes. Our current catalog "L", ($2 USA, $3 elsewhere) required to order. Hi-Manuals, Box L-802, Council Bluffs, IA 51502.

WANTED: Collins product catalogs and promotional literature from 1930-1950. Jim Stitzinger, WA3CEX, 23800 Via Irana, Valencia, CA 91605, 805-259-2011.

WANTED: Hallicrafters Skyriders with entire front panel dull aluminum color, S-30, S-33, S-35, SX-112, EP-132, console speakers R-8, R-12, other very old or unusual Hallicrafters items including advertising signs, memorabilia, parts. Also want RCA model AVR-11. Chuck Dachis, "The Hallicrafter Collector", 4500 Russell Drive, Austin, TX 78745.

WANTED: pre-1925 battery radios, crystal sets, and vacuum tubes. Also early telegraph keys and pre-1900 electrical apparatus. Jim Kreuzer, N2GHD, Box 398, Elma, NY 14059, 716-681-3186.

TUBES. (Thousands in stock.) Send SASE for list. Fala Electronics, P.O. Box 1376-1, Milwaukee, WI 53201.

MUSEUM SEEKING radio/television broadcasting equipment, literature, microphones, transcriptions. Radio. TV's Van Dyke, Squires Avenue, E. Quogue, NY 11942, 516-728-9835.

OLD Telegraph/Radio/Electronic Equipment/Estates Wanted: Buy/Trade. K2DCY, 11 Squirehill, N. Caldwell, NJ 07006.

WANTED: Collins Antiques, anything old from, spurs, receivers, transmitters, and all accessories, any condition. Top $$$ paid. Rich, 800-462-2972 anytime.

WANTED: Telegraph Keys. Collector bitten by the bug! Joel Wisotsky, N2LAI, 31 Cow Lane, Great Neck, NY 11024, 516-482-3241 eve.

COLLINS WANTED: 75A thru 75A-4, 32V thru 32V-3, all AM transmitters and KWS-1, SC-101 and 312-A1. S-Line, 30L-1 and 30S-1. KWM-1 thru KWM-2A. Wen Turner, AD7Z, Box 451, Cal-Nev-Ari, NV 89039.

GENERAL

THE MID-MICHIGAN SKYHOOK is for sale! You now have the opportunity to own one of the premier tower/antenna installations in the U.S. As featured on the cover of Jan. '87 *QST*. Free standing, 180 feet, top 60 feet rotates all KLM mono-band beams + tri-bander. $45,000 OBO. Contact John Baublitz (WD8RXP), owner, designer & builder. 517-875-4778 late afternoons.

GREAT DX QTH HOUSE FOR SALE on peak of Shongum Mountain, 2033 sq ft. Randolph, NJ. Has 72-ft 4 section motorized heavy duty tower, (US Towers HDX-572MDL and Hygain TH7DX plus more). LR, DR, KIT, 4 bedrooms, 3 full baths, 25'x14' family room with fireplace and two picture windows, Mom-in-law apt, 2.3 acre lot. Quiet street, peaceful, pleasant surroundings, highly rated public schools, lake rights, move-in condition. $275K. Underwoods. W2EBH or N2VRF, 201-895-3057.

???SAVE TIME! SAVE MONEY! I will send your name to all display advertisers with an address in this issue. Send me your name and address printed on 3"x5" paper with $5.00 to: David Humbert, PO Box 536, Anaheim, CA 92815-0536.

IBM SHAREWARE 99¢ A DISK! Huge current virus free selection. Over 200 Ham titles. Catalog $1. Refundable with order. Cheap Software, PO Box 693, Agoura Hills, CA 91376-0693.

AMTOR, CW, RTTY-AEA CP-1, C-64CPU, 1541Disc, 12" CRT, complete $350 - G.C. Receiver JRC-525 w/NVA88 Spkr, optional 4kc Xtal filters, RS-232 interface mint, $875 - John WA8NWK 419)332-0939.

BOOKS AND TECH MANUALS: MILITARY, Electronics and other subjects(WW1 to present). Many "Rare hard to find" AMATEUR, COMMERCIAL; Equip't and Technical subjects... For current 18 pg catalog; send $2.00 (refundable) To: Keystone Bibliopolist, PO Box 34427, Omaha, NE 68134. John-W0EKB.

HEATHKIT Amateur Radio Repair by RTO Electronics, 9046-3 US 31, Berrien Springs, MI 49103. 616-473-3201.

SWAN 700CX w/VX-2 $500, DD-76 $75, WM-3000 Mtr. $75, SW R1 $30, Autek-1 pwr/swr mtr. $45, Autek 1A audio filter $45, Heathkit SB-102 $300, SB-650 Freq. Display $125, Hm-102 pwr/swr mtr. $30, HD-1418 audio filter $75, SB-600 speaker $30, HD-1986 microlizer $30, HD-1422 Ant. noise bridge $30, AM-2 pwr/swr mtr. $25, SB-310 Shortwave Rcvr w/ 80, 40, 20, 15 mtr bands $150, Heathkit IB-101 freq. counter $50, Heathkit IB-102 Freq. scaler $50, Browning Eagle R-27 and S-23 $500, Hygain Afterburner 6mtr. amp $75, Hygain pwr mtr. $25, Morse-A-Word $75, Drake MN-2000 w/4-1 balun $150. KA0LES, 515-274-2656.

SUPERFAST MORSE CODE SUPEREASY. Fee catalog: SASE. Bahr-Q2, 150 Greenfeild, Bloomingdale, IL 60108.

QST's FOR SALE: years 1957-1972, 1978. Missing issues Jan '65, Nov '58, Apr '67, Sep '67, Apr '64, Feb, May, Nov '78, Mar '68. Best offer plus shipping. Stanley Sanders, KC2K. O-52 28th St. Fairlawn, NJ 07410-3736.

TEMPO S-1 Handie Talkie, charger, and PL unit. $95. Jack, N6UC 714-544-5369.

PACKET TNC - MFJ Model 1270 Packet TNC with power adapter and cables $95. Jack, N6UC, 714-544-5369.

TRI-EX HZ 354N heavy duty 54' free standing motorized 3 section crank up tower. Includes limit switches, remote rasing and lowering control, all engineering drawings and schematics, down and ready to go $875, pickup only. KI5FT 505-527-0970.

WANTED: HAM EQUIPMENT AND OTHER PROPERTY. The Radio Club of Junior High School 22 NYC, Inc. is not only the Big Apples largest Ham club but also the nations only full time, non-profit organization, working to get Ham Radio into schools around the country as a theme for teaching using our EDUCOM-Education Thru communication-program. Send your radio to school. Your donated amateur or related property, which will be picked up or shipping arranged, means a tax deduction to the full extent of the law for you as we are an IRS 501(c) (3) charity in our fourteenth year of service. Your help will also mean a whole new world of educational opportunity for children around the country. Radios you can write off, Kids you can't. Get ready for summer by helping someone else and yourself. Please, write-phone-or FAX the WB2JKJ "22 Crew" today: The RC of JHS 22, POB 1052, New York, NY 10002. Telephone 516-674-4072 or FAX 516-674-9600. Young people, nationwide, can get high on Ham Radio with your help. Meet us on the WB2JKJ Classroom net: 7.238 MHz, 1200-1330 UTC and 21.395MHz, 1400-2000 daily - Also - at HAM-COM 94, the ARRL National Convention in Texas, June 10-12.

ROSS'$$$ NEW MAY (ONLY) specials save time and money have model number and manufacture ready when you call or write. Kenwood TH-22AT $260.50, TR-751A $615, YK-88A 62.50, TH-205A $250, AEA PK-6A/HFM $145, PM-1 $125; Alinco Call; Yaesu SP-5 $145, FT-530 $416, FT-416 Call; Icom Call; Astron Call; MFJ Call; Kantronics Call; Barker & Williamson Call; Bencher Call; Butternut Call; Cushcraft A3WS Call; Telex Hy-Gain Call; KLM Call; RFConcepts Call; Mirage Call; Larsen Call. LIMITED TIME OFFERS. Looking for something not listed or hard to find? Call or write. Over 9000 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. Preston. Hours Tuesday-Friday 9:00 to 6:00, Mondays 9:00 to 2:00PM, Closed Saturday and Sunday. Ross Distributing Company, 78 South State, Preston, IDAHO 83263. 208-852-0830.

WANTED: manual & schematic on the Courier Port-A Lab 500D SWR/Power meter. Ernie Hanson, 1706-5 Vicora Linkway, Don Mills, ON. CANADA M3C 1A6. 416-429-4570.

RADIO RUBBER STAMPS free brochure Reid Associates 6680 Mellow Wood, West Bloomfield, MI 48322.

THE CODE BOOK: Morse code instruction manual eliminates learning problems. Quickest/Easiest way to success-fastest results possible. Large format. $14.95 ppd($19.95 foreign). RWB/CG, 8 little Fawn Drive, Shelton, CT 06484.

COLLINS KWM-1 Transceiver, very good physical condition, no power supply, AS-IS. Best offer. Write: Hoag, 6 Clinton, Warwick, N.Y. 10990.

FREE! PC to Transceiver interface cable. Included with purchase of Smart Rig version 3.0 - The complete Windows 3 X graphical rig control and automatic logging program for Kenwood stations. Free information, write to: Agate Software, PO Box 1237, Brea, CA 92622, 714-777-0855.

SELL: New Telrex TB5EM Tri-Band Antenna. Assembled-not used. Pick-up only. W2PAV, 914-356-5814.

KENWOOD TH21-AT Handie Talkie, extra batteries, charger, case and PL unit $215. Jack, N6UC 714-544-5369.

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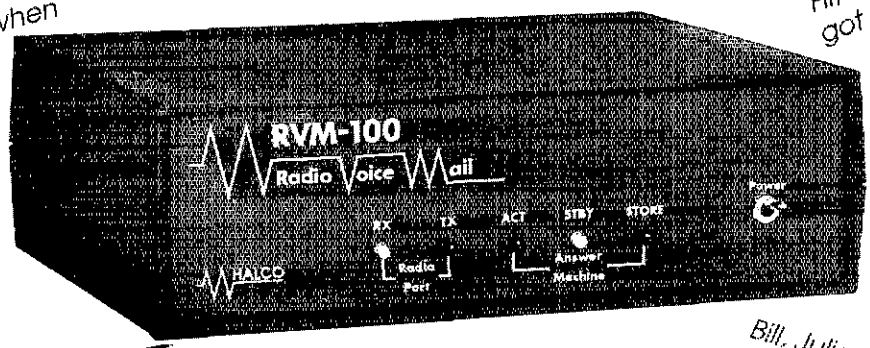

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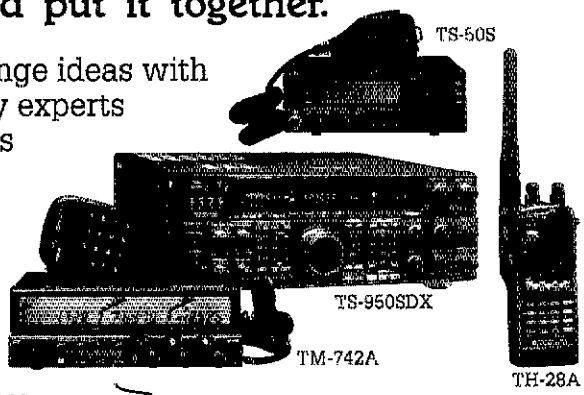

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TS-690S 9-band xcvr w/6m/mic		1699.95	Call $
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SM-230 Sta. monitor w/pan; 950/850		1099.95	Call $
AT-300 Ext. auto tuner; 850/450/50		669.95	Call $
DSP-100 Digital signal proc. 450/850		669.95	Call $
SW-2100 1.8-30MHz SWR/pwr meter		164.95	Call $
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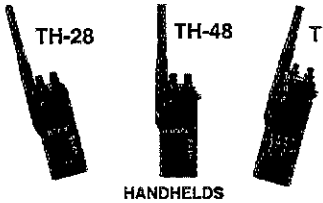

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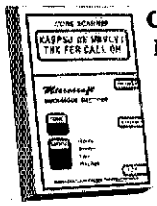

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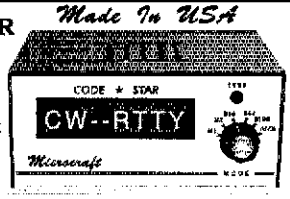

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FT-23 R/17 Mini HT	299/329	Call $
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FT-2400 50 Watt, Mobile	439.00	Call $
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FT-5100 Compact 2m/440 Mob.	749.00	Call $
FT-5200 Compact 2m/440 Mob.	789.00	Call $
FT-6200 Cpt 440/1.2 GHz Mob.	879.00	Call $
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C228A 2M/220MHz	695	Call $
C558A 2M/440MHz	689	Call $
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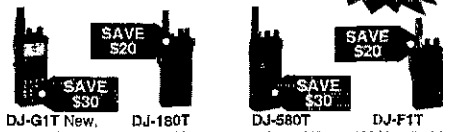

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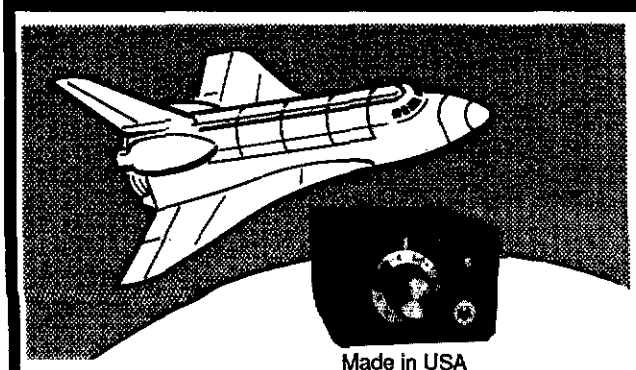

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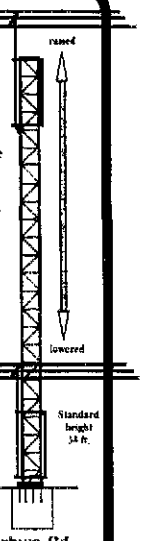

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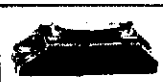

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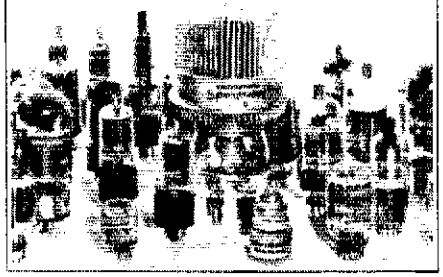

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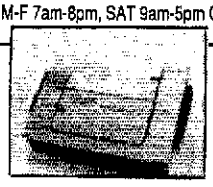

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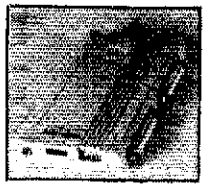

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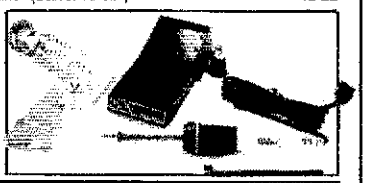

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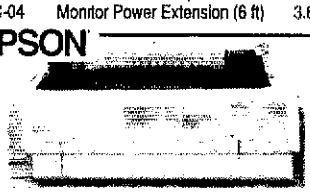

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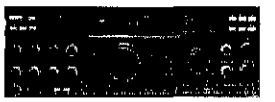

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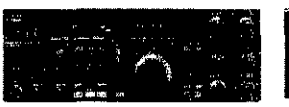

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6063-T832 DRAWN TUBING

O.D.	WALL	I.D.	COST
.375"	.058"	.259"	.35/Ft.
.500"	.049"	.402"	.45/Ft.
.500"	.058"	.384"	.50/Ft.
.625"	.058"	.509"	.55/Ft.
.750"	.058"	.634"	.65/Ft.
.875"	.058"	.759"	.75/Ft.
1.000"	.058"	.884"	.80/Ft.
1.125"	.058"	1.009"	.90/Ft.
1.250"	.058"	1.134"	1.10/Ft.
1.375"	.058"	1.259"	1.20/Ft.
1.500"	.058"	1.384"	1.40/Ft.
1.625"	.058"	1.509"	1.60/Ft.
1.750"	.058"	1.634"	1.80/Ft.
1.875"	.058"	1.759"	1.90/Ft.
2.000"	.058"	1.884"	1.95/Ft.
2.125"	.058"	2.009"	2.05/Ft.

In 6' and 12' lengths; 6' ship via UPS, 12' ship via truck or air freight collect.

6061-T6 EXTRUDED TUBING

.188"	Solid	----	.15/Ft.
1.125"	.058"	1.009"	.70/Ft.
1.250"	.058"	1.134"	.85/Ft.
2.000"	.120"	1.760"	2.60/Ft.
2.000"	.250"	1.500"	4.10/Ft.
2.500"	.120"	2.260"	3.25/Ft.
3.000"	.065"	2.870"	2.20/Ft.
3.000"	.120"	2.760"	3.85/Ft.

In 6', 12', and 24' lengths; 6' ship UPS, 12' and 24' ship truck / air collect.

ROHN TOWER

25G / 45G / 55G	**65/149/197**
A25AG2 / 25AG3 / 25AG4 ..	**94/94/95**
45AG2 / 45AG4	**180/186**
AS25G / AS455G	**30/74**
EF2545 / EFBX	**375/399**
FK2548' / 58' / 68' .	**1350/1450/1485**
FK4544' / 54' / 64' .	**1775/1950/2075**
GGK25G2 / GGK45G2	**325/350**
HBX40 40' tower (10 Sq.')	**325**
HBX48 48' tower (18 Sq.')	**450**
HBX56 56' tower (10 Sq.')	**589**
HDBX40 40' tower (18 Sq.')	**429**
HDBX48 48' tower (18 Sq.')	**579**
TB3/TB4	**75/90**

COAX & CABLE

ANDREW HELIAX®

1/2" ..... **2.49/Ft.** 7/8" ..... **5.99/Ft.**
connectors: 1/2" .. **32.00** 7/8" ... **78.00**

COAX

9086 (9913 equivalent)	**.49/Ft.**
9096 (stranded 9086)	**.65/Ft.**
RG-213/U (8267 equivalent	**.39/Ft.**
RG-8X (mini RG-8/U)	**.25/Ft.**
RG-58C/U	**.24/Ft.**

BARE COPPER WIRE

14 gauge stranded	**.10/Ft.**
14 gauge flex-weave	**.15/Ft.**

ROTOR CABLE

7 conductor (2-#18, 5-#22)	**.20/Ft.**
8 conductor (2-#18, 6-#22)	**.25/Ft.**
heavy duty 8 (2-#16, 6-#18)	**.45/Ft.**

PHILLYSTRAN

NONCONDUCTING GUY CABLE

HPTG1200I (1200#)	**.39/Ft.**
HPTG2100I (2100#)	**.48/Ft.**
HPTG4000I (4000#)	**.69/Ft.**
HPTG6700I (6700#)	**.89/Ft.**
end kits 2100/4000/6700	**4/5/6**

GUY HARDWARE

3/16EHS guywire (3990#)	**.18/Ft.**
1/4EHS guywire (6700#)	**.21/Ft.**
3/16CCM cable clamp	**.55**
1/4CCM cable clamp	**.65**
1/4TH thimble	**.55**
3/16 preformed big grips	**2.99**
1/4 preformed big grips	**3.49**
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502 guy insulator	**4.49**
3/8EE turnbuckle	**8.95**
3/8EJ turnbuckle	**9.95**
1/2X9EE turnbuckle	**11.95**
1/2X9EJ turnbuckle	**12.95**
1/2X12EE turnbuckle	**13.95**
1/2X12EJ turnbuckle	**14.95**
GAR30 / GAS604 Anchor	**30/20**
Klein safety belt (S M L XL)	**69.95**

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WALL	5'	10'	15'	20'
.12	29	55	82	99
.18	49	95	139	179
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Don't be fooled by aluminum masts! The typical yield strength of our 2" O.D. galvanized steel masts is 87,000psi.

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Multi-Mode VHF/UHF Full Duplex Base, Optional Modules For Extra Bands

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100 Watt HF Transceiver With General Coverage Receiver

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2 Meter Handheld With Up To 7 Watts Output

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6 Meter Portable For Mountain Or Remote Campsite, USB, LSB, CW, FM

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Compact 2M/70cm Mobile. Built-In Antenna Duplexer

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2 Meter, FM Handheld. World's Smallest Size HT With Full Sized Keyboard

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100 Watt HF Transceiver With Dual VFO's

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New, Affordable HF Transceiver With Plenty Of Features

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Medium, Medium/ Heavy, Heavy Duty And Azimuth-Elev.
Yaesu Sale Ends 3/24/94

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Dual Band Mobile With Snap-Off Front Panel

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FT-530
2M/440MHz Handheld With Multiple Power Levels, 82 Memories And Aircraft Receive

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New, Compact HF Transceiver With 100kHz-30MHz Receive

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AR270B	$ 84.95
ARX270	$184.95
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1274	$129
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1704	$ 54
1786	$214
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Spring Savings are Blooming at Kenwood

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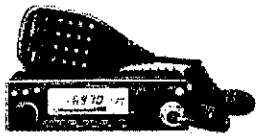
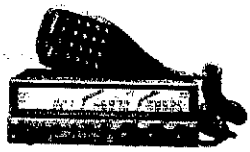


TM-241A SAVE $30.00

Wide band receiver coverage •CTCSS encode built-in • Three power settings: 5, 10, and 50W •20 full-function memory channels store everything you need •Multiple scanning functions

TS-950SDX SAVE $100.00

An industry first! 50-volt, MOS-FET final amplifier and DSP for superior linearity. 150 watts output • All-band HF transceiver with general coverage receiver • Switchable AGC, selectable IF filters with memory, dual-mode noise blankers, IF notch filter, CW reverse mode, CW pitch, SSB slope tuning, IF and AF variable bandwidth tuning • Built-in CW memory keyer (DRU-2 voice keyer optional)



TM-742A/942A SAVE $40.00

TM-742A: 50W output (144 MHz), 35W (440 MHz); TM-942A: 50W (144 MHz), 10W (1200 MHz) • 101 memory channels & memory bank system • Independent SQL & VOL controls for each band

TS-50S SAVE $50.00

An exceptional compact, all-band HF transceiver, with 500kHz to 30MHz receiver • 100 watts • DDS with "fuzzy logic" control • Kenwood's Advanced Intercept Point (AIP) ensures top performance with reduced noise floor

TS-450S/SAT SAVE $50.00

All-band HF transceiver with general coverage receiver, with 100 watts • Wonderfully easy to use, yet high-performance package • Filter options for superb receiver performance

TH-22AT/42AT SAVE $20.00

3-watt output from MOS-FET power module and supplied 6-volt battery (TH-22AT:approx. 3 watts, TH-42AT: approx 2.5 watts), and 5-watt output with optional PB-34 • Easy 12-volt operation with PG-2W or PG-3H cable • Compact design: 2-3/16 x 4-5/8 x 1 in. • Built-in DTMF keypad with monitor

TH-78A SAVE $30.00

Full duplex cross-band operation • CTCSS encode/decode built-in • Alpha numeric display and message paging • Wide band receiver • Sliding keyboard cover and illuminated keypad • 52 memory channels, expandable to 250 (ME-1 option)

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To our customers: **PRESENT THE COMPLETED COUPON AT THE TIME OF PURCHASE TO YOUR AUTHORIZED KENWOOD AMATEUR RADIO DEALER FOR YOUR DISCOUNT.** This coupon may be used only for the Kenwood models listed here, for the appropriate discount indicated. This coupon is not good for cash. Offer good only at authorized dealers.

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_TH-78A	$30.00 off
_TM-241A	$30.00 off
_TM-742A/942A	$40.00 off
_TS-50S	$50.00 off
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KENWOOD

NEW!

FT-11R/41R
2m/70cm Handhelds

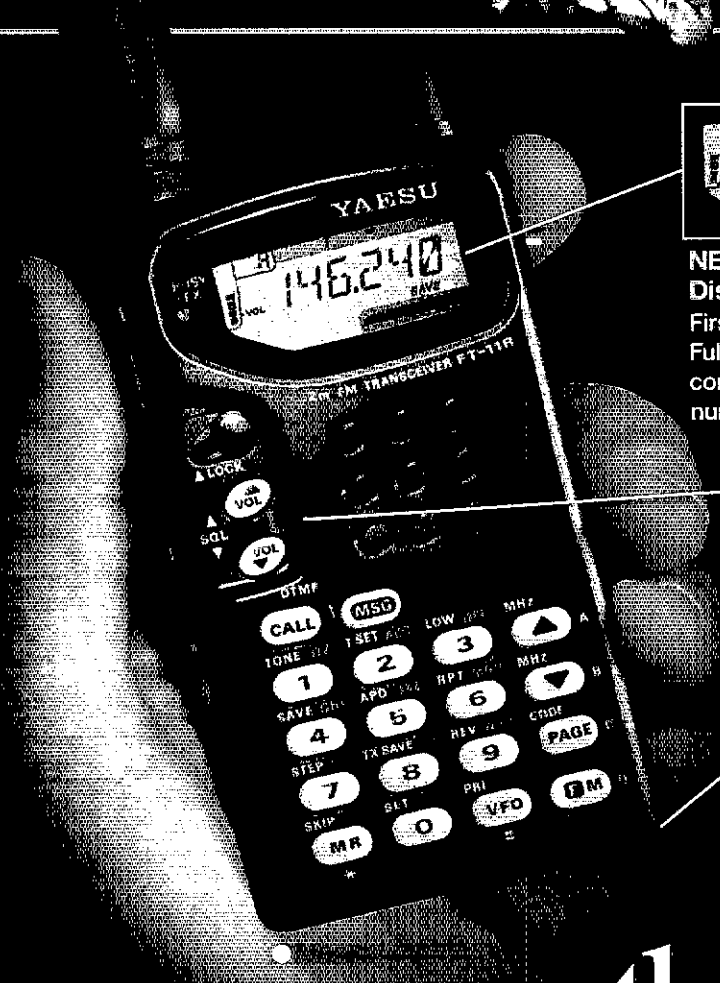
- **Frequency Coverage:**
  Wide Receiver Coverage:
  FT-11: 110-180 MHz RX,
  144-148 MHz TX
  FT-41: 430-450 MHz RX/TX
- Selectable Alpha Numeric Display
- New Compact Battery Design
  4.8V produces 1.5 Watts
  9.6V produces Full 5 Watts
- 150 Memory Channels
  (75 when Alpha Numeric)
- AM "Aircraft" Receive
  (110-136 MHz)
- Small Compact Size w/ Easy Operation (measures only: 4"H x 2¼"W x 1"D)
- Rx/Tx Battery Savers
- High-efficiency MOS FET Power Module
- Large Back-Lit Keypad and Display
- Up/Down Volume/Squelch Controls
- Built-in DTMF Paging/Coded Squelch
- Automatic Power Off (APO)
- **Accessories:**
  FNB-31 4.8V, 600 mAh Battery
  FNB-33 4.8V, 1200 mAh Battery
  FNB-38 9.6V, 600 mAh Battery
  FBA-14 6 AA Size Battery Case
  FTS-26 CTCSS Decode Unit
  NC-50 Dual Slot 1-Hour Desk Charger
  CA-10 Charge Adapter (required w/ NC-50)

Contact your Dealer for full details.

"Look, alphanumeric display and a 4.8V battery. Terrific!"

"Small and thin – with a full sized keypad! How'd they do that?"

"Yaesu did it again!"



NEW Alphanumeric Display
First time for Yaesu HT Full function LCD combines letters and numbers.

NEW Up/Down Thumb Control
with Volume and Squelch Bar Graph. No other radio has this. Back lit, too!

NEW Compact Battery Design
4.8V gets you 1.5 Watts. A first for amateur radio.

Get a grip on this!

World's smallest size HT with a full sized keypad
Measures only: 4"H x 2¼"W x 1"D

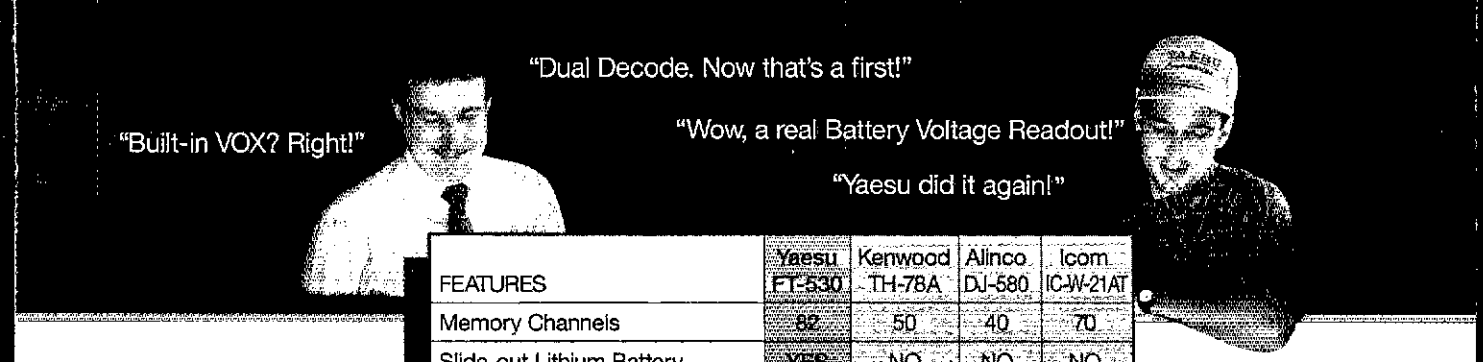
"Small" is relative, isn't it? It could mean size – which in this case it does. And, it could mean "reduced", which it doesn't! Nothing missing from the hot new FT-11R HT from Yaesu except bulk! You're going to wonder just how all the features of this full-function radio fit in. Until you remember Yaesu pioneered 2-way radio micro technology.

To see what this really means to you, check out all the new features. Like the alphanumeric display. This Yaesu HT first, lets you tag your favorite frequency by name, call sign or number. Or, the new "voltage stingy" battery. It's an industry first for amateur radio. Smaller and compact, the 4.8V battery gives you 1.5 watts on TX. And, if that's not enough, there's an optional drop in, dash mount battery charger.

You see it's not a small time performer. Just small sized. The FT-11R. Another small example of Yaesu superiority. See your dealer today!

YAESU

Performance without compromise.℠

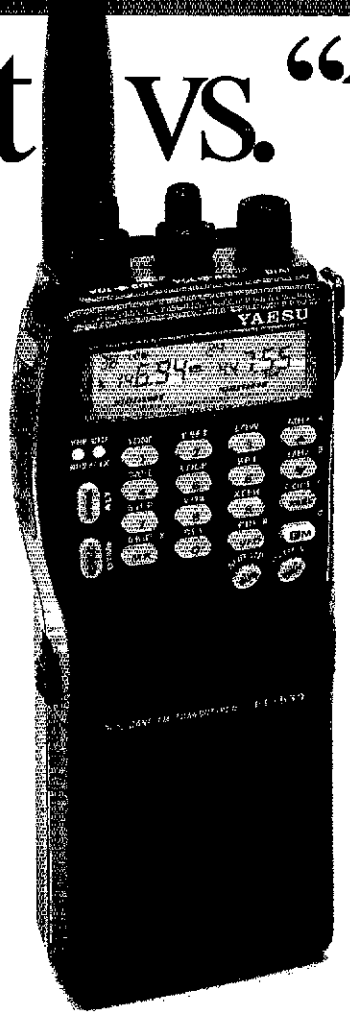


FEATURES	Yaesu FT-530	Kenwood TH-78A	Alinco DJ-580	Icom IC-W-21AT
Memory Channels	82	50	40	70
Slide-out Lithium Battery	YES	NO	NO	NO
Dual CTCSS Decoder	YES	NO	NO	YES
Battery Voltage Readout	YES	NO	NO	NO
Automatic CTCSS Tone Search	YES	NO	NO	NO
Transmit Battery Saver (Repeater & Simplex Operation)	YES	NO	NO	NO
Built-In Vox	YES	NO	NO	NO
One Touch Reverse Button	YES	NO	NO	NO
Dual In-Band Receive (V+V, U+U)	YES	YES	NO	YES
Programmable External Speaker Audio	YES	NO	NO	YES
Optional Digital Display Mic with "S" Meter	YES	NO	NO	NO
AM Aircraft Receive	YES	YES	YES	YES

The Best vs. "the rest."

FT-530
Dual Band Handheld

- **Frequency Coverage:**
  2-Meter 130-174 MHz RX
  144-148 MHz TX
  70 cm 430-450 MHz RX/TX
- 4 TX Power levels:
  w/FNB-25: 2.0, 1.5, 1.0, 0.5W
  w/FNB-27: 5.0, 3.0, 1.5, 0.5W
- DTMF Paging and Coded Squelch
- AOT – Auto On-Timer with built-in clock and alarm functions
- IBS – Intelligent Band Select (provides automatic TX band select on scan stop)
- Backlit keypad and display with time delay
- Built-in cross-band repeat function
- APO – Automatic Power Off
- 5 Watts output w/ FNB-27 battery or 12 VDC
- 2 VFO's for each band
- **Accessories:**
  NC-42 1-Hour Desk Charger
  FNB-25 600 mAh Battery (2 watt)
  FNB-26 1000 mAh Battery (2 watt)
  FNB-27 600 mAh Battery (5 watt)
  FBA-12 6 AA Cell Holder
  CSC-56 Vinyl Case w/ FNB-25
  CSC-58 Vinyl Case w/ FNB-26/27
  E-DC-5B 12 VDC Adaptor
  YH-2 Headset for VOX
  MH-12A2B Speaker Mic
  MH-18A2B Lapel Speaker Mic
  MH-19A2B Mini Earpiece Mic
  MH-29A2B LCD Display Mic with Remote Functions
  MMB-54 Mobile Mounting Hanger



No other dual band handheld beats the FT-530 on features for performance and ease of use. With the largest backlit keypad available, 82 memories, exclusive Dual CTCSS Decode and AM Aircraft Receive, the FT-530 is simply the best value there is.

Compare for yourself, then forget "the rest." See your dealer for the best dual band handheld you can buy. The FT-530.

YAESU

Performance without compromise.℠

FT-2500M/FT-7400H 2m/70cm Mobiles

Specifications

- **Frequency Coverage:**
  FT-2500M
  RX: 140-174 MHz
  TX: 144-148 MHz
  FT-7400H
  RX/TX: 430-450 MHz
- Rugged Military Spec Design
- Advanced Track Tuning (ATT)
- Selectable Alpha-Numeric Display
- Largest Display Available
- Power Output:
  FT-2500M 50/25/5 Watts
  FT-7400H 35/20/5 Watts
- Flip Up Front Control Panel Hides Seldom Used Buttons
- Backlit DTMF Mic
- 31 Memory Channels
- CTCSS Encode Built-in
- Automatic Power Off (APO)*
- Time-Out Timer (TOT)*
- Manual* or Automatic Backlighting Adjustment
- **Accessories:**

FTS-17A	CTCSS Decode Unit
FRG-6	DTMF Paging Unit
SP-4	External Speaker
FP-700	Power Supply

*FT-2500M

"No other mobile has a Military spec rating. This radio can really take it!"

"Backlit DTMF Mic, too. Only Yaesu radios have this."

NEW

"3-stage advanced track tuning really reduces intermod. Its great!"

"Yaesu did it again."

Performance beyond the call of duty.

Just when you thought you had the most formidable mobile built, we made the FT-2500M. It's the next evolution of powerful, rugged mobile radios.

The FT-2500M, based on the acceptance of the popular FT-2400H, takes its durable quality, features, and performance then goes one better! The FT-2500M has a new easy-to-operate front panel design with rubber coated knobs and large amber display, and the Yaesu exclusive 3-Stage Advance Track Tuning feature which reduces intermodulation and front-end overload. With its superior technology, the FT-2500M is as close as you can get to commercial grade performance in amateur frequencies.

The FT-2500M is the only mobile with a Military spec rating; the only mobile radio with the most often used controls on the front and those you "set and forget" neatly hidden; and the only mobile radio with a backlit DTMF mic. With its extra large heat sink and one-piece die-cast chassis, the tough FT-2500M is unlike any other mobile in its class.

So test the mettle of your mobile, if it doesn't measure up to the endurance standards set by the U.S. Military, you need the FT-2500M. Designed for flawless performance in rough and rugged situations, the FT-2500M is really formidable – just what you'd expect from Yaesu. See it at your dealer today!

YAESU

Performance without compromise.℠

FT-2200/7200

Just 5.5"W x 1.6"H x 6.5"D, the FT-2200/7200 radios are designed to fit into today's more compact cars with ease.

SPECIFICATIONS • Frequency Coverage: FT-2200 RX: 110-180 MHz, TX: 144-148 MHz, FT-7200 RX/TX: 430-450 MHz. • Wide Receiver Coverage: 110-180 MHz • AM "Aircraft" Receive: 110-139 MHz • Built-in DTMF Paging/Coded Squelch • Selectable Channel Only Display • 10 Memory DTMF Auto Dialer • Backlit DTMF Mic • Power Output 50/25/5 Watts (FT-7200 35 Watts) • 50 Memory Channels • Remote Operation w/ Optional MW-2 • CTCSS Encode Built-in • Optional Digital Voice Storage System. Accessories: See your authorized Yaesu dealer.