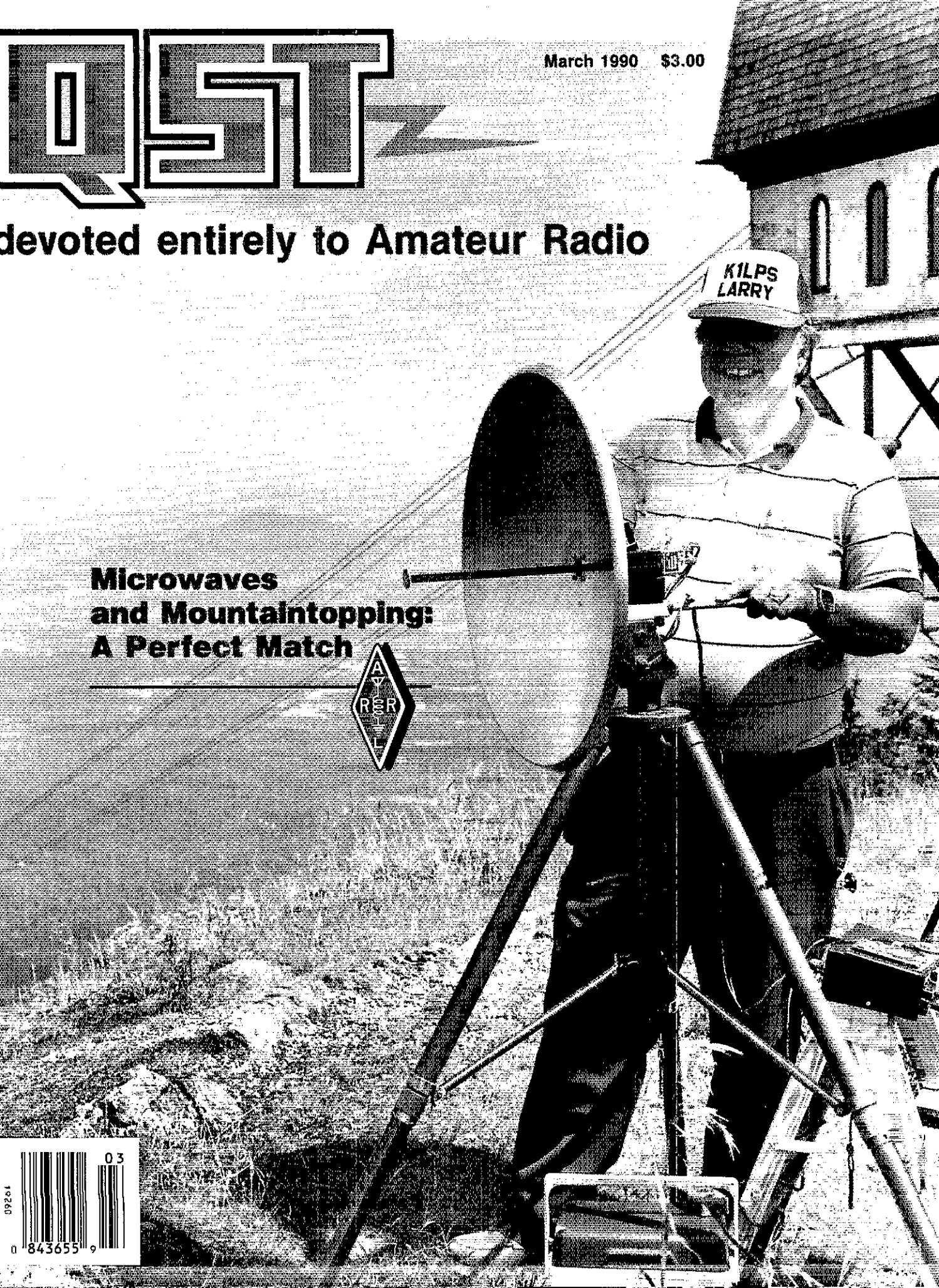


QST

March 1990 \$3.00

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63 years and still serving the amateur's needs..now two more fine new amplifiers

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**Now you have a
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quality HF desk
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and reliability you
have come to
expect from a
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KENWOOD

Affordable DX-ing!

TS-140S/680S

HF transceiver with general coverage receiver.

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

- **Covers all HF Amateur bands with 100 W output.** General coverage receiver tunes from 50 kHz to 35 MHz. (Receiver specifications guaranteed from 500 kHz to 30 MHz.) Modifiable for HF MARS operation. (Permit required).
- **All modes built-in.** LSB, USB, CW, FM and AM.
- **Superior receiver dynamic range** Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range.
- **New Feature! Programmable band marker.** Useful for staying within the limits of your ham license. For contesters, program in the suggested frequencies to prevent QRM to non-participants.

- **Famous Kenwood interference reducing circuits.** IF shift, dual noise blankers, RIT, RF attenuator, selectable AGC, and FM squelch.
- **M.CH/VFO CH sub-dial.** 10 kHz step tuning for quick QSY at VFO mode, and UP/DOWN memory channel for easy operation.
- **31 memory channels.** Store frequency, mode and CW wide/narrow selection. Split frequencies may be stored in 10 channels for repeater operation.



- **Selectable full (QSK) or semi break-in CW.**
- **RF power output control.**
- **AMTOR/PACKET compatible!**
- **Built-in VOX circuit.**
- **MC-43S UP/DOWN mic. included.**

Optional Accessories:

- **AT-130** compact antenna tuner
- **AT-250** automatic antenna tuner
- **HS-5/HS-6** headphones
- **IF-232C/IF-10C** computer interface
- **MA-5/VP-1** HF mobile antenna (5 bands)
- **MB-430** mobile bracket
- **MC-43S** extra UP/DOWN hand mic.
- **MC-55** (8-pin) goose neck mobile mic.
- **MC-60A/MC-80/MC-85** disk mics.
- **PG-2S** extra DC cable
- **PS-430** power supply
- **SP-41/SP-50B** mobile speakers
- **SP-430** external speaker
- **SW-2100** SWR/power meter
- **TL-922A** 2 kW PEP linear amplifier (not for CW QSK)
- **TU-8** CTCSS tone unit
- **YG-455C-1** 500 Hz deluxe CW filter
- **YK-455C-1** New 500 Hz CW filter.

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TS-680S

All-mode multi-bander

- 6m (50-54 MHz) 10 W output plus all HF Amateur bands (100 W output).
- Extended 6m receiver frequency range 45 MHz to 60 MHz. Specs. guaranteed from 50 to 54 MHz.
- Same functions of the TS-140S except optional VOX (VOX-4 required for VOX operation).
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The IC-970 comes fully equipped as an all mode dual bander for 144MHz and 440MHz. Expand your limits on 1200MHz with the optional UX-97 band unit or listen to the world with the UX-R96 50-905MHz receive unit.

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Reach beyond the stars, communications via satellite has never been easier. The amazing IC-970 automatically tracks uplink and downlink frequencies as the tuning control

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Dual band watch lets you receive both main and sub band audio simultaneously. Multiple scanning systems on the main and sub bands, plus 99 memories, an easy-to-read multi-function display and ICOM's DDS system create the transceiver of tomorrow. Additional features include a built-in pager, code squelch function, direct keyboard entry and ICOM's C-IV system.

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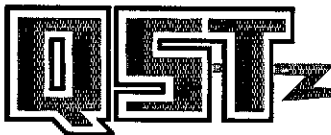
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OUR COVER

Larry Filby, K1LPS, mans his 10-GHz contest station atop Vermont's Jay Peak. See page 83 for the complete story on the Fourth Annual ARRL 10 GHz Cumulative Contest. (cover photo by Paul Wade, N1BWT)

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AEA's NEW PK-232MBX With PakMail™



Now AEA's popular PK-232 multi-mode data controller has new features you've been asking for...PakMail™ Mailbox with selectable third-party traffic, seven-character AMTOR (CCIR R.625) call identity, TDM (Time Division Multiplex) receiving for SWL's, and Prioritized Acknowledgement (ACK) protocol for improved packet performance. Compatible with almost every computer or asynchronous data terminal, you can enjoy the full spectrum of amateur digital communications with AEA's new PK-232MBX.

All Operating Modes. The PK-232MBX includes all authorized amateur digital modes available today...Morse, Baudot, ASCII, AMTOR/SITOR 476 and 625, Packet, WEFAX receive and transmit, as well as commercial standard NAVTEX automated marine information services.

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Host Mode. Only AEA provides the type of full-featured Host Mode preferred by many professional programmers for efficient control of the PK-232MBX. AEA's Host Mode programs include PC-Pakratt with FAX for the IBM PC's and compatible MS-DOS computers, COM-Pakratt with FAX for the Commodore C-64 and C-128, and now MacRATT with FAX for the Apple Mac-Intosh.

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You Deserve The Original. AEA produced the first multi-mode data controller. The PK-232 continues to be the standard against which all other multi-mode controllers are judged; the choice of critical amateurs, commercial services and government agencies. Don't settle for less than the best.

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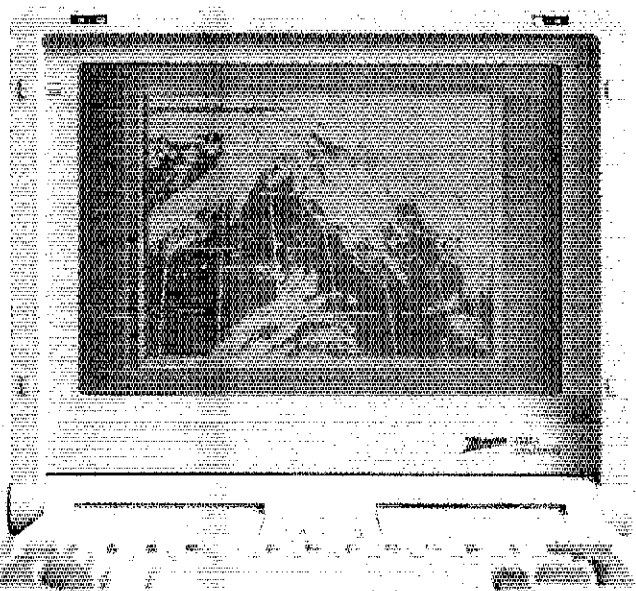
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CONNECTED TO RTTUO 418
908 62223
12 ALL
5631 RS 1287 ALL 040GB RTTUO 24-Jan 10:15:00
5458 RS 2206 ALL 040GB RTTUO 24-Jan 10:15:00
5457 RS 4632 ALL 040GB RTTUO 24-Jan 10:15:00
Enter connect path, hit CR to terminate
RTTUO
5112 RS 1612 ALL 040GB RTTUO 04-Jan Packet in South Africa.
5111 RS 1378 TUPP 040GB RTTUO 04-Jan International TCP/IP news.
5065 RS 139 ALL 040GB RTTUO 03-Jan TANDON DRIVE PARTS
2949 RS 537 ALL 040GB RTTUO 12-Sep PK232 Settings For KISS Mode
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Signal here is good, I am using an ICOM 280, PK-232, IBM Turbo XT Clone, all going into an Icom, 88 feet up.

Straight A's!

On 10-15-20 Meters

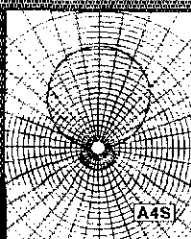
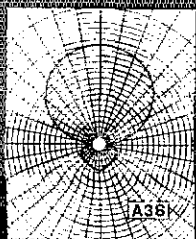
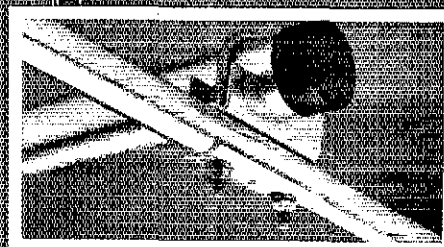
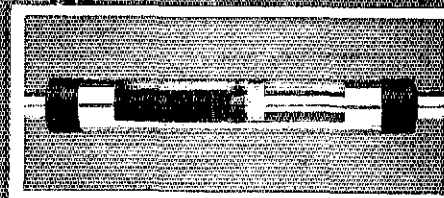
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These tribander Yagis are designed with today's technology for great performance, high strength and survivability under extreme conditions. They are light in weight with clean profiles to reduce wind loading and stress on the mast, rotator and tower. The A3S and A4S have been designed for maximum gain and front to back ratio with clean patterns optimized for broadband coverage. 30/40 meter add-on kits are available for both models. Both come with all stainless steel hardware for long life in the harshest environments.

Hear them on the air. There is a difference!

- All stainless hardware
- Separate traps
- Epoxy coated trap coils with aluminum capacitor covers for weather protection
- Filament wound fiberglass insulators for greater strength
- Tunable to optimize anywhere in bands
- Adjustable to compensate for installation variations
- Boom anti-torque pins
- No balun required
- Seamless, high strength, superior finish 6063T-832 aluminum
- User friendly instructions for quick and easy assembly

A4S



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Weight-less!

TH-26AT/46AT

144 MHz/450 MHz

Compact Portable FM transceivers

Quick! Grab one before it gets away! These new compact portables boast a whole set of brand-new features. The new DTMF encode/decode squelch system (DTSS) for selective calling, four 15 digit auto-dialer, DC direct-in capability (with optional PG-3F or PG-2W), versatile scanning functions, wide-range of DC power sources, 5 W capability, and an extensive list of exciting accessories make this radio the one to grab!

- **Frequency coverage:**

TH-26AT: 136-173.995 MHz;

TH-46: 438-449.995 MHz.

(TH-26AT modifiable for MARS/CAP.

Permits required.) TX on Amateur band only.

- **NEW! Dual Tone Squelch System (DTSS)** enables selective calling with 3-digit DTMF codes! The DTSS codes can be stored in channels 1-3.

- **Multi-function scanning.**

Band and memory channels can be scanned, with time operated or carrier operated scan stop.

- **21 memory channels.** Store everything you need, including CTCSS and DTSS codes. Ten channels can store RX and TX frequencies independently for odd split operations.

- **Frequency step selectable for quick QSX.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.

- **Five watts output** when operated with PB-8 battery pack or 13.8 volts.

- **Large top mounted LCD display**, with night-light.

- **Auto-dialer function.** Four 15-digit DTMF codes can be stored for auto-patch use.

- **T-ALERT for quiet monitoring.** Tone Alert beeps when squelch is opened.

- **Auto battery saver**, and economy power mode to extend battery life.

- **Automatic repeater offset.**

- **Supplied Accessories:**

Flex antenna, PB-10 battery pack (7.2 V, 600mAh), wall charger, belt hook, wrist strap, bottom cover.

Optional Accessories:

- **PB-5** 7.2 V, 200 mAh NiCd pack for 2.5 W output • **PB-6** 7.2 V, 600 mAh NiCd pack • **PB-7** 7.2 V, 1100 mAh NiCd pack • **PB-8** 12 V, 600 mAh NiCd for 5 W output • **PB-9** 7.2 V, 600 mAh NiCd with built-in charger • **PB-10** 7.2 V, 600 mAh (works with BC-2 wall charger) • **PB-11** 12 V, 600 mAh OR 6 V, 1200 mAh, for 5 W OR 2 W • **BC-10** Compact charger • **BC-11** Rapid charger • **BT-6** AAA battery case • **BT-7** AA battery case • **DC-1/PG-2V** DC adapter • **HMC-2** Headset with VOX and PTT • **SC-24, 25, 26** Soft cases • **SMC-31** Speaker mic. • **SMC-33** Speaker mic. w/remote control • **TSU-7** CTCSS encode/decode unit • **PG-2W** DC cable w/fuse • **PG-3F** DC cable with filter and cigarette lighter plug • **WR-1** Water resistant bag

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TS-950SD

"DX-clusive" HF Transceiver

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

• Dual Frequency Receive Function.

The TS-950SD can receive two frequencies simultaneously. The sub-receiver has independent controls for frequency step size, noise blanker, and AF gain and its own digital display.

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

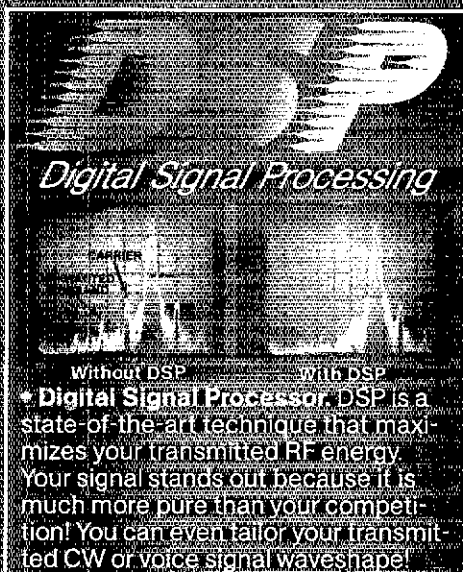
• **New high voltage final amplifier.** 50 V power transistors in the 150-watt final section, results in minimum distortion and higher efficiency. Full-power key-down time exceeds one hour.

• **New! Built-in microprocessor controlled automatic antenna tuner.** The new antenna tuner is faster and you can store the settings in memory! (Manual override is also possible.)

• Outstanding general coverage

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

The Ultimate Signal.



• **Digital Signal Processor.** DSP is a state-of-the-art technique that maximizes your transmitted RF energy. Your signal stands out because it is much more pure than your competition! You can even tailor your transmitted CW or voice signal waveshape!

• High performance IF filters built-in.

Select various filter combinations from the front panel. For CW: 250 and 500 Hz, 2.4 kHz for SSB, and 6 kHz for AM. Filter selections can be stored in memory!

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

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

• **Built-in TCXO for highest stability.**

• **Built-in electronic keyer circuit.**

• **100 memory channels.** Store independent transmit and receive frequencies, mode, filter data, auto-tuner data and CTCSS frequency.

• **Digital bar meter.**

Additional Features: • Built-in interface for computer control • Programmable tone encoder • Optional VS-2 voice synthesizer • Built-in heavy duty AC power supply and speaker • Adjustable VFO tuning torque • Multiple scanning functions • MC-43S hand microphone supplied

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Optional Accessories
• VS-2 Voice synthesizer
• SP-950 External speaker
w/AF filter • SM-230 Sta-

tion monitor w/pan display
• SW-2100 SWR/power
meter • TL-922A Linear
amplifier (not for QSK)

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Of, by, and for the radio amateur, ARRL numbers within its ranks the vast majority of active amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs.

A bona fide interest in Amateur Radio is the only essential qualification of membership; an Amateur Radio license is not a prerequisite, although full voting membership is granted only to licensed amateurs in the US.

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"It Seems to Us ..."

Rotten Operating

It's time to dust off the Wouff Hong.

Remember the Wouff Hong? It's a device almost as old as the League itself, designed so that the merest glance is sufficient to strike terror in the heart of any wayward radio amateur. Anyone guilty of poor or thoughtless operating is well advised to repent, lest the Wouff Hong be wielded upon them in unspeakable ways.

The Wouff Hong was inspired by some rotten sending overheard one night in 1917 by "The Old Man," a frequent QST correspondent revealed later to be none other than Hiram Percy Maxim himself. The first live specimen of one surfaced at ARRL Headquarters in 1919, just before amateurs were returned to the air following the World War I hiatus. To this day, members attending ARRL conventions may share its secrets by being inducted into the Royal Order of the Wouff Hong at the stroke of midnight.

If T.O.M. were still writing for QST he would have some choice things to say about how we ushered in the '90s, and some interesting thoughts about where the Wouff Hong might most profitably be put to use.

While it's not the only current example and the situation was hardly the fault of the organizers, the New Year's DXpedition to remote Bouvet Island, 3Y5X, inspired some of the worst on-the-air conduct ever heard on the amateur bands. If someone had set out to create a situation that could be used to discredit Amateur Radio at future allocations conferences, such as WARC-92 just two years away, they could hardly have done better than we did to ourselves.

The 3Y5X operators provided the first opportunity in a decade for amateurs to contact a rare and remote spot. Tens of thousands of people wanted contacts. Split-frequency operation is normal procedure for such DXpeditions: They transmit on one widely publicized frequency, and announce a range of frequencies where they are listening. This is efficient because everyone calling can hear the DXpedition station, and it works well as long as their transmit frequency is kept reasonably clear. A contact takes just a few seconds, and eventually everyone who wants a contact gets one.

Any high-profile radio operation is an inviting target for sociopaths bent on disruption. There are two million licensed radio amateurs in the world, and lots more transmitters in the hands of unlicensed people; among them there are bound to be some whose perspective on reality is not quite 20/20. Anyone who's run a successful net knows what to do about them. Ac-

knowledge that they're fouling things up, and you're stuck with them; ignore them, difficult as that may be at times, and eventually they lose interest and go away. This fringe element came out for 3Y5X, but unfortunately it was only a small part of the problem.

Also gumming up the works were operators who were having trouble figuring out how to use their equipment split-frequency. Lots of people earned themselves inadvertent, instant notoriety by transmitting on the wrong frequency. According to an FCC news release, many of them also earned themselves an FCC citation because they did so on phone, outside the US phone band. Yes, the FCC was listening, and in the first 13 days of January issued more than 240 citations to people calling 3Y5X out-of-band. FCC says, "...these violations appear to have resulted from misuse of increasingly complex amateur service equipment rather than any willful action ...". Maybe so, but may we gently suggest that a major DXpedition is *not* the time to learn how to use your fancy new radio?

A much larger problem, and one that is all the more regrettable because it was caused by people who should know better, was the *reaction* to the interference from these sources. Self-appointed policemen simply added to the bedlam, often knowingly in violation of the rules. That was just what the sociopaths wanted. We hope some of those 240 citations were sent in the policemen's direction, for they would be well deserved.

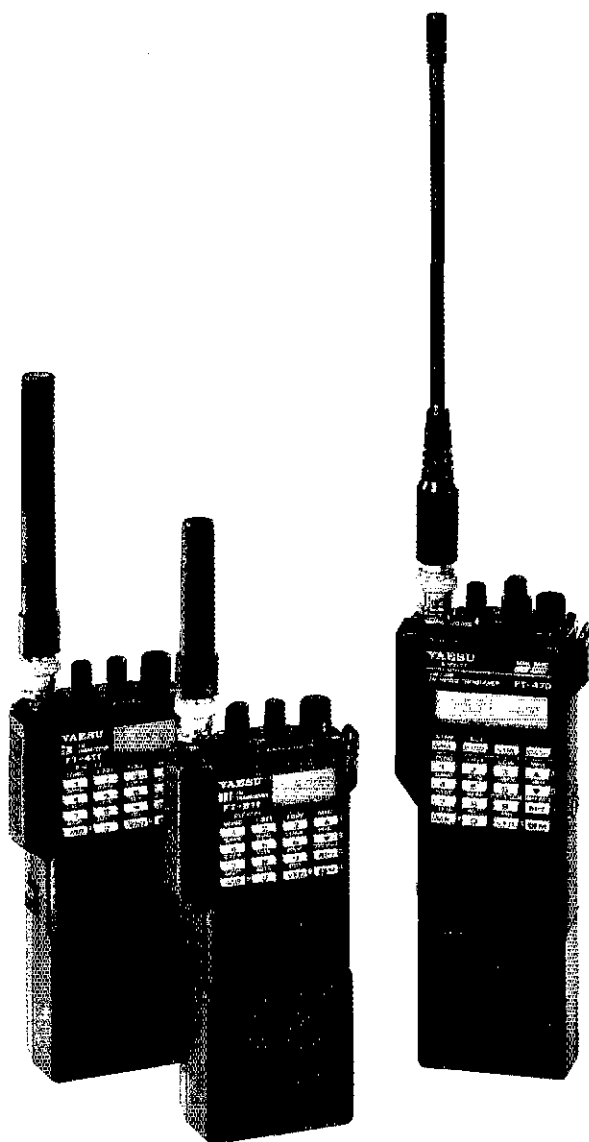
Aside from firm applications of the Wouff Hong, what can we do? The amateur community knows, more than the FCC, who the perpetrators are. We have to make it clear to our brethren that deliberate interference and other rules violations simply *will not be tolerated*. There is no safe haven for rotten operators in any DX club worthy of its League affiliation.

Some of the QRM to 3Y5X probably came from non-DXers who were frustrated by interference to their own operating from the thousands of callers roaming the rest of the band. The callers spread out a lot more than necessary, a problem that needs to be better addressed by future DXpeditions. But that *cannot* justify deliberate interference in retaliation.

There is *no* justification for deliberate interference. *EVER*. If you don't believe that, if you refuse to subscribe to that principle, find another hobby. The sooner the better.—David Sumner, K1ZZ

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2 METER HANDHELD SPECIFICATIONS	YAESU FT-411/811	ICOM IC-2SAT/IC-4SAT	KENWOOD TH-215/TH-415
Memory Channels	49	48	10
VFOs	2	1	1
Memory Channels Store Any Offset	49	10	10
Wide Receiver Frequency Range (MHz)—VHF	140-173	138-174	141-163
Wide Receiver Frequency Range (MHz)—UHF	430-450	440-450	438-450
Built-in CTCSS Encode/Decode	Included	Option	Encode Only
Memory DTMF Autodialer	10	None	None
CTCSS Paging	✓	Option	—
Programmable Battery Saver	✓	✓	✓
Backlit LCD Display	✓	✓	✓
Backlit DTMF Keypad	✓	—	—
APO, Automatic Power Off	✓	✓	—
1 MHz Up/Down Stepping	✓	✓	✓
Vinyl Case	✓	Option	Option
Scan For CTCSS Tone	✓	—	—
Built In VOX	✓	—	—
Clock	—	✓	—
Odd Split, Any Tx Or Rx Frequency In Any Memory Channel	49	10	1
Suggested Retail Price	\$406.00*	\$439.95*	\$349.95*

DUAL-BAND HANDHELD SPECIFICATIONS	YAESU FT-470	ICOM IC-32AT	KENWOOD TH-75A
Memory Channels	42	20	20
VFOs Per Band	2	1	1
Wide Receiver Frequency Range (MHz)—VHF	130-180	138-174	140-164
Wide Receiver Frequency Range (MHz)—UHF	430-450	440-450	438-450
Built-in CTCSS Encode/Decode	Included	Option	Encode Only
Memory DTMF Autodialer	10	None	None
Dual Receive With Balance Control	✓	—	✓
CTCSS Paging	✓	—	✓
Cross Band Full Duplex	✓	✓	✓
Programmable Battery Saver	✓	✓	✓
Backlit LCD Display	✓	✓	✓
Backlit DTMF Keypad	✓	—	—
Alternating Band Scan	✓	✓	✓
Cross Band Repeater	✓	—	—
Power Output on 2 Meter and 440	2.3W	5.0W	1.5W
APO, Automatic Power Off	✓	—	✓
1 MHz Up/Down Stepping	✓	✓	✓
Memory Channels Store Any Offset	42	20	20
Vinyl Case	✓	Option	Option
Odd Split, Tx Or Rx, Any Frequency In Any Memory Channel	42	20	2
Suggested Retail Price	\$576.00	\$629.00	\$549.00

UP FRONT in QST

1989 Boy Scout Jamboree

The full story on the 1989 National Jamboree appears elsewhere in this issue.



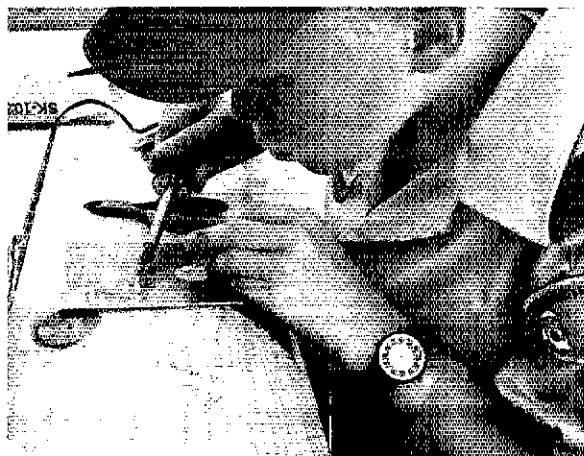
Top right: After more than two years of planning, K2BSA finally got on the air from the 1989 National Scout Jamboree at Fort A. P. Hill, Virginia, August 2-8. K2BSA originated more than 2,000 NTS messages and delivered more than 400. (K9UTQ photo)

Top left: Operations along the Merit Badge Midway included packet and FSTV...often simultaneously! (WB2JWD photo)

Left: The main attraction was the demonstration tent. Seventy-four Scouts earned their Radio Merit Badges at the Jamboree, and Scouts QSOed some 3,000 stations from around the world. All 50 states, several US territories, and even foreign countries were represented by the 35,000 participants. (K9UTQ photo)

Bottom left: QST Assistant Technical Editor, ARRL Liaison, and Eagle Scout Rus Healy, NJ2L, presents Life Scout Greg Beaver, N8LAI, a set of ARRL books in recognition of his achievements in Amateur Radio and Scouting. Greg earned his Amateur Extra Class license at the Jamboree, just before his 13th birthday. He had earned his Novice ticket just five months earlier. (K2NA photo)

Bottom right: The Boy Scout Radio Merit Badge encompasses much more than just communicating. Theory of electronic circuitry and hands-on experience are a vital part of understanding radio. (K9UTQ photo)





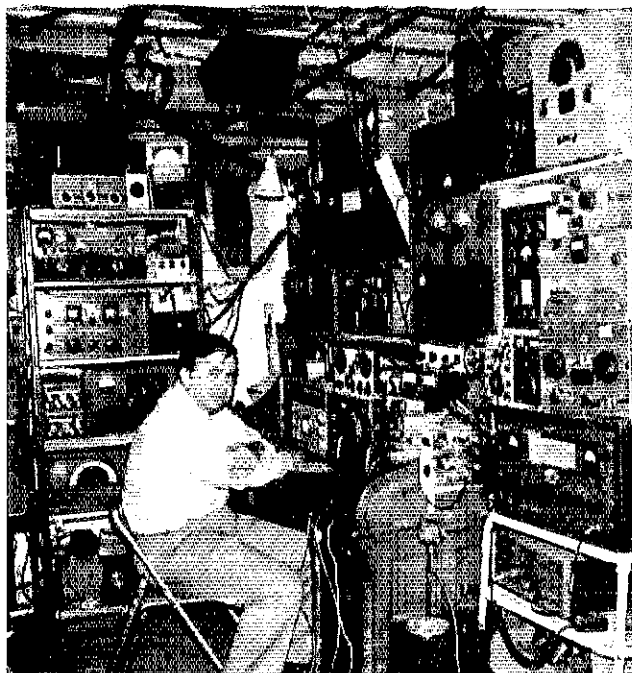
ARRL Northwestern Division Vice Director and past YLRL President Mary Lou Brown, NM7N, of Anacortes, Washington, with feathered friend.



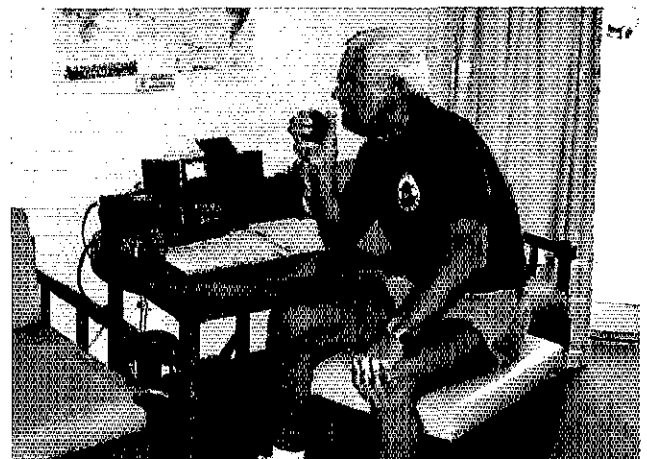
Friedl Meissner, DK6FM, of West Germany, operates the YLRL station in the hospitality room at the Coco Palms Resort, Kauai, Hawaii.

YLRL turns 50:

The Young Ladies Radio League (YLRL) celebrated its 50th anniversary last year, and Founding President Ethel Smith, K4LMB, of McLean, Virginia, was on hand at the Golden Anniversary celebration in Kauai, Hawaii, with 140 YLs from around the globe. Festivities enjoyed by members (and their OMs) included DX YLs modeling their native attire, a luncheon, prize drawings, tours to the Kauai Amateur Radio Club, the NIST atomic clock, the Pacific Missile Tracking Range, WWVH, and a final evening luau. *(info and photos courtesy of N7HAT)*



1500-year-old amateur station: A classic DXer, Jim Hanlon, W8KGI, sits amid a staggering collection of hardware that totals more than 1,500 years of age. Jim is well-known by readers of the *Classic Radio Exchange Newsletter*, and works at AT&T Bell Labs near his home in Columbus, Ohio. *(photo courtesy of W8KGI)*



In search of . . . Members of The International Group for Historic Aircraft Recovery (TIGHAR) journeyed to the South Pacific to search for clues to the mysterious 1937 disappearance of Amelia Earhart and her navigator, Fred Noonan, in the vicinity of Gardner Island. Lt Col Tom Gannon (USAF Ret), WA4HHJ/3D2HJ, of Fort Walton Beach, Florida, operates from his motel room at the TIGHAR base in Suva, Fiji. Bart Whitehouse, WA0HWP, of Littleton, Colorado, handled amateur communication aboard the expedition vessel. While Earhart's Lockheed Electra 10E was not located, the team discovered 19 artifacts now being examined for possible links to the incident. Other amateurs interested in the mysterious disappearance of Earhart may join the members of the Amelia Earhart Research Consortium net Mon or Fri at 2100 UTC on 28.51, 28.515 and 28.58 MHz, depending on band conditions. *(photo courtesy of WA4HHJ)*



CQ de UAØC/W7KYC: The Khabarovsk Territorial Radiosports Federation hosted 15 US amateurs for the USSR Radiosport contest September 22-26, 1989. Pictured operating is first place winner Kevin, WA7VTD, and (l-r) Mike, UWØCN; Rene, KX7Z; Eugene, UAØCA; and Dave, N7MYO. Khabarovsk is about 400 miles northeast of Vladivostok, in the extreme eastern part of the USSR. (K7RUN photo)

Up Front guidelines

Do you have something that belongs in Up Front in QST? Do you have a dynamic, striking photograph depicting an exciting facet of Amateur Radio? We're looking for reader submissions of material for this column. If you have a quality color photo or slide of amateurs in action, or a well-composed shot of an unusual or interesting Amateur Radio-related subject, send it in. We prefer slides or transparencies, but we can also use glossy color prints. Submissions will be acknowledged, but will not be returned. Send to Up Front in QST, 225 Main St, Newington, CT 06111.



Inverted vee? Andy Owens, N5HKM, of Dallas, supervises lowering of the wreckage after strong Texas winds modified his tower. Dave Miller, KB5GGG, of DeSoto, Texas, mans the crane. Andy plays the mandolin with his bluegrass band *Danger In The Air*. (photo courtesy of KB5GGG)



Soviet-American exchange: During a recent goodwill visit to the US Naval Base in Norfolk, Virginia, by three Soviet Navy ships, the captain of the destroyer *Otlichnyy* met George Goering, KC4ACB, of Virginia Beach and asked for help in locating a *Beatles* cassette. In exchange, he presented George with this key. (KC4ACB photo)



O'er the bounding RF waves: Dick Ellers, K8JLK, of Warren, Ohio, mentioned to the license bureau clerk that 73 is a significant number in Amateur Radio. She then reached ahead in her stack of registrations to issue him this distinctive combination. Dick enjoys "masthead marine" VHF using the bow-mounted whip with his hand-held transceiver while sailing on Mosquito Creek Reservoir. (K8JLK photo)

League Lines

The 1990 Annual Meeting of the ARRL Board of Directors was held in Hartford, Connecticut, on January 19-20. See *Moved and Seconded*... on page 55 and the article on page 53 for complete details on the meeting.

At its February 8 meeting, **the FCC is expected to give consideration to a Notice of Proposed Rule Making on a codeless license.** Check W1AW bulletins for late-breaking news.

We've entered a new era in amateur space communications. The next generation of amateur satellites, UoSATS D and E and four Microsats (PACSAT, WEBERSAT, LUSAT, and DOVE), began their journey into space from the launch site in Kourou, French Guiana on Sunday, January 21. Once in space, UoSATS D and E became OSCARs 14 and 15 and the Microsats became OSCARs 16-19. The Happenings column on page 60 of this issue details this historic event.

The FCC issued Notices of Violation to more than 240 amateurs for transmitting phone emissions on frequencies not authorized for phone operation. The FCC stated that "These transmissions violated Section 97.305(c) of the Commission's rules, thereby creating interference to an amateur station on Bouvet Island. Amateur service stations were cited for these violations during the period between January 2-13, 1990."

The next **ARRL open house** will be held in conjunction with the Newington (CT) Amateur Radio League's flea market on Sunday, June 3, from 10 AM to 4 PM. You're invited to visit ARRL HQ and tour the newly renovated W1AW.

W1AW will be on the air all day on March 10, thanks to the Meriden (CT) Amateur Radio Club. Operation will begin at 1300 UTC. This will be the first organized multiband operation from the newly renovated station. Planned frequencies include: SSB—28.35, 21.25, and 14.25 MHz; CW—14.04 and 21.04 MHz. An SASE to ARRL HQ will speed up your request for a QSL card.

Attention young artists: If you are between the ages of 8 and 18 and have an interest in electronics, we'd like to showcase your talent and originality. **The ARRL is sponsoring a national art contest** with the theme "Youth in Amateur Radio." Winning entries will be featured in *QST*. Entries deemed appropriate will be forwarded to a worldwide contest sponsored by the International Telecommunication Union in Geneva, Switzerland. For a copy of the rules, send an SASE to ARRL, Educational Activities Branch, 225 Main St, Newington, CT 06111. The deadline is April 15, 1990.

This is a banner year for the Shuttle Amateur Radio EXperiment (SAREX)! **Two NASA Shuttle missions will carry radio amateurs into space.** Dr Ron Parise, WA4SIR, has been cleared to operate voice and packet radio on STS-35 in May, and Lt Col Ken Cameron, KB5AWP, has been authorized to operate voice, packet radio, and amateur television aboard STS-37 in November. An ARRL Foundation grant provided more than \$8,000 worth of hardware to be carried on the shuttle. League involvement in the project now shifts to an informational and educational role.

There are two new faces at ARRL HQ. Barry Shelley has joined the ARRL staff as Business Manager, and Brad Thomas, KC1EX, has come aboard as Advertising Manager.

Call for papers: **Papers are invited for presentation at the ARRL 1990 Educational Workshop**, scheduled for Saturday, June 9, at the ARRL National Convention in Kansas City, Missouri. Topics include all aspects of Amateur Radio recruiting and instruction such as one-on-one tutoring, motivational techniques, PR ideas, and working with seniors, the disabled, and youth. If you're interested in presenting a paper, contact Educational Activities Coordinator Rosalie White, WA1STO, at ARRL HQ, and request an author's kit. Camera-ready papers are due at ARRL HQ by April 27.

The FCC has amended its rules by expanding the 6-meter repeater subband from 52-54 MHz to 51-54 MHz to permit establishment of additional repeaters to meet increased demand. The Commission stated that voluntary band plans will assure adequate protection for weak-signal work in the DX window and other amateur uses. Details will appear in the April *QST* Happenings column.

The FCC has approved use of the current version of Form 610-A, dated August 1986, through July 30, 1992. Form 610-A is used for application by an alien Amateur Radio licensee to receive a reciprocal operating permit.

Job opening no. 1: **The Technical Department at HQ needs an Assistant Technical Editor.** We are looking for a licensed, experienced amateur with a Bachelor's degree in science and engineering, or equivalent experience. The successful candidate will be able to write and edit effectively, have a solid grasp of electronic fundamentals, and be able to do library research. The ideal candidate will have experience in preparing material for publication, and with word processing on a personal computer. Excellent benefits. Starting salary range is \$27,300-\$30,000. Contact Joel Kleinman, N1BKE, at ARRL HQ.

Job opening no. 2: **A new position, Educational Correspondent, has been created in the Educational Activities Branch of ARRL.** Candidates should be licensed amateurs who would enjoy helping new hams and instructors by mail and on the telephone. Starting salary is \$19,344. Send resume to Rosalie White, WA1STO, at ARRL HQ.

Earthquake!

Amateur Radio responds to the northern California disaster.

Compiled by Steven Ewald, WA4CMS
Assistant Public Service Manager

The following articles and first-person accounts are representative of the outstanding efforts put forth by Amateur Radio operators during the aftermath of the October 17, 1989, earthquake.

The Ultimate Emergency Test

We hams pride ourselves on being able to provide public service communications when we are needed. Like other emergency groups in California, Santa Cruz ARES members have often pondered the consequences of a major earthquake. Like many of you, we have prepared for disaster situations by participating in training sessions and drills. But, do people take these exercises seriously, or are they just another fun activity—like DXing, Field Day, transmitter hunts, and QSO parties? Did you ever stop to think, “Gee, if this were the real thing, what would I actually do?” There are times when events control our destiny.

At 5:04 PM, Tuesday, October 17, 1989, the third largest earthquake to hit the continental US this century struck Santa Cruz County, California. Measuring 7.1 on the Richter Scale, the quake's epicenter was located just eight miles from the center of Santa Cruz. Heavy damage occurred along a 75-mile length of the San Andreas fault—extending north to San Francisco and Oakland, and south to Hollister and Salinas. Damage exceeded \$7.1 billion, making this the most costly natural disaster in US history.

When the shaking stopped—a mere 15 seconds later—592 homes had been destroyed countywide, 2,069 suffered heavy damage, and 9,210 had minor damage. Some 668 mobile homes were destroyed or received major damage. Nearly 10,000 people were displaced from their homes, and two months later, 3,000 remained homeless. Thankfully, only six people died in the county.

The Disaster Area

Santa Cruz County, situated on the Pacific coast about 60 miles south of San Francisco, has a population of 230,000. The principal cities are Santa Cruz and Watsonville.

When the quake ended, the county was effectively isolated. Slides and damaged bridges closed most highways and rural roads to the east and south. Electric power, tele-

phone service and radio communications were disrupted.

Quake Communications

Initially, radio amateurs provided the only communications between the county Emergency Operations Center (EOC) and many field locations. These included hospitals, Red Cross shelters, adjacent county EOCs and the State Office of Emergency Services in Sacramento. Reports were received that Watsonville Community Hospital had been damaged. That hospital had recently installed a 2-meter base station. John Rider, N6TYH, came on the air from Watsonville, and we immediately sent him to the hospital. He had the hospital station on the air a few minutes later. The telephone system was out, as was their main emergency generator. Hospital personnel were already evacuating critical-care patients from the third and fourth floors of the building. We requested ambulances, including units from the Army at Fort Ord and from Monterey County, to the south. Movement of patients to the other two county hospitals and to Monterey County began. Medical helicopters were requested from as far away as Stanford Medical Center and from Fort Ord. Some of these choppers were



Bindy Beck, KC6AAN, is shown operating out of a parked car in front of the Moscone Convention Center shelter. (N6VAW photo)



Marilyn Bagshaw, N6VAW, crosses a police line to get to the Marina Middle School emergency shelter. (KC6AAN photo)

unable to establish radio communication with the hospitals for landing clearance. Amateur Radio was used to relay landing instructions via their home bases. Jamie Finch, W16F, was sent to pick up a portable generator for a nearby food-processing plant. That generator was set up on the lawn of the hospital to power lights for emergency surgery.

Many gas leaks and broken sewer and water lines were reported via ham radio. Ham "shadows" accompanied search teams as victims were sought in damaged buildings. Structural engineers and inspectors were airlifted by military aircraft from other parts of California. Amateur Radio was used extensively in coordinating these operations. Early on the morning following the quake, ham "shadows" accompanied these personnel as they began evaluating the damage in Santa Cruz and Watsonville. As in many disaster situations, a major part of the Amateur Radio operations involved support communications for establishing, staffing, and provisioning Red Cross emergency shelters. ARES support of Red Cross activities continued for eight days.

Personnel

At the peak of our operations, we were simultaneously manning 25 locations in Santa Cruz County—almost half were Red Cross shelters. Many locations required 24-hour coverage, and some needed two or more operators. From the very beginning we experienced great difficulty with staffing. More than 370 hams were utilized during our eight days of operations. Many worked multiple shifts—some worked all eight days. Although many local hams contributed their services, we were largely dependent upon volunteers from other areas. Some came from as far away as Los Angeles and San Diego. Others came from Nevada and Oregon. Most came from the adjacent counties of Monterey and Santa Clara, where 'quake damage was much less severe. If those counties had needed more hams for their own emergency operations, our situation could have become even worse. As it was, many people were forced to work very long shifts under extremely stressful conditions.—Wayne Thalls, KB6KN

Radio Amateurs Take Leading Role in Communications

After checking into the local repeater (147.33 MHz) in Marin County, I turned on my car radio and listened to reports of the horror, devastation, and tragedy that had occurred on Tuesday, October 17. The earthquake that rocked the Santa Cruz area had toppled a mile-long stretch of the Nimitz freeway and a section of the I-80 Bay Bridge, and caused an out-of-control fire in San Francisco's Marina District. I sat in disbelief.

How could this happen? I monitored our frequency, listening to the operators reporting in with emergency traffic concerning the collapse of a false ceiling in a major grocery store in Novato. I later heard on the repeater that, thankfully, no one was injured in the incident.

I reported to my designated operating station. Another Marin Amateur Radio Club



Jim Rich, N6SZQ, mans the radio at the American Red Cross headquarters in Sacramento. (WA6CFI photo)

operator beat me to the task of providing communications to Novato Community Hospital. Marin County is north of San Francisco. The county survived the 'quake with very little damage. About 100 members of our local Radio Amateur Civil Emergency Service (RACES) were stationed at strategic locations throughout the county, and operated for three hours on mostly simplex frequencies, with the three hospitals communicating through the repeater.

Knowing of the damage in San Francisco, we monitored Bay-area traffic to find a way to put our resources to the best use. Our resources consisted of operators who established health-and-welfare nets on all frequencies, and provided operators to come to the shelters and operate on the San Francisco emergency frequency of 145.15 MHz.

San Francisco had five operating stations, four at shelters for the homeless and one as net control. The four stations were the American Red Cross Building, Marina Middle School, Moscone Convention Center, and St Ignatius High School. The net control was in contact with the four other American Red Cross shelters: Alameda, Oakland, San Jose, and Santa Cruz/Watsonville areas. The San Francisco American Red Cross Building also housed the net control operator during quieter times. San Francisco stations used the 145.15-MHz repeater, occasionally passing simplex traffic on the same frequency. The repeater is located on the ridge above Daly City near the San Francisco airport.

At each station there were three to five hams: one or two operators monitored the repeater frequency and the remaining were used as runners on different simplex frequencies, obtaining and dispersing information to the proper officials. Many operators worked back-to-back eight-hour shifts during times of high traffic.

Approximately 50 radio operators volunteered at the shelter sites in San Francisco. They began showing up at their operating stations immediately after the 'quake. This procedure was practiced at an April 19 earthquake drill. Ironically, the RACES group had

practiced in the same buildings that were now functioning as real earthquake-relief centers.

Twelve to 15 operating sites were eventually established throughout the city of San Francisco. Each operator brought a 440-MHz or 2-meter rig with antenna and enough battery power to last 12-24 hours.

Preparing for an emergency of this scale sometimes can become overwhelming. I had never met the other operators who I was working with, but similar training taught each of us how to log our messages down to the very last detail and establish control in a chaotic environment. The emergency communication operations in San Francisco continued 24 hours a day for seven days. The telephone company restored service to each of the shelters by 2 PM PST on Tuesday, October 24, 1989.—Bindy Beck, KC6AAN

NTS and Packet Radio Put to Test

On that ill-fated day in October, I was browsing through the messages on the local packet system, when suddenly, shortly after 5 PM, my chair started to bounce up and down. At first, I thought it was just one of the many little earthquakes that any native Californian has grown accustomed to riding out with little concern.

Suddenly, the motion began to get violent

This building, like many others in downtown Santa Cruz, suffered severe damage during the earthquake. Many were later demolished because of structural inadequacies. (KB6KN photo)



and things began flying around the shack. A large bookcase to my left fell over and spilled hundreds of books and QSTs across the floor. Loud noises from stuff falling over in my storage area behind the shack convinced me it was time to get out of the building.

My first thought was power. I got out my generator and started setting up on the road next to my shack. My neighbors came over and helped me with the gasoline. I started the generator, and let it run for a while. I got out my hand-held and began to monitor the 2-meter repeater in our area. There was a lot of conversation on the air as the hams began to check in. This was a good sign because the repeater is located at the same site as the packet node that I use for forwarding packet messages. The repeater is at a county site that has emergency power, so I had assumed it would be on the air. In a few minutes, I had the VHF/UHF side of the BBS in operation. Steve, WA6HAM, was bringing over another generator to get the HF station going. The first step was to find out what nodes and BBSs were on the air. I began working my way through the network to find out who was there.

As the sun came up the next morning and the HF bands started to come alive, the traffic began to pour in. W9ZRX connected to me and started a two-hour forwarding session. The inbound volume was unbelievable. At times, I had W9ZRX on 20 meters, W3IWI on 15 meters, K6IYK from southern California on the 220-MHz port, and AL7IN from Oregon on the 433-MHz port—all forwarding to me at the same time! I only had two outbound ports to try to handle the four inbound ports that never seemed to slow down. I called for help, and remote SysOps Brad, WA6AEO, and Dennis, KA6FUB, came over to the station. For the next 48 hours, the BBS was manned around the clock. By the weekend, we had handled more than 5000 messages, most of which had been forwarded to the Santa Cruz and Bay areas.—*Low Jenkins, N6VV*

Earthquake Observations from Afar

As I drove home on the evening of October 17, someone announced the San Francisco area's major earthquake on a local repeater. My first thoughts were of relatives in the South Bay area; and my second was whether N6VV's station east of Oakland had survived.

I guessed we were about to participate in the most intensive use of packet for transmission of NTS messages that our fledgling mode had ever seen. Most long-haul message forwarding in the US takes place on HF. N6VV is one of the major HF Gateways in northern California. Without his big signal, I feared we would quickly develop a large backlog.

The three major HF BBSs in the area,

N6VV in Pleasant Hill, N6MPW in Ben Lomond, and N6IYA in Felton, survived. Despite the lack of commercial ac power, all three BBSs returned to service quickly, running on standby generators. These hams, along with many others, really deserve a hand.—*Dave Zeph, W9ZRX, Indiana HF Gateway SysOp*

Disaster Duty

At 5 AM, Thursday, October 19, I left my Sacramento home for Oakland, at the request of the Alameda County ARES group. I soon joined up with eight other local hams in a convoy heading east. Our mission: to support the disaster relief efforts of the American Red Cross by providing radio communications.

The food service manager sent a message asking for the status of the long-overdue "500 hand-held hot meals."

We reported to Oakland Red Cross headquarters. After initial confusion and delays, our leader, Frank, N6SNO, received our assignments. I was sent to the Red Cross facility at Bunch School—the site of the collapsed section of the Nimitz freeway in Oakland. I arrived at 9:15 AM, and looked up at the pancaked double-deck highway. Rescue and construction workers, police, fire and medical personnel swarmed over the site. Two men walked on top of the mangled structure, directing a crane. A helicopter hovered in the distance. I turned and drove through the school yard gate.

I parked near the entrance to the gymnasium and was briefed by the operator I was relieving. He introduced me to Gary Wilkes, the Red Cross liaison at the facility. Gary explained their mission: to receive, prepare and deliver food to the workers at the collapsed freeway, 1½ blocks away.

I established contact with Red Cross headquarters on my car's 2-meter radio, then took my hand-held and went inside the gym. Volunteers were bringing in food and preparing sandwiches.

For the next hour, I handled routine traffic. I heard N6UGO report that an estimated \$250 million in damage had been done to 22 buildings in Oakland. For the next 45 minutes I maintained contact with Gary by holding a Red Cross CB hand-held in one hand, while in my other hand I held the microphone of my mobile rig.

I sent more messages concerning supplies

I sent more messages concerning supplies left behind at a closed shelter, people offering to help, and the efforts of Red Cross officials to secure hard hats and masks. The food service manager sent a message asking for the status of the long-overdue "500 hand-held hot meals." Sometimes a message would go out requesting a response that would never come.

Aaron arrived at 4 PM, and I took a short break. Gary told me that the phone company had agreed to provide hard hats, and that some supermarket employees would bring them across the bay, via the subway. Gary was a resourceful, energetic Army man—a natural leader, who overcame numerous obstacles during the day.

Aaron and I passed more traffic. Then a truck arrived with food and hard hats. I asked about our relief, which was expected at 4 PM. A huge crane rumbled slowly down the street outside the school yard.

My relief arrived on a motorcycle, at 6 PM. I was briefing him when I saw Gary, Gordon, and Brian, the facility manager, walking toward me. They were accompanied by a middle-aged man in a jump suit decorated with badges and patches. He was a congressional aide. Six congressmen had flown in from around the country, bringing sophisticated infrared imaging equipment to look for survivors. He wanted to know where they should deploy. He also wanted to know where the congressmen were.

I broke into the net with this priority traffic for the Oakland EOC. We all stood around my car, waiting for a reply. A few minutes later a call came over the speaker, mounted on my car's roof: "Regional Headquarters to Bunch School. Please detail the number of meals you have served today and yesterday. Break out by breakfast, lunch, dinner or snacks, hot or cold. We also need to know...."

We broke out laughing. As soon as I could, I broke in: "Please stand by, headquarters. We are waiting for priority traffic concerning a visiting congressional party."

Five minutes later the answer came back from the EOC: The congressional aide should report to the Incident Commander at Cyprus and West Grand. I acknowledged the message, and looked around for the aide. He was gone. I sent out a runner to find him. Five minutes later he returned, to tell me that the aide had left ten minutes ago, saying, "I know where to go."

Brian winced when he learned of this. He gave me my final message, which I wrote down and gave to my relief to pass: "Please ask the IC to report to us when the congressional aide arrives at his location."

Based on what I saw hams from all over northern California do in the week following the deadly earthquake, I'd have to say that Amateur Radio has paid its dues in full.—*Jim Rich, N6SZQ*

What Do You Get for Your Membership Dues?

Every year since 1981, the League has stretched every dollar of membership dues a little farther.

By David Sumner, K1ZZ
Executive Vice President, ARRL

ARRL dues go up April 1, for the first time in nine years. It's a modest increase in the annual rate—\$5.00 for most members, \$4.00 for those eligible for the senior citizen rate, \$2.00 for family and blind members, and either \$1.25 or \$2.50 for youth members depending on their age. The postage differential for sending *QST* to members outside the US and possessions will also increase slightly, from \$11 per year to \$12.

The 20% rise in the regular dues rate compares very favorably with the 50% inflation that has occurred since the last increase, in 1981. The League's Board of Directors and staff are proud of how we've managed to contain costs while at the same time answering the call for an ever-wider range of activities and services. For example, Headquarters is now providing a broader range of services to more members than in the past, and is producing more publications, without additional staff.

Every year since 1983, we have printed the audited financial statements for the League in *QST*. We'll do it again this year, probably

in the June issue (assuming the audit is completed no later than April). Not every member is interested in wading through all those numbers, but even those who aren't have been reassured to know that the state of the League's finances has been verified independently and the results made available for all to see. And most of you, we think, are interested in how your League's dollars are put to work for Amateur Radio.

More than Just Dues

Membership dues are not the only source of revenue for the League. In 1990 (see Fig 1) we expect to receive just over \$10 million in revenue, but only \$3.7 million will come from dues—about \$375,000 of that as a result of the rate increase. The next largest source of revenue is the sale of publications: the *Handbook*, *Tune in the World*, the *License Manuals*, and dozens of other books and supplies. Of course, most of the \$3.3 million we expect to see from this source will go toward the costs of editing, production, printing, and distribution. The third major source

of League revenue is the sale of advertising space, mostly in *QST*. Operating revenues (exam fees, outgoing QSL bureau fees, awards fees, etc) will account for less than 3% of the total, and other revenues (voluntary contributions, interest and dividend income, etc) for another 3%.

More than a Magazine

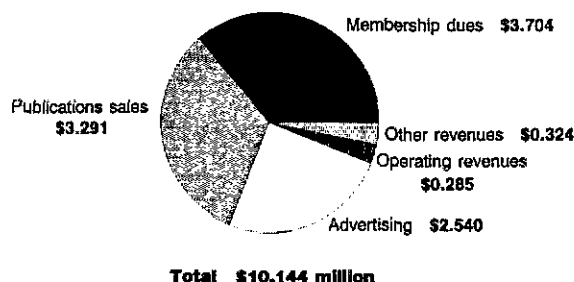
Producing a monthly membership journal of the quality of *QST* isn't cheap, but the direct cost (not including overhead) of doing so will be less than 30% of the League's overall budget for 1990 (see Fig 1). Producing our other publications, which not only are an important source of revenue but also make a major contribution to the League's educational mission, will account for another 26%. The remainder of the budget comprises the essence of the League as a volunteer association.

In 1990, almost a million dollars will be devoted to volunteer programs: the section-level field organization, volunteer examiners, affiliated clubs, hamfests and conventions,

Expected Sources of Revenue

1990

(Millions of Dollars)



Expected Uses of Revenue

1990

(Millions of Dollars)

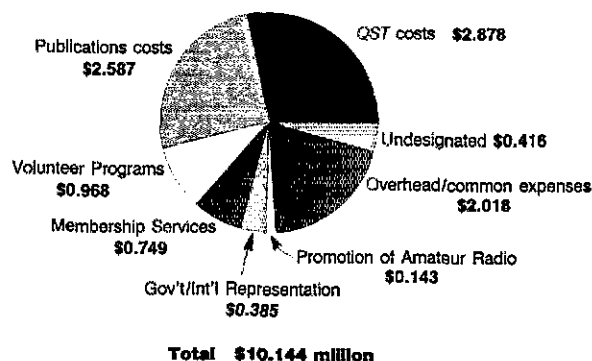


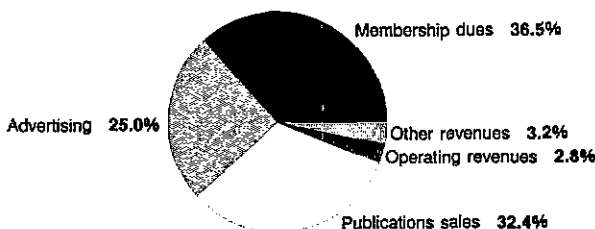
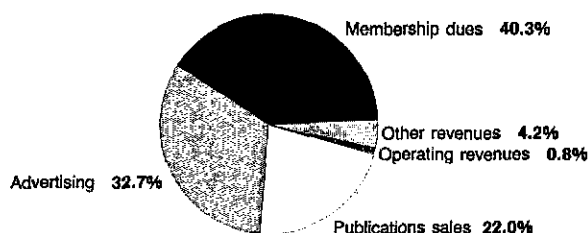
Fig 1

Major Sources of Revenue
1981

Fig 2

Major Sources of Revenue
1990

(Estimated)



instructors, public service activities, and the Board of Directors. These programs support countless hours of volunteer effort which benefit Amateur Radio and the public far in excess of the League's cash investment. The willingness of active members to contribute their time to the League's mission is our greatest asset.

About three-quarters of a million dollars will go toward providing membership services: awards programs, contests, the QSL bureau, W1AW, and other information services. These programs are designed to benefit you as an active radio amateur, to make you want to belong.

Representing Amateur Radio to the federal government and internationally is expected to cost \$385,000 this year. It could be more, it could be less; a lot depends on what sorts of new threats may arise, on how quickly our legal challenge to the FCC's reallocation of 220-222 MHz moves through the Court of Appeals, and on other things beyond our control. At 1989 budget time, no one could have predicted that our Washington team would spend five months of that year defeating license fees in Congress. But as always, what needed to be done was done, the budget notwithstanding.

Promoting Amateur Radio is budgeted at \$143,000 for the year. This is what we expect to spend on recruiting new amateurs and on acquainting the public with the good things hams do, using opportunities such as the two Space Shuttle missions carrying hams into space.

As adopted by the Board in January, the budget for 1990 left \$416,000 of the expected revenue unexpended. Following review by the newly appointed Administration and Finance Committee, some of this amount will be added to the programs listed above; the remainder will be earmarked for the General Fund or for a special reserve such as the Fund for the Defense of Amateur Radio Frequencies.

Some Things Have Changed

The League's revenue sources are a little different today than they were nine years ago (see Fig 2). Publications sales are more important, reflecting the merits of a conscious

ARRL Membership Dues Rates Effective April 1, 1990

	One Year	Two Years	Three Years
Regular, US	\$30	\$57	\$80
US, 65 & over	24	45	65
Foreign	42	81	116
Foreign, 65 & over	36	69	101
Family/blind	4	8	12
Youth 13-17, US	\$15		
Youth 12 & under, US	\$7.50		
Life, US	\$750 (eight payments of \$93.75)		
Family/blind Life	\$100		
Life, Foreign	\$1,050		

shift of resources into our publications program several years ago. Advertising revenue, up slightly in absolute terms, is lower in percentage terms—a trend that will be reversed as ad rates are adjusted (a 10% increase took effect last fall) to reflect circulation gains and increased costs.

Operating revenues, while still a small percentage of the total, have increased as a result of the Volunteer Examiner program, the outgoing QSL Bureau, and awards fees. The 1990 budget as adopted by the Board calls for \$30,000 in new revenue from DXCC award fees; a schedule of DXCC charges that favors members will be announced later.

Even when taken together with user fees for special membership services (such as awards and the QSL bureau), dues as a percentage of League income has declined—an indication that an increase in the dues rate is overdue.

You're Not a Subscriber

Unless you're reading this *QST* in a library or you bought it at a radio store, it came to you as but one of many benefits of League membership. Through your membership, and particularly if you're an active volunteer, you support a wide range of activities for the protection, promotion, and advancement of Amateur Radio.

Your elected Board of Directors is asking

you to dig just a bit deeper so the League will be on a sound footing to face future challenges. We know you'll agree that your membership in ARRL is worth it—and more.

Strays



QST congratulates...

the following radio amateurs on 50 years as ARRL members:

- George Hart, W1NJM, of Newington, Connecticut
- W. P. Sides, W4AUP, of Montgomery, Alabama
- William R. Marks, W1AP, of Jacksonville, Florida
- Liscum Diven, W7IR, of Scottsdale, Arizona
- John P. Foster, W5HNW, of Belleview, Florida
- Nelles Roth, W8UPR, of Wauseon, Ohio
- Charles M. Kugel, W4KOS, of Lighthouse Point, Florida
- Marc Molyneux, Jr, N4EM, of Mobile, Alabama
- Donald Brown, W4MY, of Atlanta, Georgia
- Philo H. Rockwood, W0VIP, of Fergus Falls, Minnesota
- Charles C. Dawson, W9CUW, of Bear Creek, Wisconsin
- Clarence S. Schultz, W0CHJ, of Junction City, Kansas
- John G. Nauman, W9CN, of Merritt Island, Florida
- Clarence A. Grimm, W9NJZ, of Bensenville, Illinois
- William N. Genematas, W8RSO, of Grosse Pointe Shores, Michigan
- Walter N. Pike, of Beltsville, Maryland
- Ward S. Atherton, W4RVE, of Fort Pierce, Florida
- Veikko K. West, K6ORP, of San Mateo, California
- George D. Meserve, W0HG, of Prairie Villa, Kansas
- Irving Astmann, W6OMR, of Mt Shasta, California
- Philip O. Malmberg, W4NOO, of Cocoa Beach, Florida
- Normand E. Tetreault, W1FO, of Wakefield, Rhode Island
- Lewis L. Blain, W6EBS, of Tulare, California

Practical Radio Aurora

Radio amateurs have known and used auroral propagation for more than fifty years. Here are some new suggestions—*practical* proposals—for making wider use of this most curious form of VHF and UHF propagation.

By Emil Pocock, W3EP
RR 3 Box 70 (Rte 207)
Lebanon, CT 06249

Radio amateurs discovered auroral propagation in 1939, and have accumulated a great deal of practical knowledge about it over the intervening fifty years. Five previous *QST* articles have laid the foundations for understanding and using this most unusual form of radio propagation.¹ These fine contributions to the radio art make a most useful introduction to auroral propagation, and readers who are unfamiliar with radio aurora will want to review them. Although usually associated with the VHF and UHF bands from 50 to 432 MHz, aurora also provides useful propagation on 28 MHz. Aurora is not often exploited on 28 MHz, but it may be especially attractive during the solar minimum, when F-layer skip at 28 MHz all but disappears.²

This article builds on previous *QST* articles in three ways. First, it explains some characteristics of radio aurora that have received scant attention in the past. These include the relations of auroral activity to the solar cycle, considerations of geographic coverage, and implications of Doppler shift. Second, some practical hints are presented for making auroral contacts in the bands above 432 MHz—something amateurs have yet to accomplish. Finally, there's a short discussion of some recently discovered aurora-related phenomena that bear watching in the future. Understand from the outset that some analyses presented here simplify complex and incompletely understood physical mechanisms for the sake of focusing on useful principles. These simplifications are noted where appropriate.

Aurora and the Daily, Annual, and Solar Cycles

More than five decades of radio-aurora observations and more than two centuries of systematic visual aurora observations have shown that auroras appear in certain

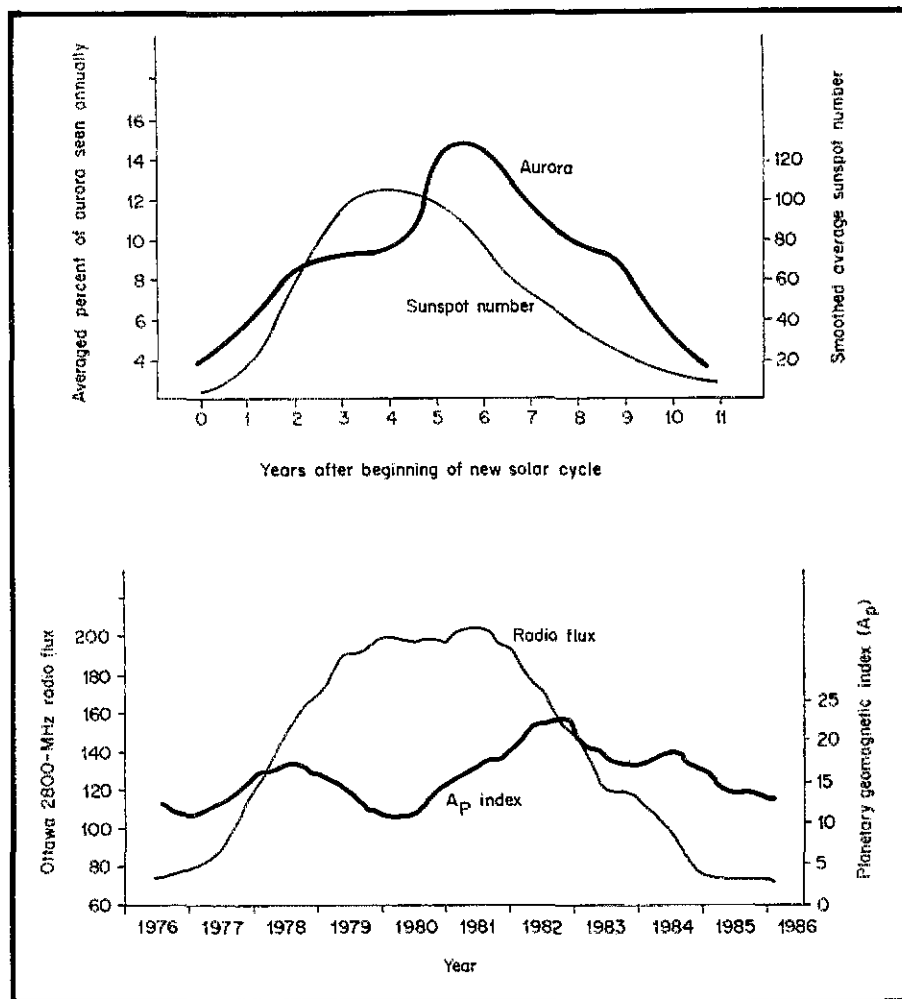


Fig 1—At A, occurrence of aurora compared with the sunspot cycle. The auroral curve shows the average percentage of the total number of auroras in the 11-year solar cycle seen each year across the cycle. Data points are four-year averaged annual observations during solar cycles 14 through 17 (1901-1945), made from the Yerkes Observatory, Wisconsin. The smoothed average sunspot numbers for cycles 8 through 20 provides a reference. Based on Chamberlain, pp 109-111. At B, planetary geomagnetic index (A_p) compared with the 2800-MHz solar flux during solar cycle 21. Source: NOAA-USA Space Environment Services Center.

daily, monthly, and annual cycles. As these have been discussed elsewhere in some detail, only the briefest review is necessary here.³ Auroral activity has two distinct daily peaks. The most prominent occurs at about 1800 local time, followed by a gradual decline toward midnight. A secondary

peak occurs at about 0200. Auroras are rarely observed at 1200 local time. There is a distinct tendency for aurora to reappear at 27-day intervals, because auroras are closely linked to general solar activity. Finally, auroras are two to three times as likely to occur near the spring and fall

¹Notes appear on page 25.

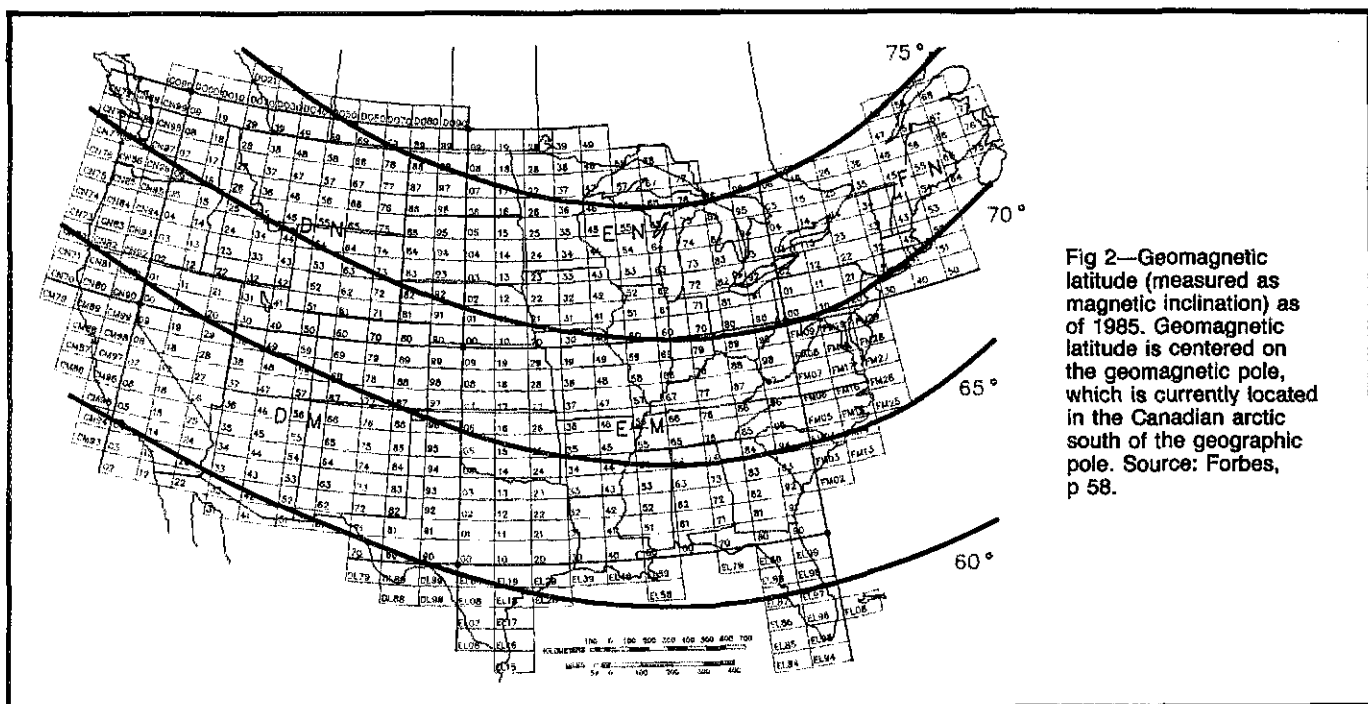


Fig 2—Geomagnetic latitude (measured as magnetic inclination) as of 1985. Geomagnetic latitude is centered on the geomagnetic pole, which is currently located in the Canadian arctic south of the geographic pole. Source: Forbes, p 58.

equinoxes, that is, in late March and late September, than during other times of the year.

A less well-known auroral cycle lags the 11-year cycle of solar activity by nearly two years. This is indicated in Fig 1A, which presents a summary of visual observations made from the Yerkes Observatory in Wisconsin between 1901 and 1945.⁴ Aurora appearances do not form a smooth curve. There is a slight plateau between two and four years into the 11-year cycle, a main peak just after five years, and a small bump at about year eight.

It is difficult to account for the odd shape of this curve, but because auroral activity corresponds closely to geomagnetic activity, the ups and downs of the planetary A index (A_p) may provide the underlying pattern of auroral activity. Quite surprisingly, a plot of the A_p index during the most recent complete solar cycle (1975-1986) reveals a very similar curve with three peaks corresponding to the features noted in the curve of visual data from early in the century. Compare Fig 1A with Fig 1B. If these data do trace a predictable cycle of auroral activity, then auroral activity will probably peak during late 1991 or early 1992, one to two years after the

currently predicted peak of solar cycle 22.

Geographic Considerations

In the northern hemisphere, auroras appear in the northern sky; they are rarely seen in southerly geographic latitudes in the northern hemisphere. Although this is generally accurate, the appearance of auroras correlates more closely with geomagnetic latitude, measured as magnetic inclination.⁵ See Fig 2. Between 20 and 80 auroras also may appear annually over the Great Lakes (75° geomagnetic latitude), to fewer than 5 per year south of Pennsylvania (70° geomagnetic latitude), but authorities do not agree on these numbers.⁶ Stations in the American West are likely to experience fewer auroras than stations at the same geographic latitude in the East because, as Fig 2 shows, the geomagnetic latitude dips considerably to the southeast in North America. The southerly extent of any particular aurora also correlates closely with the intensity of a geomagnetic disturbance. The higher the K index, the farther south, by geomagnetic latitude, an aurora is likely to appear.⁷ Table 1 compares approximate K-index values and visual occurrences of aurora with geomagnetic latitudes. The strong as-

sociation of aurora with geomagnetic activity has made close monitoring of the K and A indexes one popular technique for predicting radio aurora.⁸

Given the geographic distribution of aurora, it is often assumed that auroras spread southward from some more northerly origin. On-the-air observations seem to confirm the gradual expansion of radio-aurora activity over time, but this may be deceiving. This impression may simply be the result of how quickly operators became aware of auroral conditions, as on-the-air activity may lag considerably behind actual conditions, especially in more southerly latitudes where auroras are rare.⁹ Aurora may actually form quite suddenly over a wide area. Reports in Amateur Radio journals over the years are scattered with references to aurora beginning and ending as if a great ionospheric switch were thrown; other anecdotal evidence suggests that the intensity of radio-aurora activity peaks very soon after aurora appears. What can we make of these sometimes contradictory observations?

A detailed study of 144-MHz contacts during the great February 1986 aurora seems to show that the aurora appeared and disappeared simultaneously over a

Table 1
Distribution of Aurora with Geomagnetic Latitude

Geomagnetic Latitude	Average Annual Number of Overhead Auroras	Average K Index Required for Aurora
75°	20-40	5
70°	10	7
65°	1-2	9

Sources: See Chamberlain and Forbes.

Table 2
Claimed North American Distance Records via Aurora

Frequency (MHz)	Distance (km)	Stations	Date
144	2169	WBØDRL — KA1ZE	Feb 8, 1986
220	1842	WB5LUA — W3IY/4	Jul 14, 1982
432	1901	WB5LUA — W3IP	Feb 8, 1986

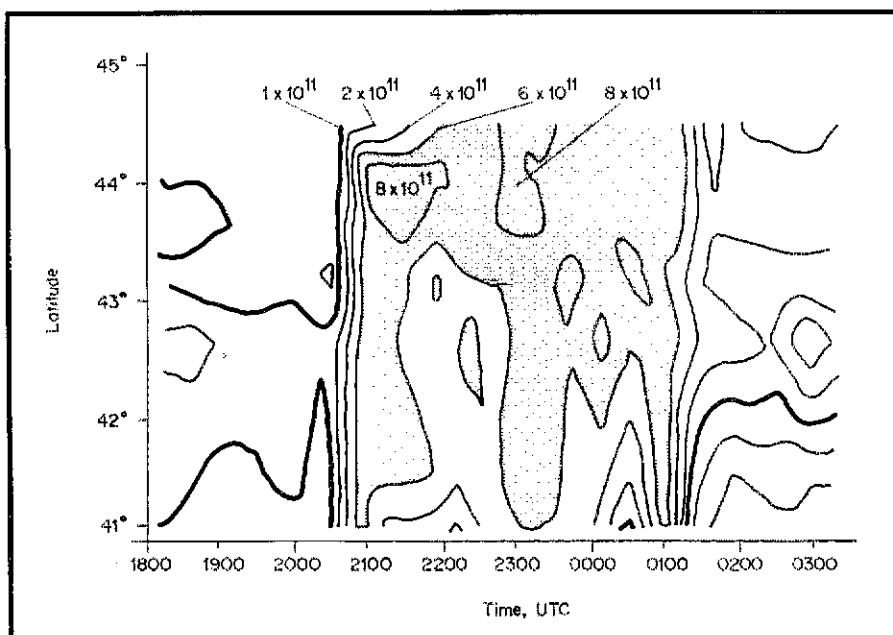


Fig 3—Electron density in the E layer at about 110 km altitude north and south of the Millstone Hill radar site in the Haystack Observatory, Massachusetts (42° latitude), on Feb 8-9, 1986. Density is measured in electrons per cubic meter (e/m^3). Note the sudden intensification over a wide north-south belt at about 2030 UTC. The shaded portion represents a density in excess of $6 \times 10^{11} e/m^3$. Source: Massachusetts Institute of Technology, Haystack Observatory.

broad geographic band, thus no real expansion took place.¹⁰ A radar scan of the ionosphere made from the Haystack Observatory in Massachusetts during the same period supports this view. Fig 3 shows isograms of equivalent electron density in the E layer at about 110 km altitude over time during that aurora. Electron density increased nearly tenfold, from less than 10^{11} to nearly 10^{12} electrons per cubic meter (e/m^3), within a twenty-minute period. This rapid ionization did not expand slowly southward, but appeared over a very broad north-south region all at once. Although the radar did not scan farther south than 41° latitude, satellite observations made at the same time indicate that these conditions extended as far as South Carolina at 34° latitude.

Over the following few hours, electron density receded and expanded twice, perhaps giving some credence to the notion that auroral activity may expand over time. The auroral session ended much as it had begun, that is, suddenly and simultaneously over a wide area—as if a great switch had been thrown once again. Although these data refer to just one period of a very intense aurora, they are typical of most auroras at middle latitudes.¹¹

Maximum Distances

Auroral propagation is basically an E-layer phenomenon. Therefore, the maximum great-circle distance over which two stations could make contact, regardless of frequency, is about 2000 to 2200 km. This

is the normal maximum range for single-hop sporadic-E and meteor-scatter contacts, for example, both of which are also E-layer phenomena. Current American distance records for auroral propagation, listed in Table 2, bear out this approximate figure, but there is still room to stretch those records. Contacts beyond 2200 km may be aided by enhancement due to favorable tropospheric conditions, or by high station elevations.

The three record contacts and many other recorded VHF and UHF aurora contacts in excess of 1500 km have predominantly east-west orientations.¹² The reason for this is not difficult to deduce. In order to make an aurora contact, both stations must be within 1100 km of the auroral front (the southern edge of auroral ionization in the northern hemisphere), otherwise the aurora will be below the radio horizon. Both signal paths intercept the auroral front at approximately equal angles of incidence, although in practice there is a great deal of leeway because the auroral front is not a precisely defined scattering medium. A typical two-dimensional geometry is shown in Fig 4. Stations A and B lie within 1100 km of the auroral front and have a common scattering region. Station C, north of the auroral front, would generally be shut out from auroral propagation; station D is too far south to use the aurora.

By extending this two-dimensional geometric analysis,¹³ it can be seen from Fig 5A that the maximum distance that

could be spanned perpendicular to the auroral front, that is generally north-south, is less than 1100 km, as shown by stations A and B. The very longest contacts are on paths just tangent to the auroral front, such as that made by stations A and C. Usually directional antennas are pointed considerably east or west of north when long-distance contacts are made. Paths significantly longer than 2200 km are probably not possible, except under the conditions noted earlier, because auroral ionization of sufficient density to scatter VHF radio signals has not been observed higher than the E layer. Stringent geometrical requirements make double-hop auroral propagation unlikely.

The Aurora Boundary Ellipse

The maximum distances a station could expect to work in intermediate directions, somewhere between 1000 and 2000 km, are shown as open points in Fig 5A. One quarter of an ellipse is formed when these points are connected. A complete ellipse appears when this process is duplicated for the west side of A and continued for various positions of the auroral front to the north of station A. The resulting aurora boundary ellipse, shown in Fig 5B, measures 2000 km along its minor (perpendicular) axis and 4000 km along its major (horizontal) axis.¹⁴ The edge of this ellipse represents the maximum distance a station at the ellipse's center could expect to span via any aurora.¹⁵

A single boundary ellipse neatly defines the approximate limits of auroral contacts in many practical tests, but some cases require slight adjustment of the ellipse orientation.¹⁶ Fig 6 shows the contacts made by Bill Maxson, N4AR, on 144 MHz over a five-hour period during the March 1989 aurora. In this case, the ellipse had to be

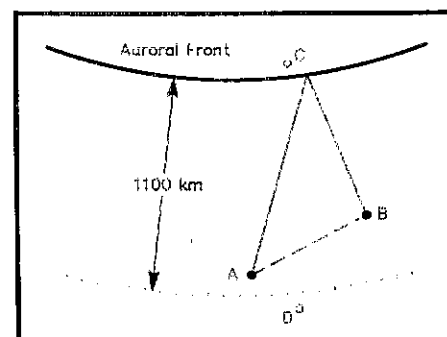


Fig 4—Two-dimensional geometry of a typical auroral contact. The solid lines show the actual signal path between stations A and B. The dashed line shows the great-circle path; the dotted line is the southern edge of the region in which stations can make auroral contacts. Station C lies north of the auroral front, and is usually unable to make auroral-scatter contacts. Station D is too far south of the auroral front to participate.

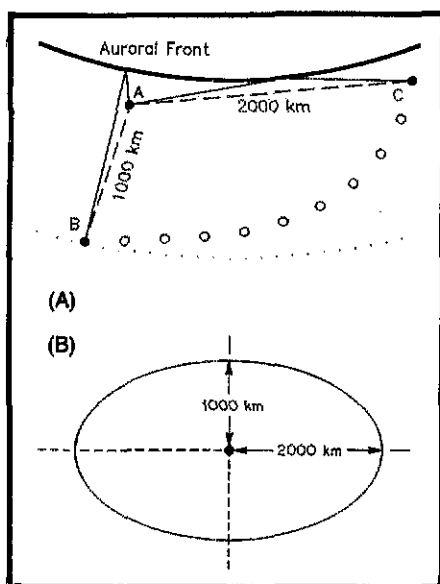


Fig 5—At A, extreme distances over which station A may communicate via auroral scatter perpendicular to and parallel to the auroral front are shown by points B and C. Extreme distances in intervening directions are shown by the open points. When connected, these points form one quarter of an ellipse. At B, the aurora boundary ellipse marks the limits to which a station at the center may communicate via aurora, assuming that all auroral fronts are parallel to the major axis.

tilted slightly with regard to geomagnetic latitude in order to fit all the stations he worked into the ellipse. The position of the auroral front probably changed substantially over the five-hour period, and for at least part of the time, the auroral front appeared at an angle with respect to N4AR's

latitude. Also note that for any particular aurora, the distance between the station and the auroral front will impose additional restrictions within the limits of the boundary ellipse. For instance, as Figs 4 and 5A imply, aurora contacts in each extreme of the boundary ellipse cannot be made simultaneously. This is because vastly different auroral-front positions are needed to work into each extreme of the ellipse. In spite of these cautions and conditions, the boundary ellipse provides a good approximation of the limits of auroral propagation.¹⁷

Doppler Shift

VHF amateurs have long noticed and taken for granted the rough quality of aurora-propagated CW signals, variously described as a buzz, hiss, or raspy sound. SSB signals are usually so garbled that they are not useful for communications, especially on 144 MHz and above. Signals also seem much wider than normal, CW signals perhaps occupying 1 kHz or more at 144 MHz. In addition to the buzz and widening effect, VHF signals scattered by aurora are shifted in frequency by as much as several kilohertz. What causes these characteristics, and does understanding them have any practical application?

The frequency shift immediately suggests that some sort of Doppler effect operates on aurora-propagated signals. The Doppler effect is that familiar phenomenon that causes the pitch of a passing train whistle to increase as the train approaches a stationary observer and to decrease as it speeds away. The Doppler effect extends to radio, light, and other forms of radiating energy just as well as sound; the principle is the same. The problem of explaining the frequency shift in radio-aurora propagation

is slightly more complicated, because neither the transmitting station (the train whistle in the classic analogy) nor the receiving station (the observer) is moving relative to one another. The relative motion is supplied by the aurora itself, for a moving reflector also induces Doppler shift. Indeed, both the frequency shift and the auroral buzz may be attributed to two separate sorts of apparent motion with the complexities of the aurora.

The shift in the center frequency of aurora-propagated signals can be explained by the mass movement of auroral E-layer electrons in the same direction relative to the earth. Such a motion exists as a result of powerful ionospheric currents that propel electrons (or at least electric charges) at velocities of 500 to 3000 meters per second (m/s) approximately parallel to the earth's geomagnetic latitudes within the auroral E layer. These velocities are sufficient to cause a frequency shift of up to 3 kHz for a 144-MHz signal and even greater shifts for higher signal frequencies.¹⁸

The magnitude of the Doppler shift caused by auroral propagation may be roughly calculated with an adaptation of the basic Doppler equation. For a moving reflector, the effect is doubled, and this is incorporated in the equation below.

$$\Delta f = \frac{2f_s v}{c} \quad (\text{Eq 1})$$

where

Δf = change in frequency, Hz

f_s = signal frequency, Hz

v = apparent velocity of the reflector, m/s

c = speed of radio waves, 3×10^8 m/s

Actual Doppler shift will be considera-

Fig 6—Contacts made by N4AR (located in grid EM77), 2217-0333 UTC, March 13-14, 1989, are shown by solid dots. Note that all contacts fall within the aurora boundary ellipse. N4AR probably worked to the very limit that auroral propagation allowed in several directions.

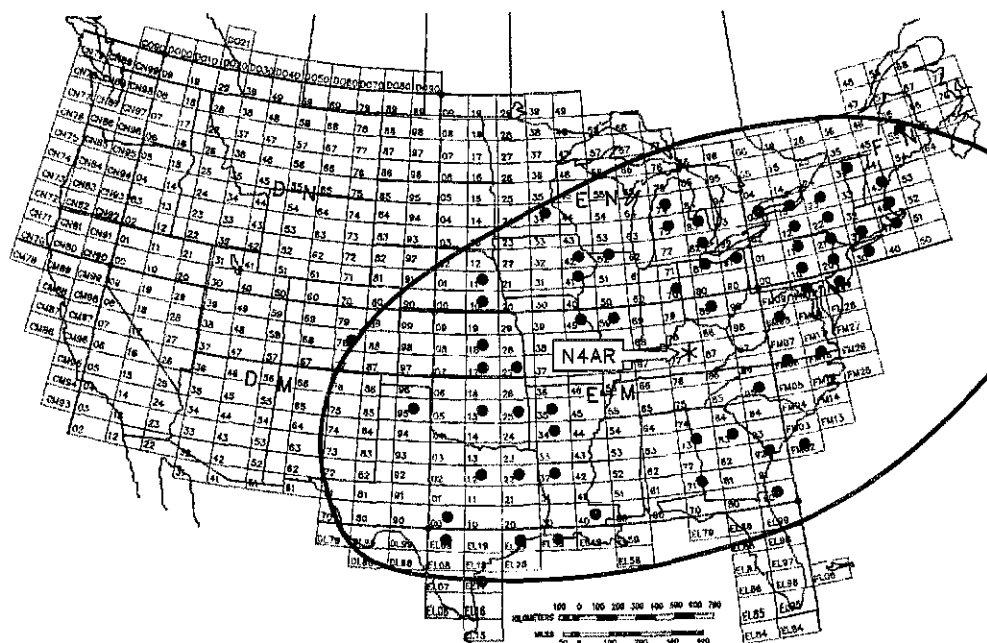


Table 3**Expected Doppler Shift (kHz) for Aurora-Propagated Signals at VHF and UHF**

	Signal Frequency (MHz)					
Equivalent velocity (m/s)	50	144	220	432	903	1296
521	0.18	0.50	0.75	1.5	3.0	4.5
1042	0.35	1.00	1.50	3.0	6.0	9.0
2083	0.70	2.00	3.00	6.0	12.0	18.0
3125	1.00	3.00	4.50	9.0	18.0	27.0

bly less than the calculations yield for electron currents of 500 to 3000 m/s velocity. Earthbound radio stations are nearly always at some distance perpendicular to the electron current, thus the relative velocity will be somewhat less, perhaps half the actual velocity. Even when equivalent velocities are used, the figures given in Table 3 still overestimate Doppler shift. The simplified equation does not take into account the index of refraction of the auroral ionosphere nor the scattering losses, both of which also reduce the Doppler effect.

The direction of Doppler shifts (higher or lower in frequency) depends on the direction of the electron flow and the relative positions of transmitting and receiving stations. Auroral electrons flow toward the sunlit side of the earth, that is, toward the east during daylight and toward the west during evening. The great reversal from east to west takes place at about 2200 local time.¹⁹ It may be possible to detect the direction of the current flow and the timing of the great reversal by careful observations of Doppler shift. Calculation of effective velocity from Doppler shift may be more difficult, because the positions of transmitting and receiving stations in relation to the current flow may not be known with much precision. There may be some clever solutions to this problem that would make for some interesting experimental observations, but in most practical applications, it is not necessary to know the actual velocity.

Determining the Doppler shift from two-way contacts involves further difficulties, because two separate Doppler shifts take place. Consider this example. K9MRI sits down on his favorite aurora calling frequency of 144.190 MHz. Because of the Doppler effect, you hear him calling CQ on 144.188, and give him a call at that frequency. Doppler shift also affects your return signal, but it is likely to be in the opposite, and at least partially compensating, direction. K9MRI may hear you close to his own frequency, even though two Doppler shifts have taken place. It is also possible that your signal will be shifted in the same direction, thus magnifying the net Doppler effect. K9MRI is not likely to hear you on 144.190 in any case, but he cannot determine from your apparent frequency the actual Doppler shift on either signal.

In practice, it may be enough to take note of the net apparent Doppler shift, and use this figure in estimating where to listen for other stations or when moving from band to band. Once the net Doppler shift on a given frequency and path are determined, the Doppler shift on other bands can be estimated with some confidence. Such information might be very useful when moving a station from band to band, for example, especially when moving from 144 MHz to 432 MHz and higher. Doppler shift can be expected to be three times greater on 432 MHz than 144 MHz, and finding a station on a specific frequency might be tricky without taking this into consideration.

Auroral Buzz and Widening

The buzz and widening that are also familiar features of aurora-propagated signals result from a second Doppler phenomenon that can be attributed to a simultaneous raising and lowering of the signal frequency over a small range. If a physical reflector was responsible, it could be expected that it would be moving back and forth rapidly relative to transmitter and receiver. As the reflector moves forward with respect to the observer, the frequency of the reflected signal increases; as it moves back, the frequency decreases. The net effect would be to transform a single pure note into a complex of closely related higher and lower frequencies—a buzz.

Scientific studies suggest that several possible movements of auroral electrons may cause the buzz effect. Random motion of electrons in the aurora may be responsible, especially as the aurora is not a single scattering plane, but exhibits features of depth. There may be many scattering regions, each contributing a slightly different sort of relative motion to the scattered radio signal. In addition, one of the primary movements of auroral electrons is downward in tight spirals from much higher in the ionosphere.²⁰ Spiraling electrons appear to both approach and recede relative to a stationary observer, and thus may contribute to the apparent forward and backward motion of the auroral scattering medium.

The apparent velocity of the relative back-and-forth motions of the auroral medium can also be calculated from Dop-

Table 4**Expected Relative Strengths of Aurora-Propagated VHF and UHF Signals**

Frequency (MHz)	Relative Signal Strength (dB)	Approximate Signal Strength Comparison (S units)
50	+32.2	9 + 52 dB
144	0.0	9 + 20 dB
220	-12.9	9 + 7 dB
432	-33.5	7
903	-55.8	3
1296	-66.8	1

An S unit is equivalent to 6 dB.

pler shift. In this case, the width of the widened signal corresponds to the Doppler shift. One half the width of the signal can be attributed to the velocity of the medium in one direction, and this Doppler frequency shift can be applied to Eq 1 and Table 3 to estimate the comparative broadening on various bands. Typical 144-MHz CW signals may appear 1 kHz wide, suggesting a medium that appears to be moving at about 500 m/s. Under the same conditions, 432-MHz CW signals would be 3 kHz wide.

Signal Strength

Signal strengths of aurora-propagated VHF and UHF signals decrease rapidly with increasing frequency. Empirical studies indicate that strength varies with the seventh power of wavelength.²¹ This can be written as a convenient equation in terms of frequency and decibels (dB) as:

$$S = 70 \log \left(\frac{f_1}{f_2} \right) \quad (\text{Eq 2})$$

where

S = comparative signal strength, dB

 f_1 = first frequency, MHz f_2 = second frequency, MHz

Table 4 provides the signal-strength relationship among the various VHF and UHF bands using 144 MHz as the point of comparison. The table assumes the same station gains across the various bands. The most striking feature of this relationship is the relatively weak signal strength likely above 432 MHz. Even during an intense aurora, when signals on 144 MHz may be 20 dB over S9, 1296-MHz signals may be barely out of the noise.

Aurora at 903 and 1296 MHz

Radar studies have shown that auroral echoes can be returned at frequencies as high as 3 GHz, suggesting that two-way amateur contacts ought to be possible above 432 MHz. No such contacts have been reported so far, but this achievement is within reach. How can it be done? Previous discussions of auroral characteristics provide some hints of what to expect. Extreme Doppler shift will undoubtedly make 903- and 1296-MHz auroral signals sound unfamiliar. They are likely to be shifted in fre-

quency considerably, perhaps 4 kHz or more. Extreme Doppler broadening may make 903- and 1296-MHz auroral signals several kilohertz wide and sound like keyed noise. One 1295-MHz radar study of aurora produced consistent Doppler shifts of 4 kHz and broadening of 16 kHz.²² Finally, signal strength is likely to be very weak by comparison to signals at 432 MHz, even during the most intense auroras. At 1296 MHz, signals will be at least 6 S units (36 dB) weaker than those of comparable stations at 432 MHz. Thus, actual signal-strength differences may be greater, because 1296-MHz amateur installations rarely equal the station gain of typical 432-MHz stations.

A pair of well-equipped stations no more than 500 km apart may have better success in making a historic 903- or 1296-MHz auroral contact by first establishing themselves on 432 MHz. When signal strength on 432 MHz exceeds 6 S units above the noise, special attention should be paid to peaking antennas for maximum signal strength. If the auroral front is very close to stations attempting such contacts, there may be some advantage to elevating the antennas. Note the direction and magnitude of the Doppler shift on 432 MHz; it is likely to be twice as great on 903 MHz and three times as great on 1296 MHz. After all the preliminaries are noted, one or both stations should quickly change over to an agreed upon frequency on the 903- or 1296-MHz band, taking into account the estimated Doppler shift. Then listen for signals that sound like keyed noise—and good luck!

Auroral-E Propagation

An aurora-related propagation mode called *auroral E* has been used for at least thirty years, but some recent discoveries have considerably expanded the scope of aurora-related propagation phenomena.²³ There may be at least two distinct types of VHF auroral-E propagation. The more familiar type affects 50 MHz several hours after normal auroral activity has ceased. In most cases, it appears only after midnight local time across the northern part of the US and southern Canada, although other paths have been spanned occasionally. East-west distances of 2000 to 5000 km are typical; signals are sometimes weak with a characteristic fluttery or watery sound, quite distinct from normal auroral signals. This type of auroral E has not been reported on 144 MHz or higher.

What may be a second auroral-E mode has been reported increasingly in recent years, most commonly on 50 MHz. This type appears during the height of exceptionally intense radio aurora sessions; signals are very strong and clear, nearly indistinguishable from familiar sporadic-E propagation. It has been possible to hear the transformation of Doppler-shifted aurora-propagated signals to the clear and strong signals that characterize auroral E over a period of less than a minute. Distances are typically limited to 2200 km, although some apparently double-hop contacts have been reported on 50 MHz. During the March 1989 aurora, as many as 100 auroral-E contacts were made on 144 MHz

for the first time, and at least one other similar episode in the Pacific Northwest during August 1989 has been reported.²⁴

There is some evidence that this second type of auroral E may affect signals at 220 MHz and even higher in frequency. Further experience with this newly discovered auroral phenomenon may reveal some of its mysteries.

Prospects

The next three years may provide exceedingly fruitful periods for radio-aurora operating and observation. The current solar cycle has already proven itself to be one of the most intense on record, and as appearance of aurora is closely related to solar activity, we might expect some spectacular conditions. The chances for aurora in the southern part of the US also appear excellent over the next several years. There is still room for distance records to be extended on various frequencies; no one has yet claimed an auroral contact on 903 or 1296 MHz. The causes of auroral-E propagation are still largely unknown, but these modes hold promise for transatlantic contacts on 50 MHz, more frequent occurrences on 144 MHz, and possibly a further breakthrough on 220 MHz. More reports are needed on 28-MHz auroral phenomena. Wherever you live in the middle latitudes, auroral propagation will undoubtedly provide considerable activity and excitement for you on the bands above 28 MHz over the next few years!

Acknowledgment

My thanks to Dr John C. Foster, Assistant Director, MIT Haystack Observatory, for providing data from the Millstone Hill 440-MHz radar, and for his accompanying explanations. The Millstone Hill incoherent-scatter radar is supported by the National Science Foundation.

Notes

¹The first account of auroral propagation can be found in "56 and 112 Mcs.," QST, May 1939, p 78. Subsequent QST articles on aurora are listed in the first 5 references.

²Aurora and related geomagnetic storms usually disrupt all forms of propagation on the amateur bands below 28 MHz. Even mild auroras may absorb high-frequency signals, especially over polar and near-polar paths.

³See the QST articles cited in the first 5 references as well as Chamberlain, pp 110-112 and 222-223, and Lange-Hesse.

⁴See Chamberlain, pp 109-113. The Yerkes Observatory is at Williams Bay, Wisconsin, at 42° 30' north latitude.

⁵For more information, see Forbes, pp 52-64.

⁶See Harang, p 6; Chamberlain, p 106; and Moore, p 16 (reproduced in Miller, p 15). The geomagnetic latitude used in Moore's figure is apparently that of total magnetic intensity; it is not comparable to the magnetic inclination used in Fig 2. See Forbes for a more complete discussion.

⁷See Miller, p 16.

⁸This is discussed more fully in Miller and in C. L. Bixby and J. Morris, "The Art and Science of DXing," QST, Jan 1979, pp 11-14.

⁹This was the tentative conclusion of a study of reported 144-MHz auroral contacts in Pocock (Proceedings, 1989), pp 157 and 161.

¹⁰Compare this discussion with Pocock (1987), p 8.

¹¹Letter from John C. Foster, Assistant Director, Haystack Observatory, Jan 9, 1990.

¹²See Pocock (1987, and Proceedings, 1989).

¹³This simplifies the case considerably, because auroral path analysis is a three dimensional problem. See Miller and Lange-Hesse, pp 516-526 and 543-559.

¹⁴This also describes a 30° ellipse. Graphic analyses are easier with a template that contains many sizes of 30° ellipses; they are commonly available from stationers and drafting suppliers.

¹⁵A similar "aurora boundary fence" is described in Jessop, pp 2.21-2.23. A slightly different set of maximum-distance curves result from a three-dimensional analysis of the problem for very northern latitudes. See Lange-Hesse, pp 550-553.

¹⁶See Pocock (1986, and Proceedings, 1989).

¹⁷Several factors may explain these anomalies. The auroral front is not a single, smooth boundary. It may be wavy, discontinuous, or composed of partially separated ionized regions. Thus, exceptional contacts may be attributed to localized auroral features. Analysis of some of the cases suggest that the 4000- x 2000-km ellipse may be a bit conservative. A 4400- x 2200-km ellipse, which would still fall within theoretical limits, may be more appropriate, and may not require different tilts to account for all contacts.

¹⁸See Chamberlain, pp 224-226; Walt, pp 121-123; and Lange-Hesse, pp 534-536.

¹⁹See Leadbrand, pp 122-123; and Petrie, pp 68-69.

²⁰See Chamberlain, p 226; and Lange-Hesse, pp 534-536. An especially graphic explanation of the spiraling of precipitating electrons within auroral storms is found in Akasofu.

²¹Miller, pp 17-18; and Chamberlain, pp 119-120.

²²Abel and Newell, pp 235-238.

²³Amateur experiences with auroral-E propagation are reviewed in Pocock (QST, 1989).

²⁴Thanks to Jerry Logan, NF7X, for bringing to my attention the August 1989 auroral-E event.

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13431 N 24th Ave
Phoenix, AZ 85029

On 160 meters, "the gentleman's band," many hams operate short base- or top-loaded verticals. They use an antenna length (height) of about 30 to 60 feet with modest radial systems. Their available space, height restrictions or finances simply do not permit installing the traditional $\frac{1}{4}$ - λ tower and a system of 120 $\frac{1}{4}$ - λ radial wires that approaches an efficiency of 100%. The name of the game is, "Make the most of what you have."

For purposes of discussion, I will use a 40-foot mast of 1.6-inch average diameter and a frequency of 1.9 MHz as the basis for various short vertical antennas. Differences between the field pattern of such a short vertical and that of a $\frac{1}{4}$ - λ vertical over the customary "perfect earth" are almost indistinguishable unless the patterns are superimposed. See Fig 1A. The $\frac{1}{4}$ - λ radiator is very slightly better at the lower angles and the 40-foot radiator is very slightly better at the higher angles.

Over real earth, with enough input power to each antenna to produce equal radiated power, the patterns will again be essentially the same, and look like those of Fig 1B. Aside from questions of efficiency, the antenna patterns should be similar for the same location.

Over real earth with a modest radial system of 10 to 20 radials, each of perhaps 35 or so feet in length, antennas in various locations will not all see exactly the same ground-loss resistance. For purposes of discussion, let's assume it to be 15 ohms—recognizing that the typical short antenna is seldom found on the "average earth," that is, in a meadow accommodating an extensive radial system. This figure is derived largely by experience with suburban backyard antenna systems. This ground-loss resistance (R_g) will appear at the feed point of each antenna in series with the radiation resistance (R_r) and any other loss resistance.

For those interested in the mathematics or in designing for a somewhat different antenna height, etc, the equations used in this discussion are given in the Appendix. There are many formulas and curves for radiation

resistance, R_r , versus vertical height of the antennas discussed here. Accurate formulas are tedious of solution (see Appendix Eq 1) and accurate simple formulas are restricted to narrow height ranges. Appendix Eq 2, however, applies to simple vertical monopoles with acceptable accuracy for our purposes up to heights of 90°. R_r is virtually independent of radiator diameter within any practical diameter range of these antennas.

The various antennas to be discussed are shown in Fig 2. The sinusoidally distributed currents are shown to scale. The value of

the base current for 100 W input to the antenna is listed as I_b . At 1 kW, it would be 3.16 times that value.

Antenna 1—The $\frac{1}{4}$ - λ Vertical

By definition, a $\frac{1}{4}$ - λ antenna has an electrical length (height) of 90°. R_r by Eq 2 is the conventional 36.6 ohms. In series with the assumed R_g of 15 ohms, a feed-point resistance R_b of 51.6 ohms results. Because efficiency is the ratio of R_r to the total feed-point resistance including all losses (Eq 4), an efficiency of 71% is indicated. These data are listed in Fig 2 under Antenna 1.

Antenna 2—The Short Base-Loaded Vertical

A 40-foot vertical has an angular height of 27.8° (Eq 3) and R_r of 2.24 ohms (Eq 2) at 1.9 MHz. Being short of $\frac{1}{4}$ - λ resonance, it exhibits capacitive reactance as part of its feed-point impedance. The capacitive reactance can be computed by viewing the antenna from the base as a transmission line terminated in an open circuit. The characteristic impedance of this "line" for the 40-foot height and 1.6-inch diameter is calculated as 365 ohms from Eq 5. Its input reactance, using Eq 6, will be $-j692$ ohms. This capacitive reactance can be canceled by a base-loading coil with an inductive reactance of $+j692$ ohms. This requires an inductance of 58 μ H (Eq 7). If the 58- μ H coil has a Q of say, 300, its loss resistance, R_c , will be 2.3 ohms (Eq 8), which will appear at the base in series with the R_g of 15 ohms and the R_r of 2.24 ohms for a total R_b of 19.54 ohms. Efficiency (Eq 4) is 11.5%. Note the triangular current distribution. The loss in any required L network to match these antennas to a 50-ohm coax feed line is assumed negligible.

We can expect the signals from this 40-foot base-loaded antenna to be down about 8 dB (Eq 9) from a full $\frac{1}{4}$ - λ antenna in the same location with the same ground-loss resistance.¹ Of course, very few $\frac{1}{4}$ - λ towers are so situated.

The ground loss is the thing which we must endure since we can do little to change it in limited space for a radial system. The

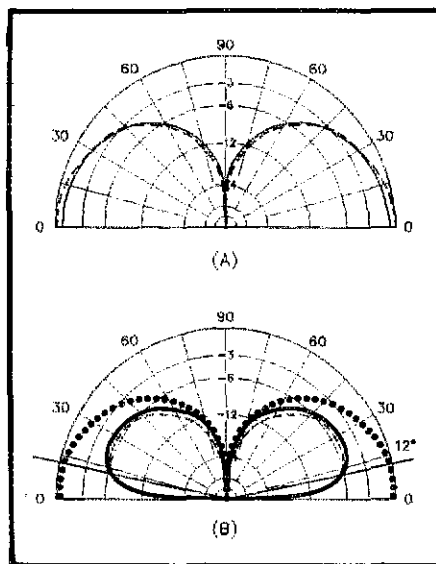
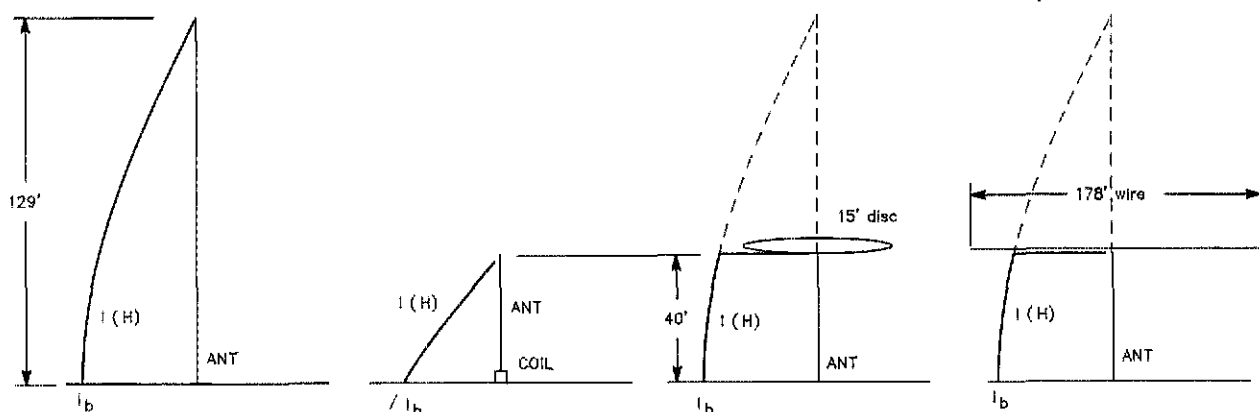


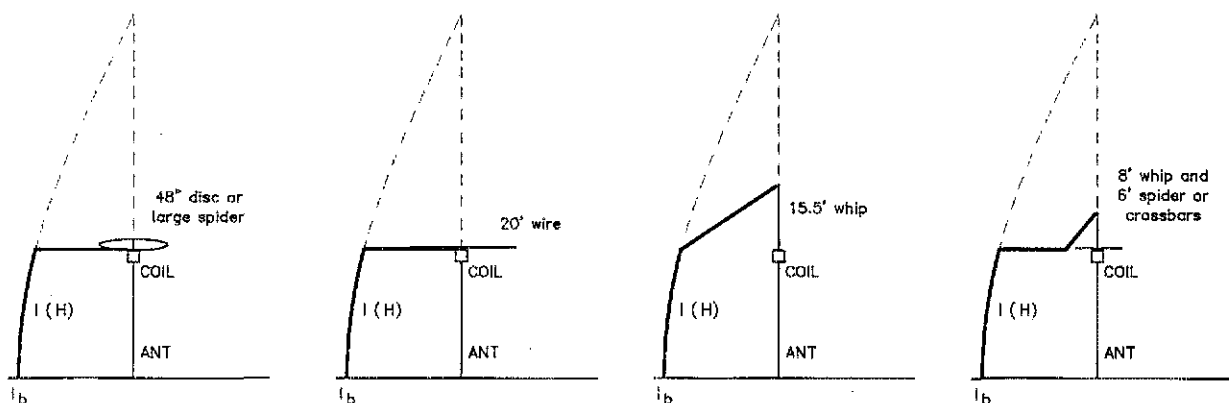
Fig 1—At A, the E-field patterns of a $\frac{1}{4}$ - λ antenna and a short antenna differ only slightly over perfect earth. For equal radiated power, the similarity is also present over real earth, as shown at B. Over real earth, both patterns are down by approximately 6 dB from the perfect-earth field value at the pseudo-Brewster angle of 12°—poor earth conditions typical of the suburban backyard surrounded by houses. (Patterns calculated with MN).

Solid lines—Patterns for a short vertical antenna.
Broken lines—Patterns for a $\frac{1}{4}$ - λ 160-m vertical antenna.
Dotted lines—Pattern for a $\frac{1}{4}$ - λ antenna over perfect earth.

¹Notes appear on page 30.



Antenna no.	(1)	(2)	(3)	(4)
R_r	35.6	2.24	7.96	7.96
R_g	15	15	15	15
R_c	—	2.3	—	—
R_b	51.6	19.54	22.96	22.96
100 W I_b	1.39	2.26	2.09	2.09
P_r or R_{eff}	71	11.5	34.7	34.7



Antenna no.	(5)	(6)	(7)
R_r	7.96	8.22	7.96
R_g	15	15	15
R_c	4.6	4.6	4.6
R_b	27.56	27.82	27.56
100 W I_b	1.90	1.90	1.90
P_r or R_{eff}	28.9	29.5	28.9

Fig 2—The antennas described in the text are shown with their current distributions, radiation resistances R_r , assumed ground-loss resistances R_g , coil loss resistances R_c (if any), total base input resistances at resonance R_b , base currents I_b for 100 W input to the antenna, and efficiency in percent. The efficiency percentage is the same as the radiated power in watts.

other factor, R_r , however, is something we can change.

Antenna 3—Capacitive Top Loading

At higher frequencies, a capacitive top hat is often used to increase the radiation resistance of a short antenna and bring it to $1/4\lambda$ resonance. This would eliminate the need for the base loading coil with its 2.3

ohms of loss resistance. The radiation resistance of the base section of a 40-foot top-loaded vertical can be calculated by Eq 1, but again a simpler equation (Eq 10) yields values sufficiently accurate for our purposes. For this antenna an R_r of 7.96 ohms results. This increases efficiency to 34.7% for a gain of 4.8 dB over the base-loaded system.

Shown in Fig 2 as Antenna 3, the improvement can also be seen as the change in current distribution compared with that of Antenna 2. The current times the length is the area under the current curve along the antenna. Power radiation is proportional to the square of this area, so the power radiated by Antenna 3 is 3 times that of Antenna 2 for the same input

power—a gain of about 4.8 dB.

The top loading seemingly replaces the antenna portion and current distribution shown in broken lines. Therefore, some interpret top loading as increasing the effective height of an antenna. The top-loaded antenna, however, will not have the R_r implied by its $\frac{1}{4}\lambda$ resonance.

The 40-foot mast, viewed figuratively from the top as a 365-ohm transmission line, appears as a short-circuited line. The bottom end is terminated in an impedance that is very low compared to its characteristic impedance. Using Eq 11, a short-circuited line that is 27.8° long with a Z_0 of 365 ohms has an input impedance of $j192$ ohms. A capacitive reactance of 192 ohms would bring it to resonance. The corresponding capacitance is 436 pF by Eq 12.

A solid thin disc provides just about the highest capacitance available for a given area. Depending on the method used to calculate the disc size, it will be approximately 15 feet in diameter. The customary equation used to calculate the capacitance of a disc (Eq 13) is not applicable to such a large disc only 40 feet above the ground. At any rate, a purely capacitive top load seems impractical for such a short antenna at this frequency.

An intermediate arrangement could be a reasonably sized capacitive hat on Antenna 2. This would somewhat increase the antenna R_r and somewhat decrease the base inductance required to resonate it, resulting in improved efficiency over Antenna 2.

Antenna 4—The Wire Flattop

A horizontal wire flattop can be used to bring the 40-foot mast to $\frac{1}{4}\lambda$ resonance. As shown for Antenna 4, the center of the wire is connected to the top of the mast. Equal currents flowing outward cancel almost all radiation from the flattop. To bring a short antenna to $\frac{1}{4}\lambda$ resonance, the wire length should be about twice the length of the missing angular length. In this case, at 1.9 MHz, that length is approximately $2 \times (90^\circ - 27.8^\circ) = 124^\circ$ or 178 feet. This is 89 feet of wire on each side connected to the top of the 40-foot mast. But 178-foot flattops are not usually possible in this environment. Drooping the flattop wires eliminates the two end-supporting masts, but does not reduce the space required by a significant amount. It produces a downward-flowing current component which is in opposition to the current in the mast, slightly reducing R_r . A long but somewhat narrow space may accommodate such a flattop, and efficiency of 34.7% would be effected.

Good quality insulators must be used at the wire ends because of the rather high voltages present. Strain insulators ordinarily used in guy wires will not do.

The wire flattop is a cousin to the inverted L, which is really not a top-loaded vertical but an antenna that is a combination of vertical and horizontal elements.

Antenna 5—The Inductive-Capacitive Top Load

The 7.96-ohm R_r of the top-loaded antenna still looks attractive. If an inductive reactance is placed in series with a capacitive reactance, it reduces the effective capacitive reactance. Inductive reactance can make a small capacitance (high reactance) look like a large capacitance (lower reactance), as shown by Eq 14.

If a more practical hat size, say 48 inches in diameter, is postulated, its capacitance as calculated from Eq 13 is about 43 pF. Its reactance is $-j1946$ ohms (Eq 15). As previously calculated, the inductive reactance of the mast as seen from the top is $+j192$ ohms, leaving $1946 - 192 = 1754$ ohms to be supplied by the inductor. From Eq 16, this is 147 μ H, a feasible coil. Assuming that a Q of 300 is reasonable, then the coil loss resistance given by Eq 8 is 5.85 ohms.

This 5.85 ohms of resistance is located at the top of the mast. Because the current is sinusoidally distributed, the current at an angular distance from the current loop (at the base in a $\frac{1}{4}\lambda$ resonant antenna) is the loop current multiplied by the cosine of the angular distance from the loop. Since $P = I^2 R$, we can "refer the resistance to the loop" by multiplying it by $\cos^2 \theta$, Eq 17. Since the cosine of θ decreases with antenna height, taller antennas reflect less of the coil resistance to the base.

For the 27.8° mast, Eq 17 refers the 5.85 ohms to the feed point as 4.6 ohms, a loss resistance that becomes part of R_b . With R_r of 7.96 and R_b of $7.96 + 4.6 + 15 = 27.56$ ohms, efficiency by Eq 5 is 28.9%.

A gain of 4.0 dB has been achieved over the base-loaded antenna, Antenna 2. Don't sniff at 4 dB! Some hams put up two-element phased arrays to achieve 4 dB of gain.

A 20-foot or so wire flattop of no. 10 wire with its center connected to the top of the loading coil could serve the same purpose as the 48-inch disc. Such an arrangement is essentially the wire flattop of Antenna 4 shortened by the action of the loading coil.

Wire lengths intermediate to the 178 feet of Antenna 4 and the 20 feet above could be resonated by progressively larger inductors, with space considerations or coil power loss determining the length of the wire. The same precautions regarding insulators apply. Tuning could be accomplished by pruning the wire length. Sloping the wire will change the tuning, because it affects the capacitance to ground.

Antenna 6—Inductive-Capacitive Top Loads With Whips

Another common technique is to use a whip above a loading inductor in a vertical antenna, such as in center loading or above-center loading. A whip as seen from the inductor can be treated as an open-circuited transmission line.

Assume a 15.5-foot whip with an average diameter of 0.562 inch (1 inch tapering to $\frac{1}{8}$ inch). Anything longer seems rather difficult to support without guying somewhere above the coil. This is difficult because very high voltages are present on the top-loading coil and all parts of capacitive structures above the coil.

Eq 3 gives the whip angular length as 10.78° . The Z_0 is 371 ohms by Eq 5. The mast provides 192 ohms of inductive reactance as previously calculated. Eqs 6, 14 and 7 yield an inductance of 147 μ H.

Assuming again a Q of 300, the same 4.6 ohms is referred to the base. The coil requirement of the 15.5-foot whip is exactly the same as that of the 48-inch disc. The whip, however, contributes to the R_r . Eq 2 applies and yields 0.33 ohm of radiation resistance at a point 27.8° above the base. Eq 17 refers it to the base as 0.26 ohm of R_r , which adds to the 7.96 ohms for the mast section for a total R_r of 8.22 ohms. The efficiency by Eq 4 is 29.5%. The gain over the base-loaded antenna is 4.1 dB, not significantly different from that of Antenna 5 using the disc.

The question often arises as to how much the whip contributes to radiation. This 15.5-foot whip, which is a fairly extreme whip length, atop a 40-foot mast and coil, contributes only 0.26 ohm to the total of 8.22 ohms R_r , or 3%. Hence, only 3% of the radiated power comes from the whip in spite of its representing 28% of the overall height of 55.5 feet. For all practical purposes the mast does the radiating while the whip merely supplies its reactance to resonate the system. Most properly, a whip-loaded antenna height in this mast height range is that of the mast.

Under the assumptions made, the inductive-capacitive top-loaded antennas, 5 and 6, should provide signals about 4 dB down from a $\frac{1}{4}\lambda$ antenna in the same location with the same ground-loss resistance.

Capacitive Structures

The capacitive structures described represent just about the largest disc or whip that is manageable, although I once heard a Texas station (where else?) with a hat made of 24-foot crossed sections of irrigation tubing with wires connecting the ends and the midpoints. Whips of generous diameter can be combined with rather long crossbars or spiders with enough legs to approach the capacitance of a disc for a more manageable and practical capacitive structure.

Whips and spiders or crossbars seem to add their capacitance fairly well, but no combination is equal to the sum of the capacitance of its parts. The larger the hat just above the coil, the less the whip contributes.

Antenna 7 of Fig 2 illustrates the current distribution of a combined capacitive hat and whip antenna. The combination has an effective combined capacitance of 43 pF,

requiring the same 147 μH of inductive reactance. Its characteristics are similar to those of Antennas 5 and 6.

Bandwidth

The inductive-capacitive top-loaded antenna described will exhibit bandwidths of approximately 20 kHz between the 2:1 SWR points. If other than fixed-frequency operation is planned, then it is best to design and trim for a natural resonance at 2 MHz and use a small base coil to move around the band. A variable inductor of about 30 μH should provide for tuning down from 2 MHz to 1.8 MHz. I use a remotely switched motor-driven inductor.

Reduction of loss will decrease the bandwidth. The limiting case of essentially no ground loss would probably yield a bandwidth of about 10 kHz, but then other problems become quite severe.

Effect of Coil Loss

Larger, higher capacitance structures reduce the inductance requirements. Heroic structures are required to get the required inductance down to the 80- μH range.

Because of the swamping effect of the assumed 15-ohm R_g , loss in a top-loading coil has surprisingly little effect on efficiency over a rather large loss range. With 100 W to the antenna, loss in the 147- μH coil with a Q of 300 would be 13 W, and the peak potential across the coil about 4000 volts. This is quite acceptable for coils of modest size and construction.

Operation of antennas such as Antenna 7 at the legal limit of 1500 W to the antenna would produce power loss in the coil of 250 W and peak coil voltage of 20,000. While the 250 W would average out to rather modest levels for SSB operation, the peak voltage would still exist. Under "key-down" or AM operation, the 250-watt level would be catastrophic to coils of the usual size and construction. For legal-limit input, the top-loading structure will have to be such as to require less inductance, or the coil will have to be designed for a substantially higher Q, or both.

For example, say a coil could safely dissipate a power on the order of 150 W. This is probably possible for a good-sized coil in an open-air environment. If so, then coils ranging from 80 μH with a Q of 300 (requiring very large capacitive structures) to 150 μH with a Q of 600 (requiring the reasonable structures of Antenna 7) will survive.

The alternative is to ensure that the duration of such power input never exceeds some brief time well within the thermal time constant of the coil—a risky procedure at best. Stories of burning or melting top-loading coils are not uncommon.

Effects of Ground-Loss Reduction

The efficiency of these short top coil-loaded antennas is improved with reduction of ground loss. An extensive radial system and earth of good quality produces a loss

resistance of about 2 ohms. Over such a ground system, Antenna 7, with a 147- μH coil of Q = 300, will have an efficiency of almost 54%, for a signal increase of 2.5 dB. Although hardly worth the effort, this is possible because at a 100-watt power level the coil loss would be about 32 W.

Operation of this same antenna over such a ground system at 1500 W would lead to a coil loss of 475 W and 20,000 volts across the coil. Even a 147- μH coil with a Q of 600, which is quite hard to achieve in practice, would have to dissipate 300 W. An 80- μH coil with its attendant capacitive structure problem would dissipate 150 W. In summary, high-power operation of these short inductive-capacitive 160-meter antennas over good ground systems is limited by coil heat dissipation and voltages. The base-loaded vertical, with its loading coil at ground level, makes exotic coils possible, but the better solution is Antenna 4, the T with the horizontal-wire top load. Antenna 5, using a wire flattop of intermediate length, could reduce loading-coil requirements to a range of permissible loss, with space requirements being the trade-off.

The best article on ground radial systems that I have seen in amateur literature is one by Brian Edward, N2MF.² His Fig 7 is particularly applicable to ground systems of the kind likely to exist under the space limitations in which short antennas are often situated.

Vertical antennas are sometimes "low tuned" by top loading to raise the current loop farther above ground to reduce ground losses. In a short antenna, the angular distance just is not there to allow much current difference, and the required larger and hence more lossy inductor incurs additional coil loss that may exceed the ground-loss reduction.

The antennas discussed are all assumed to be base fed. Grounded towers can be top loaded to facilitate shunt feed or slant-wire feed. Short folded monopoles, folded umbrellas etc on grounded masts can also be top loaded. Although these feed methods yield a different (usually higher) feed-point impedance, this transformation of impedances does not affect the ground currents or ground losses of the antenna. Such currents and losses will be the same as they would be if the tower was isolated from ground at the base and fed at that point.

Conclusions

Short inductive-capacitive top-loaded antennas are suitable for operation under the conditions assumed. Coil loss is the compromise to space considerations, and the limiting factor for high power operation.

Coil-loss problems decrease with increased mast height or the availability of horizontal space for such as horizontal-wire top-capacitive structures. Reduction of coil loss will improve efficiency to some extent and permit operation at higher power levels.

Very low-loss ground systems, although improving efficiency for low-power opera-

tion, place prohibitive requirements on the loading coils for even large whip and spider capacitive structures. Survival of conventional loading coils with high power input is most probably because of very high ground loss.

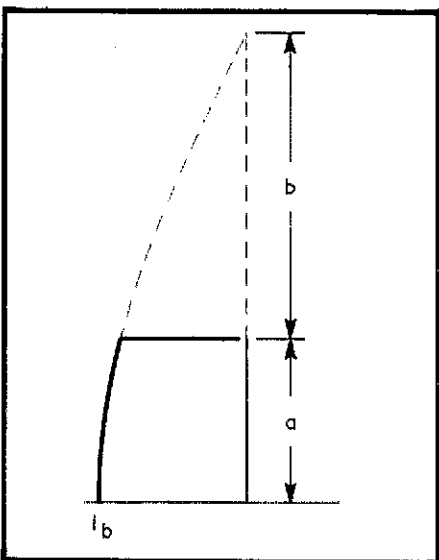


Fig 3—Showing how lengths a and b are defined for Eq 1 of the Appendix. The total length (height), a plus b, equals 90°.

Appendix

$$R_r = \frac{30 f(\text{height})}{\sin^2 G} \quad (\text{Eq 1})^3$$

where

$$f(\text{height}) = \sin^2 B \left[\frac{\sin 2A}{2A} - 1 \right] - \frac{\cos 2G}{2} \left[S_1(4A) + S_1(2A) (\cos 2G + 1) + \sin 2G \left[\frac{S_1(4A)}{2} - S_1(2A) \right] \right]$$

$$A = 2\pi a/\lambda$$

$$B = 2\pi b/\lambda$$

$$a = \text{length } a, \text{ feet (see Fig 3)}$$

$$b = \text{length } b, \text{ feet (see Fig 3)}$$

$$\lambda = \text{wavelength, } \frac{984}{f(\text{MHz})} \text{ feet}$$

$$G = A + B$$

$$S_1(x) = \int_0^x \frac{1 - \cos x}{x} dx = \frac{x^2}{2 \times 2!} - \frac{x^4}{4 \times 4!} + \frac{x^6}{6 \times 6!} - \dots - \frac{x^n}{n \times n!}$$

$$S_1(x) = \int_0^x \frac{\sin x}{x} dx = x - \frac{x^3}{3 \times 3!} + \frac{x^5}{5 \times 5!} - \dots - \frac{x^n}{n \times n!}$$

S_1 and S_2 must be to about six-place accuracy for short antennas

$$R_r = 36.6 \frac{(1 - \cos H)^2}{\sin^2 H} \quad (\text{Eq 2})^4$$

where

R_r = radiation resistance of simple monopole, ohms

H = angular height of simple monopole

$$H = 0.366hf \quad (\text{Eq 3})$$

where

H = angular length, degrees; Note: $360/984 = 0.366$

h = length, feet

f = frequency, MHz

$$\text{Eff} = 100 \frac{R_r}{R_b} \quad (\text{Eq 4})$$

where

Eff = efficiency, %

R_r = radiation resistance, ohms

R_b = total feed-point resistance, ohms

$$Z_0 = 60 \left[\ln \left(\frac{48h}{d} \right) - 1 \right] \quad (\text{Eq 5})$$

where

Z_0 = characteristic impedance of vertical monopole considered as a transmission line, ohms

h = height of monopole, feet

d = average diameter of monopole, inches

\ln = natural logarithm

$$Z_{oc} = \frac{-jZ_0}{\tan \theta} \quad (\text{Eq 6})$$

where

Z_{oc} = input impedance of open-circuited line, ohms

Z_0 = characteristic impedance of line, ohms

θ = angular length of line

j = the complex operator

$$L = \frac{X_L}{2\pi f} \quad (\text{Eq 7})$$

where

L = inductance, μH

X_L = inductive reactance, ohms

f = frequency, MHz

$$R_c = \frac{X_L}{Q} \quad (\text{Eq 8})$$

where

R_c = resistance of coil, ohms

X_L = inductive reactance of coil, ohms

Q = quality factor of coil

$$\text{dB} = 10 \log_{10} \left(\frac{\text{Eff}_1}{\text{Eff}_2} \right) \quad (\text{Eq 9})$$

where

dB = gain, decibels

Eff_1 and Eff_2 = efficiencies being compared

$$R_r = 36.6 \sin^2 H \quad (\text{Eq 10})^5$$

where

R_r = radiation resistance of the base section of a top-loaded antenna at $1/4\lambda$ resonance

H = angular height of base section

$$Z_{sc} = jZ_0 \tan \theta \quad (\text{Eq 11})$$

where

Z_{sc} = input impedance of short-circuited transmission line

Z_0 = characteristic impedance of line, ohms

j = the complex operator

θ = angular length of line

$$C = \frac{10^6}{2\pi f X_c} \quad (\text{Eq 12})$$

where

C = capacitance, pF

f = frequency, MHz

X_c = capacitive reactance, ohms

$$C = 0.8992d \quad (\text{Eq 13})$$

where

C = capacitance, pF

d = diameter, inches

$$X = X_c - X_L \quad (\text{Eq 14})$$

where

X = resulting reactance

X_c = capacitive reactance, ohms

X_L = inductive reactance, ohms

$$X_c = \frac{10^6}{2\pi f C} \quad (\text{Eq 15})$$

where

X_c = capacitive reactance, ohms

f = frequency, MHz

C = capacitance, pF

$$L = \frac{X_L}{2\pi f} \quad (\text{Eq 16})$$

where

L = inductance, μH

X_L = inductive reactance, ohms

f = frequency, MHz

$$R_{\text{Loop}} = R_\theta \cos^2 \theta \quad (\text{Eq 17})$$

where

R_{Loop} = resistance at θ transferred to current loop

R_θ = resistance at θ from current loop

θ = angular distance between resistance to be transferred and current loop

Notes

¹[EDITOR'S NOTE: As Fig 2 shows, with equal power applied, more current flows at the base in the shorter, base-loaded element than in the full-size, $1/4\lambda$ element. Intuitively, it may then seem that this higher base current might yield a field-strength increase (gain) to offset some of the resistive losses, and therefore the author's figure of "8 dB down" may appear to require modification. However, not only the current amplitude, but also the current distribution in the conductor (as indicated in Fig 2) is a factor in determining far-field signal strength. The 8-dB difference can be verified with antenna analysis programs using method of moments calculations, such as NEC, MININEC, and MN. Other antenna configurations evaluated in this article can be similarly verified.]

²B. Edward, "Radial Systems for Ground-Mounted Vertical Antennas," *QST*, Jun 1985, pp 28-30.

³Adapted from G. H. Brown's thesis, "A Theoretical and Experimental Investigation of the Resistances of Radio Transmitting Antennas," Univ of Wisconsin, 1933, citing van der Pol and R. Bechmann, *Jahrbuch O. Drahtl. Telegr.*, 13, 217, 1918.

⁴From B. Byron (W7DHD), "Short Vertical Antennas for the Low Bands," *Ham Radio*, Part 1, May 1983, pp 36-40, and Part 2, Jun 1983, pp 17-20.

⁵See note 4.

Strays



RADIO MUSEUM

Carl Nelson, Managing Director of the Pavak Museum of Wonderful Wireless, stands beside a display of antique tubes, including a DeForest Audion tube. The St Paul Radio Club joined the museum to commemorate Lee DeForest's patent of the Audion tube and the birthday of museum founder Joe Pavak, WØEOP, with special event station KØAGF on February 17-18. Pavak, now a Silent Key, was first licensed in 1933, and began collecting old radios 44 years ago. The museum is open to the public; for information write them at 3515-17 Raleigh Ave, St Louis Park, MN 55416. (photo courtesy of NGØF)



gan collecting old radios 44 years ago. The museum is open to the public; for information write them at 3515-17 Raleigh Ave, St Louis Park, MN 55416. (photo courtesy of NGØF)

I would like to get in touch with...

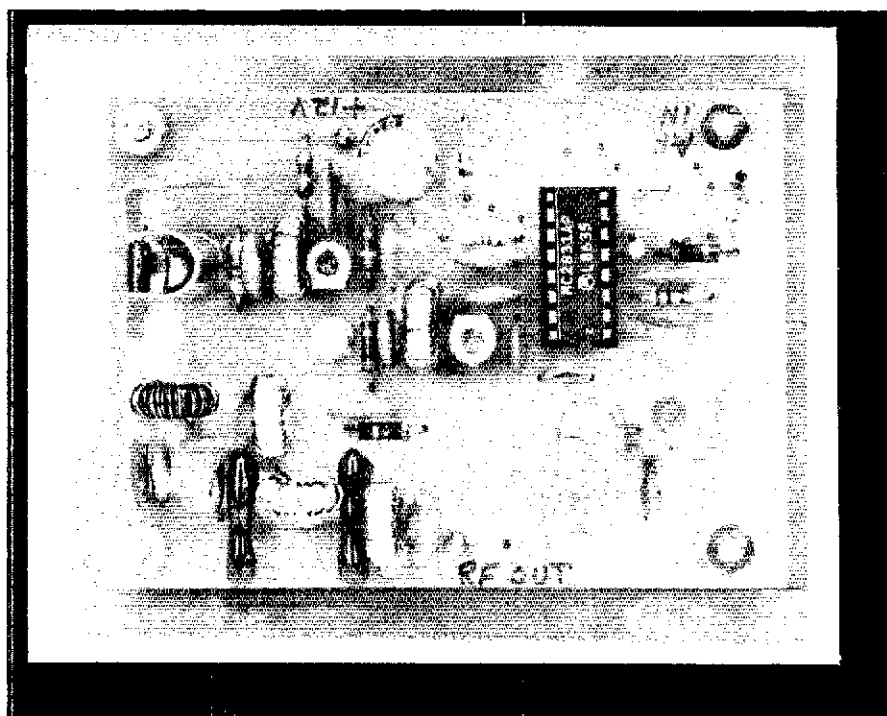
☐ anyone who knew or knows anything about Roy Kenton Johnson, W6BDQ, CRM USNR, who lived in San Francisco. I am almost 70 and still searching for information regarding my father, whom I never met or knew. Kenton Johnson, W6NKE, 8300 Oso Ave, Canoga Park, CA 91306.

☐ anyone with an instruction sheet for a Radio Shack Micronta Dynamic Transistor Checker, cat no. 22-025. Robert Everding, NØEVQ, 514 Glenmeadow Dr, Ballwin, MO 63011.

☐ anyone with a schematic for converting a Gonset Super 6 shortwave converter to solid state. Richard Cosma, KAINRW, 14 Temple St #E308, Framingham, MA 01701.

☐ anyone with a schematic or manual for a Collins 75A3 receiver. Mike Lunbach, N9AIN, 922 Hastings Ln, Hanover Park, IL 60103.

Using the MC2831A FM Transmitter Subsystem IC



Subsystem ICs are great for miniaturized transmitters and receivers. Here are some guidelines for using the Motorola MC2831A.

By Doug DeMaw, W1FB

ARRL Contributing Editor
PO Box 250
Luther, MI 49656

Good fortune came to my door when the mailman delivered two samples of a new IC that Motorola developed for the cordless-phone industry. The data sheet that accompanied the samples inspired visions of numerous amateur circuits that could be wrapped around the 16-pin DIP ICs that awaited my attention. Imagine a complete FM transmitter on a single substrate! Certainly, such a device would be excellent as the heart of an amateur FM transmitter.

The MC2831A is aimed at 49-MHz cordless-phone use. The manufacturer shows a circuit that uses the third harmonic of the crystal as the operating frequency. This energy is taken from pin 14 to the IC and passed through a band-pass filter that is tuned to the third harmonic. Only about 0.4 W of power exists in the third harmonic, but it is ample for the short range of cordless phones.

I chose a 10-meter circuit in which to test this interesting IC. The basic circuit of Fig 1 can be extrapolated to 2 and 6 meters by adding the proper number of multiplier and amplifier stages.

A Practical 10-Meter Circuit

Please refer to Fig 1. The IC (U1) is shown at the left. Y1 is used in a VXO cir-

cuit. L1 permits adjustment of the crystal operating frequency. The frequency shift is approximately 14 kHz at 14.5 MHz (twice that range at 29 MHz) as L1 is varied from minimum to maximum inductance. The VXO circuit enables the frequency to shift under modulation, thereby ensuring FM deviation when audio is applied to pin 5 of U1. Control R5 is adjusted to provide the frequency swing (deviation) desired.

The dashed lines and non-numbered components at the bottom of the U1 illustration are optional. They permit tone encoding, should that be desired. S1 can be used to actuate the tone. I left those terminals of U1 unconnected. The values shown will provide a 5-kHz tone.

RF output from U1 is taken at pin 14. I chose the second harmonic of the crystal frequency. T1 is tuned to 29 MHz by way of a high-Q toroidal transformer. I used fairly light coupling (C7 and C22) in and out of the tuned circuit to help reduce the level of the 14.5-MHz energy from U1. This causes the tuned circuit to act somewhat like a high-pass network. Smaller capacitance values can be used at a sacrifice in power output from Q1.

The recommended operating voltage for the MC2831A is +3 to +8 V dc. The maximum safe operating voltage for U1 is +10 V. Total current drain for the chip is 4 mA at 4 V.

Outboard Circuitry

The discrete components to the right of

U1 in Fig 1 illustrate how we can build up the output power at 29 MHz. Q1 operates as a linear amplifier. A class-C stage is not suitable at Q1 because of the modest power output from U1. Also, the linear amplifier has less harmonic output than does a class-C amplifier. Although a 2N5179 is specified for Q1, you can use the more common 2N5770. In fact, a 2N2222A should be okay at Q1. I did not try one in this circuit.

I chose an NEC 2SC1973 for Q2. This jumbo TO-92 type device is rated at 1-W output at 50 MHz with only 30 mW of drive!¹ A 2N3866 should be okay as a substitute. C23 of Fig 1 is used to bypass VHF harmonics that are present in the output of Q1. R11 prevents self-oscillation of Q2.

The output impedance of Q2 is 144 Ω when it delivers 0.5 W of output. FL1 is designed for 50 Ω . This requires that a broadband matching transformer (T3) be used between Q2 and FL1. I obtain in excess of 0.5 W of output power when the Q2 V_{cc} is +12. This results in a total exciter current of 130 mA. The output increases to 0.7 W at +12.5 V. The turns ratio of T3 should be changed in accordance with the Q2 power output. Z (collector) = $V_{cc}^2/2P_o$, where P_o is the output power in watts. The T3 turns ratio is the square root of the impedance ratio. I measured the Q2 efficiency as 53 percent.

You can increase the power output of the exciter by using a lower resistance value at

¹Notes appear on page 33.

Except as indicated, decimal values of capacitance are in microfarads (μF); others are in picofarads (pF); resistances are in ohms; k=1,000, M=1,000,000

* heat sink
** see text

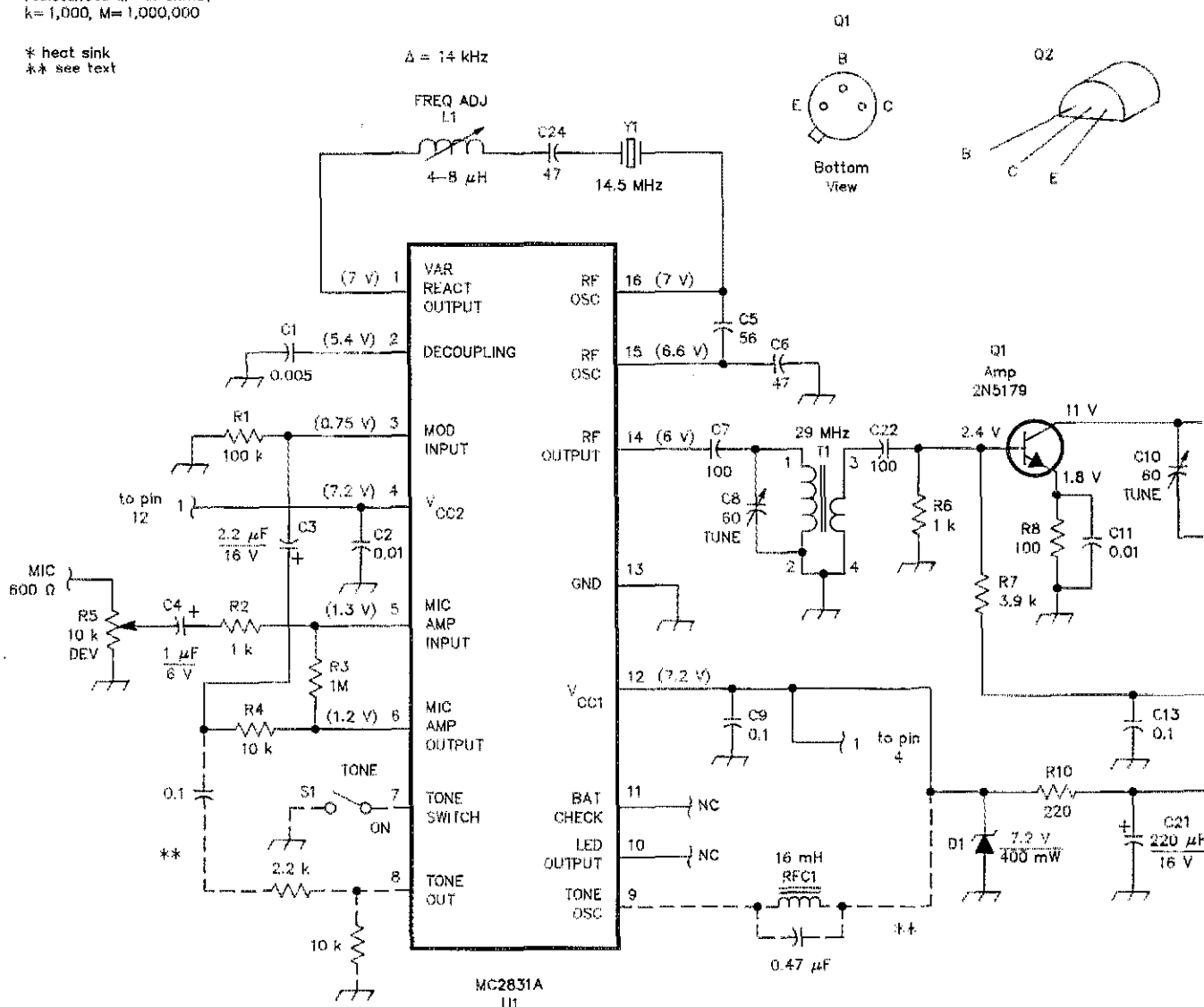


Fig 1—Hybrid diagram of the 10-meter FM exciter. Fixed-value capacitors are disc ceramic, 50 V or greater. Fixed-value resistors are 1/4-W carbon composition. Dashed lines and related components show optional circuits (see text).

C8, C10—Miniature 60-pF trimmer (see Note 1).
C17-C20, incl—NP0 ceramic disc, silver mica or polystyrene.
C21—Electrolytic or tantalum.
D1—Zener diode, 7.2 V, 400-mW or 1 W.
L1—Slug-tuned inductor, 4-8 μH , PC mount. 30 turns of no. 30 enam wire on a 3/16-inch-OD form, scramble wound to occupy 1/4 inch (see Note 1).
L2, L4—Toroidal inductor, 0.3 μH . Use 10 turns of no. 24 enam wire on an Amidon Assoc T-37-6 toroid.

L3—Toroidal inductor, 0.373 μH . Use 11 turns of no. 24 enam wire on an Amidon Assoc T-37-6 toroid.

L5—See text.

Q1, Q2—See text.

R5—10-k Ω linear-taper, carbon-composition control, panel mounted (see text).

RFC2—Miniature 3- or 5- μH RF choke or 6 turns of no. 26 enam wire on an Amidon Assoc FT-25-43 ferrite toroid.

T1—Primary has 14 turns of no. 26 enam wire on an Amidon Assoc T-37-6 toroid. Secondary has 6 turns of no. 26 wire.

T2—Primary contains 14 turns of no. 26 enam wire. Secondary has 3 turns of no. 26 wire. Amidon T-37-6 toroid core.

T3—Primary has 15 turns of no. 26 enam wire on an Amidon FT-37-43 ferrite toroid. Secondary has 10 turns of no. 26 enam wire.

U1—Motorola FM subsystem IC. At this writing, available from Motorola dealers for less than \$3. (The MC2833, with two undedicated transistors, has largely superseded the '2831.)

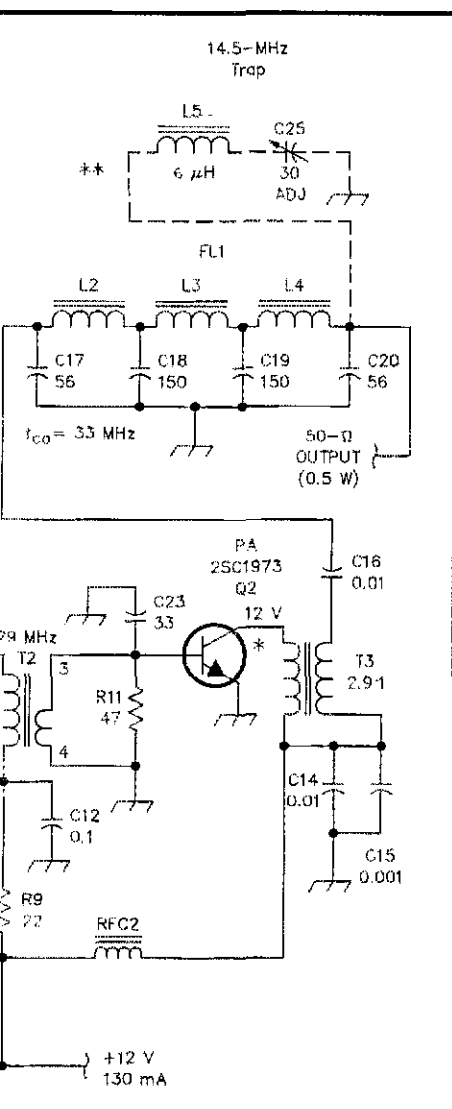
Y1—Fundamental crystal, 30-pF load capacitance in HC-6/U holder.

R8 of Fig 1. Do not use less than 56 Ω for R8 in order to prevent overheating of Q1. In a like manner, you can reduce the output power from Q2 by using a larger

resistance value at R8. An output of 0.5 W should easily drive a 10-W outboard amplifier if a high-gain transistor is used.

A 14.5-MHz series trap is shown in

dashed lines at the upper right in Fig 1. If you want to try your hand at 10-m FM QRP with the "barefoot" exciter, add the L5/C25 trap. It can be tuned to eliminate



most of the residual 14.5-MHz energy that feeds through the circuit from U1. The trap can be tuned while monitoring the transmitter output at 14.5 MHz and tuning C25 for minimum signal, as indicated on the S meter. L5 consists of 47 turns of no. 30 enamel wire on an Amidon FT-37-61 ferrite toroid. C25 can be a 3-30 pF ceramic, plastic or mica trimmer.

Test Model Construction

Single-sided board material is used.² Deviation control R5 is panel mounted, although it could be a PC-board trimmer if you wish.

The L1 coil form, C8, C10, Q1 and Q2 are not always easy to locate. These components are available by mail.³

I used epoxy to affix a modified TO-5 heat sink on the body of Q2. It runs quite warm without the heat sink. My sink is an Aavid no. 5784. I bent the press-on ring to fit snugly over the body of Q2. A few drops of epoxy were placed atop the transistor after the heat sink was in place. You can fashion your own heat sink from no. 18 aluminum, brass or copper.

You can add a 33-V, 400-mW Zener diode to Q2's circuit for SWR protection. Simply bridge the diode from the collector pad of the PC board to ground. The cathode of the diode connects to the Q2 collector.

Exciter Adjustment

Select a crystal for Y1 that is marked 2 kHz higher than the desired operating frequency. Adjust the slug in L1 to obtain the chosen operating frequency. This will allow leeway for "rubbering" the crystal to the selected frequency.

Connect a 50-ohm dummy antenna at the output of FL1. Apply operating voltage to the assembly, then adjust C8 and C10 for maximum exciter output power. A scope can be used to set these trimmers for the output-waveform purity. The objective is to tweak C8 and C10 to produce the cleanest sine wave practicable while sampling across the 50-ohm load. The sine-wave peaks will not be equal when 14.5-MHz energy is present.

Adjust the trimmers for equal amplitude of the positive and negative sine-wave peaks. This indicates resonance of the tuned circuits, T1 and T2. Alternatively, you can monitor the exciter output with a receiver that is tuned to 14.5 MHz, then adjust the two trimmers for minimum 20-meter response, consistent with maximum output power at 29 MHz.

Final Comments

The circuit in Fig 1 represents a starting point for experimentation. A 2-meter FM exciter can be made by using an 18-MHz crystal at Y1 and taking the output from pin 14 of U1 at 36 MHz, then multiplying the frequency to 146 MHz along the lines shown in this 10-meter circuit. In a like manner, you can build a 6-meter FM exciter around the MC2831A.

If I were to go through this exercise again, I would make the output of pin 14 of U1 the crystal frequency, then double it to 29 MHz by way of a push-push, balanced doubler. This would reduce the 14.5-MHz energy by at least 40 dB if the doubler were properly balanced. A pair of 2N2222As should work well in a push-push doubler, and the efficiency could approach that of a straight-through class-C stage.

Good luck with your experiments! I would appreciate hearing about your results if you develop other circuits around the MC2831A.

Notes

¹Q2 and the other special parts are available from Oak Hills Research, 4061 N Douglas Rd, Luther, MI 49656. Send SASE for price information.

²PC boards for this project are available from FAR Circuits, 18N640 Field Ct, Dundee, IL 60118, tel 312-426-2431, after 6 PM Central Time. Price: \$3.75 plus \$1.50 shipping per order to US addresses. A PC-board template and parts-placement diagram are available from the ARRL HQ Technical Department Secretary for an SASE.

³See Note 1.

Strays



WAS IN MEXICO

Need Tlaxcala for Worked All States in Mexico? Then you'll need a QSL from Cpt Jesus Garcia Fernandez, XE1GFJ (standing),



the only amateur in that state. Seated at XE1GFJ is frequent visitor Bill Thompson, N5KLG/XE1EWT, of Edmond, Oklahoma. (KA5YSF photo)

TRANSATLANTIC NORTH-HAMPTON GREETINGS

Mayor Paul Kutzler of Northampton Borough, Pennsylvania, and County Chief Executive Gerald Seyfried of Northampton, Massachusetts, joined to wish Malcolm Lloyd, mayor of Northampton, England, best wishes on his community's 800th anniversary.



The event was organized by the Delaware-Lehigh ARC. Seyfried and Clarence Snyder, W3PYF, of Easton, Pennsylvania, watch as DLARC member Bill Goodman, K3ANS, also of Easton, and a native of Northampton, England, tunes in special-event station GB800 on 15 meters. (photo courtesy of N5IEP)

Practical Battery-Back-Up Power for Amateur Radio Stations— *Part 1*

Many radio amateurs use batteries only in low-power, portable/mobile applications. Here's how to use batteries to keep a ham station going when commercial ac power fails.

By George L. Thurston III, W4MLE

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Tallahassee, FL 32303

Hheavy-duty back-up power is readily available for many—perhaps most—Amateur Radio stations, and it need not be expensive. Virtually all modern amateur gear is designed to operate from 11 to 14 or 15 V dc, making operation possible from highly reliable, heavy-duty batteries. Yet, battery backup is underappreciated and underutilized by amateurs—probably because of a lack of familiarity and the supposed difficulty or expense of obtaining suitable batteries. Surplus commercial or industrial heavy-duty lead-acid cells often can be obtained for the asking, however, and frequently they come in batches big enough to supply several stations at once.¹

Besides superb back-up against failure of commercial ac power, batteries provide other benefits. One of these is surge protection: A power-line spike big enough to demolish a regulated dc power supply probably won't get past a battery to damage solid-state electronics. In addition, batteries:

- Are clean and safe.²
- Require very little maintenance.
- Offer considerable overvoltage protection if a power-supply regulator fails.
- Can accumulate dribs and drabs of energy from alternative power systems, such as solar energy, water or wind power, and deliver it when needed.

As useful and versatile as batteries are, however, building a battery back-up system requires care and planning. Many hams believe that an old automobile battery, stuck under the operating desk and put on a charger every so often, constitutes battery back-up. "Tain't so!

This three-part article describes how to get a practical battery-back-up system up and running. In this article, Part 1, we'll discuss



Part of the author's 12-V back-up power system, these 2-V, 300-Ah, lead-acid float cells—obtained free of charge from a local telephone company—help keep W4MLE on the air when commercial power fails. (W4MLE photos)

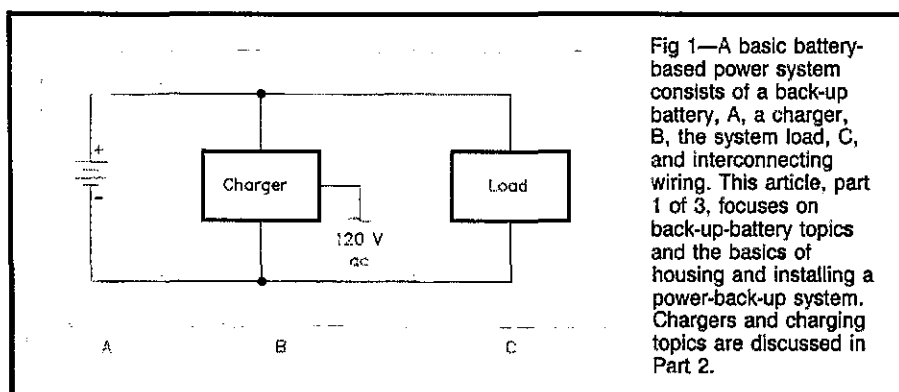
back-up-battery types, chemistry, construction and procurement, and the basics of housing and installing a power-back-up system. In Part 2, we'll cover battery chargers and charging. Part 3 will cover back-up-battery monitoring, maintenance and safety, and how to dispose of unusable batteries safely and responsibly.

Components of a Battery-Back-Up System

In its most basic form (Fig 1), a battery-backed-up power system consists of a back-up battery, its load, a charger, and interconnecting wiring. A practical system—Fig 2 outlines mine—may include more than one storage battery, and also includes fusing and instruments (or points for connecting instruments) to monitor voltage and current in the system.

Suitable Batteries for Back-Up Power

Automotive batteries are unsuitable for station back-up power except as a last resort.³ Intended to start cars, they are designed to provide several hundred amperes for the few seconds needed to crank an engine. From a back-up-power standpoint, though, their weakness is that they don't like to be discharged very far. You



¹Notes appear on page 37.

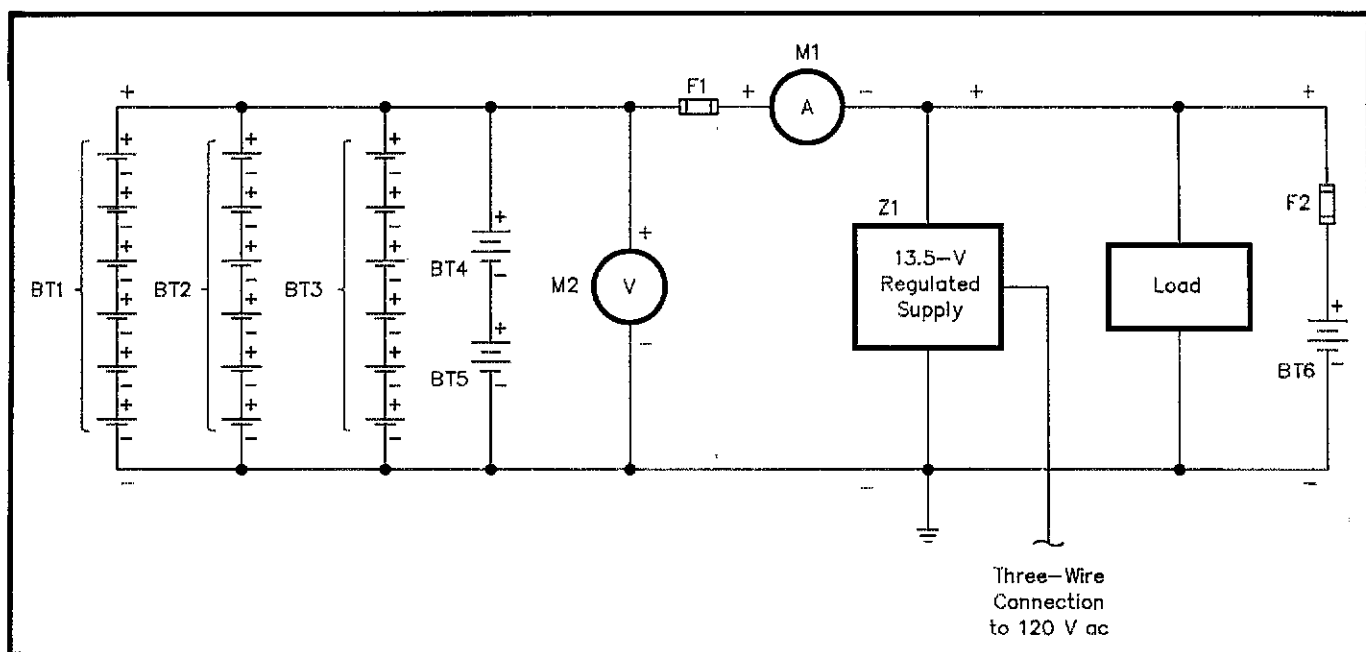


Fig 2—A practical battery-backed-up power system may include more than one storage battery, and also includes fusing and instruments, or points for connecting instruments, to monitor system voltage and current. This drawing, which depicts the author's system, illustrates how batteries of varying types and capacities can work together to provide solid back-up power. *Stock regulated power supplies usually must be modified before they can be used for charging service at Z1; see below and Part 2 of this article—to appear in a subsequent issue of QST—for more information.* A simple battery voltage/current monitor (M1 and M2 serve this function in this diagram) will be described in Part 3.

BT1, BT2, BT3—Battery consisting of six 2-V, 300-Ah float cells.

BT4, BT5—6-V, 100-Ah deep-cycle batteries.

BT6—Optional deep-cycle battery to handle peak current demand in cases of high-voltage drop in station-to-battery wiring; see text.

F1, F2—32-V fuse of a current rating no greater than that necessary to handle the system current demand with a margin of safety (for example, 20 to 25 A for the ≈ 15 -A load presented by a 13.8-V, 100-W MF/HF transceiver). F2 is used only if BT6 is present.

M1—Zero-center ammeter; range dependent on battery capacity and load.

M2—Meter capable of measuring voltages from 10 to 15. A 0- to 15-V meter will work, but a 10- to 15-V, expanded-scale meter is better.

Z1—Regulated power supply, modified for protection against reverse voltage as described in Part 2 of this article. *Do not use a supply that has not been modified for reverse-voltage protection.*

may have already discovered this the hard way: Kill your car battery two or three times by leaving your headlights on, and you'll probably have to replace it.

Three other types of rechargeable lead-acid battery, readily available to radio amateurs, can be deeply discharged and recharged:

- **Deep-cycle batteries** are used in recreational vehicles and by boaters and fishermen to operate boat trolling motors, lights, pumps and electronics. Industrial deep-cycle batteries are often fully discharged every day and recharged every night.

- **Gelled-electrolyte batteries**, manufactured both for float and deep-cycle service, are usually intended for portable use and can be quite small. In most respects, they can be managed either as conventional deep-cycle batteries or, in light-duty applications, as float batteries. I won't discuss gelled-electrolyte batteries specifically because they behave much like their liquid-electrolyte counterparts.

- **"Float-service" batteries**, used in uninterruptible power systems⁴ for telephone and large computer systems, should not be discharged and recharged more frequently than necessary. They are kept on a regulated charging source all the time—the same

source that normally powers the load.

Properly applied, deep-cycle, gelled-electrolyte and float-service batteries are well-suited for back-up service even though their chemistries are similar to that of automotive batteries. They can replace your station's commercial ac power so completely during an outage that your rig may not notice that the power is down!

Back-Up Battery Chemistry

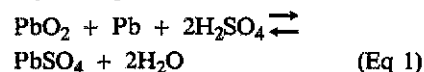
Selection, use and care of lead-acid back-up batteries requires knowledge of their chemistry and construction. Most such batteries consist of a case, or tank, divided into compartments—one compartment per cell—each of which is filled with dilute sulfuric acid (H_2SO_4). Immersed in this acid are *plates*—actually latticework frames—made of lead alloy. Half of the total number of a given cell's plates are filled with lead peroxide (PbO_2); these plates serve as the cell anode (+ electrode). The remainder of the cell's plates are filled with *spongy* metallic lead (Pb)—lead that's finely divided to expose maximum surface area to the electrolyte. These spongy plates serve as the cell cathode (− electrode).

Deep-cycle cells generally differ in construction from automotive cells in that their

plate-support grids consist of a lead-antimony alloy that stands up well to repeated cycling.

Float cells usually contain lead-calcium plates that tend to respond to repeated cycling by swelling, cracking and falling apart, eventually creating short circuits between adjacent plates.

With no load connected to a fully charged battery of any of these types, a voltage—about 2 V per cell—appears between the anode and cathode of each cell. When a load is connected, the battery releases stored chemical energy by causing electric current to flow through the load. The transformation of chemical to electrical energy occurs as a result of several chemical reactions in the battery, with the final results represented by the equation:



Translated, this means that the lead peroxide and spongy lead react with the sulfuric acid to release energy and produce two new compounds—lead sulfate ($PbSO_4$) and water. This reaction is indicated by the right-pointing arrow in Eq 1. As the discharge continues, more and more acid is converted, causing the specific gravity of the

electrolyte to decrease.⁵ When all the lead peroxide (PbO_2) is used up, the battery is "dead." Because the electrolyte normally contains a surplus of acid, its specific gravity usually doesn't fall all the way to 1.0.

When the battery is charged, the reaction reverses (hence the left-pointing arrow in Eq 1), converting the charging electrical energy into stored chemical energy. Now, lead sulfate on the positive plate is converted back to lead peroxide, releasing sulfuric acid. Lead sulfate on the negative plate is converted back to spongy lead, producing still more sulfuric acid. When all the sulfuric acid has been released, the battery is fully recharged and the specific gravity of the electrolyte is back at maximum.

The chemical process is the same in lead-calcium and lead-antimony cells (including gelled-electrolyte cells). But the design and application of these two types differ in detail, such as the optimum electrolyte specific gravity, the normal open-circuit voltage for a single cell at full charge, and the optimum float voltage. Lead-calcium cells, usually used in float-charged systems, require and produce a slightly higher voltage per cell, lose less energy through internal leakage and take less maintenance, than their lead-antimony counterparts. These design differences are important in Amateur Radio applications.

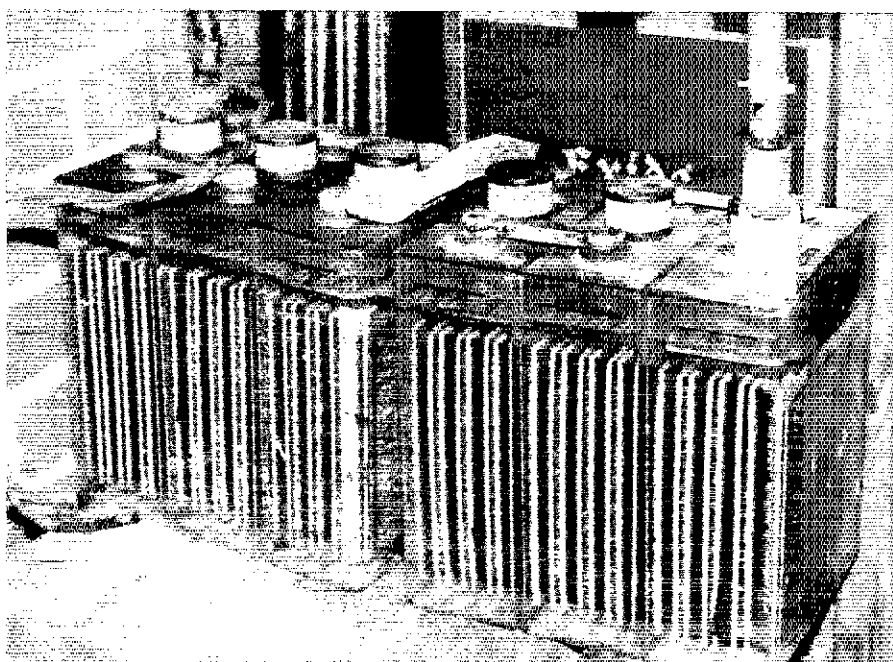
Since back-up batteries are seldom, if ever, called upon to deliver short bursts of extremely high current, their electrolyte is not as acidic as that in automotive batteries, and they contain fewer plates.⁶ On the other hand, back-up-battery plates are thicker and more densely packed with material than those of automotive starting batteries. And the plates of float batteries are usually immersed in larger quantities of electrolyte than other lead-acid battery types.

An Overview of Available Back-Up Batteries

Float-service batteries are the vice presidents of the battery world. Their functions are to wait for a main power system to fail, to be ready when it does, and to not complain when it doesn't. They are electrochemical couch potatoes, luxuriating in a light but continuous flow of current—just enough to replace their internal leakage losses—from a regulated power supply.

Float cells are sold in many forms. They range from 6-V, 100-Ah batteries of three cells each, to individual 2-V, 100- to 300-Ah cells weighing as much as 85 pounds each. Cells of much higher capacities are manufactured for industrial uses, but their size usually precludes their use in ham stations.

Most manufacturers, such as Gould, Exide and C&D, warrant their float cells for 20 years under strenuous industrial use. Used for power back-up in Amateur Radio stations, industrial float batteries may be virtually immortal, with industrial preventive-maintenance discards probably lasting more than 10 years even after a hard working life. Remember, though, that float



These 6-V, 100-Ah, float batteries, also part of the W4MLE back-up battery, consist of three cells each.

cells don't like deep discharges. One manufacturer⁷ warns that

if occasional discharges are experienced, battery life will decrease in proportion to the frequency and depth of these discharges...

It is customary that a stationary battery will not experience any more than 200 discharge cycles evenly distributed throughout its useful life. Frequent or greater depths of discharge can shorten service life to 10 years or even less, even with proper maintenance and operating conditions.

Two hundred cycles may sound like a lot, but remember that many industrial applications—golf-cart service, for instance—require full discharge every day and complete recharge every night. In such service, 200 cycles amounts to less than a year of business days!

Deep-cycle batteries can tolerate frequent discharges to about 11 V, and can withstand such use every day for years if well-maintained. But they also perform quite well in float service. The most useful deep-cycle batteries for Amateur Radio Service consist of six 2-V cells, connected in series, in a single, compact case. Deep-cycle batteries intended for use on boats and recreational vehicles are typically rated at 60 to 100 Ah, compared to 40 to 50 Ah for car (starting) batteries. And deep-cycle batteries are designed to operate at 13.8 V *while charging*. Industrial deep-cycle batteries may be designed for slightly lower voltages.

Deep-cycle fishing and recreational-vehicle batteries are normally warranted for 18 months because they tend to be abused by forgetful sportsmen who top them off by fast charging after leaving them discharged for long periods. Properly nurtured

and used in stationary service at a ham station, however, deep-cycle fishing batteries can last much, much longer than 18 months.

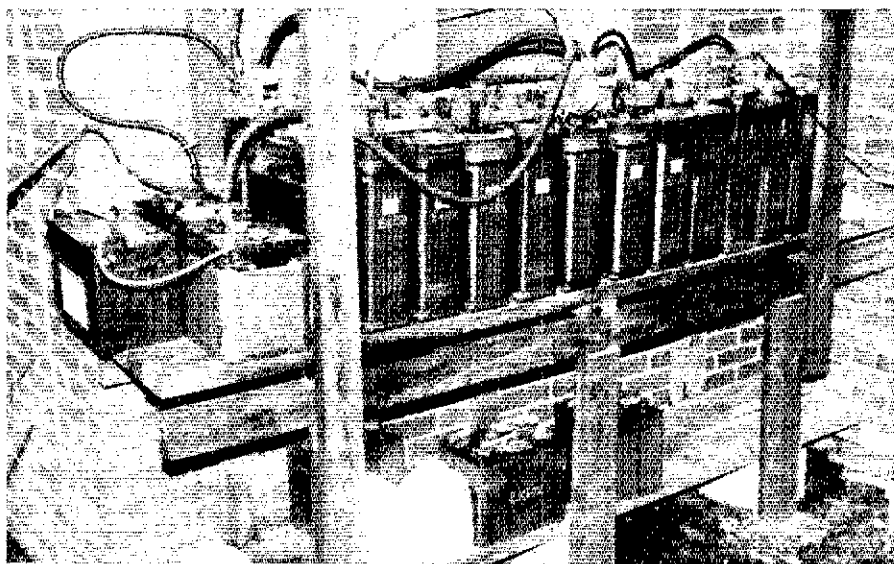
Obtaining Back-Up Batteries

Where can you find suitable back-up batteries? You could buy float cells from a manufacturer for something like \$1/Ah per 2-V cell. That amounts to maybe \$300 for a 2-V, 300-Ah cell—\$1,800 for a 6-cell battery! Surprisingly, however, float cells are often available gratis.

Used batteries are seldom retained when float-cell-backed power systems are upgraded. Old float cells are generally hauled off to a toxic-waste dump or to a salvage house, where the cells' lead, and polycarbonate plastic cases, are reclaimed. Often, an Amateur Radio club, or even individual amateurs, can arrange to get these discarded cells for hauling them away.

The Tallahassee Amateur Radio Society has a written agreement with the local telephone company (Centel) to accept discarded batteries on behalf of club members. About 75% of the cells the club has received from the company were in good health. Similar arrangements have been worked out between industrial battery users and other Amateur Radio clubs nationwide. My own station has a 1000-Ah float-cell bank, some cells of which once powered the city police department's telephones. Other cells powered a monster computer at Florida State University!

Of course, deep-cycle batteries can be purchased off-the-shelf at most boat dealers, fishing-tackle shops and automotive stores. Price, warranty and rated capacity are the important considerations in a new-battery purchase.



W4MLE's main battery—BT1-BT5 in Fig 2—consists of deep-cycle and float cells, connected in series-parallel and housed outdoors.

Housing a Battery-Back-Up System

Back-up batteries can be kept indoors, since they do not sputter electrolyte as automotive batteries do, *but they must be ventilated*. Charging generates oxygen and hydrogen—gases that form a highly explosive mixture if allowed to collect in an enclosed area. With back-up batteries, safe ventilation is generally assured if you follow a simple rule: *Don't put them in a closet or enclose them in a box*. Small batteries can be stored in a corner or under a desk; a room's ordinary air circulation will suffice for ventilation in most cases.

Back-up batteries can be kept outdoors in most climates; fully charged, they freeze at about -95°F .⁸ Completely discharged—when their electrolyte is least acidic—their freezing point is quite close to that of water (32°F). To protect the battery from sunlight, rain, snow, trash, insects and accidental short circuits, the cells should be provided with a housing or cover. You may be able to obtain a suitable plastic-coated steel battery rack from the supplier of your back-up cells. Such racks can usually hold two sets of six cells each. Or you can build a rack of your own, as I did the rack shown in the photo above. If you build your own rack, be sure it can take the weight of your back-up batteries; my rack consists of 2×4 and 4×4 lumber.

The porous, explosion-proof caps in the tops of back-up-batteries' cells are normally covered by plastic lids. If these lids get lost, don't leave the caps open; trash, rain and insects can get in. (Mud-dauber wasps, for instance, love to build nests in the necks of the funnels—and mud contains no known vitamins beneficial to battery cells.) Ordinary glass marbles, placed in the cap necks, are a good substitute for the lids; they can be easily removed when water must be added to the cells.

Back-up batteries need protection from direct sunlight. The polycarbonate plastic

cases of float cells can be damaged by ultraviolet light; they develop cracks, and leak. If you store your cells outdoors, keep them off the ground and out of the sun, where you can eyeball them frequently to check their electrolyte levels. At nontropical latitudes in the northern hemisphere, the north side of a building receives little or no sun throughout the year; if that's where you live, the north side of your house is a good location for battery storage, when it's available.

Minimizing Voltage Drop in Battery-to-Station Wiring

Wire is resistive, and resistance dissipates useful power as heat. Because of this, be sure to install your back-up battery as close as possible to its heaviest load—no more than 10 to 15 ft away, and the closer the better. A 200-W load, such as a 100-W-output MF/HF transceiver, draws at least 15 A at 13.5 V; a 300-W load draws 22 A at this voltage. The wire resistance between battery and load causes a voltage drop; for example, a resistance of $0.1\ \Omega$ in a line carrying 22 A causes a drop of 2.2 V! The resistance of the system's positive and negative leads must be taken into account. Moral: Use *heavy-gauge* wire.

Automotive battery cables are a good source of such wire. Welding cable is another. Or, you can try flexible, three-conductor, house-wiring cable: Double it and connect all six of its no. 10 solid conductors in parallel. Use one such six-conductor cable for the positive connection, and another for your system's negative load-to-battery lead. (You may be able to find some suitable discarded cable at a building site, or obtain "reel ends" from a building-materials supplier.) Make sure that every connection is well soldered and mechanically tight. You may have to use a propane torch to heat the joints sufficiently to solder them. Connect the main-battery negative lead to

the power supply and the rig.

Assuming that the battery is sufficiently close to its load, most of the resistance in a back-up system occurs at its connectors. Measure the system voltage at the battery, at the power supply and at the load. If you measure a drop of more than half a volt at full load, you have a problem. (Monitors for in-line current and voltage at the battery terminals should be located where you'll see them every time you enter the room. Part 3 of this article will describe battery monitoring in detail and describe a circuit designed for this purpose.)

In cases of excessive voltage drop, such as those with long runs of wire (15 feet or more), another solution is possible. Put a small (100 Ah) battery under your operating desk, within two or three feet of the system's heaviest load (usually your MF/HF transceiver). Hang this additional battery—BT6 in Fig 2—across the 12-V line by connecting it directly—through a suitably rated fuse in its positive lead—to the rig terminals, in parallel with the line from the outside batteries and power supply. This battery will keep the system voltage from sagging during the relatively brief periods of heavy load and then recharge itself from the main battery during intervals of light load.

Notes

¹A cell is a single electrochemical unit capable of generating electricity by means of two electrodes and an electrolyte. Depending on its chemistry and design, a cell may be classed as *primary* (non-rechargeable) or *secondary* (rechargeable). A battery consists of two or more cells connected in series, parallel or series-parallel to combine their voltage and/or current capacities. (In popular usage, *battery* can mean a single cell or a battery of cells. For clarity, *battery* is used to mean "a battery of cells" throughout this article.) The batteries used in commercial and Amateur Radio back-up service are invariably rechargeable and, in heavy-duty, full-station back-up service, are nearly always based on *lead-acid* chemistry. Thus, throughout this article, back-up battery is used to mean "*lead-acid back-up battery*."

²But reasonable safety precautions must be taken when handling and installing back-up batteries because they contain caustic and highly corrosive sulfuric acid.

³"Standby Power: Will the Automotive Battery Do?" *Telephone Journal*, Jan-Feb 1975.

⁴Uninterruptible power systems are designed to be just that: power-supply systems capable of taking over, or continuing to operate, when regular ac power fails.

⁵The *specific gravity* of a substance is the ratio of its density to the density of another substance, with both densities measured in air. The specific gravity of back-up-battery electrolytes uses that of pure water—1.0—as a referent. The specific gravity of the electrolyte in fully charged float cells typically ranges from about 1.2 to 1.275; for deep-cycle cells, the specific gravity is slightly higher.

⁶Float-service cells usually contain approximately 6-molar sulfuric acid; this is, six moles (molecular weights, measured in grams) of H_2SO_4 per liter of electrolyte. The molecular weight of sulfuric acid is 98, so a mole of sulfuric acid is 98 grams.

⁷C&D *Stationary Battery Installation and Operating Instructions*, pub in 1981 by C&D Batteries, 3043 Walton Rd, Plymouth Meeting, PA 19462.

⁸If you store your batteries outside, be sure they are inaccessible to unauthorized personnel.

QST

ICOM IC-725 MF/HF Transceiver

Reviewed by Kirk Kleinschmidt, NT0Z

With the introduction of the IC-725, ICOM joins the entry-level transceiver battle with Kenwood and Yaesu. ICOM's budget-priced '725 should hold its own against its chief competitors: Kenwood's TS-140S; Yaesu's FT-747GX; and Heath's SB-1400 (a slightly reworked FT-747GX).

The '725 is a full-featured 100-W transceiver in a diminutive (3.7 × 9.5 × 9.4-inch) cabinet. Some of its advanced features include ICOM's direct-digital synthesis (DDS) frequency control (more on that later), 26 user-programmable memories, three scanning modes, band-stacking registers (to remember the frequency, mode and filters selected with each memory and band location), two VFOs, selectable 10-dB-gain preamp, 20-dB attenuator, computer interface, and the ability to control the ICOM AH-3 automatic antenna tuner (well suited for multiband mobile operation).

Controls and Connections

The front panel, which accommodates quite a few controls, does not appear overcrowded. The left third of the front panel contains the main **POWER** switch, the **TRANSMIT** switch and push buttons for the Noise **Blanker**, **ATTenuator**, **PRE**amplifier and **AGC**. There's also a backlit **S** meter and relative power-output meter, a headphone jack, an 8-pin microphone connector and two concentric controls—one for **AF** gain and **SQUELCh**, the other for **MIC** gain and **RF POWER**.

The center portion of the front panel is primarily occupied by the black-on-orange LCD and frequency-determining controls such as the VFO knob, the **kHz**, **MHz**, **BAND** and **LOCK** switches (used to set tuning speeds and to change bands; **LOCK** disables the main tuning knob and is also used to transmit subaudible tones in the optional FM mode). To the left of the tuning knob are the mode-selection switches: **SSB**, **CW** (wide and narrow), and **AM/FM**.

On the upper right are the six memory- and VFO-manipulation controls: **VFO A/B**, **SPLIT**, memory channel **UP/DOWN**, **MEMORY**, and **Memory Write**. These controls also have secondary functions: Programmed **SCAN**, **VFO A = B** and **Memory > VFO**. Under the memory controls are the **RIT** and **TUNER** controls (**TUNER** selects and deselects the optional AH-3 automatic antenna tuner).

The '725's rear panel has the following connectors: **DC 13.8 V**, **Antenna**, computer interface, **TUNER** interface, **SEND** and **ALC** jacks (for controlling external amplifiers),



two accessory sockets (for connecting external audio devices, RTTY or packet-radio terminals, automatic antenna tuners or selectors, etc), **CW KEY**, **EXTERNAL SPEAKER**, ground, and a switch to enable the semi-break-in feature in **CW** mode.

The supplied HM-12 hand-held microphone is equipped with **UP** and **DOWN** frequency-selection buttons, in addition to the **PTT** switch. The up/down buttons can also be disabled by a microphone-mounted switch.

Frequency Selection

The IC-725 uses the main VFO knob and several push-button switches to select the operating frequency. When the VFO knob is rotated, the VFO changes frequency in 10-Hz steps. If this is too slow for you, you can select alternate rates of 20 or 50 Hz per step. I found even the 10-Hz rate to be extremely fast—I used the faster rates only while tuning among shortwave broadcast stations. The fastest tuning rate makes the '725 feel awkward. Pushing the **kHz**, **MHz** or **BAND** keys while rotating the VFO knob results in accelerated frequency or band changes.

The '725 has two VFOs, allowing split-frequency operation. There are also 26 programmable memories. The first 22 are regular memories, each storing frequency and mode. Memory channels 23 and 24 each store a pair of frequencies and modes for commonly used split-frequency pairs, and channels 25 and 26 are used to set the

upper and lower limits of the programmed-scan function.

I commend ICOM on the sensible, easy-to-use layout of its VFO and memory function controls. Whether quickly stepping through available memory positions, writing a new frequency to memory, or switching between the two VFOs or a memory position, the '725 makes it easy. Unlike many similar rigs, it's not necessary to enter memory mode to cycle through the available memory channels. In VFO mode, the up and down arrow keys cause the rig to cycle through the memory channels. This makes it easy to tune up and down the band and load the memory channels with the frequencies of several DX or contest stations without a lot of button pushing.

The '725 has three scan modes: (1) programmed scan, using the contents of memory channels 25 and 26 as limits; (2) memory scan, which repeatedly scans all programmed memory channels; and (3) selected-mode memory scan, which repeatedly scans the contents of all memory channels with the same operating mode. Certain scan functions can be changed by installing a diode on one of the internal circuit boards.

Although the '725 is an entry-level unit, ICOM's advertisements promote the rig's high-tech DDS frequency synthesizer. DDS is supposed to be the last word when it comes to synthesizer performance, offering improved lock-up times and providing excellent phase-noise performance. Sure, the

Table 1

ICOM IC-725 160- to 10-Meter Transceiver, Serial no. 02826

Manufacturer's Claimed Specifications

Frequency coverage: Receiver, 500 kHz to 30.0 MHz; transmitter, 1.8 to 2.0, 3.40 to 4.1, 6.90 to 7.5, 9.90 to 10.5, 13.90 to 14.5, 17.90 to 18.5, 20.90 to 21.5, 24.40 to 25.1, 27.90 to 30.0 MHz.

Modes of operation: USB, LSB, CW, FM, AM.

Power requirement: 13.8 V dc, 20 A max on transmit, 1.5 A max on receive.

Transmitter

Transmitter output power: Max 100 W PEP on SSB, 100 W on CW and FM, 40 W on AM.

Spurious signal and harmonic suppression: Greater than 50 dB below peak power output.

Third-order intermodulation distortion: Not specified.

CW keying waveform: Not specified.

Transmit-receive turnaround time (PTT release to 90% audio output with an S9 signal): Not specified.

Transmitter AF response: Not specified.

Receiver

Receiver sensitivity (preamp on):

SSB and CW (bandwidth not specified): $<0.15 \mu\text{V}$ for 10 dB S/N from 1.8-30 MHz.

AM: (6.0-kHz bandwidth) $<2 \mu\text{V}$ for 10 dB S/N from 1.8-30 MHz.

FM: (bandwidth not specified) $<0.5 \mu\text{V}$ for 12 dB SINAD from 28-30 MHz.

Receiver dynamic range: Not specified.

S-meter sensitivity (μV for S9 reading): Not specified.

Squelch sensitivity: $<0.3 \mu\text{V}$.

Receiver audio output: $>2.6 \text{ W}$ at 10% THD (total harmonic distortion) with an 8- Ω load.

Receiver audio + IF response: Not specified

Other

Color: Gray.

Size (HWD): 3.7 x 9.5 x 9.4 inches; 10.1 lb.

[†]Blocking dynamic range measurements were noise limited at all spacings; third-order IMD dynamic range measurements were made at the ARRL Lab standard signal spacing of 20 kHz.

Measured in the ARRL Lab
As specified.

As specified. FM and AM
(transmit) optional.

At 14.2 MHz and 13.8 V, 17.4 A
max; 0.84 A in receive at min
audio gain.

Transmitter Dynamic Testing

Typically 125 W PEP on SSB and
CW. Power output varied slightly
from band to band. (IMD
performance rated only to 100 W.)

See Fig 1.

See Fig 2.

See Fig 3.

Fast AGC, 20 ms; slow AGC, 22
ms.

420-2650 Hz.

Receiver Dynamic Testing

Minimum discernible signal
(noise floor) with 500-Hz filter:

Preamp on

3.5 MHz, -137.5 dBm ;

14 MHz, -137.5 dBm .

Preamp off

3.5 MHz, -128.5 dBm ;

14 MHz, -129.5 dBm .

6.0-kHz bandwidth (preamp on,
test signal 30% modulated with
1-kHz tone):

1.0 MHz, $1.85 \mu\text{V}$;

3.5 MHz, $0.51 \mu\text{V}$;

14 MHz, $0.48 \mu\text{V}$.

FM module not tested.

Blocking dynamic range[†]:

3.5 MHz, noise limited;

14 MHz, noise limited.

Two-tone, third-order
intermodulation distortion
dynamic range, preamp on:[†]
3.5 MHz, 91.5 dB; 14 MHz,
90.5 dB. Preamp off: 3.5 MHz,
92.5 dB; 14 MHz, 90.5 dB

Third-order intercept, preamp on:
3.5 MHz, 0 dBm; 14 MHz,
 -2 dBm . Preamp off: 3.5 MHz,
10 dBm; 14 MHz, 6 dBm.

Preamp off, 1.0 MHz, $150 \mu\text{V}$;
14 MHz, $56 \mu\text{V}$; 29 MHz, $78 \mu\text{V}$.

Min, $<0.3 \mu\text{V}$; max, $>2.2 \text{ V}$.

3.13 W at 10% THD with an 8- Ω
load.

430-2090 Hz.

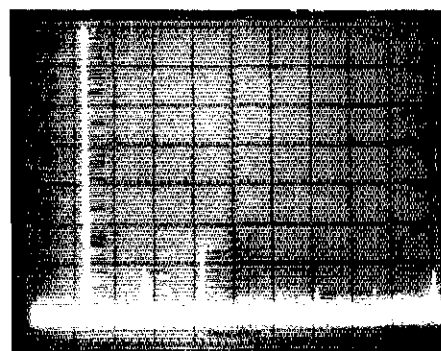


Fig 1—Worst-case spectral display of the ICOM IC-725. Horizontal divisions are each 10 MHz; vertical divisions are each 10 dB. Output power is approximately 134 W at 14.2 MHz. All harmonics and spurious emissions are at least 56 dB below peak fundamental output. The IC-725 complies with current FCC specifications for spectral purity.

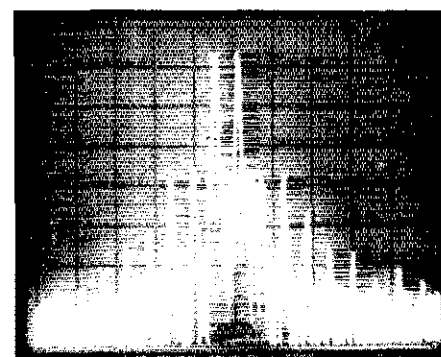


Fig 2—Spectral display of the IC-725 during two-tone intermodulation distortion (IMD) testing. Third-order products are approximately 35 dB below PEP output, and fifth-order products are approximately 38 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. The transceiver was being operated at 100 W PEP output on 14.2 MHz.

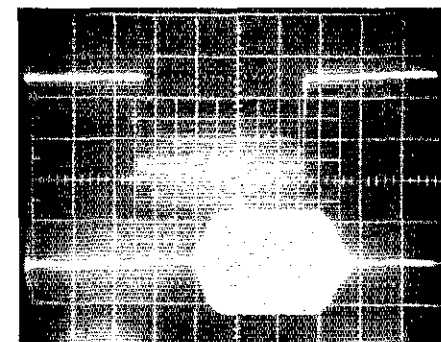


Fig 3—CW-keying waveforms for the ICOM IC-725 in the semi-break-in mode. The lower trace is the RF envelope; the upper trace is the actual key closure. Each horizontal division is 5 ms. The transceiver was being operated at 130 W output on 14.02 MHz. The IC-725's CW keying is good.

IC-725 is an entry-level rig—I had to remind myself of that fact when using the '725 in tough band conditions—but ICOM's inclusion of DDS hasn't (at least in the samples we tested) resulted in the phase-noise reduction hinted at in ICOM's advertisements.

The IC-725's frequency display is up to ICOM's usual standards. It's easy to read and prominently displays all the necessary information (band, mode, selected VFO, etc.).

The RIT feature, although smooth and easily switched in and out, does not have much range. The review rig exhibited less than 3 kHz of RIT travel. (Of course, for wider excursions, split operation using both VFOs works very well.) Another unhelpful characteristic of the '725's RIT is that the offset frequency is not indicated separately on the frequency display. Pressing the second-function key and the RIT on/off key sums the RIT offset with the displayed frequency.

The feel of the IC-725's tuning knob is excellent. It is extremely smooth and has the right amount of weight. A slight flick of the wrist will send the VFO dashing up or down the band—unlike the detented tuning knobs on some other rigs. The IC-725 also has an adjustable knob brake so you can customize the feel of the rig's tuning knob.

The Receiver

The '725's front end is made up of eight automatically selected band-pass filters: 0.5 to 1.6, 1.6 to 2, 2 to 4, 4 to 8, 8 to 11, 11 to 15, 15 to 22, and 22 to 30 MHz. As you tune up and down through the MF/HF range of the receiver, the appropriate band-pass filter is switched in. Although its sensitivity is quite good (see Table 1), the IC-725's receiver performance under tough band conditions (lots of strong signals or a strong station close by) is far from top-notch. This is not uncommon in entry level rigs. Although the IC-725's third-order IMD dynamic range is good, broadband noise generated in the receiver thwarted all our efforts to measure the rig's blocking dynamic range.

The IC-725 comes equipped with a 2.3-kHz SSB filter and a 6-kHz AM filter; optional 250- and 500-Hz CW filters are available. The 500-Hz filter is just right for those who like a good CW filter, but one that's not extremely narrow. This filter provides an excellent middle ground, and significantly improves the rig's CW performance.

The IC-725 allows selection of only one bandwidth during AM reception: 6 kHz at -6 dB and "less than 20 kHz" at -40 dB. (The IC-725's SSB filter is not selectable during AM reception, and envelope detection of even communications-quality AM is suboptimal with an SSB filter, anyway.) A 6-kHz-wide filter, assuming that it has a good -60/-6 shape factor (2:1), is

acceptable—although a kilohertz or two too wide—for reception of international broadcast stations (spaced 5 kHz apart) and amateur AM signals. The IC-725's AM filter is far too wide for good AM reception in Amateur Radio and shortwave-broadcast bands—and the '725 sounds as if audio rolloff has been built in to compensate for the filter's wideness. In on-the-air tests, the IC-725's 6-kHz-wide filter allows reception of strong SWBC signals 10 to 12 kHz away from their carrier frequencies. Selectivity this broad is optimal only for mediumwave channel spacings (9 or 10 kHz). Remedy: Switch the IC-725 to USB or LSB and receive AM as SSB. The IC-725's SSB filtering is good. Selectivity on FM (with the optional FM unit [not tested] installed) is rated at 15 kHz.

Mode selection on the '725 is simply a matter of pushing a button (or two). Each of the three mode-selection push buttons serves a double duty. Pushing the AM/FM key switches the rig into AM mode; pushing it again engages FM mode, and so on. The SSB key toggles between USB and LSB, and the CW key toggles between wide and narrow modes (provided an optional CW filter is installed).

DXers and contesters will immediately notice the IC-725's lack of serious QRM-fighting controls. The optional CW filter and the noise blanker are about it! There's no IF shift or variable-bandwidth control. In casual operation, these features are usually not missed, and leaving them out keeps the cost of the '725 down, but I would have used them if ICOM had included them.

The noise blanker in the '725 is a mixed blessing. In my experience, the noise blanker works well on some pulsed (ignition-type) noise, but does not work well on any type of atmospheric noise, with one exception: Sometimes, the blanker would totally eliminate the Soviet over-the-horizon radar ("woodpecker")—even a 20-over-S9 woodpecker! At other times, because of propagation effects or other influences, the noise blanker does little to eliminate the woodpecker. The really frustrating thing about the noise blanker is its annoying tendency to chop and distort desired signals. This, a side effect of limited dynamic range, is commonly caused by noise blankers.

A 10-dB-gain preamp and a 20-dB attenuator can be switched into the receive line. The attenuator is useful in taming extremely strong signals. (The IC-725 has no RF-gain control.) Especially useful on 15 and 10 meters, the preamplifier really perks up marginal signals. Using the preamp at lower frequencies, however, usually causes more trouble than it is worth in terms of degraded strong-signal-handling capability.

The IC-725's audio output is a booming 3-plus watts into an 8-ohm load. That's power to spare—perhaps too much for

fixed-station operation. The rig's audio-gain control is quite touchy. Rarely did I have to turn the knob past 9 o'clock (that means ¾ of the knob's range is never used!). I had a difficult time trying to find just the right setting for the AF-gain control with the internal speaker—it was nearly always a bit too high or a bit too low. Perhaps a more linear AF-gain control, or the use of an external speaker, would provide better performance.

Switchable AGC (fast or slow) adds to the IC-725's flexibility, although I did not notice a great deal of difference between the fast and slow settings. The AGC switch does not function in FM mode.

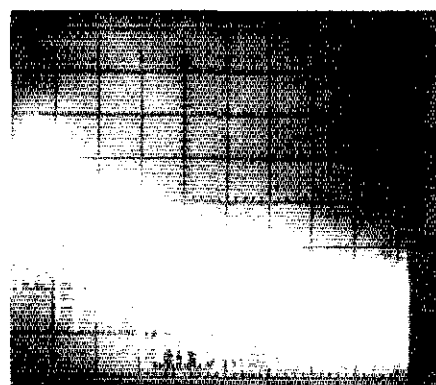
The Transmitter

Power output for the IC-725 is the industry standard 100 W PEP (40 W on AM with the optional UI-7 AM/FM unit). The review unit put out as much as 140 W on 12 meters, although our lab engineers are quick to point out that the '725's IMD performance is specified at 100 W output, and, according to ICOM, exceeding that level will degrade the unit's IMD performance and may damage or destroy the final-amplifier transistors. It's easy to reduce the IC-725's maximum power output, though.

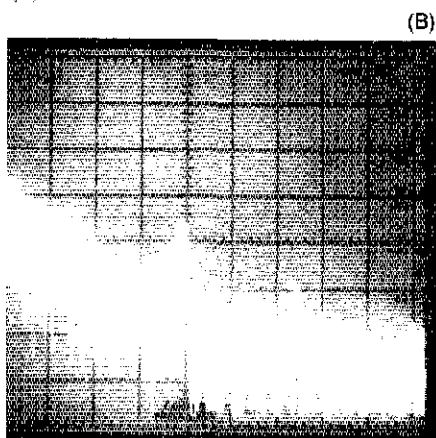
The '725 has a transmitter-drive control. CW and SSB output power typically can be varied between about 10 and 100 W. That the '725 would not put out less than 10 W was a surprise to me; as an avid QRP operator, I expected the IC-725's output to be much less at the low end. Fortunately, the rig's minimum and maximum power output can be adjusted by means of separate internal controls. The locations of these potentiometers (R208 and R210) are shown on p 31 of the IC-725 owner's manual. The review rig is now set for 5 W at the low end and about 95-105 W at the high end. It takes only about 10 minutes to make these adjustments; all you need is a Phillips screwdriver for the bottom-cover screws, a slot-head screwdriver for the adjustments, a CW key, a dummy load and a wattmeter.

The broadband nature of the rig makes it easy to tune up—if that's the right term! Simply adjust the RF PWR control to obtain the desired power output and you're all set. For SSB or AM operation, you'll have to set the mike gain control to the point where the ALC-indicator LED lights to its brightest level on voice peaks. This is not as handy as having a separate meter scale for measuring ALC levels, but the LED arrangement seems to work well.

The duty cycle of the '725 is not mentioned in the operator's manual, so as a general precaution I did not operate the rig key-down for very long. When operating RTTY, the rig became quite warm, even at 25 W output. Normal CW and SSB operation (50% duty cycle) doesn't generate much heat. The rig's quiet cooling fan runs during transmission.



(A)



(B)

Fig 4—Spectral display of the IC-725 transmitter output during composite-noise testing. Power output is 130 W at 3.5 MHz (A) and 130 W at 14 MHz (B). Each vertical division is 10 dB; each horizontal division is 2 kHz. The scale on the spectrum analyzer on which these photos were taken is calibrated so that the log reference level (the top horizontal line on the scale in the photos) represents -60 dBc/Hz and the baseline is -140 dBc/Hz. Composite-noise levels between -60 and -140 dBc/Hz may be read directly from the photographs. The carrier, off the left edge of the photographs, is not shown. These photographs show composite transmitted noise at frequencies 2 to 20 kHz offset from the carrier.

The IC-725's CW shaping is good, and the transmit/receive turnaround time is fast enough to accommodate digital modes such as packet radio and AMTOR. The rig's semi-break-in circuits do not chop off the first CW character when switching from receive to transmit. The semi-break-in feature can be switched off by pushing a button on the rear of the '725. The break-in delay is also adjusted on the rear panel.

Owner's Manual

At 36 pages, plus a separate schematic, the owner's manual for the IC-725 isn't skimpy, but it's not too informative, either. Instructions for setting up the rig and those describing its operation are excellent—easy to read, logical, and supported by useful diagrams. The short section on maintenance and adjustment is limited mostly

to instructions on opening the rig and installing optional filters and making minor adjustments. As I expected, the supplied schematic does not detail the '725's DDS circuit.

Accessories

Installing the 500-Hz CW filter gave me the perfect opportunity to look "under the hood" of the '725. Inside the rig I found three main circuit-board assemblies: one on the top of the chassis, one on the bottom of the chassis, and one just behind the front panel. Removing the top and bottom parts of the cabinet is easy, requiring only the removal of a few screws.

There are four main internal plug-in accessories: 250- and 500-Hz CW filters (only one at a time can be installed); the UI-7 AM/FM unit; the UT-30 programmable tone-encoder unit (it goes with the AM/FM unit); and the CR-64 high-stability oscillator unit. The installation of each of these units is a simple affair, completely illustrated in the manual. Installing the filter takes all of *five minutes*, start to finish.

The list of other accessories for the IC-725 is surprisingly extensive. Among them are the MB-23 carrying handle, the AH-3 automatic antenna tuner, the SP-7 external speaker, the CT-16 satellite interface, the IC-MB5 mobile mounting bracket, the CT-17 level converter and the EX-627 external automatic HF-antenna selector. The list goes on.

Operating Impressions

My satisfaction with the IC-725 varied over time: It depended greatly upon the type of operating I was doing. The '725 excelled during casual operation—it has a lot of things going for it: small size, a general-coverage receiver (that got a good workout on SWBC and nonbroadcast, nonamateur stations), and flexible, easy operation. The '725 worked well on RTTY and drove my 3CX800A7 amplifier without complaint. The rig never gave me a bit of trouble, and lived up to its design objectives in almost every way.

Still, I have mixed feelings about the '725. In addition to the *many* features and characteristics of the '725 that I like, it has several that I find disappointing. As I mentioned, I had a lot of trouble with the '725's receiver in strong-signal environments, like evening operation on 40 meters and during contests like the CQWW DX SSB event. That combination caused the receiver to generate a lot of garbage as it succumbed to strong, nearby (and sometimes not-so-nearby) signals, making copy difficult. The IC-725's receive-audio distortion and signal-intermod-with-noise effects limit the viability of the receiver during "CW narrow" operation.

The noise blanker's characteristic of blanking desired signals, and the extreme sensitivity of the AF gain control, made for a lot of knob turning and button pushing when I was trying to dig out the weak ones.

To be fair, I have to point out that the receiver maladies I experienced with the '725 (except the severe audio distortion) are common to other comparable rigs. Contests and evening operation on 40 meters in New England can be a challenge for any receiver!

All said and done, the IC-725 is a pretty neat little radio. It would make a fantastic mobile rig, and a nifty first rig. Actually, anyone but serious DXers and contesters will find the '725 to be extremely capable and easy to use.

The introduction of the IC-725 has certainly done one thing—it's made it darn difficult to choose between the latest entry-level radios. Even after using all of them I still can't make up my mind about which one I like best!

Thanks to Dave Newkirk, AK7M, for his contributions to this review.

Price class: IC-725, \$950; 500-Hz CW filter, \$77; 250-Hz filter, \$74; AM-transmit/FM transceive module, \$72. Manufacturer: ICOM America, Inc, 2380 116 Ave NE, Bellevue, WA 98004, tel 206-454-7619.

Feedback

□ There's an error in Fig 3 of "Stable HEXFET RF Power Amplifiers," Technical Correspondence, *QST*, Nov 1989, p 39. As shown, the transformer acts as a step-up circuit, presenting an impedance of $200\ \Omega$ to the FET. To present the required $12.5\text{-}\Omega$ load to the FET, the transformer should be connected as shown here in Fig 5.—*Tnx to Joseph C. Pinckney, WB2VNM*

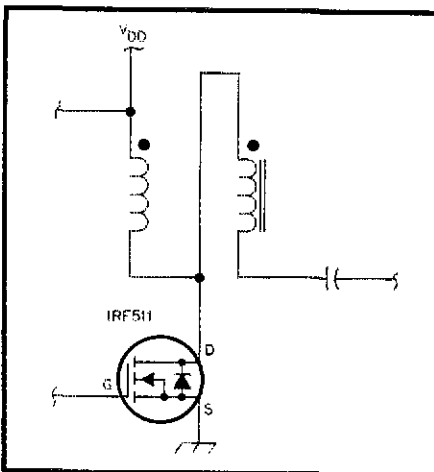


Fig 5—Correct connection for the transformer.

□ In Fig 3 of "A Tester for Crystal F, Q and R" (D. DeMaw, *QST*, Jan 1990, p 23), the U2 terminal labeled GND should be ADJ, and there should be a $220\text{-}\Omega$ resistor across U2's ADJ and OUT terminals. (*tnx Paul Parker, WB6DHH*)

A NARROW RTTY FILTER FOR THE KENWOOD TS-430S TRANSCEIVER

□ For owners of TS-430S transceivers that include YK-88CN 270-Hz CW filters: Connecting pins 1 and 2 of connector 27 on the 430's IF board with a short piece of solid wire (no. 22 is suitable) causes the YK-88CN to be selected in the transceiver's "narrow SSB" modes. When used for LSB reception, the filter is centered on the standard high RTTY tones for 170-Hz shift (2125 Hz mark and 2295 Hz space) and works great. The only drawback to this modification is that the 270-Hz filter doesn't work in the USB mode (necessary for AMTOR operation) unless the IF SHIFT control is turned clockwise as far as it can go—and then it passes only the mark tone and attenuates the space tone.—*Kenneth O. Flint, N7IMR, 3600 Data Dr #58, Rancho Cordova, CA 95670*

DIODES FOR RF PROBES

□ Concerning the Hints and Kinks item "RF Probes Revisited" (March 1986 Q57), I have a few comments regarding the RF sampler shown in Fig 3 on page 48 of that issue. The 1N4007 power diode used in the sampler is a poor choice for an RF rectifier because of its relatively slow reverse recovery rate (t_{rr}): around 30 μ s. At radio frequencies, the 1N4007 cannot clear out its minority carriers in time to operate properly on the next cycle of the applied signal.

A somewhat better choice for an RF-probe rectifier would be one of the silicon fast-recovery diodes used in the TV industry. These silicon diodes, used to rectify RF ac (at 15.734 kHz in standard TV power supplies), may have a PIV rating as high as 1.5 k and a t_{rr} of around 1 μ s.

Some catalogs list high-voltage, fast-recovery diodes that have a t_{rr} of 0.2 μ s. Such diodes are suitable for use at frequencies up to 250 kHz—certainly better than the power-line-frequency speed of the 1N4007! A 0.2- μ s diode is worth trying in an RF probe. (By the way, I cross-referenced the in-house part number of a typical fast-recovery, TV-power-supply diode in a semiconductor reference guide published by a well-known electronics chain. The recommended replacement was a 1N4007 equivalent! Such a diode would rectify poorly, if at all, in an RF-driven portion of a TV or VDT power supply.)

Incidentally, I've had great results using vacuum-tube diodes in in-line RF probes. The types I've used include the 9004, 9005, 9006 and 559. These work perfectly up past 432 MHz and can be built into a short section of transmission line; if the line is flat, the peak power on the line can easily be computed from the diodes' voltage output.—*Harold Isenring, W9BTI, 10850 Amy Belle Rd, Colgate, WI 53017*

MORE "LOW POWER" POWER OUTPUT FOR THE YAESU FT-23R TRANSCEIVER

□ Having owned a Yaesu FT-23R handheld and PA-6 mobile dc adapter/charger for a few months, I found I needed more punch than the maximum RF output (about 5.5 W) the rig produced when powered by the car electrical system. To solve this problem, I purchased a "brick" at a local hamfest—and discovered that the FT-23R's 5.5 W overdrove it. Set for low power, the rig put out about 0.5 W—too little to drive the amplifier!

I called Yeasu and learned that the FT-23R's low-power output is adjustable. Here's how. Carefully open your radio as per the illustration on page 17 of its operating manual, and fold the radio in half. Look down the side of the half containing the antenna connector to locate two small trimmer pots. The uppermost one small (closest to the antenna connector) sets the transceiver's RF output power. Output increases with clockwise rotation of this control.

Connect the transceiver to a dummy antenna via an RF wattmeter. Using a power supply set to supply the voltage at which you'll use the transceiver in the field or car, adjust the rig's low-power output to the level you need. Reassemble the FT-23R.

Because this adjustment also increases the FT-23R's high-power RF output, be sure to keep the transceiver in its low-power mode to keep from overdriving the amplifier—and to avoid stressing the FT-23R's output-amplifier transistor.³—*Hank Hanburger, K3YDX, 2265 Misthaven Ln, Gambrills, MD 21054*

LOOP COUPLING FOR J ANTENNAS

□ Coax can be matched to a J antenna's quarter-wave section by means other than

clamping, clipping, bolting or soldering. Using an idea by Lawrence Showalter, W6KIW, and Robert Hopkins, K6MUP, I tried coupling to a J with a loop (Fig 1). Loop coupling systems are nothing new for some antennas, but for the J, loop coupling is a new idea that works fine. I find that loop coupling allows me to obtain a lower SWR on the J's feed line more quickly than tapping the line on the J element.

My J antennas consist of 1/2-inch-diameter copper tubing, elbows, Ts and caps. The center-to-center spacing of the 3/4- and 1/4- λ portions of a J constructed of these materials is 1 3/4 inches. The coupling loop I use is 5 1/2 \times 1 3/4 inches in size and consists of plastic-coated no. 14 copper wire. Connect one end of the loop to the coax center conductor and the other end of the loop to the coax shield. Be sure the loop ends don't touch where they connect to the coax, and coat the connections well with liquid plastic. (Plastic compounds intended for dip-coating tool handles work fine.) Position the loop flat against the J's piping, with the loop bottom about 3/8 inch from the inside bottom of the crook of the J. Temporarily tape the loop to the J element.

Adjusting the loop for minimum SWR is simple: Move the loop up or down from its initial position until you find the point of minimum feed-line SWR. Once you've found this point, tape the loop as closely

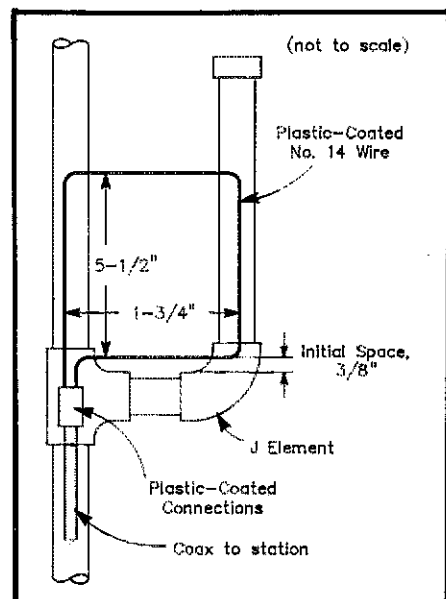


Fig 1—Henry Davis feeds his VHF J antennas with the loop coupling system shown here. See the text for how to position and mount the loop for minimum SWR.

¹Reverse recovery time is the time a diode takes to recover to a specified value of reverse current or voltage after switching from the on state.—AK7M

²Hints and Kinks recommends against using the FT-23R at output powers above its rated maximum in the high-power mode. Component damage, and emission of spurious signals at levels above those allowed by FCC purity-of-emissions rules, may result.—AK7M

to the J's copper pipe as possible. Space between the coupling loop and the J element raises the SWR.—*Henry Davis, W6DTV, 7822 Washington Ave, Sebastopol, CA 95472*

USING THE KENWOOD BS-8 PANORAMIC-DISPLAY MODULE WITH GENERIC OSCILLOSCOPES

□ You can use your oscilloscope as a panoramic display in conjunction with Kenwood transceivers that have 8.83-MHz intermediate frequencies (IFs) by teaming the scope with a Kenwood BS-8 pan-display module, generally available at Kenwood ham-radio-equipment dealers for about \$110.³

Connect the adapter as shown in Fig 2. The BS-8 requires 11 V dc (negative ground) and 12 V dc (positive ground); these voltages may be obtainable from the scope if it's solid state. Pick up the transceiver's 8.83-MHz IF signal at the input end of the receiver IF stages. (In the Kenwood

TS-430S transceiver, this signal is accessible at jack 6 on the 430's RF board.) Feed the BS-8's output (labeled to Scope Vertical Input in Fig 2) into the scope's vertical (Y) input.

Finding a tap to obtain the oscilloscope's sawtooth sweep signal may take a little experimentation. This signal should be available at the scope's horizontal-output driver stage, or at the output of the scope's sawtooth-oscillator buffer amplifier.

Adjust the scope's vertical sensitivity; 0.1 V/div is sufficient. Use the slowest sweep speed that does not produce noticeable display flicker.—*Kurt E. Hunter, WB3AGC, Box 351 Highland Rd, Orefield, PA 18069, and Martin K. Salabes, K3CSV, 1631 Sweetland St, Nokomis, FL 34275*

WINDING LARGE COILS ON A MOTORIZED BARBECUE SPIT

□ Evenly winding large coils of no. 16 or heavier-gage wire can be tricky. Such a job may require three hands! Winding evenly spaced coils with lighter-gage wire is also a chore, even if you use string for spacing the turns. Winding such a coil often involves several tries, and the result rarely looks professional.

I wind large coils on a motorized barbecue spit with a set of mandrels made from plastic irrigation tube. End washers, made from PC-board material and cut to fit the square spit, cap the mandrels. "Instant" glue holds the washers to the mandrels.

This arrangement allows me to wind large coils for power-amplifier tanks, Transmatches, and so on, from wire up to no. 12. For air-core, self-supporting coils, I use a mandrel 1/4 inch less in diameter than the final diameter of the coil. The motor is slow enough for the turns to be wound against firm thumb pressure below the rotating mandrel, which limits "spring-out" when the wire is cut.

Thin-wire, space-wound coils can be wound with great accuracy on slip-on forms. With patience, you can even wind Litz-wire and π -wound chokes. For plug-in transmitter coils, 1/4-inch-diam plastic-pipe couplers are fine—and cheap. They can be drilled and mounted on 14-gage-wire legs passed through two holes in a terminal strip and soldered to form plug-in pins.

Although large, solenoidal coils are less in vogue than they once were, they are still useful in antenna tuners and vacuum-tube power amplifiers. My rotisserie technique allows me to fabricate such coils professionally and cheaply.—*Alex Comfort, MD, KA6UXR, 121 S Evergreen, Ventura, CA 93003*

AN AGC-THRESHOLD CONTROL FOR THE HEATH HW-9 TRANSCEIVER

□ Strong signals near or in the Heathkit HW-9's IF passband can cause weaker signals in the passband to be distorted or "pumped" by AGC effects in the transceiver's high-gain IF-amplifier stages. As designed, these stages run at full gain, and there is no panel control for adjusting their gain. Here's an easy modification that solves this problem.

During alignment of the HW-9, R329 (AGC SET), a 500-k Ω circuit-board trimmer pot, is set and not adjusted again. Through experimentation, I discovered that R329 allows the transceiver's IF gain to be reduced enough to minimize AGC pumping. I replaced R329 with a chassis-mounted control to allow routine adjustment of the HW-9's IF-amplifier gain.

Remove the original R329 from the PC board and discard it. Mount R329's shaft-driven replacement—I used a 500-k Ω linear control from Radio Shack—on the HW-9 chassis. (There is ample room on the chassis for the control. I elected not to place the control on the HW-9's front panel, instead installing it on the transceiver's side [left, viewed from the front.]) Connect the new control to the R329 circuit-board holes via a piece of RG-174 coax.

The only readjustment necessary after this modification is a slight touch-up of R333 (METER ZERO). Now, your HW-9 can perform better in the presence of strong signals: Using the panel-mounted R329, simply reduce the IF-amplifier gain to the point at which AGC pumping disappears. Adjust R329 for full receiver gain as necessary.—*Jim Douglas, N1ZF, 9 Linda Ln, Clark, NJ 07066*

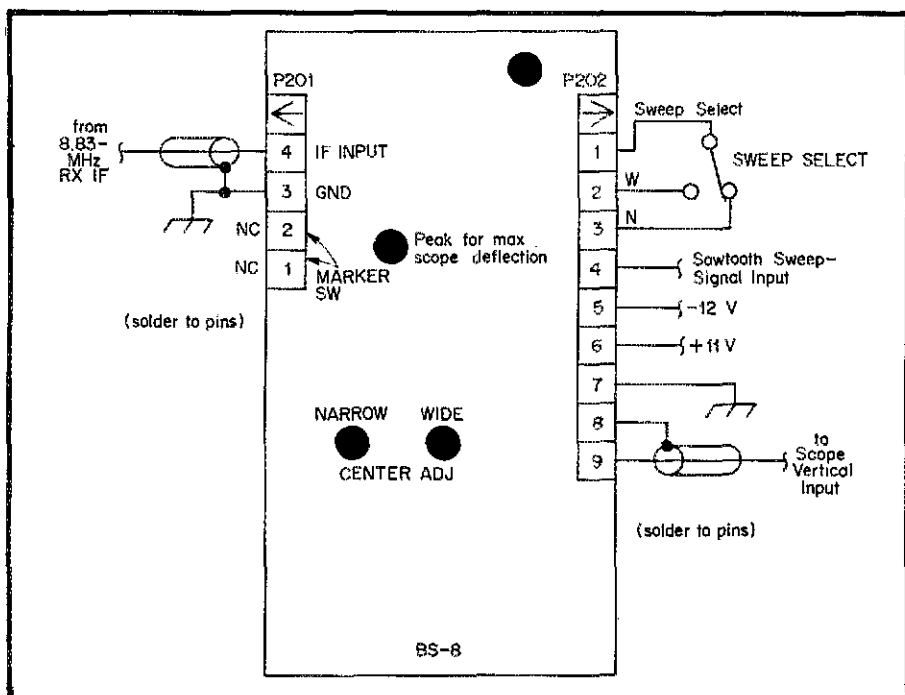


Fig 2—Kurt Hunter and Martin Salabes connect a Kenwood BS-8 pan-display adapter to a generic oscilloscope as shown here. Some Kenwood transceivers include a jack that carries the 8.83-MHz IF signal necessary to drive the BS-8; see the text for one means of obtaining this signal from a TS-430S.

The publishers of QST assume no responsibility for statements made herein by correspondents.

TRANSCEIVER AUDIO-FREQUENCY RESPONSE

□ A good technical Product Review must contain information that is important to users of the equipment. The August 1989 Product Review of the Yaesu FT-747GX accomplished this end.¹

One of the most important things about any transceiver is: *How does it sound?* If it sounds lousy, it doesn't—for instance—matter how sensitive the receiver is. If the receiver section has a severe treble and/or bass roll-off, the audio *cannot* sound good. This is not just a matter of aesthetics. If the audio-frequency passband is restricted beyond certain limits, the *understandability of speech will be degraded*.

Long ago, Bell Telephone Labs researchers found that, for best understandability, speech needed a passband of about 300 to 3000 Hz, a total bandwidth of 2700 Hz. For example, if the high frequencies are severely rolled off, the sibilant (hissing) sounds of speech—like the *f*, *s*, *h* and soft *c*—become muddy and not consistently distinguishable from each other.

A voice-communications product should be designed to provide effective communication. If "...the overall SSB receive bandwidth of the FT-747GX is only 1246 Hz at -6 dB, with a 2.2-kHz-wide IF filter in line!", there is a problem that needs to be fixed. Fortunately, Dave Newkirk and column editor Rus Healy followed through with the manufacturer's representative and found a solution to this problem. This is the kind of Product Review that benefits the *owners*, and the *manufacturer*, of the equipment. The manufacturer ultimately benefits because good-sounding radios will sell better than muddy-sounding radios.

Of equal importance is a transceiver's SSB transmit bandwidth at the -6 dB points. Measuring the transmit bandwidth is a simple thing to do. All you need is a sine-wave audio generator and a wattmeter. Set the audio generator output frequency to about 1000 Hz. Feed the audio into the transmitter (connected to a dummy load) and adjust the generator output level until the wattmeter reads 40 W. Decrease the generator's frequency until the wattmeter reads 10 W. Write down the frequency. Now, increase the audio-generator frequency above 1000 Hz until the power output measures 10 W. Write down that frequency. End of test. The whole procedure takes less than five minutes. This is time well spent if the results will appear in a credible publication with a circulation figure of

159,000 hams. The transmit and receive audio frequency -6 dB passband of a transceiver is important to—and easily understood by—most hams.—*Richard L. Measures, AG6K, 6455 La Cumbre Rd, Somis, CA 93066*

TUBE-NUMBER CROSS REFERENCE

□ Much to my surprise, I receive a couple of requests each month for a VT-to-commercial tube cross reference. I've compiled a comprehensive cross reference that provides the commercial tube-number equivalents for WW II Army vacuum-tube numbers (VT numbers).² The US Navy normally used the commercial identification for vacuum tubes, but my list also includes 18 known exceptions that have 5-digit Navy identification numbers.

This cross reference does not provide commercial-to-military relationships. Also, I've not attempted to categorize tubes for their intended purpose, nor to include tube characteristics.—*Bill Welsh, W6DDB, 45527 3rd St East, Lancaster, CA 93535-1802*

ICOM IC-22S REPLACEMENT IC

□ There are still many of the popular ICOM IC-22S rigs around, perhaps owned by folks like me who refuse to let them die. When my IC-22S quit, the repairman diagnosed the problem as a defective programmable divider (IC1), a TC5080P. The technician spent about eight weeks trying to locate a replacement. When he couldn't find one, I took the rig home.

ICOM customer service confirmed that the TC5080P was no longer available and they knew of no substitute. After some searching, I learned that the ECG1207 is a direct replacement for the TC5080P, but even this IC is discontinued. I was elated to find a local electronic-components supplier had four ECG1207s lying in a dusty box.³ I bought two of them. The ECG1207 is installed in my '22S and it works perfectly.

Perhaps there are other electronics stores around the country that also may have the ECG1207 in stock.—*George L. Brian, WA4WJD, 3913 Albert Dr, Nashville, TN 37204*

²The *Surplus Conversion Manual*, by R. C. Evenson and O. R. Beach, Vol 1, 2nd edition, 1948, published by Techno-Graphic Publications and distributed then by Editors and Engineers, Ltd of Summerland, California, contains such a list. That publication is evidently out of print. A copy of the complete cross reference (including Bill's additions) is available from the ARRL Technical Department Secretary for a no. 10 SASE and \$1 to cover photocopying costs.—*Ed.*

³Randolph & Rice, 1213 McGavock St, Nashville, TN 37202; tel 615-255-5602.

BAMBOO SOURCE

□ Bamboo poles for quads and other antenna projects are often hard to obtain. I've found a source that provides not only bamboo poles, but bamboo plants as well for those who want to grow their own.⁴ The bamboo poles are available in 10-foot lengths and diameters from one-half to four inches.—*Rob Frohne, KL7NA, 119 E Whitman Dr #10, College Place, WA 99324*

MORE ON BAUD RATE—UGH!

□ In October's Technical Correspondence,⁵ Mr Moore asserts that describing a system to be "...operating at 1200 bauds, with a 'baud rate' of 300, implies that the system line pulse rate is varying cyclically between 900 and 1500 pulses per second (1200 ± 300)!"

I assert that it *does not*! The technical picture I get from that statement is one of a system that at some moment was operating at 1200 baud, but has been constantly changing by +300 baud every second since ... by now, well above the frequency of light!—*Bruce E. Lackey, WB3HAE, 1003 Aster Boulevard, Rockville, MD 20850*

Mr Moore responds:

Bruce is right, and I was in error (I know better!) by suggesting there was anything cyclic about "baud rate."—*Ernest J. Moore, VE3CZZ, 37 Ashgrove Cres, Nepean, ON K2G 0S1*

ICOM SERVICE CONNECTION

□ Those with telephone data-communication capability may be interested in a new feature on the CompuServe® information service. There is now an ICOM SUPPORT data library in the CompuServe HAMNET forum. CompuServe members can download service bulletins for many ICOM products from the data library.

While in HAMNET, take a look in data library 1. Electronic copies of *ARRL Letter*, *Gateway* and *W1AW* bulletins are available there.

If you want to join CompuServe (there are charges for connecting to the service), see your local computer dealer, or call 800-848-8199.—*Bob Schetgen, KU7G, ARRL HQ*

MORE ON TREE-SUPPORTED ANTENNAS

□ I found Doug Brede's article to be very

⁴Bamboo Brokerage, Inc, 5016 192nd Place NE, Redmond, WA 98053-4602, tel 206-858-5166. A catalog is available.

⁵E. Moore, "Baud Rate—Ugh!", Technical Correspondence, QST, Oct 1989, p 37.

¹D. Newkirk, "Yaesu FT-747GX MF/HF Transceiver," Product Review, QST, Aug 1989, pp 33-36 and 52.

informative.⁶ Here's another means of attaching a wire to a tree that should help prevent damage to the tree—a porcelain cable holder (see Fig 1).

The True Value® and ServiStar™ hardware stores in my neighborhood sell these devices. The surfaces of the holder are smooth and should not cause much abrasion.

If you need some "elastic rope" to compensate for the movement of a tree or its branches in the wind, try the elastic tie-downs (bungee cords) that can be found in hardware, department and camping-goods stores under many different names. I found such tie-downs in packages marked "Buffalo Brand Bungee Straps" and "Adjust-A-Cord Carrier Strap."—Bob Raffaele, W2XM, 5 Gadsen Ct, Albany, NY 12205

PROGRAMMING IN C

☐ I enjoyed James Cain's article about the new facilities at W1AW.⁷ Even though I've been a ham since I was 14 (1954), I've never been able to make the trip to see W1AW. Mr Cain's article was probably the next best thing to being there.

I was especially pleased to see that some of the engineers are using the C language for software development. For control at the hardware level, no other high-level language can even come close.

My company writes and distributes C compilers for personal computers, with an emphasis on IBM® PC and compatible machines. We're willing to offer any licensed ham copies of our C compiler, program editor, function library and source code debugger for \$50.⁸ (Bought separately, these retail for \$150.) The compiler is high quality, meets almost all of the proposed ANSI C standards, and is very easy to use. (The Heath® Company markets our compiler with their C training course.)

C is a perfect choice for the high-speed requirements often found in our hobby, and tests show our compiler to be at least five to eight times faster than interpreted BASIC. I believe my offer would put C within the reach of almost all hams—and we might start seeing more software articles in QST using C.—Jack Purdum, W9NMT, Ecosoft Inc, 6413 N College Ave, Indianapolis, IN 46220

⁶D. Brede, "The Care and Feeding of an Amateur's Favorite Antenna Support—the Tree," QST, Sep 1989, pp 26-28 and 40.

⁷J. Cain, "A Visit to W1AW," QST, Dec 1989, pp 14-17.

⁸Order from Ecosoft Inc, 6413 N College Ave, Indianapolis, IN 46220, tel 800-952-0472. The ARRL and QST in no way warrant this offer.

Note: All correspondence addressed to this column should bear the name, call sign and complete address of the sender. Please include a daytime telephone number at which you may be reached if necessary.

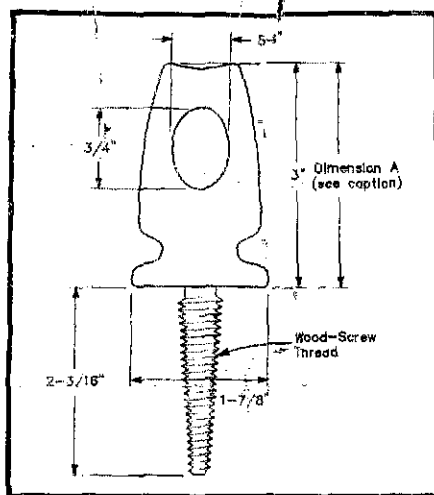


Fig 1—Dimensions of the porcelain cable holder. The holders are available with A dimensions of 2, 3, 3-1/16 and 3-1/8 inches.

Strays

I would like to get in touch with...

☐ anyone with information on equipment used to play a World War II-era brush Mail-A-Voice circular magnetic recording. Bill Kime, WD8RQK, 3640 East Stage Rd, Ionia, MI 48846.

☐ anyone who has recently incorporated the Collins 51J-4 receiver into a transmitter/receiver combination for use on amateur bands, especially the WARC bands. Igor F. Pifat, YU1PQI, Rifata Burdzevica 69, YU-11050 Beograd, Yugoslavia.

☐ US amateurs pursuing the Worked All Irish Counties Award sponsored by the Irish Radio Transmitters Society, to exchange information and to help with spotting. Dick Bean, WA1KDL/EI2HC, 304 Canton St, Westwood, MA 02090.

W1AW Schedule

April 2-October 29, 1990

MTWThFSSn = Days of Week

Dy = Daily

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice Fast Code Practice CW Bulletins Teleprinter Bulletins Voice Bulletins	MWF: 0200, 1300, 2300; TThSSn: 2000; Sn: 0200 MWF: 2000; TTh: 0200, 1300; TThSSn: 2300; S: 0200 Dy: 0000, 0300, 2100; MTWThF: 1400 Dy: 0100, 0400, 2200; MTWThF: 1500 Dy: 0130, 0430
EDT	Slow Code Practice Fast Code Practice CW Bulletins Teleprinter Bulletins Voice Bulletins	MWF: 9 AM, 7 PM; TThSSn: 4 PM, 10 PM MWF: 4 PM, 10 PM; TTh: 9 AM; TThSSn: 7 PM Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM Dy: 6 PM, 9 PM, 12 PM; MTWThF: 11 AM Dy: 9:30 PM, 12:30 AM
CDT	Slow Code Practice Fast Code Practice CW Bulletins Teleprinter Bulletins Voice Bulletins	MWF: 8 AM, 6 PM; TThSSn: 3 PM, 9 PM MWF: 3 PM, 9 PM; TTh: 8 AM; TThSSn: 6 PM Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM Dy: 8:30 PM, 11:30 PM
MDT	Slow Code Practice Fast Code Practice CW Bulletins Teleprinter Bulletins Voice Bulletins	MWF: 7 AM, 5 PM; TThSSn: 2 PM, 8 PM MWF: 2 PM, 8 PM; TTh: 7 AM; TThSSn: 5 PM Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM Dy: 7:30 PM, 10:30 PM
PDT	Slow Code Practice Fast Code Practice CW Bulletins Teleprinter Bulletins Voice Bulletins	MWF: 6 AM, 4 PM; TThSSn: 1 PM, 7 PM MWF: 1 PM, 7 PM; TTh: 6 AM; TThSSn: 4 PM Dy: 2 PM, 5 PM, 8 PM; MTWThF: 7 AM Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM Dy: 6:30 PM, 9:30 PM

Code practice, Qualifying Run and CW bulletin frequencies: 1.818, 3.5815, 7.0475, 14.0475, 18.0975, 21.0775, 50.08, 147.555 MHz.

Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 18.1025, 21.095, 28.095, 147.555 MHz.

Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 18.160, 21.39, 28.59, 50.19, 147.555 MHz.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.

Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code practice texts are from QST, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from January 1989 QST, pages 9 and 100" indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 100.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Tuesdays and Saturdays at 2230 UTC, Keplerian Elements for active amateur satellites will be sent on the regular teleprinter frequencies.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. Baudot, ASCII and AMTOR (in that order) are sent during all 1500 UTC transmissions, and 2200 UTC on WThFSSn. During other transmission times, AMTOR is sent only as time permits.

CW bulletins are sent at 18 WPM.

W1AW is open for visitors Monday through Friday from 8 AM to 1 AM EDT and on Saturday and Sunday from 3:30 PM to 1 AM EDT. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 PM Monday through Friday.

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.

W1AW will be closed on May 28, July 4 and September 3.

Tony Bongiovi, KX2Z

An extremely successful record producer, KX2Z is into ham radio and public service in a big way.

By Kirk Kleinschmidt, NT0Z
QST Editorial Supervisor

Piercing lyrics, the syncopated back beat of rock 'n' roll drums, big-name musicians, a wall full of gold and platinum records and the musical, rhythmic cadence of sweetly sent Morse code—what's wrong with this picture? Nothing, really. It's all in a day's work, and play, for Tony Bongiovi, KX2Z, record producer, recording engineer, entrepreneur and Extra Class ham.

If the name Bongiovi sounds familiar, it should. The 41-year-old Bongiovi is an older cousin of rock superstar Jon Bon Jovi. The Raritan, New Jersey, natives have made their mark on the music industry—Jon as a performer, Tony as a producer.

"I got him started," Bongiovi says in a straightforward way. "I develop artists. I bring them into the studio and get involved with the production of their records. I did that with Jon, and it took us about four or five years. He was right out of high school when we started. We're doing very well with his records."

A lot of successful recording artists (Madonna and Bruce Springsteen, among others) pass through Bongiovi's unequaled Manhattan recording studio, aptly named Power Station. [It used to be a Con Edison power station.]

The building's subdued, monolithic appearance, and the fact that the roof is populated with large Yagi antennas, gave me the impression I was stepping into some clandestine foreign embassy. Once inside, however, I knew I was in the right place. Power Station—multi-floored recording studio and home to amateur station KX2Z—proved to be a fitting backdrop for my conversation with Bongiovi, ARRL Life Member, and a most unconventional ham.

Bongiovi began his professional recording career at the age of 17. Working at home, he managed to duplicate the famed "Motown sound." This caught the attention of Motown President Berry Gordy, who had Bongiovi flown to Detroit on a regular basis to engineer records for Stevie Wonder, Diana Ross, The Supremes, Gladys Knight and the Pips and other leading Motown artists.

In 1968, Bongiovi became a full-time engineer at the Record Plant in New York, and the Tony Bongiovi "sound" permeated

the rock radio scene of the late '60s.

In 1970, Tony's present-day partner Bob Walters brought Tony to Media Sound studios, and Bongiovi became a sought-after producer and was a major factor in Media Sound's success.

In 1977, Bongiovi and Walters launched Power Station, considered by many critics and musicians to be the best recording facility in the world. To date, Bongiovi has produced more than 35 gold and platinum records.

To give you an idea of just how connected Power Station is, all but one of last year's Grammy Award winning albums, and nearly half of the records on today's Billboard charts were recorded, mixed, overdubbed or edited at Power Station Recording Studios.

Not content to simply produce records, Tony is a well-known figure in the field of acoustics and sound recording. He's designed noise-reduction systems for helicopters, and was an acoustics consultant on Dick Rutan and Jeana Yeager's historic round-the-world flight in *Voyager*.

Considering Bongiovi's hefty resume, I didn't quite know what to expect from my encounter with KX2Z—starmaker and ham operator rolled into one. As it turns out, I had nothing to worry about. Tony is a friendly, laid-back kind of guy, from his jeans-and-T-shirt attire to his articulate sense of humor. He seems untouched by the glitter and hype

surrounding the recording industry.

"I really got started in radio when I was about 15," said Bongiovi as we made our way to the reception area, past unending rows of gold records. "I started building receivers for model airplanes, but because I couldn't afford to buy the necessary parts for a ham station, I quickly lost interest."

Tony turned to CB radio for a few years, but didn't seriously think about Amateur Radio until he got a scanner for Christmas some 10 years ago. "I heard the guys on 2 meters, and that got me interested again," he says.

Bongiovi listened to WIAW code practice bulletins and code practice cassettes to learn the code.

"The code came really easy...being in the music business and having a musical background...it's a very rhythmic and almost musical thing."

It must have been pretty easy, because Tony is a real CW op whose favorite pastime is rag-chewing on 40-meter CW—at a brisk 30-35 WPM. "I used to be a bit faster, actually copying faster than I could send—but now I'm solid at 30 WPM," he added.

Bongiovi credits Dan, KU2D, and Chas, N2BOG, for helping him become an accomplished CW op—KU2D for slowing down to help him out, and N2BOG for teaching him how to copy fast code without writing it down.

Tony was first licensed as KA2ORT in 1981. "I went from Novice to Extra in less than a year," he says, thanks in part to his proximity to the local FCC Field Office, located only a short taxi ride away. "I kept going back until I passed—it took me four or five times to pass the Extra Class test."

Because his station is located on the fourth floor, just above several million dollars worth of sensitive recording equipment, an RFI-free setup was critical. It just wouldn't do to hear a faint, raspy CQ in the background track of someone's latest album!

To find just the right gear, he went to a local ham store and literally borrowed one of everything—one Kenwood, one ICOM, one Yaesu, one Ten-Tec, and one Collins. Once the stuff was set up, Tony tuned up the rigs and checked them for trouble downstairs. Tony's first and only HF station—a KWM-380 and an Alpha 78 amplifier—is still going strong.

The operating position at KX2Z took me by surprise. I guess I was expecting to see a dazzling, space-age display of ham radio electronics—something on par with the



Tony Bongiovi, KX2Z, at the business end of his station—located on the fourth floor of his Power Station Recording Studio in Manhattan. (photos by author)



Would you believe a split-band speech processor? Okay, so the mixing console is really part of Tony's Power Station Recording Studio. On the other side of the glass window is one of several recording studios, complete with pyramid-like, acoustically designed ceilings, pine-covered walls and 48-track tape decks.

recording studios I'd seen downstairs. Instead, I saw something a little more down to earth.

The station is piled on top of a small table tucked into a corner of Tony's top-floor apartment. The armrests of his favorite operating chair are literally worn off, and the gear is mostly covered with a respectable layer of dust—something I could relate to! Miscellaneous ham stuff is tacked onto the walls, and the requisite amount of unidentifiable equipment covers the floor underneath the table.

To the right of Tony's ham station, a large, walk-through green house (home to a couple of tropical birds—one named Gigahertz) opens onto the roof. Here, two towers provide support for a 5-element 20-meter Yagi, a 4-element 40-meter Yagi and an 80-meter dipole. Setting up and maintaining the antennas provides an interesting challenge. "Because of my importance to the studio, my partners won't let me climb around on the towers. They don't want me to fall down and break my neck, or worse, so I have to have some help." Tony's chief antenna helper is Bob Christiansen, KB2EF.

Although Bongiovi's station can run the legal limit, and his station sprouts a fair amount of aluminum, he's not a technically oriented ham.

Tony likes to communicate—to talk to people. "It's a hobby for me, a form of relaxation. I like to talk about anything except ham radio: What's your favorite vegetable? What's the last good book you've read?—stuff like that."

The view from the rooftop station is classic New York City—you can see part of the skyline, but only being up four or five stories, you get a better view of the sides of many of the taller, downtown buildings. A short distance away is the top of the CBS building, covered with satellite antennas and other protuberances whose functions are not readily discerned.

The CBS building is related to one of

Tony's most rewarding Amateur Radio pursuits—emergency disaster communications. In fact, around the New York City area and in the recording industry, Bongiovi is affectionately becoming known as the "Master of Disaster" because of his ham radio appearances on CBS and CNN during hurricanes, earthquakes and the like.

It all started during the Grenada invasion. "I took a break from a studio session and turned on the rig. I heard a kid on 20 meters talking about the invasion so I called the news room at CBS and asked them if they had heard anything about it," said Tony.

CBS didn't know anything about the incident so they sent a crew over to listen. When CBS wanted to put his station on camera, Tony called the FCC to check out the rules. Before long, CBS had set up a camera and a direct network feed. "At first, I didn't want to do it. But that was the start of it," he added.

It was indeed the start of something. From Hurricane Gloria to Chernobyl to the San Francisco earthquake, Bongiovi has been putting his best foot forward, helping out during disaster situations and running emergency traffic.

His unexpected relationship with CBS has heightened Bongiovi's awareness of the public service aspect of Amateur Radio. What he likes best is that after many of his network appearances, his phone rings off the hook. "Sometimes I get as many as 150 calls—people want to know what's going on... some even offered me money... I told them to give it to the Red Cross."

Tony's TV cameos have sparked some action with the record companies—in an ironic way. "Record company presidents never call you," Tony says, chuckling sarcastically, "you can never get through to them. But one night, during the Hurricane Hugo crisis, I got calls from no less than three record company executives. Do you know what they were interested in? They wanted to know if their

houses on St Croix were still standing!"

Bongiovi thinks that good media relations are important for Amateur Radio, and thinks all hams should be prepared to deal more effectively with the media during emergencies. "When I see many hams on TV, they almost always explain things in an overly technical way. You have to make it really simple, because the general public doesn't appreciate technical explanations of towers and beam antennas. They just want to know what's going on."

Bongiovi, a Volunteer Examiner for the ARRL VEC program, has a soft spot for Novices. He likes to give an occasional Novice test, and frequents the Novice CW subbands to help Novices improve their code speed. Paradoxically, Bongiovi, a dedicated CW operator, is a strong proponent of a codeless license for VHF and above. "The hard-liners are discouraging many potential hams because of some kind of ego problem. It's the old 'if I had to do it, you do too' routine."

Although Bongiovi has not talked to any other celebrity hams, such as Chet Atkins, Ronnie Milsap, Donny Osmond or Joe Walsh, he has tried to introduce a superstar or two to the ranks of Amateur Radio—with largely unsuccessful results.

One night, after a long session in the studio, Bongiovi brought Mick Jagger, of Rolling Stones fame, up to his shack and fired up his rig. After working a few stations on SSB, it was apparent that things were not working out. "Nobody would believe that it was actually Mick Jagger they were talking to," he says, "so Mick lost interest and wandered back downstairs."

Another singer, Ozzy Osbourne, stayed at the rig a while longer, but to this day, neither of them has appeared on the FCC rosters. Oh well...

What does Tony see as Amateur Radio's future? "Greater use of frequencies," for one thing, and a "trend toward people operating rather than building their own gear," for another.

"Let's face it. You buy a new transceiver, and if the damn thing breaks down, you don't even try to take it apart—you'd be crazy. Years ago you had to build the stuff, but today, if your rig sneezes, you have to send it back to the factory."

Bongiovi makes no apologies for his point of view. He's very much his own person. "I'm doing exactly what I want to do. I don't feel any different now than I was when I was in high school. I have my radio station now, and at least I can afford the equipment!"

Tony isn't a DXer (although he did inadvertently work BY1PK), doesn't participate in contests, has no interest in packet radio, and doesn't even have a QSL card. But that's part of Amateur Radio's wide appeal—different strokes for different folks.

For Bongiovi, Amateur Radio is a way to escape, if only momentarily, the pressures of the recording industry. It's a relaxing hobby, plain and simple. "I meet a lot of interesting people," he explains. "I just get on the radio and have a ball with it. All I do is operate, and that's all I want to do. I enjoy that."

Love My Son, Love His Radios

To a nonham, marrying a dedicated amateur is one thing; discovering that Amateur Radio "runs in the family" is quite another!

By Christine M. Gardner
23 Grace Circle
Marlboro, MA 01752

Before my husband became my husband, his mother drew me aside and whispered a warning.

"Love my son, love his radios," she said. The expression she wore as she waited for my reaction can only be described as one of challenge. Well, sure, I thought, I like music. I smiled. She nodded. All was well in our misunderstanding of each other's gestures.

I met his friends. Most of them were introduced to me by letter-number combinations instead of names. They called him WA1LXN. I called him Dan. They called me LXN's YL. Most of them carried beeping, squawking hand-held radios in their shirt pockets or attached to their belts.

I couldn't help feeling more than a little uncomfortable when I began noticing how many of their wives' pocketbooks also beeped and squawked.

I became an XYL, Dan my OM. I convinced him that I would be content to live out my life as a nonham. Call sign-less. The beeps and boops ("Dits and dahs, dear") all sound alike to me. Putting a microphone in front of my face instantly paralyzes my vocal cords. I choose to communicate via the written word. I'm happy with a byline, he can have the call sign. When I demanded to know why he referred to our children as "harmonics," the OM told me that "Harmonics are known to cause so much interference you can hardly hear yourself think." That was something I could understand.

Meet Lizzy, youngest and only female harmonic of the former WA1LXN, now KB1WW, and his XYL. Let me correct that. I went from YL to XYL to YF. I've given up having our towels monogrammed.

Lizzy, unlike her two older brothers, started raiding her dad's shack from the first day she realized it was a place where she could talk, a lot, and not get asked to please stop for two seconds!

Everywhere Dad went, Lizzy followed. Before they were out of the driveway, I saw the portable radio in her hands or the



Nine-year-old Lizzy Gardner, KA1TOK, of Marlboro, Massachusetts, shares a shack with her dad, Dan, KB1WW. "That Outrageous Kid" loves to "TOK" to fellow amateurs all over the world. (Photo courtesy of Christine Gardner)

microphone cord stretched to where she sat in the car. Unlike her mother, she does not freeze in front of a microphone. "The Kid," which is what we've called her since Day One, was born to talk.

When she was eight, The Kid started hanging around "The Club," the Algonquin Amateur Radio Club in Marlboro, Massachusetts. The OM is president of The Club (again).

She insisted on helping when "M" put up his 60-foot tower. "M?"

"You know, Ma, 'dah-dah' is 'M' in Morse code. Dad = Dada = dah dah = M." "Oh, of course."

The Kid studied up on theory and she and M practiced code for hours. I shook my head and remained silent. I would hate

to see the disappointment on her face. I know she's a smart kid, but this was heavy duty stuff. She took classes at the club. When the big day arrived, M wasn't allowed in the room during the testing, so he fooled around in the club's shack and paced the halls. I stayed at home and wondered what I would say to the poor baby. I had seen the study guide questions. How is a nine-year-old girl supposed to know the difference between a quarter-wave vertical and a half-wave dipole? (What are they is my question?) The Kid would be crushed if she failed.

The Kid and M came home wearing smiles wider than the two what-ever-they-are's that sit on top of the 60-foot tower that's attached to the side of our house. She's now the youngest member of The Club and a member of the ARRL. She's made a lot of new friends.

"Who's that you're talking to?" I ask her.

"That's FFX (Gerry, N1FFX)." Or it could be Dianne, KAINOJ, or Dianne's mother, Ann, KAIPON.

I leave her notes that say, "Clean your room after school!"

M leaves her notes that say, "Lizzy, don't forget to give me a shout on 28.364 this afternoon between 4 and 4:10, and remember to turn the tri-bander to the east. Listen for DXO (Bob, WB4DXO) around 4:30."

If you like to talk, she's there. Lizzy, KA1TOK, "That Outrageous Kid." Love my daughter, love her radios.

Strays



I would like to get in touch with...

□ anyone with information on an external, home-brew SSB filter for a Yaesu 747. Andy Birkhead, KB9CAT, 6681 Eagle Potine Dr South 2B, Indianapolis, IN 46254.

Radio is More Than a Merit Badge!

A look at the 1989 National Scout Jamboree.

By Lary Eichel, K2NA
PO Box 13278
Boulder, CO 80308

Amateur Radio helped weave the fabric of the Jamboree experience as some 60,000 scouts, leaders and visitors from all 50 states celebrated scouting at the 1989 National Scout Jamboree, August 2-8, 1989, at Fort A. P. Hill, Virginia. The Jamboree was so popular, the sheer number of participants often caused massive traffic snarls that made getting to the site a real problem!

For the hams involved, this was a major event: For more than two years, a group of Radio Scouts planned for the event. (See "Radio Scouting" in August 1989 *QST*.) The Radio Scouting staff operated Demonstration Station K2BSA, provided Radio Merit Badge and Novice license instruction, and originated more than 2,000 messages.

Space for the temporary repeater network was secured on a 100-foot-high microwave tower, courtesy of the Army. Fortunately, there were no major problems (such as the severe weather in 1985), so the repeaters became a part of the normal activity of the busy Jamboree city.

With the tents ready for equipment, Woodbridge Wireless radio club volunteers delivered the bulk of the radio equipment and antennas. K2BSA staff arranged the station to fit its surroundings: VHF/UHF, satellite, FSTV and packet were all squeezed into one end, with HF positions spread across the back wall. K2BSA at the 1989 National Scout Jamboree was on the air. Less than 36 hours later, K2BSA had worked all states!

Once in operation, there were few times when the demonstration station was not crowded with scouts and leaders. The packet radio and NTS networks carried many greetings to and from the Jamboree.

Where there are scouts, there must be merit badges, and the 1989 National Jamboree was no exception. Some 74 scouts earned Radio Merit Badges at the Jam-



Thirty-three K2BSA staffers kept the Demonstration Station on the air and running smoothly during the 1989 National Scout Jamboree. Altogether, the scouts and staffers made nearly 4,000 QSOs during the week-long event. (K2NA photo)

boree, and nearly 300 scouts completed at least some of the requirements.

The merit badge area was transformed into a classroom, a test equipment and kit-building area, an SWL post, a Morse code practice area and an FSTV/packet terminal. The radio area was in a prime location and the FSTV/packet terminal attracted many passersby. One scout earned his Novice license during the Jamboree even though he had no prior radio experience!

Long lines at pay telephones prompted many scouts to visit K2BSA to send a message home. During the day, scouts lined up to fill in the blanks on the message forms. Besides the popularity of the message service, scout-operated FSTV and packet radio were the hit of the show. Scouts could

exchange greetings and pictures between the Demonstration Tent and the Merit Badge Midway in spite of the din of activity in the station (scouts are not *quiet*!). When the packet link dropped out, the scouts maintained communications with messages scribbled on paper and held up to the FSTV cameras! The kids are natural communicators.

Radio is an activity for everyone, and the use of radio by the blind is well known. One blind scout made several visits to K2BSA, and hopes to join the ranks of licensed hams soon after he returns home. The deaf can participate in radio, too: A deaf Scout Leader spent several hours on AMTOR and packet chatting with newly found ham friends. Radio involves more than just sound; radio is a vehicle for communications, by voice, by computer, by video and through satellites.

Many ham radio manufacturers, local radio clubs, packet radio and NTS operators went all-out to support K2BSA. Their investment in the youth at the Jamboree was well spent. One QSL card noted, "K2BSA was hotter than DX this week!" K2BSA operation at the 1989 National Scout Jamboree added fuel to the growth of youth in Amateur Radio. But as we see it, the challenge is to keep the growth alive. Watch for and support Radio Scouting activities—radio *is* more than a merit badge!

K2BSA National Jamboree Box Score

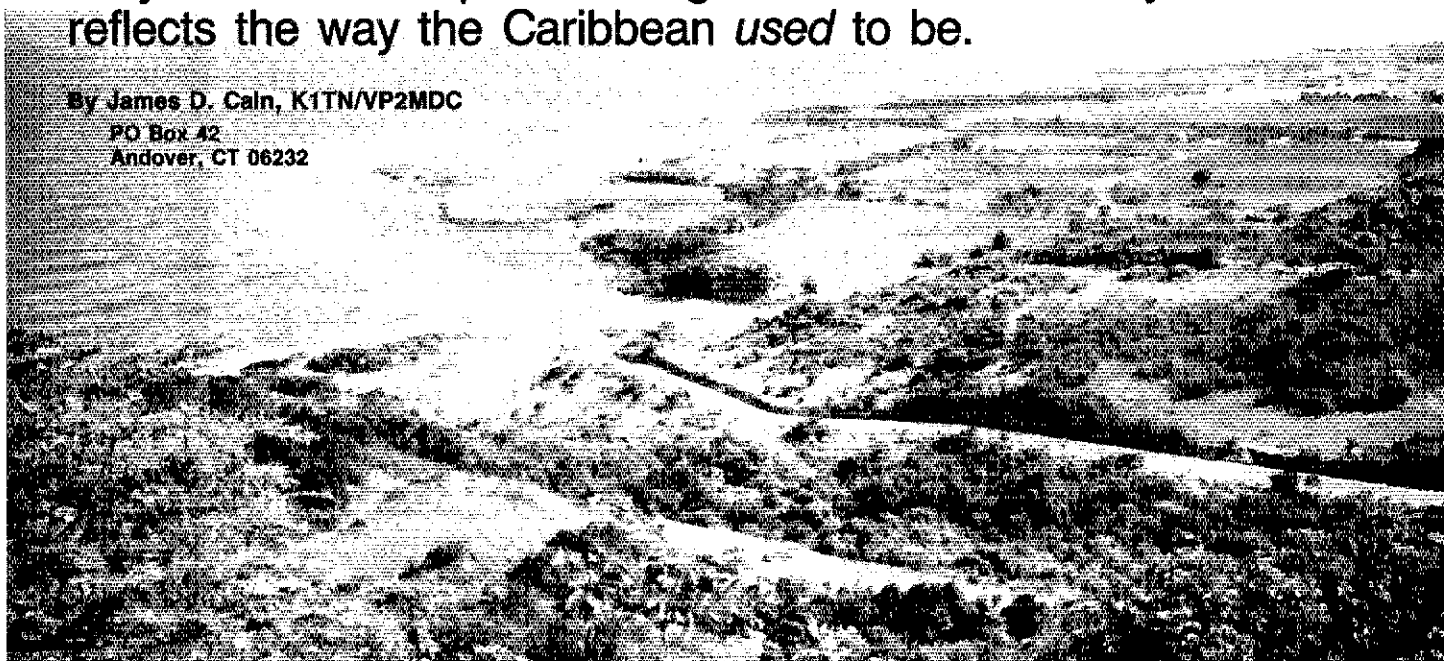
Band	QSOs
10	675
15	800
20	1150
40	1025
80	180
VHF/UHF	110 (excluding packet and repeater)
Total	3840
2000+ messages originated, 400+ delivered.	

A Montserrat Memoir

Why one ham keeps returning to this out-of-the-way isle that reflects the way the Caribbean *used* to be.

By James D. Cain, K1TN/VP2MDC

PO Box 42
Andover, CT 06232



It's a lousy place to visit and you would hate it." So goes the inside joke among those of us who have taken radio vacations on the Leeward Island of Montserrat. The ploy, of course, is to discourage others from discovering our paradise.

"You're only running 100 watts? You must be kidding, you're 30 over 9." We never tire of hearing that line coming from the other side of the world. Nor of returning home to mailboxes already filled with QSLs, many of them from much rarer DX stations.

And even though hundreds of thousands of contacts have been made from Montserrat over the years, there always are the dozens of "First Montserrat, PSE QSL" requests after every trip there.

I have a friend, a new DXer with some 200 countries worked, who has yet to log his first VP2M. Blame Hurricane Hugo. When this killer storm hit the US Virgin Islands and Puerto Rico last September, another victim, tiny Montserrat, was virtually ignored by the media.

Yet, Montserrat—The Emerald Isle—suffered greatly in both a human and material sense. A dozen people perished (out of only 13,000), and the island's fragile infrastructure, from homes to power lines to drinking water, was devastated.

This lush, semitropical island, a deep, dark green from the air as one approaches on the twin-engine Air Montserrat flight from Antigua, now bears a brownish hue. Its

greenery was leveled by Hugo's 140-mi/h winds.

A Trip of Discovery

I first visited Montserrat in March 1987. I knew from my friend Chod Harris, VP2ML, that the radio experience would be eye-opening, but did not suspect that radio would be only a small part of Montserrat's charm.

My interest in hamming was at a low ebb. Despite decades of serious contest work, I visited M'rat in 1987 on a noncontest weekend. Yet in six days of casual CW operation (with 100 watts output), I made 1400 contacts.

When JT1KAA calls you, then sends a QSL direct, you know you've found radio Nirvana.

The delightful propagation notwithstanding, I did discover that when things break, they aren't easily fixed. The local Radio Shack stocks boom boxes, batteries, and not much else. You can forget coax, connectors, microphones, and most everything else hams need.

There's one thing I never did quite figure out, though. Downtown Plymouth's lone magazine store sported CQ magazines on its shelf. (OK, so they were three months old.)

Montserrat's Heroic Ham

If you know Montserrat you know Bobby. Bobby Martin, VP2MO, that is. Bobby is Mr Amateur Radio and Montserrat's unofficial worldwide ambassador. He helps with licensing and generally sees to it that ham visitors

to the island are accommodated. He is one of the finest people I have ever met.

Bobby was born on Antigua, the nearest island to Montserrat. He and his wife Mae live in a modest concrete house, much of which Bobby built with his own hands. Despite a painful back condition, Bobby has spent the last several years building an addition to the house, and he and Mae had looked forward to moving Bobby's ham shack out of their bedroom and into the new room.

Bobby's future ham shack is made of concrete blocks. "I buy a few blocks at a time when I have the spare money," he says. "No reason to be in debt just to have a bigger house."

Mae enjoys comparing notes with visitors about her favorite TV show, "The Young and the Restless." Or, as Bobby calls it "The Young and the Worthless," a joke that demolishes cultural barriers.

Hugo destroyed Bobby's tower and beams, but his house survived, and VP2MO was back on the air using battery power within hours of the storm's departure.

Chod Harris, writing in the December 1989 issue of *The DX Magazine*, describes Bobby's role in post-Hugo communications:

At the height of the storm, Bobby lost a lot of the equipment which helps him talk to other radio operators around the world. But as soon as the storm had abated, he salvaged what he could and rigged up a piece of wire over a fallen electrical cable to act as an aerial.



The author (the one without a hat) with a friend, Chillum, who operates a crafts shop in "downtown" Plymouth.

At 4 AM Sunday, Bobby sent an SOS that his equipment was "coming down."

When he ran out of gas for his generator (Harris writes), Bobby set up an emergency station in his car so he could contact operators in the US, who relayed messages to other radio operators in North America and the Caribbean.

Bobby also transmitted news reports for the Caribbean News Agency, the Associated Press, and UPI, filing reports by Radio Antilles news staffers Joe Dominique and Peter Richards.

"I got a kick out of a live interview both reporters conducted with the Chief Minister via my set," said Bobby.

"It was the first official word out from the Chief Minister and even Prime Ministers were standing by to hear what Mr Osborne (the Chief Minister) had to say," he added.

His Excellency Governor Turner, in his telegrams to London, referred to Bobby Martin, VP2MO, as "Montserrat's Heroic Ham."

A Rich History

Montserrat has been a British protectorate since the 17th Century. Originally populated by the Irish and served by black slaves, the island today is home to a few remaining ancestral whites, and an otherwise predominately black population comprised of West Indians and descendants of former slaves.

Montserrat is largely dependent on the largess of the British government. A strong independence movement exists, however, and a referendum on severing ties with England was scheduled for 1990. Montserrat is one of only a handful of Caribbean islands left with "VP" call signs. I don't know what "VP"

stands for, if anything. Maybe Victorian Province. Or Very Pretty.

An ambitious airport expansion was on the drawing board, to more readily accommodate jet traffic, and the island's complement of two hotels might actually have doubled as a result of the improved accessibility.

But Hugo has sidetracked these plans. Months after the storm's rampage, electrical power still is intermittent at best, the water system (a model of efficiency) is erratic, and many of the island's residents remain in emergency shelters.

Reportedly the *only* building on the island not sustaining some damage was the AIR Recording Studio, a retreat for many well known rock groups.

In Montserrat's immediate vicinity, only Guadeloupe also sustained significant damage, according to Oxfam America. But on Montserrat, Hugo was catastrophic, destroying about 80% of all property on the island and leaving 80% of the island's population homeless, Oxfam reported.

Following Hugo, some fifty portable generators were shipped to M'rat and immediately snatched up by those of means. Gasoline to feed them was going for \$7 per gallon.

These supplies came to Montserrat mostly by ship, augmented by a handful of C-130 "Hercules" cargo planes. But because Hugo blew away the island's one jetty, everything now must be ferried to shore in small boats, at what must be—uncharacteristically for those who live there—a maddeningly slow pace.

The island's small medical school, a source of both revenue and pride, was destroyed by Hugo, and reportedly will not be rebuilt.

As for the fate of Radio Antilles, the major German-operated MF radio site and a Caribbean beacon, it was scheduled to be back on the air only around April of this year.

Home Away From Home

Trips to Montserrat (I have made three) are never uneventful. There usually are radio problems to be fixed, not to mention the unexpected inconveniences one might not tolerate elsewhere.

High humidity and the salt air in particular attack all kinds of metal. The braid around coaxial cable turns green almost before your eyes. And my keyer paddle still suffers from what I call "Caribbean Crud." It's a great excuse, however, when you make sending errors.

It is nearly impossible to keep up a Beverage antenna; the cows and goats will promptly tear it down, although I confess I've never actually seen a goat *eating* the wire.

The power can be erratic. One time, all went dead three hours into the CQ Worldwide DX Contest. Surprise... it wasn't the usual downed line, but rather a fried circuit breaker that looked like Edison might have built it.

Fortunately, Bobby Martin sees to it that the power company's "scheduled maintenances" do not take place during radio contests!

Incidentally, the circuit breaker that failed was right in our house (the island runs on

220 V, most people having their own step-down transformers). The repairman and his trainee were there in less than an hour, at 11 PM on a Friday night. The breaker was quickly and professionally replaced.

M'rat is a great place to give up eating meat, and you can forget about fresh milk. You buy whatever Plymouth's two grocery stores happen to have on the shelf that day.

There is a secret place where you can buy fresh herbs and vegetables; you'll find it.

The beer is very low octane, at the price of the real thing, and comes in 7½ oz bottles. This is typical of much of the Caribbean. Chod tells me that he once was there during a "beer drought" ("Worst three hours I ever spent," he says).

Where Am I?

On a visit to M'rat in early 1988, I tackled the new 10-meter phone segment for Novices and Technicians. Although I'm not wild about voice operating, the new band seemed like an opportunity to be an exciting contact for some newcomers.

These neophytes were great fun to work. I called "CQ Novices and Technicians only, please," and found that everybody else really was very generous about letting them through. I gave one Novice his first QSO ever. Another called his Novice friend across town, who got on and worked me with two watts.

A Technician class licensee called to say he had been licensed 25 years (nearly as long as I) and how grateful he was to be able to operate SSB on 10 meters. He was 86 years old.

Some of the Novices at first thought I was in Canada, because the only other contacts they had made outside of the US were with VE stations. I became very accomplished at spelling "Montserrat," and I learned that trying to pinpoint my location as "35 miles west of Antigua" would work only if the person at the other end knew where Antigua was. (On many maps Antigua is a mere dot, and Montserrat doesn't show up at all.)

Speaking of Antigua, every morning I



Bobby Martin, VP2MO, "Montserrat's Heroic Ham."

would have coffee on the veranda and look across those 35 miles of the Caribbean Sea, at the silhouette of Antigua, wondering if I ever would work a V2 station. In a way, I never have. In three trips and about 9,000 contacts, the closest I got was an American ham out of Westport, Connecticut, aboard a sailing ship in the harbor at Antigua.

On clear days you can just make out Nevis, V47, to the north, and standing on the roof I could see Guadeloupe, FG. This perspective sends you back to your world atlas and reinforces just how compact this chain of islands is, belying their differences in history and character.

Another incident is worth telling. I generally have been remiss about exposing friends to Amateur Radio. Nobody pushes to "see the radio station" and I don't drag visitors to the shack.

Friends Reggie and Russ were along on our second trip to M'rat. One morning I was making a rare SSB contact, with Roy Neal, K6DUE. Reggie chose that very moment to walk into the bedroom/shack and ask if I was talking to anybody interesting.

"Oh, you know, just the usual ham crowd," I said, handing her the mike. "Say hello to Roy Neal, former Science Editor for NBC Television and the TV voice of the space program."

Although we had been friends for years, I never really had demonstrated ham radio to Russ and Reggie. But they knew there was something special about doing radio from Montserrat, especially when I announced that I had "upgraded" to my own personal VP2M call sign.

Reggie and Russ had flown in on a Saturday evening, as I was half way through the ARRL CW DX Contest and starting to get loony. I had neglected to bring a multiplier check-off sheet with me, so I put our guests to work making some up, by hand.

Last November, Reggie and Russ came to visit as I was finishing the last hour of the CQ Worldwide CW Contest, from home. After the final bell rang, I showed them how my computer already had calculated my final score and how many countries I had worked. Looking at the computerized station, we all thought back to the jury-rigged operation on M'rat, and to all those handwritten logs and check sheets.

My Island

By my third and most recent trip to M'rat, in November 1988, I was feeling quite at home. This was a bachelor trip, just me and my college roommate from the '60s.

Aside from smoking Cuban cigars and lamenting our lost youth, we planned a multi-single in the CQ CW Contest. But instead we went our separate ways, he working single-band 10 meters and me just horsing around during his off times.

Despite my competitive nature and the expense of getting to M'rat, I felt no pressure to get on the air. Handing out the multiplier to a couple thousand stations and then going into town for the steel drum bands and crab races was fine with me.



Remains of a villa on Montserrat following Hurricane Hugo.

Three hams from Texas were on M'rat that weekend, running a very successful operation (as VP2MW) from the other side of the island. Because Montserrat sports an active volcano at its center (that's how the island got there in the first place), we barely knew they were on the bands, even though our stations were less than 10 miles apart.

On my way in I had run into one of the Texans—Bill, KM5R, in the Antigua airport, and I helped him lug his Alpha amplifier aboard the Air Montserrat plane. I think when I saw that Alpha was when I decided it was going to be no contest!

I will return to M'rat sometime soon, to see the new look of the island, and to visit my friends once again. Some of them are hams, some not, just like at home. I have renewed my license for another year.

I've visited and operated from just five

foreign countries, but I know I never really understood DX, and working DX, until I left the States. We hams have a special opportunity to make friends in other countries not only on the air, but when we visit them, as well.

For now, I'm saddened by what nature has done to my favorite island and its people. Early reports indicated that able bodied Montserratians can find plenty of work but old and disabled people have been hit hard by the wind and water damage to their few possessions. And there are a lot of older people on Montserrat, because they don't die of air pollution, urban stress, alcoholism, or violence.

But with citizens like VP2MO I am confident of Montserrat's ability to bounce back. And you will be hearing VP2MDC again, before long.

Strays



I would like to get in touch with...

☐ Anyone using a Sanyo MBC-550 computer on packet. Bill Robinson, 4920 Skyland Dr, Meridian, MS 39301.

☐ Anyone who has a service manual or schematic for a Realistic DX-300 communications receiver, or an Eico 232 VTVM. Donald B. Sylvain, WA3WOD, 6021 Rossmore Dr, Bethesda, MD 20814.

☐ Anyone who knows where I can obtain a Swan PSU-3A or SX-117 power supply. John

A. Zonzo, Sr, WA9UZY, 2922 N Keating Ave, Chicago, IL 60641.

☐ Anyone who knows where to get the band-switch belt for a Hallicrafters FPM-300. Dale Hall, PO Box 9609, Kansas City, MO 64134.

☐ Anyone who has a schematic for a Synthacoder 22 made by Engineering Specialties, Oxnard, California. This unit was used with the ICOM 22S 2-meter transceiver. Bill J. Lorton, KC7WO, 2672 Broadview Ave, Medford, OR 97501.

☐ Amateurs who are planetarians, possibly to set up an HF net. Jim Brown, N3FYC, Director, Stanback Planetarium, PO Box 3036, South Carolina State College, Orangeburg, SC 29117, or Chuck Sommer, President, Goddard Amateur Radio Club, PO Box 86, Greenbelt, MD 20770.

Board Steers Course for WARC-92, Future

ARRL policymakers meet in Hartford, January 19-20.

By Rick Palm, K1CE
Field Services Manager

With the fuse on WARC-92 growing ever shorter, the ARRL Board of Directors at its 1990 Annual Meeting took steps toward defense of Amateur Radio interests for the future. Citing the need for adequate reserves for the WARC, a host of other threats including 220 MHz, zoning, restrictive covenants, inflation, and the need to restore essential levels of membership services, the Board approved the first dues increase in nine years. Effective April 1, 1990, the regular annual dues rate will be \$30, and family and blind membership will be \$4.

The Board unanimously returned Dr Larry Price, W4RA, to the office of President; David Sumner, K1ZZ, as Executive Vice President and Secretary; and Jim McCobb, K1LLU, as Treasurer. The Directors also unanimously elected George Wilson III, W4OYI, First Vice President; Rod Stafford, KB6ZV, and Jim Haynie, WB5JBP, as additional Vice Presidents; and Jay Holladay, W6EJJ, International Affairs Vice President.

Serving on the Executive Committee are Directors Marshall Quiat, AG0X, Frank Butler, W4RH, Stephen Mendelsohn, WA2DHF, and Hugh Turnbull, W3ABC. The EC has the authority to act on behalf of the Board between Board meetings.

Year of the Amateur Satellite Program

Noting that the satellite program represents



The Board unanimously returned Dr Larry Price, W4RA (l), to the office of President; and David Sumner, K1ZZ, as Executive Vice President and Secretary.

a major source of technological advancement, public service and education, to fulfill the commitment to the public as outlined in Amateur Radio's charter, the Board proclaimed 1990 as the year of the amateur satellite program. The year will see the launch of no less than eight new OSCAR satellites including six just launched as part of the Microsat/UoSAT effort. (See Minute 62.)

Field Organization Issues

To clarify the role and importance of ARRL public relations volunteers in the field, the title of the Public Information Officer is now *Public Information Coordinator*, and the Public Information Assistant is *Public Information Officer*. (See Minute 59.)

A new *Local Government Liaison* (LGL) will bring the Field Organization closer to the local level to monitor zoning and other regu-

lations that may potentially hinder Amateur Radio activities. The LGL will buttress the work of the State Government Liaison. (See Minute 73.)

The Volunteer Resources Committee will study the possibility of establishing a new appointment, *Section Training Coordinator* (STC), to promote on-the-air programs designed to socialize new hams, including *Communicators*, should the new codeless class of license be created. The STC would encourage training programs for various aspects of emergency and public-service communication, traffic handling, compliance with FCC regulations, and so forth. (See Minute 50.)

The Volunteer Resources Committee will take a top-to-bottom look at the National Traffic System, with input from Area Staff and others. (See Minute 77.)

Staff and General Counsel will continue to

Table 1

Summary of Major Board Actions

Minute	Purpose	Disposition
Regulatory		
65	Continue work on club and previously held call signs	Adopted
75	Petition for no change in AM power	Adopted
88	Prepare comments on FCC/NTIA spectrum-management Notices of Inquiry	Adopted
Operating and Awards		
40	VRAC/VUAC study 144, 220, 420 band plans	Adopted
42	VRAC study the VUAC 13-cm band plan	Adopted
43	5BDXCC endorsements for 12 and 17 meters	Adopted
48	W1AW guest ops to receive certificate	Adopted
54	Change dates of 1990 June VHF QSO Party	Lost
55	1990 US-USSR Goodwill Contest	Adopted
76	MSC study field-checking of DXCC cards	Adopted
Organizational		
5-13	Elections of officers	Elected
25/70	Dues increase	Adopted
26	Ratification of 1990 budget	Adopted
47	Election of ARRL Foundation Directors	Elected
49	AIRS changed to ARRL Monitoring System	Adopted
50	VRC study Section Training Coordinator	Adopted
51/69	MSC study spectrum-management committee	Adopted
58	Committee to study Articles and Bylaws	Adopted
59	PIA now PIO; PIO now Public Information Coordinator	Adopted
61	Create Disaster Communications Coordinator	Postponed
62	1990 year of the Amateur Satellite Program	Adopted
67	Study premium class of ARRL membership	Lost
73	Create Local Government Liaison	Adopted
77	VRC study NTS structure	Adopted
81	1992 National Convention in Los Angeles	Adopted
Publications		
41	Map in <i>Repeater Directory</i> : 15/20-kHz areas	Postponed
60	Publications Committee study call directories	Adopted
64	Special pubs prices for hamfest prizes	Adopted
66	EC, staff, study QST surveys	Adopted

Committee Reports Available

Copies of the reports of the Standing Committees of the Board, Ad Hoc Committees, and Advisory Committees are available to members at the cost of reproduction and mailing. Here is a list of these reports as presented at the 1990 Annual Meeting of the Board, with the number of pages and the cost. The absence of a report from this list means that no written report was submitted.

Please order by document number, and include remittance with your order. Address orders to the Secretary, ARRL.

Committee	Document No.	Pages	Cost
Administration & Finance	13	8	\$1.00
Membership Services	14	2	1.00
Publications	15	1	1.00
Executive Committee	17	3	1.00
Election Committee	18	9	1.00
SAREX Working Group	20	2	1.00
RFI Task Group	21	1	1.00
Amateur Radio Digital Committee	23	3	1.00
Legal Strategy Committee	24	2	1.00
Education Task Force	25	2	1.00
ANERCOM	26	15	2.00
VHF Repeater Advisory Committee	27	4	1.00
DX Advisory Committee	29	27	3.00
VHF/UHF Advisory Committee	31	6	1.00

explore with the FCC the possibility of re-instituting club call signs and calls previously held by individuals. (See Minute 65.)

The ARRL Interference Reporting System is renamed the *ARRL Monitoring System*, consistent with IARU nomenclature. (See Minute 49.)

Regulatory and Band Planning

AM DSBers, rejoice! Exercising the general philosophy that privileges should not be reduced once earned, ARRL will file a petition with the FCC to modify Part 97, cementing for the future the special power limits extended to this mode currently due to expire in June. (See Minute 75.)

Two expert panels, the VHF/UHF and

VHF Repeater Advisory Committees, will study the present band plans for the 144-148, 220-225, and 420-450 MHz bands. Any recommendations for changes will be made to the Membership Services Committee for review prior to the 1991 Annual Meeting. (See Minute 40.)

Recognizing the need for further resources devoted to spectrum management, the Board assigned its Membership Services Committee to study the possibility of establishing a spectrum-management committee. The committee would review current band plans and recommend spectrum usage practices. (See Minute 69.)

Operating

The Board considered recommendations of the DX Advisory Committee, approving 18- and 24-MHz endorsements to the Five Band DXCC award. (See Minute 43.) The Membership Services Committee will also study the feasibility of field-checking QSL cards for the initial DXCC application. (See Minute 76.)

Future guest operators at the newly renovated Hiram Percy Maxim Memorial Station, W1AW, will receive a handsome certificate upon completion of at least one QSO, thanks to a Board vote. (See Minute 48.)

Thanks

Charles P. Bender, W1WPR; E. Laird Campbell, W1CUT; Tod Olson, K0TO; and Gay Milius, W4UG, were all recognized for their many years of service to ARRL in various volunteer and professional capacities. Bender was W1AW station operator, Chief Operator, and Station Manager for 38 years. Campbell served 35 years in the Communications, Advertising, Production, and Technical Departments, and he was *QST* Managing Editor.

Tod Olson, K0TO, a former Section Communications Manager, served the Board for 16 years as a Vice Director, Director, and International Affairs Vice President. In the last role, Olson strengthened ARRL's ties with



Veteran League staffer and current Washington Area Coordinator Perry Williams, W1UED, acts as a resource to the Board during discussions on regulatory matters.



General Counsel Christopher Imlay, N3AKD (r), and new League Vice President Jim Haynie, WB5JBP.

IARU member-societies in other countries.

Gay Milius, W4UG, was named Director Emeritus in recognition of his service as Director of the Roanoke Division from 1981 to 1988, and as Vice Director of both the Hudson and Roanoke Divisions. (See Minutes 52, 53, 56, and 71.)

The Fine Print

Decisions made by *your* League are not made in a vacuum. They are made by people you elect, who listen to your concerns, have your input, and reflect your interests when sitting at the Board table. Take a look at the fine print on the following pages, and if you have an opinion on something, tell your Director about it. You'll then have the satisfaction of knowing that when he or she returns to the Board table in July, you'll be participating in the shaping of your League's affairs.



The effervescent Stephen Mendelsohn, WA2DHF, Hudson Division Director and returning member of the League's Executive Committee.

Moved and Seconded . . .

MINUTES OF THE 1990 ANNUAL MEETING OF THE BOARD OF DIRECTORS THE AMERICAN RADIO RELAY LEAGUE, INC. January 19-20, 1990

SUMMARY AGENDA

- 1) Roll Call
- 2) Moment of Silence
- 3) Consideration of the agenda for the meeting
- 4) Approval of the Minutes of the 1989 Second Meeting
- 5) Election of Officers
- 6) Election of Executive Committee
- 7) Election of ARRL Foundation Directors
- 8) Reports by the Officers
- 9) Receive reports and consider recommendations of the Committees
- 10) Appointment of Committees
- 11) Report of the Host Director, 1990 ARRL National Convention
- 12) Directors' Motions
- 13) Authorization of certain expenses

1) Pursuant to due notice, the Board of Directors of the American Radio Relay League, Inc., met in annual session at the Summit Hotel, Hartford, Connecticut, on Friday, January 19, 1990. The meeting was called to order at 8:35 AM EST with President Larry E. Price, W4RA, in the Chair and the following Directors present: Hugh A. Turnbull, W3ABC, Atlantic Division; Edmond A. Metzger, W9PRN, Central Division; Howard Mark, W0OZC, Dakota Division; Joel M. Harrison, WB5IGF, Delta Division; Allan L. Severson, AB8P, Great Lakes Division; Stephen A. Mendelsohn, WA2DHF, Hudson Division; Paul Grauer, W0FIR, Midwest Division; Tom Frenaye, K1K1, New England Division; William R. Shrader, W7QMU, Northwestern Division; Rodney J. Stafford, KB6ZV, Pacific Division; John C. Kanode, N4MM, Roanoke Division; Marshall Quiat, AG0X, Rocky Mountain Division; Frank M. Butler, Jr., W4RH, Southeastern Division; Fried Heyn, WA6WZO, Southwestern Division; Jim Haynie, WB5JBP, West Gulf Division. Also present as members of the Board without vote were Jay A. Holladay, W6EJJ, First Vice President; George S. Wilson, III, W4OYI, Vice President; Tod Olson, K0TO, International Affairs Vice President; David Sumner, K1ZZ, Executive Vice President; and James E. McCobb, Jr., K1LLU, Treasurer. Also in attendance at the invitation of the Board as observers were the following Vice Directors: Kay C. Craigie, KC3LM, Atlantic Division; Henry R. Leggette, WD4Q, Delta Division; George E. Race, WB8BGY, Great Lakes Division; Paul Vydaireny, WB2VUK, Hudson Division; L. C. "Chuck" Miller, WA0KU, Midwest Division; Mary Lou Brown, NM7N, Northwestern Division; Charles P. McConnell, W6DPD, Pacific Division; James G. Walker, WD4HLZ, Roanoke Division; Evelyn Gauzens, W4WYR, Southeastern Division; Wayne Overbeck, N6NB, Southwestern Division; and Sam C. Sitton, KV5X, West Gulf Division. There were also present: Harry MacLean, VE3GRO, First Vice President, the Canadian Radio Relay League; Counsel Christopher D. Imlay, N3AKD; Barry J. Shelley, Business Manager; Paul Rinaldo, W4RI, Publications Manager; John F. Lindholm, W1XX, Membership Communications Services Manager; Richard K. Palm, K1CE, Field Services Manager; and Perry Williams, W1UED, Washington Area Coordinator.

2) The assembly observed a moment of silence in recollection of Radio Amateurs who have passed away since the previous Board Meeting, especially Honorary Vice President and Past Director John Griggs, W6KW, and past Section Manager Karl Medrow, W3FA. Good wishes for a speedy recovery were offered to Vice Director Cliff Laverty, W1RWG, who has been seriously ill. Greetings from President Emeritus Harry Dannals, W2HD, Past Director Al Oubre, K5DPG, and Past Director Gay Milius, W4UG, were conveyed to the Board. The Chair introduced Messrs. Severson and Shrader in their new roles as Directors. Mr. Shrader introduced the new Vice Director of the Northwestern Division, Ms. Brown, and Director Severson introduced the

new Great Lakes Vice Director, Mr. Race. Mr. Turnbull introduced Ms. Craigie, Atlantic Division Vice Director, and Mr. Harrison introduced Vice Director Leggette of the Delta Division.

3) On motion of Mr. Mendelsohn, seconded by Mr. Harrison, the agenda was ADOPTED with the addition of "Report of the Canadian Radio Relay League" under item 8.

4) On motion of Mr. Kanode, seconded by Mr. Mendelsohn, the Minutes of the 1989 Second Meeting were APPROVED as presented.

5) The Chair announced the opening of nominations for the office of President. Mr. Mendelsohn nominated Mr. Price. On motion of Mr. Grauer, seconded by Mr. Mark, it was unanimously VOTED that nominations are closed and the Secretary is instructed to cast one ballot electing Mr. Price as President.



George Wilson, III, W4OYI, was elected First Vice President. George chairs this year's Administration and Finance Committee.

6) The Chair announced the opening of nominations for First Vice President. Mr. Severson nominated Mr. Wilson. On motion of Mr. Quiat, seconded by Mr. Mark, it was unanimously VOTED that nominations are closed and the Secretary is instructed to cast one ballot electing Mr. Wilson as First Vice President.

7) The Chair announced the opening of nominations for an additional Vice President. Mr. Shrader nominated Mr. Stafford. On motion of Mr. Quiat, seconded by Mr. Mendelsohn, it was unanimously VOTED that nominations are closed and the Secretary is instructed to cast one ballot electing Mr. Stafford as a Vice President.

8) The Chair announced that nominations were in order for an additional Vice President. Mr. Harrison nominated Mr. Haynie. On motion of Mr. Quiat, seconded by Mr. Severson, it was unanimously VOTED that nominations are closed and the Secretary is instructed to cast one ballot electing Mr. Haynie as a Vice President.

9) The Chair announced the opening of nominations for International Affairs Vice President. Mr.

Quiat nominated Mr. Holladay. Mr. Mark nominated Mr. Olson, but Mr. Olson declined the nomination citing the press of personal business. On motion of Mr. Frenaye, seconded by Mr. Mark, it was unanimously VOTED that nominations are closed, and the Secretary is instructed to cast one ballot electing Mr. Holladay as International Affairs Vice President.

10) The Chair announced the opening of nominations for Executive Vice President. Mr. Heyn nominated Mr. Sumner. On motion of Mr. Quiat, seconded by Mr. Kanode, it was unanimously VOTED that nominations are closed and the Secretary is instructed to cast one ballot electing Mr. Sumner as Executive Vice President.

11) The Chair announced the opening of nominations for Treasurer. Mr. Mendelsohn nominated Mr. McCobb. On motion of Mr. Quiat, seconded by Mr. Kanode, it was unanimously VOTED that nominations are closed and the Secretary is instructed to cast one ballot electing Mr. McCobb as Treasurer.

12) The Chair announced the opening of nominations for Secretary. Mr. Severson nominated Mr. Sumner. On motion of Mr. Shrader, seconded by Mr. Kanode, it was unanimously VOTED that nominations are closed and the Secretary is instructed to cast one ballot electing Mr. Sumner as Secretary. Whereupon, the Chair announced that Messrs. Price, Wilson, Stafford, Haynie, Holladay, Sumner and McCobb were elected as the officers of the ARRL until the 1992 Annual Meeting of the Board (applause).

13) The Chair announced the opening of nominations for Executive Committee. Mr. Kanode nominated Mr. Quiat. Mr. Quiat nominated Mr. Butler. Mr. Harrison nominated Mr. Mendelsohn. Mr. Stafford nominated Mr. Heyn. Mr. Metzger nominated Mr. Grauer. Mr. Frenaye nominated Mr. Turnbull. On motion of Mr. Metzger, seconded by Mr. Severson, it was VOTED that the nominations are closed. The Chair announced the appointment of Messdames Gauzens, Brown and Craigie as Tellers. The Tellers reported that Messrs. Quiat, Butler and Mendelsohn were elected on the first ballot; Mr. Turnbull was elected on the second ballot (applause).

14) Without objection, the election of directors of the ARRL Foundation was deferred until later in the Meeting.

15) Mr. Price presented his report as President, covering internal communications, FCC matters, affairs of the International Amateur Radio Union (of which Mr. Price is Secretary), preparations for the World Administrative Radio Conference to be held in Spain in 1992 (WARC-92), membership matters, and the long-range planning process.

16) Mr. Holladay presented his report as First Vice President. The priorities he identified for the coming year included continuing to address fiscal concerns, insuring that we are prepared for WARC-92, increasing emphasis on public relations, and recruiting of new amateurs. During 1989 Mr. Holladay had served on the Executive Committee, the Membership Services Committee and the Long-Range Planning Committee and also served as Board Liaison to the VHF/UHF Advisory Committee. He had been a delegate to the IARU Region 2 Conference at Orlando, where he observed a high level of cooperation and agreement on the essential issues.

17) Mr. Wilson presented his report as a Vice President. Active in the affairs of six committees during 1989, he served as Chair of the Ad Hoc Election Procedures Committee, the Committee to Examine a Possible Code Free License, and the Committee to Examine the FCC Part 97 Rewrite; and as a member of the Legal Strategy Committee, the Long-Range Planning Committee and the Volunteer Resources Committee. Mr. Wilson expressed pride in the League having turned back a proposal to impose license fees on Amateur Radio; the impact of such fees on the intake of new amateurs "could have been horrible," he said.

18) The report of Clyde Hurlbert, W5CH, as Vice President, was presented. It discussed problems and challenges in the field of financing, League operations, administration, business operations, and

the need to raise dues to support member services.

19) Mr. Olson presented his report as International Affairs Vice President. It summarized the Region 2 IARU Conference in Orlando, including its election of officers and the work of its committees. Mr. Olson also summarized the work of the International Amateur Radio Union in general.

20) The extensive report of the Executive Vice President focused on the ARRL agenda for the next several years. Mr. Sumner mentioned the need for strategic planning in anticipation of a codeless license, to earn community support of Amateur Radio, to stimulate technical advancement, for greater involvement by young people, to earn the support of developing countries, to deal with possible biological effects of radio frequency energy, to strengthen financial resources, to enhance our image, and for spectrum management. Appendices described WARC-92 preparations, ARRL publications activities, a progress report on educational activities and the status of actions previously requested by the Board.

21) Mr. McCobb reported as Treasurer on activity in the investment portfolio, the specifics of which will be presented in detail in the written Annual Report later in the year.

22) Mr. Imlay's extensive report as Legal Counsel summarized spectrum allocation matters, including the court appeal of the FCC's Docket 87-14 reallocation of 220-222 MHz, personal emergency locator transmitters (Docket 89-599), the spectrum policy review begun by the National Telecommunications and Information Administration, and the WARC-92 Notice of Inquiry (in Docket 89-554). Mr. Imlay also mentioned the code-free license petition, RM-6995, proposed amendments to Part 97, proposed revision of the Rules concerning RTTY and data communications, a request for a declaratory ruling concerning the possession of radio receivers, and other FCC matters. He concluded with a summary of local antenna and RFI cases.

During the course of the above, the Board was in recess from 10:20 to 10:50 AM.

23) Mr. Grauer presented his report as President of the ARRL Foundation, including the good news that its assets had increased by \$100,000 during the previous fiscal year. Grants included a number of scholarships, a grant to the Courage Handi-Ham System Equipment Loan Program, support for the Shuttle Amateur Radio Experiment, an emergency communications grant following Hurricane Hugo to buy equipment for use in Puerto Rico, and a number of Victor C. Clark Youth Incentive Program awards.

24) Acting for President Bruce Balla, VE2QO, Mr. MacLean presented the report of the Canadian Radio Relay League, as a matter of fraternal interest to the ARRL Board. Among topics included were the new officers of CRRL, Bylaw changes, restructuring of Amateur Radio in Canada, and efforts toward creating a single Amateur Radio society in Canada. At 11:40 AM the Board stood in recess for luncheon, reconvening at 1:08 PM with all persons hereinbefore mentioned present. At this point the President announced the appointment of Mr. Wilson as Parliamentarian for the meeting.

25) Mr. Metzger, as Chairman, presented the report of the Administration and Finance Committee. It was moved by Mr. Metzger, seconded by Mr. Heyn, that the following resolution be adopted:

WHEREAS, there will be another World Administrative Radio Conference in approximately 1992; and

WHEREAS, there are continuing legal and other expenses related to the defense of our 220 MHz frequencies; and

WHEREAS, recent successes on Capitol Hill point to the desirability of continued monitoring of legislative activity, with attendant expense; and

WHEREAS, there are growing problems nationally affecting the ability of Radio Amateurs to erect antennas for effective communications, including problems with zoning as well as fast-growing problems involving restrictive covenants; and

WHEREAS, inflation and other factors continue to increase expenses involved in every activity; and

WHEREAS, it is not acceptable to reduce membership services for any appreciable period of time; and

WHEREAS, there are new and expanded membership services proposed for the future; and

WHEREAS, there has not been a dues increase since 1981; and

WHEREAS, since 1981 there has been an increase of approximately 50 percent in the national cost price index; and

WHEREAS, our proposed budget for calendar year 1990 is a bare-bones budget, and by calendar year 1991 additional revenues will be needed to properly provide for the above; now therefore, it is

RESOLVED that effective April 1, 1990, Bylaw 4 of the Bylaws of the American Radio Relay League is amended by replacing "\$25" with "\$30" in the first sentence.

A roll call vote being required, the matter was decided in the affirmative with all Directors voting aye except Mr. Grauer, who voted nay. So the Bylaw was AMENDED. The Board was in recess from 2:33 to 2:59 PM.

26) On motion of Mr. Metzger, seconded by Mr. Harrison, it was unanimously VOTED that the 1990 budget of the American Radio Relay League presented at the January 1990 Meeting of the Board of Directors is ratified.

27) On motion of Mr. McCobb, seconded by Mr. Butler, it was unanimously VOTED that Business Manager Barry J. Shelley is authorized as a signatory on checking accounts and certificates of deposit at Connecticut Bank and Trust Company, Connecticut National Bank, Shawmut Bank, and Andover Bank. Authority is also granted to effect the transfer of funds from those banks by wire or other electronic means.



Rocky Mountain Division Director Marshall Quiat, AGØX, was elected to the Executive Committee.

28) Mr. Quiat, as Chairman, presented the report of the Membership Services Committee. Studies by the Committee continue on developing a standard computer file format for contests, preparation of signs for clubs to use on highways, and the study of amateur television issues in the 420-MHz band. Rules governing use of packet or voice assistance in connection with contests were adopted for 1990 events. The Committee will examine a request from the Insurance Administrator for a premium increase on equipment insurance. The Committee also continues its study of the formation of an Amateur Radio Spectrum Consultative Committee to address spectrum management issues.

29) Mr. Haynie, as Chairman, presented the report of the Publications Committee calling for aggressive direct marketing and for the incorporation of the publication *Gateway* into *QEX*.

30) Mr. Stafford, as Chairman, reported for the Volunteer Resources Committee on its investigation of ways in which volunteer leadership can be

trained; planning the integration of Communicator Class licensees into ARRL affairs; making changes in the Section Public Information Program; and monitoring the progress of the Volunteer Examiner Coordinator activity. The Board was in recess from 4:20 to 4:41 PM.

31) Mr. Price, as Chairman, presented the report of the ARRL Executive Committee. It summarized the three meetings of the Executive Committee during the year, each of which has been reported in *QST*.

32) A report on the Shuttle Amateur Radio Experiment by the SAREX Working Group was received.

33) Mr. Turnbull, as Chairman, presented the report of the RFI Task Group. A case concerning alleged interference to a medically installed pace maker is still unresolved, proposed tests never having materialized. The Task Group continues to participate in industry's development of standards for RFI measurements.

34) Mr. Olson reported briefly for the Biological Effects Committee which, in June, had reviewed the article on biological effects by Dr. Ivan A. Shulman, WC2S, which appeared in the October issue of *QST*. The Committee intends to seek standard methods for measurements of radio frequency energy and to play an active role in producing and distributing information. Dr. Shulman became chairman effective January 1.

35) Mr. Rinaldo, as Chairman, presented the report of the Committee on Amateur Radio Digital Communication. The report covered the 8th ARRL Computer Networking Conference on October 7 at the US Air Force Academy; the petition for RTTY and packet rule changes which was filed in December; the HF Packet Radio Design Quest announced in the May, 1989, issue of *QST*; and the receipt of a \$10,000 grant from the Federal Emergency Management Agency, to be used for HF packet development.

36) Mr. Quiat, as Chairman, presented the report of the Legal Strategy Committee. Its tasks included monitoring court proceedings and decisions affecting Amateur Radio, giving assistance and guidance to staff members assisting amateurs and their attorneys with local problems, conducting continuing legal education seminars, continuing legal research such as that which led to PRB-1 and assisting in the Part 97 Rewrite Committee activities. On motion of Mr. Quiat, seconded by Mr. Heyn, it was VOTED that Christopher Imlay is designated as General Counsel of ARRL (applause).

37) Mr. Frenaye, as Chairman, presented the final report of the Education Task Force. Its recommendations have led to complete rewrites of the Technician and General Class Instructor's Guides, establishment of a Volunteer Educational Advisor Program, the conducting of a very successful ARRL National Education Workshop at the 1989 ARRL National Convention with a 139-page publication of 25 papers presented there, establishment of a program for authorizing instructors to award continuing education units (CEUs), publication of an Education Activities Forum newsletter, and renewed efforts to build school Amateur Radio clubs. Activities of the Education Task Force now can be best carried on by the Publications and Volunteer Resources Committees working with Headquarters. On motion of Mr. Mendelsohn, seconded by Mr. Frenaye, it was VOTED that the Education Task Force is discharged, with the warm thanks of the Board for a job well done. During the course of the above, Mr. Leggett took the seat for Mr. Harrison, at 5:17 PM.

38) Mr. Stafford, as Liaison, presented the final report of the ARRL National Emergency Response Committee (ANERCOM). Hurricane Hugo provided a laboratory for the emergency plans developed by ANERCOM. Cooperation with IARU Region 2 Societies was apparent both during the hurricane and at the Tenth General Assembly in Orlando. ANERCOM and the ARRL Field Services Department have been in close contact with served agencies and the Office of US Foreign Disaster Assistance. Other subjects included interface with the news media, the ARRL International Assistance and Traffic Net (IATN), health and welfare inquiry traffic, gateway message formats, and standard operational procedure.

39) Mr. Metzger, as Chairman, presented the report of the Election Committee, covering its work in administering the Director and Vice Director elections during 1989 and a Section Manager recall elec-

tion in 1990. On motion of Mr. Frenaye, seconded by Mr. Mendelsohn, it was VOTED that the following paragraph be added after paragraph 6 in the standard procedures for the ARRL Committee of Tellers:

"Upon completion of the ballot counting and certification, the results shall be communicated to candidates in an expeditious manner, by telephone or electronic means."

40) Mr. Shrader, as Liaison, presented the report of the VHF Repeater Advisory Committee. It was moved by Mr. Shrader, seconded by Mr. Butler, that the Board of Directors of the ARRL task the VHF Repeater Advisory Committee and the VHF-UHF Advisory Committee to recommend changes to the ARRL 144-148 MHz, 220-225 MHz and 420-450 MHz band plans and that such changes be presented to the Membership Services Committee for study before the 1991 Annual Board of Directors Meeting. On motion of Mr. Wilson, seconded by Mr. Mendelsohn, it was VOTED to amend the motion to read: that the Board of Directors of the ARRL task the VHF Repeater Advisory Committee and the VHF-UHF Advisory Committee to consider changes to the ARRL 144-148 MHz, 220-225 MHz and 420-450 MHz band plans and that any changes be presented to the Membership Services Committee for study before the 1991 Annual Board of Directors Meeting. The question thereupon being on the motion as amended, the same was ADOPTED. During the course of the above, Mr. Harrison returned to his seat at 5:42 PM. The Board was in recess for dinner from 5:44 to 8:39 PM, with all persons hereinbefore mentioned present except Mr. Stafford; Mr. McConnell took his seat.

41) It was moved by Mr. Shrader, seconded by Mr. Harrison, that the Board of Directors of the ARRL recommend that a one-page map of the US be included in the ARRL Repeater Directory, depicting which states are using 15 kHz separation between repeaters and which states are using 20 kHz on the 2-meter (144 MHz) band. On motion of Mr. Olson, seconded by Mr. Kanode, it was VOTED to postpone consideration of the matter until the July Meeting of the Board. Messrs. Shrader, Heyn and Harrison requested to be recorded as voting against postponement; Mr. Metzger requested to be recorded as having abstained. During the course of the above, Mr. Stafford resumed his seat at 8:52 PM.

42) On motion of Mr. Shrader, seconded by Mr. Heyn, it was VOTED that the Board of Directors of the ARRL task the VHF Repeater Advisory Committee to review the 13-cm band plan as proposed by the VHF-UHF Advisory Committee. The VRAC recommendations shall be presented to the Membership Services Committee for their study before the 1991 Annual Board of Directors Meeting.

43) No report had been received from the Contest Advisory Committee. On behalf of the DX Advisory Committee, Mr. Kanode presented a comprehensive report provided by its chairman, Richard Roderick, K5UR. It was moved by Mr. Kanode, seconded by Mr. Harrison, that the following endorsements be added to the 5-Band DX Century Club program: 12 meters (24.890 to 24.990 MHz) and 17 meters (18.068-18.168 MHz). It was moved by Mr. Wilson, seconded by Mr. Mark, that the motion be amended by striking the text and substituting therefor the following: that the DXAC review all presently available DX awards and endorsements, and submit in its next report a list of same, prioritized according to their perceived importance to the DX community. A point of order was raised by Mr. Mendelsohn, that the amendment offered was not germane to the motion it proposed to amend. However, the Chair ruled that the motion to amend was in order. The question then being on the amendment, the same was LOST. The question then being on Mr. Kanode's motion, a roll call vote being ordered upon request, the question was decided in the affirmative. Messrs. Harrison, Mendelsohn, Frenaye, Shrader, Stafford, Kanode, Quiat, Heyn and Haynie voted aye, Messrs. Mark, Severson, Grauer and Butler voted nay, and Messrs. Turnbull and Metzger abstained. So the motion was ADOPTED.

44) Mr. Holladay, as Liaison, presented the report of the VHF-UHF Advisory Committee. The report outlined the status of past VUAC recommendations. There was no report from the Public Service Advisory Committee.

45) With unanimous consent, the Chair deferred agenda item 10, Appointment of Committees, until later in the meeting.

46) Mr. Grauer, as host Director, reported on plans for the 1990 National Convention. It is to be held June 8-10 at Bartle Hall, Kansas City (Missouri) Convention Center, 13th and Central. The Allis Plaza is HQ Hotel with the Americana as backup; attendees should mention ARRL when reserving rooms. At this point, 9:50 PM, the Board was in recess for the night, reconvening on Saturday, January 20, 1990, at 8:40 AM with all persons hereinbefore mentioned present except Treasurer McCobb who had departed from the meeting.

47) Mr. Frenaye, on behalf of the ARRL Foundation, presented nominations for its Board of Directors for 1990. On motion of Mr. Butler, seconded by Mr. Harrison, it was VOTED that Paul Grauer, W6FIR, John Kanode, N4MM, and Ralph Anderson, K0NL are elected for three-year terms, and Roger Franke, K9AYK, for a one-year term, as Directors of the ARRL Foundation.

48) At this point the Board reached item 12 on the agenda, Directors' motions. On motion of Mr. Frenaye, seconded by Mr. Kanode, it was unanimously VOTED that guest operators at the newly renovated Hiram Percy Maxim Memorial Station, WIAW, be presented with a certificate upon completion of at least one QSO.

49) On motion of Mr. Shrader, seconded by Mr. Heyn, it was VOTED that the name of the "ARRL Interference Reporting System" be changed to "ARRL Monitoring System (ARRL M/S)."



Atlantic Division Director Hugh Turnbull, W3ABC, discusses progress on the RFI front. Hugh is chairman of the League's RFI Task Group.

50) On motion of Mr. Stafford, seconded by Mr. Mendelsohn, it was VOTED that the Volunteer Resources Committee shall undertake the study of the creation of a new section-level appointment called, "Section Training Coordinator." The VRC shall develop a job description for the Section Training Coordinator and then shall seek input from the field as to the advisability of creating such a new position. The job description shall include, but not necessarily be limited to, the following: 1) encouraging clubs and repeater groups to establish and maintain on-the-air code practice sessions, especially in the VHF-UHF frequencies, 2) encouraging clubs and repeater groups to establish and maintain on-the-air training programs for the various aspects of emergency communications, public service communications, traffic handling, compliance with FCC rules and regulations, etc. The VRC is to report to the Board on this matter at the July 1990 Meeting.

51) It was moved by Mr. Kanode, seconded by Mr. Frenaye, that whereas effective utilization of the spectrum available to radio amateurs has become increasingly important due to growth in the number of popular operating modes and growth in the number of users of each mode, it is therefore ordered that a spectrum management committee be established having as its basis and purpose to review current ARRL band plans and spectrum usage recommendations and practices, considering all operating modes and interests for a given band and,

where appropriate, formulate recommendations for presentation to the ARRL Board for adoption. The Membership Services Committee is directed to develop procedures for: 1) Selection of members for the spectrum management committee. Such selection shall be made without regard to current League membership. 2) The process of deliberation and recommendation to be used by the Committee. This process shall provide for input from and feedback to the user community. These procedures shall be established in consultation with the US amateur community and shall be presented for approval at the second 1990 Meeting of the Board. On motion of Mr. Heyn, seconded by Mr. Haynie, it was VOTED to postpone consideration of the matter until after lunch.

52) On motion of Mr. Quiat, seconded by Mr. Frenaye, the following resolution was unanimously ADOPTED (applause):

WHEREAS, Charles R. Bender, W1WPR, has served on the ARRL Headquarters staff faithfully for 38 continuous years as WIAW station operator, the last 18 of which as Chief Operator and Station Manager; and

WHEREAS, "Chuck" has fondly become known as the principal voice and fist behind many WIAW QSOs; and

WHEREAS, many prospective hams have learned Morse code through the diligent efforts of Chuck at WIAW; now, therefore,

BE IT RESOLVED, that this Board commends Chuck for his great contribution to the League and Amateur Radio and conveys a hearty "73" for a richly deserved, long, healthy and happy retirement.

53) On motion of Mr. Haynie, seconded by Mr. Mendelsohn, the following resolution was unanimously ADOPTED (applause):

WHEREAS, Laird Campbell, WICUT, has served on the ARRL Headquarters staff faithfully for 35 continuous years, including positions in the Communications, Technical and Advertising departments, and as the Managing Editor of QST; and

WHEREAS, Laird has also served the staff as Senior Staff Assistant for personnel matters, as Acting General Manager during WARC preparations and has been chairman of the Museum of Amateur Radio Committee; and

WHEREAS, Laird, in his additional role of Production Manager, has diligently overseen the production of more than 70 ARRL titles; now, therefore

BE IT RESOLVED, that this Board commends Laird for his tireless devotion to the League and for his contributions to Amateur Radio, and passes along its best wishes for a happy retirement.

54) It was moved by Mr. Grauer, seconded by Mr. Harrison, that the June VHF QSO Party be moved up one week, from June 9 to June 16. But after discussion, the motion was LOST.

55) On motion of Mr. Shrader, seconded by Mr. Harrison, it was VOTED that the ARRL accept the invitation to participate in a 1990 US-USSR Goodwill Contest, timed to coincide with the 1990 Goodwill Games to be held in Seattle, Washington.

56) On motion of Mr. Kanode, seconded by Mr. Mendelsohn, it was unanimously VOTED that Gay E. Milius, Jr., W4UG, the Roanoke Division Director from 1981 to 1988, is elected as Director Emeritus (applause).

57) On motion of Mr. Haynie, seconded by Mr. Heyn, it was VOTED that the following ARRL Conventions are approved: West Texas Section, Abilene, April 14-15, 1990, and Oklahoma State, Oklahoma City, August 3-5, 1990.

58) On motion of Mr. Turnbull, seconded by Mr. Metzger, it was VOTED that the President appoint or use an existing Committee to review the Articles of Association and Bylaws and propose any changes necessary to reflect the current duties of officers. Their preliminary report should be made to the Board at its Second 1990 Board Meeting.

59) On motion of Mr. Mendelsohn, seconded by Mr. Wilson, it was VOTED that the section-level titles for Public Information appointments be changed to better reflect their work. Public Information Assistant shall become Public Information Officer; Public Information Officer shall become Public Information Coordinator.

60) On motion of Mr. Grauer, seconded by Mr. Frenaye, it was VOTED that the Publications Committee study the feasibility of publishing call directories. During the course of the above, Messrs. Leggett and Sitton took the seats for Messrs. Harrison and Haynie at 9:57 AM.



Several new Vice Directors attend their first Board meeting, from left: Great Lakes Division's George Race, WB8BGY; Atlantic Division's Kay Craigie, KC3LM; and Delta Division's Henry Leggette, WD4Q.

61) It was moved by Mr. Stafford, seconded by Mr. Kanode, that the post of Disaster Communications Coordinator be created. The position shall be appointed by the President of the ARRL and shall be responsible for acting as Liaison with the IARU in the area of disaster communications. On motion of Mr. Mendelsohn, seconded by Mr. Severson, it was voted to postpone discussion of the matter until after lunch. The Board was in recess from 10:10 to 10:45 AM, resuming with Mr. Holladay in the Chair and Messrs. Haynie and Harrison in their seats.

62) On motion of Mr. Haynie, seconded by Mr. Heyn, the following resolution was ADOPTED:

The ARRL Board of Directors, on behalf of the officers and members proclaim for all to note that:

WHEREAS, the Amateur Satellite Program represents a major source of technological advancement within the Amateur Radio community; and

WHEREAS, the Amateur Satellite Program has a long history of providing useful communications resources to radio amateurs worldwide; and

WHEREAS, the Amateur Satellite Program is a major element of the public service, education, and scientific research being conducted via Amateur Radio today; and

WHEREAS, the Amateur Satellite Program represents the resourceful, creative, innovative and volunteer spirit of Radio Amateurs everywhere; and

WHEREAS, 1990 will see the launch of eight new OSCAR satellites including six on a single launch vehicle with the Microsat/UoSAT launch; and

WHEREAS, 1990 will see the construction of an additional OSCAR satellite by AMSAT-Italy and AMSAT-NA begin; and

WHEREAS, 1990 will mark the beginning of the Phase III-D construction activity by a broad base of international amateur participants; now, therefore

BE IT RESOLVED, that in recognition of the contribution of the Amateur Satellite Program to the Amateur Radio Service and of the significant events which are to occur during the course of the year 1990 within this discipline of Amateur Radio, we hereby declare: 1990 the Year of the Amateur Satellite Program.

63) On motion of Mr. Mendelsohn, seconded by Mr. Harrison, it was VOTED that it shall be a standing order that, promptly after the calling of a meeting of a Standing Committee, its Chairman

shall request the Secretary of the League promptly to notify the remaining Board members of the place and time of the meeting. The meeting notes of any Standing Committee meeting shall be published to the full Board within 45 days of that meeting. During the course of the above, at 10:57 AM, Mr. Race took the seat for Mr. Severson.

64) On motion of Mr. Grauer, seconded by Mr. Mendelsohn, it was VOTED that an ARRL approved hamfest be able to buy publications at a special price to be used as prizes at the hamfest. (Limit to be set at \$100.) During the course of the above, at 11:02 AM, Mr. Leggette took the seat for Mr. Harrison.

65) On motion of Mr. Frenaye, seconded by Mr. Butler, it was VOTED that continued efforts be

made by staff and General Counsel to work with the FCC to find a way to allow the issuance of new club call signs, as well as the reissuance of call signs previously held by individuals.

66) On motion of Mr. Heyn, seconded by Mr. Butler, it was VOTED that the Executive Committee with Headquarters staff study the method, practicality and merits of regularly having informal surveys conducted in QST. During the course of the above, at 11:08 AM, Mr. Harrison returned to his seat; Mr. Walker took the seat for Mr. Kanode.

67) It was moved by Mr. Mendelsohn, seconded by Mr. Frenaye, that the Administration and Finance Committee shall study the desirability of establishing a premium class of League membership as an incentive to those who desire to provide additional support to the League. Such a class of membership might provide additional League services at a yearly membership cost of at least twice the annual rate. But, after discussion, the motion was LOST. During the course of the above, at 11:26 AM, Messrs. Kanode and Severson resumed their seats.

68) At this point, 11:27 AM, Mr. Price returned to the Chair and announced the following appointments to Standing Committees.

Administration and Finance: Mr. Wilson, Chairman; Messrs. Harrison, Frenaye, and Metzger. As Treasurer, Mr. McCobb is also a member of this committee.

Membership Services: Mr. Kanode, Chairman; Messrs. Grauer, Mark, Stafford and Mrs. Gauzens.

Publications: Mr. Severson, Chairman; Messrs. Sitton, Shrader and Walker.

Volunteer Resources: Mr. Heyn, Chairman; Messrs. McConnell, Haynie and Vydareny.

Election: Mr. Turnbull, Chairman; Messrs. Butler and Grauer. During the course of the above, at 11:44 AM, Mr. Vydareny took the seat for Mr. Mendelsohn; at 11:50 AM, Mr. McConnell took the seat for Mr. Stafford; and Mr. Sitton took the seat for Mr. Haynie. The Board was in recess for lunch from 12:01 to 1:04 PM, reassembling with all persons hereinbefore mentioned present except Mr. McCobb. Messrs. Haynie and Stafford returned to their seats at this time.

69) The Board returned to an item of business that had been postponed until after lunch. On motion of Mr. Kanode, seconded by Mr. Stafford, it was VOTED to amend Mr. Kanode's earlier motion to read as follows,

WHEREAS, effective utilization of the spectrum available to radio amateurs has become increasingly important due to growth in the number of popular operating modes and growth in the number of users of each mode, it is therefore ordered that the Membership Services Committee study the establishment of a spectrum management committee whose basis and purpose is to review current ARRL band plans and spectrum usage



Dakota Division Director Howard Mark, W0OZC (l), and Delta Division Director Joel Harrison, WB5IGF.

recommendations and practices, considering all operating modes and interests for a given band and, where appropriate, to formulate recommendations for presentation to the ARRL Board for adoption. The MSC study shall include recommended procedures for: 1) Selection of members of the spectrum management committee. 2) The process of deliberation and recommendation to be used by the Committee. This process shall provide for input from and feedback to the user community. The study recommendations shall be established in consultation with all existing committees which are affected and with interested members of the US amateur community. These recommendations shall be presented at the Second 1990 Meeting of the Board.

The question then being on the motion as amended, the same was ADOPTED.

70) It was moved by Mr. Metzger, seconded by Mr. Butler, that Bylaw 7 is amended by replacing "\$2" with "\$4" in the first sentence. A roll call vote being required, the question was decided in the affirmative. All the Directors voted aye, so the Bylaw was AMENDED.

71) On motion of Mr. Mark, seconded by Mr. Grauer, the following resolution was unanimously ADOPTED by standing ovation:

Now let it be known that:

WHEREAS, Tod Olson has contributed to Amateur Radio as a member of ARRL's Field Organization as a Section Communications Manager; and

WHEREAS, Vice President Olson competed for many years as a top-rated contester and was the first editor of the *National Contest Journal*; and

WHEREAS, for the past 16 years, Vice President Olson has served the ARRL Board as Vice Director, Director and Vice President of International Affairs, in the latter role fostering strong ties with member societies overseas; now, therefore

BE IT RESOLVED, that this Board does hereby commend Vice President Olson for his contributions to Amateur Radio and the ARRL, and wishes him well in his future endeavors.

72) On motion of Mr. Severson, seconded by Mr. Mendelsohn, it was VOTED that Standing Order 113 is amended to include Section Manager. The new wording shall be: "The Executive Vice President, upon request, shall furnish each *Section Manager* and Director a list showing each member of his *area* who fails to renew membership prior to expiration of the grace period."

73) It was moved by Mr. Mendelsohn, seconded by Mr. Harrison, that the following resolution be adopted:

WHEREAS, a significant portion of the legal/regulatory problems faced by amateurs today come from the area of local government, zoning boards, etc., which may enact ordinances or regulations detrimental to amateur radio interests, or may use existing rules to hinder amateur operation; and

WHEREAS, Volunteer Counsel must frequently deal with such problems long after they arise; and

WHEREAS, the State Government Liaison cannot monitor the activities of each and every local government body, nor appear before each and every body; now, therefore

BE IT RESOLVED, that the station appointment of Local Government Liaison is established in the Field Organization to bring Amateur Radio closer to these most basic, grass roots levels of government.

BE IT FURTHER RESOLVED, that the Field Services Manager will promulgate appropriate certificates of appointment and job descriptions and publish appointee recruitment articles in appropriate publications.

A roll call vote being ordered, the question was decided in the affirmative. Messrs. Mark, Harrison, Severson, Mendelsohn, Frenaye, Shrader, Stafford, Kanode, Quiat, Butler, Heyn, and Haynie voted aye. Messrs. Turnbull, Metzger and Grauer voted nay. So the motion was ADOPTED.

74) It was moved by Mr. Wilson, seconded by Mr. Butler, that a new Bylaw be added after Bylaw 19: "The Election Committee shall certify the eligibility under Article 11 of any nominee to fill a Vice Director vacancy under Article 7." A roll call vote being required, the question was decided in the affirmative, with all the Directors voting aye. So the new Bylaw was ADOPTED.

75) It was moved by Mr. Frenaye, seconded by Mr. Mendelsohn, that a petition be filed with the FCC proposing modifications to Part 97.313(b), proposing the power limits for operation on AM

DSB in accordance with previous ARRL policy to support the retention of operating privileges already earned. The ayes and nays being ordered on request, the question was decided in the affirmative. Messrs. Turnbull, Metzger, Harrison, Severson, Mendelsohn, Grauer, Frenaye, Shrader, Kanode, Quiat and Butler voted aye; Messrs. Mark, Stafford and Haynie voted nay; and Mr. Heyn abstained. So the motion was ADOPTED. The Board was in recess from 2:06 to 2:25 PM.

76) On motion of Mr. Stafford, seconded by Mr. Harrison, it was VOTED that the Membership Services Committee shall study the feasibility of field checking of QSL cards for the initial application for the DXCC Award. The MSC is to seek input from the membership and the DXAC. If the MSC determines that field checking is feasible, it shall develop rules and procedures for such field checking and shall present its findings and recommendations to the Board of Directors at the July 1990 Meeting.



New England Division Director Tom Frenaye, K1KI (l), and new Northwestern Division Director Bill Shrader, W7QMU, listen intently to discussion on a motion before the Board.

77) On motion of Mr. Stafford, seconded by Mr. Heyn, it was VOTED that the VRC shall undertake a study of the structure of the National Traffic System and to recommend to the Board of Directors any changes that the VRC deems appropriate. The VRC shall seek the input of the Area Staffs and if the VRC deems it necessary and appropriate, the VRC may propose that the three Area Staff chairmen meet in person with the VRC to discuss the matter.

78) It was moved by Mr. Heyn, seconded by Mr. Butler, that the appropriate Standing Committee study the feasibility of allowing a limited number of Section Managers (up to 15) to attend each Board Meeting, as observers at no expense to the League. But after discussion, the motion was LOST. During the course of the above, at 2:50 PM, Mr. Sliton took the seat for Mr. Haynie.

79) On motion of Mr. Metzger, seconded by Mr. Quiat, it was VOTED that the Board of Directors reimburse deficiencies in various accounts of \$464.28 for the fiscal year 1989.

80) On motion of Mr. Heyn, seconded by Mr. Butler, it was VOTED that the ARRL Southwestern Division Convention to be held at Scottsdale, Arizona, October 11-13, 1991, is approved.

81) On motion of Mr. Heyn, seconded by Mr. Stafford, it was VOTED that the 1992 ARRL National Convention be held at Los Angeles, California, on August 20-23, 1992.

82) Moving now to Item 13 on the agenda, on motion of Mr. Turnbull, seconded by Mr. Shrader, it was VOTED that the Executive Vice President is hereby authorized to reimburse Division Directors for actual expenses incurred by them during the year 1990 in the proper administration of ARRL affairs in their respective divisions and in accordance with Board policy up to the amounts as follows: Atlantic Division \$12,000; Central Division \$8,500; Dakota Division \$4,500; Delta Division \$10,000; Great Lakes Division \$13,500; Hudson Division \$8,500; Midwest Division \$7,000; New England Division \$8,500; Northwestern Division \$13,000; Pacific Division \$10,500; Roanoke Division \$11,000; Rocky Mountain Division \$8,500; Southeastern Division \$12,000; Southwestern Division \$13,500; West Gulf

Division \$10,000.

83) On motion of Mr. Butler, seconded by Mr. Quiat, it was VOTED that the Executive Vice President is hereby authorized to reimburse the following Committees and Task Groups created by the Board for expenses incurred by them during the year 1990 in the proper execution of their duties and in accordance with Board policy, as follows:

RFI Task Group \$2,500; Committee on the Biological Effects of RF Energy \$3,500; Committee on Amateur Radio Digital Communications \$10,000; Legal Strategy Committee \$12,500; Election Committee \$3,000; Public Relations Committee \$5,000.

84) On motion of Mr. Kanode, seconded by Mr. Heyn, it was VOTED that to continue the Board's policy of reimbursing QSL Bureau Managers of the League for certain travel in furthering ARRL organizational objectives, the Executive Vice President is hereby authorized to pay during the year 1990 a total amount not to exceed \$4,000 under the terms prescribed by the general pattern established by the Board.

85) On motion of Mr. Mendelsohn, seconded by Mr. Butler, it was VOTED that to continue the Board's policy of reimbursing National Traffic System officials above the section level for certain approved expenses in furthering ARRL organizational objectives, the Executive Vice President is hereby authorized to pay during the year 1990 a total amount not to exceed \$3,000 under terms prescribed by the Field Services Manager following the general pattern established by the Board.

86) On motion of Mr. Grauer, seconded by Mr. Metzger, it was VOTED that to continue the policy of the Board to assume the administrative expenses of the ARRL Foundation, the Executive Vice President is hereby authorized to pay during the year 1990 a total amount not to exceed \$2,000 in accordance with ARRL standing policies with respect to travel, accounting procedures and auditing. During the course of the above, at 3:25 PM, Mr. Haynie returned to his seat.

87) On motion of Mr. Wilson, seconded by Mr. Kanode, it was VOTED that the Board of Directors authorize reimbursement of additional expenses of \$3,351.83 incurred by the Administration and Finance Committee during 1989 in the performance of its duties.

88) On motion of Mr. Olson, seconded by Mr. Frenaye, it was VOTED that the Executive Vice President, with guidance from the President, is requested to study the FCC and NTIA Notices of Inquiry pertaining to WARC 92 and other spectrum management issues, and prepare comments in sufficient time for review and approval by the Executive Committee.

89) On motion of Mr. Mendelsohn, seconded by the entire Board, it was unanimously VOTED that the Board of Directors of the ARRL, assembled in Hartford, Connecticut, this 20th day of January, 1990, thanks the Executive Vice President and his able staff: specifically, Lisa Clark, for all of her wonderful administrative work; John Lindholm, Rick Palm, Paul Rinaldo and Barry Shelley for their technical expertise at crucial moments; and Perry Williams for faithfully recording one of the most productive meetings in memory (applause).

90) Mr. Price announced the following additional committee assignments:

Contest Advisory Committee: Chairman, Richard Assarabowski, K1CC; Board Liaison, Director Kanode.

DX Advisory Committee: Chairman Richard Roderick, K5UR; Board Liaison, Director McConnell.

Public Service Advisory Committee: Chairman, Laurence Staples, W8AIB; Board Liaison, Vice Director Race.

VHF Repeater Advisory Committee: Chairman, Karl Pagel, N6BVU; Board Liaison, Director Shrader.

VHF-UHF Advisory Committee: Chairman, Lauren Libby, KX80; Board Liaison, Director Harrison.

Public Relations Committee: Board Liaison, Director Mendelsohn

91) There followed an opportunity for all present to make final comments. There being no further business, the Board adjourned *sine die* at 4:49 PM. (Total time in session as a Board: 13 hours, 36 minutes; direct authorizations: \$200,316.11.)

Respectfully Submitted,
David Sumner, K1ZZ
Secretary

Flawless Launch Yields Six OSCARs; New Era in Amateur Satellite Communications Begins

On Sunday, January 21, at approximately 0135 UTC, the "brilliant plume" coming from the first stage of an Ariane V-35 rocket marked the beginning of a picture-perfect launch of the next generation of OSCAR satellites. At that time, UoSATs D and E and the four Microsats (PACSAT, WEBERSAT, LUSAT and DOVE), began their journey into space from Kourou, French Guiana. An attempt to launch 24 hours earlier was "scrubbed" because of thunderstorms near the launch site.

The AMSAT Launch Information Network Service (ALINS) covered the launch and the events surrounding it. The launch was heard around the world with rebroadcasts by WIAW, WA3NAN, W5RRR, and a host of other HF and VHF stations on virtually all amateur bands.

The rocket reached its orbital velocity of 7 kilometers per second 16 minutes into the flight as it passed east of Bermuda. At 20 minutes into the flight, UoSATs D and E were deployed, making them OSCARs 14 and 15. One minute later, the four Microsats were successfully deployed, making them OSCARs 16-19, respectively.

Ariane Launch Control and AMSAT staff applauded as the amateur satellites were deployed in this "very historic moment" for

AMSAT and Amateur Radio.

In a letter to AMSAT President Doug Loughmiller, KOSI, ARRL Executive Vice President David Sumner, K1ZZ, congratulated AMSAT on the successful orbiting of the four Microsats. "What the AMSAT team has done," Sumner said, "reflects credit on the entire Amateur Radio community. The timing couldn't be better as we begin preparation for the World Administrative Radio Conference to be held in 1992.

"AMSAT can justifiably take pride in providing the Amateur Radio community with a new communications capability. The American Radio Relay League shares in your pride and is pleased to have had the opportunity of contributing to the project."

In confident anticipation of a successful launch, the ARRL Board of Directors passed the following resolution:

"The ARRL Board of Directors, on behalf of the officers and members proclaim for all to note that:

"Whereas the amateur satellite program represents a major source of technological advancement within the Amateur Radio Community, and

"Whereas the amateur satellite program has a long history of providing useful communi-

cations resources to Radio Amateurs worldwide, and

"Whereas the amateur satellite program is a major element of the public service, education, and scientific research being conducted via Amateur Radio today, and

"Whereas the amateur satellite program represents the resourceful, creative, innovative, and volunteer spirit of Radio Amateurs everywhere, and

"Whereas 1990 will see the launch of eight new OSCAR satellites, including six on a single launch vehicle with the Microsat/UoSAT launch, and

"Whereas 1990 will see the construction of an additional OSCAR satellite by AMSAT Italy and AMSAT North America begin, and

"Whereas 1990 will mark the beginning of Phase III-D construction activity by a broad base of international amateur participants.

"Therefore be it resolved, that in recognition of the contribution of the amateur satellite program to the Amateur Radio service, and of the significant events which are to occur during the course of the year 1990 within this discipline of Amateur Radio, we hereby declare:

"1990 the year of the amateur satellite program."

RFI CASE DISMISSED IN WASHINGTON SUPERIOR COURT

An RFI nuisance case brought against a radio amateur has been dismissed by the Superior Court of the State of Washington for lack of jurisdiction. The court stated that the FCC has exclusive jurisdiction over cases involving RFI.

The case involved Dr Wayne Hudson, KT7G, a resident of unincorporated King County, Washington, and his two neighbors, Luedke and Abigando. After the initial complaint of RFI by his neighbors, Hudson had his station inspected by the FCC and by a private firm, and his equipment was found to be in accordance with FCC rules. Hudson's tower had been inspected by King County Land Development and a permit was issued. RFI problems continued and seemed to stem from many sources apart from Amateur Radio operation. It was later determined that his neighbors used "touch lamps"—devices that can sometimes cause RFI even when turned off. Thinking that Hudson was causing the RFI, they took him to Small Claims Court where Hudson proved that he was not at fault. A verdict was rendered in his favor.

Luedke and Abigando later took their case to Washington State Superior Court where it

was determined that "The Supremacy Clause of the United States Constitution bars the instant state law claims and deprives this court of subject matter jurisdiction since RFI problems are within the exclusive jurisdiction of the FCC, preempting any state laws to the contrary...."

It was determined that the neighbors had not taken steps to solve their own RFI problems and that they had refused to take the necessary steps as requested by the FCC. They also refused to take their lamps to the manufacturer. Hudson's neighbors also sought an injunction on the basis of aesthetics saying that the antennas were unsightly. The court responded by saying that aesthetic impact is not a ground for injunctive relief. It concluded by reaffirming the fact that the court's jurisdiction is preempted by federal law pursuant to the Supremacy Clause of the US Constitution, and that the FCC has exclusive jurisdiction over RFI problems.

SCRRBA SUSPENDS COORDINATION ON 902-928 MHz; ITS PLANS OPERATION IN CERTAIN CITIES

Effective December 7, 1989, the Southern California Repeater and Remote Base Association (SCRRBA) suspended all coordination on the 33-cm amateur band (902-928 MHz).

International Teletrac Systems (ITS), a subsidiary of Pacific Telesis Group, will begin operation of an automatic vehicle monitoring (AVM) service in the greater Los Angeles area later this year. This system will occupy 8 MHz of spectrum (904-912 MHz) and will be operating under the provisions of Section 90.239. According to Bill Kelsey, WA6FVC, Chairman of SCRRBA, International Teletrac Systems is planning to offer similar AVM services in 38 other metropolitan areas during the next two years.

Cities to be affected by 1991 are: Atlanta, Baltimore, Boston, Chicago, Dallas, Detroit, Houston, Miami, New York, Philadelphia, Pittsburgh, San Diego, San Francisco, and Washington, DC.

Cities to be affected by 1992 are: Buffalo, Cincinnati, Cleveland, Columbus, Denver, Ft Lauderdale, Hartford, Indianapolis, Kansas City, Memphis, Milwaukee, Minneapolis, Newark, New Orleans, Phoenix, Portland, Rochester, Sacramento, Salt Lake City, San Antonio, San Jose, Seattle, St Louis, and Tampa/ St Petersburg.

The SCRRBA Technical Committee will be meeting with representatives of ITS to evaluate continued use of the band by amateurs in Southern California. As a result of that meet-

ing, SCRRBA will decide whether to continue coordination with the current band plan, make minor adjustments to the band plan or sponsor a band-planning meeting for the development of a new band plan for Southern California.

The 33-cm (902 MHz) band is allocated on a secondary basis to the amateur service, subject to amateurs not causing harmful interference to, and not receiving protection from, any interference related to the operation of industrial, scientific, and medical devices, automatic vehicle monitoring systems or government stations authorized in this band.

FCC COMMENTS ON AMATEUR FEEDBACK TO McNAMARA LETTER

On October 11, 1989, FCC Special Services Division Chief Robert H. McNamara wrote to a number of amateurs seeking comments and information on phone patches, information bulletins and over-the-air telegraphy practice. The letter requested information and insight that could bring a resolution to "the unfortunate continuing over-the-air dispute that takes place on the 20-meter band... which is jeopardizing international goodwill..." ARRL's response was submitted on November 15, 1989, by ARRL Counsel Chris Imlay. See the February Happenings column for the details of the reply.

In a letter dated December 21, 1989, McNamara stated that 45 replies were received in response to his letter, and that although the responses "contained somewhat conflicting information and views, they were helpful in understanding the issues so that a course of action could be selected." McNamara stated that it appeared that the intensity of the debate has subsided and that most of those participating in it have recommitted themselves to the basic principles of the amateur service by attempting to resolve such "disputes" off the air.

He stated that the "disputes" are centered in three main areas: phone-patch communications on the HF bands, information bulletins, and telegraphy practice transmissions. McNamara stated that the replies "...confirm that misuse of an important amateur service frequency band was having a major negative impact upon the service. They clearly show that the amateur service was not fully cooperating in selecting transmitting channels and in making the most effective use of the amateur service frequencies as required by Section 97.101(b)."

McNamara stated there were two general views concerning a solution in the responses. One, that the amateur community should be allowed to solve the "problem" internally. The second, that the Commission should mount a massive enforcement effort. McNamara said the second approach was not possible because of enforcement priorities and budget constraints; if direct Commission intervention proved to be necessary it would be in the form of additional restrictions that may affect all amateur operators.

McNamara said "In view of the above, we will afford the amateur community the self-regulation opportunity suggested." He went

on to suggest that interested individuals and organizations participate voluntarily in developing a plan for amateur self-regulation.

McNamara closed by observing that the FCC wants "to enable amateur operators in the United States to create and pioneer communications systems, limited only by their personal interests, imagination and technical skills. We believe that it would be tragic if the degree of regulation of the service had to be increased because the amateur service community could not effectively resolve its internal disagreements. Additional regulation for the sole purpose of maintaining order among the licensees will surely detract from the amateur service fully meeting its objectives."

ARRL Executive Vice President David Sumner, K1ZZ, observed that McNamara's conclusions do not address the specific suggestions for Commission action offered by the League in its November 15 response, and that the course of action McNamara is recommending is similar to an effort to bring opposing factions together that was undertaken in good faith, but without ultimate success, in Orlando last March.

FCC GRANTS EXTENSION OF STA FOR AUTOMATIC HF PACKET

On January 3, 1990, the ARRL requested an extension of the Special Temporary Authority (STA) permitting certain Amateur Radio stations to operate under automatic control when operating on certain frequencies below 29.7 MHz. The FCC granted the ARRL request on January 4, 1990, for one year or until rules are adopted that will permit automatic control of data and RTTY communications, whichever is shorter.

The experience gained through the STA has resulted in a recent Petition for Rule Making that the ARRL submitted to the FCC on December 12, 1989. Communications conducted in accordance with the STA have afforded amateurs a good idea what the operating parameters of unattended HF digital operation should be. The FCC has not yet assigned a RM number to the ARRL petition.

PACIFIC BELL OFFERS RESIDENTIAL RATES TO AMATEUR REPEATERS

Pacific Bell is offering residential telephone rates to amateur repeaters with phone-patch facilities. Pacific Bell's Customer Services Manager Jennifer Just said, "Our decision was based on two factors. One, that ham radio operators are prohibited by law for using the services for business purposes, and... that Pacific Bell values the emergency back-up help amateurs provide and would like to make the service as widely available as possible."

Any repeater groups serviced by Pacific Bell that are currently being charged commercial rates for their phone patch should call their local business office to apply for the change.

GTE GIVES RESIDENTIAL RATES TO AUTOPATCHES

GTE California is offering residential rates

to its customers for repeaters with autopatch facilities. In a January 9 letter to Karl Pagel, N6BVU, Karen Shaw, Vice President of Customer Relations for GTE, said GTE is making the rate change retroactive to October 1, 1989.

The policy apparently will extend to all GTE-serviced repeater or remote-base owners nationwide. Amateur Radio repeater groups that are GTE customers should be hearing from a GTE customer representative explaining the new monthly service rate. Shortly after that, they will receive a one-time credit on their telephone bill. Any group not receiving a call should contact its local business office.

ARRL NORTHWESTERN DIVISION DIRECTOR DRAKE, W7RM, RESIGNS

Citing recent medical problems and the need to concentrate on a successful recovery, Rush S. Drake, W7RM, has submitted his resignation as Director of the ARRL Northwestern Division effective December 31, 1989. Drake served as Vice Director of the Division for two years, and Director for three. William R. Shrader, W7QMU, has assumed the post of Director for the remainder of the current term. ARRL President Larry Price, W4RA, appointed Mary Lou Brown, NM7N, to complete Shrader's term as Vice Director.

FCC ENFORCEMENT ACTIONS

According to recent FCC news releases, Richard Harrison, owner and operator of Comtek in Manassas, Virginia, has been convicted of offering for sale and selling illegal CB equipment. In September 1988, Harrison sold an RF amplifier to a representative of the FCC's Baltimore Office. A subsequent search of the Comtek facilities resulted in the seizure of 55 illegal amplifiers and CB transceivers.

Harrison's acts were in violation of Section 302 of the Communications Act and are punishable by a fine not to exceed \$100,000 and/or imprisonment not to exceed one year for each count.

In another case, Donald R. Lehto, WA7WOC, of Carefree, Arizona, has paid a \$750 fine for willful and malicious interference to other amateur stations. The FCC had received numerous complaints about an amateur who followed other amateur operators from one frequency to another and jammed various networks and amateur repeaters with offensive sound effects. In May, 1989, the FCC's Douglas, Arizona, office staff monitored deliberate interference on 3.992 MHz and 3.983 MHz, and traced the interfering signals to Lehto's home.

Stephen Y. Tsuya, Engineer in Charge of the Commission's office in Douglas, Arizona, has written to ARRL OO Coordinator John Moore, NJ7E, thanking John and other volunteers for their assistance. In Tsuya's words, "Not only is the program working, it is providing invaluable... help."

Willful or malicious interference is a violation of Section 97.125 and is punishable by a maximum administrative fine of \$2,000 per day, per violation, up to a total of \$5,000.

FCC PROPOSES HIKER'S LOCATOR SERVICE ON 220-222 MHZ

On December 12, 1989, the FCC proposed the establishment of a Personal Emergency Locator Transmitter Service (PELTS) that would provide individuals in remote areas with a means of alerting others of an emergency situation and to help search-and-rescue personnel locate those in distress.

The Commission says it has two objectives in establishing PELTS: providing an area-wide, centrally coordinated radio communications system for use by the general public in remote areas (thereby reducing response time in emergency situations) and reducing the illegal use of Emergency Locator Transmitters (ELTs) and Emergency Position Indicating Radio Beacons (EPIRBs). ELTs and EPIRBs are emergency radio beacons used to assist search-and-rescue units in locating downed aircraft and vessels in distress.

The FCC proposed to use 50 kHz of the reallocated 220-222 MHz band for PELTS in five frequency pairs. To offer the public some assurance that the equipment is safe and likely to perform its intended function, the Commission proposed technical standards and design specifications for PELTS equipment.

FCC UPHOLDS BUREAU-IMPOSED FORFEITURE AGAINST AMATEUR

According to an FCC news release, on December 12, 1989, "the FCC upheld the Private Radio Bureau's action which imposed a \$1200 forfeiture against Amateur Radio operator David B. Hodges, N3DTH, for malicious interference (jamming) and for failure to identify, in violation of FCC rules."

The FCC stated that it "had received a number of complaints of interference to the Baltimore Radio Amateur Television Society amateur repeater." Subsequently, FCC engineers observed interference which they determined came from Hodges' amateur station. Although Hodges said he did not recall whether he made transmissions on any specific date, he admitted that on occasion he made such transmissions to cause interference when provoked by others. In his defense, Hodges noted his public service activities and that he had not previously been cited for any violation. He also promised he would not commit violations in the future.

"FCC noted that such transmissions serve no legitimate purpose and were clearly intended to cause harmful interference. Hodges' failure to identify his transmissions was obviously intended to make detection difficult. The Commission concluded that none of his arguments excused or mitigated the violations."

AMATEUR FINED FOR INTERFERING WITH COMMERCIAL STATION

According to a news release from the FCC's New York field office, a licensed amateur from West Taghkanic, New York,

FCC-ISSUED CALL SIGNS UPDATE

The following is a list of the FCC's most recently issued call signs as of January 1.

District	Group A Extra	Group B Advanced	Group C Tech/Gen	Group D Novice
0	WZ0A	KF0HC	N0LJQ	KB0FPA
1	WB1D	KC1SI	N1HGA	KA1UVU
2	WV2E	KE2RB	N2KER	KB2IZT
3	NX3T	KD3QK	N3HSS	KA3VOL
4	AB4SL	KN4CV	N4XSR	KC4NUW
5	AA5PS	KI5BH	N5PUL	KB5LIR
6	AA6SY	KK6EH	N6XLC	KC6HTK
7	AA7CY	KF7ZB	N7OAY	KB7JGU
8	WY8G	KF8DH	N8LQX	KB8IRE
9	WN9I	KE9TZ	N9JEN	KB9DUJ
Guam	KH2M	AH2CF	KH2EH	WH2AMK
Hawaii	**	AH6KD	NH6VQ	WH6CGH
Alaska	**	AL7LS	NL7TD	WL7BWC
USVI	NP2F	KP2BS	NP2DO	WP2AGZ
Puerto Rico	**	KP4QK	WP4XG	WP4IQZ

**indicates all 2 x 1 calls have been issued in these areas.

was fined \$1,000 for pirate radio operation. The FCC stated that "On the afternoon of Sunday, December 17, 1989, an FCC engineer inspected the station of Frederick K. Stark, KA2YLZ, after monitoring his operation on 1000 kHz. . . . Unlicensed radio operation is a violation of Section 301 of the Communications Act. Unlicensed radio operators may be subject to fines up to \$100,000 and/or one year in prison."

ROBERT H. RATCLIFFE, KB3KC, NAMED ASSISTANT CHIEF, FCC MASS MEDIA BUREAU

Robert H. Ratcliffe, KB3KC, has been named as the FCC's Assistant Bureau Chief (law) in the Mass Media Bureau. Ratcliffe also served for several months as FCC Chairman Alfred Sikes' interim legal assistant for mass media affairs.

CRRL PRESIDENT AND COUNSEL RETIRE

CRRL President Tom Atkins, VE3CDM, has retired to devote more time to his family and to IARU work. Atkins was recently elected Secretary of IARU Region 2, and will be taking a seat on the worldwide IARU Administrative Council. Effective January 1, 1990, the new CRRL President is Bruce Balla, VE2QO.

In other CRRL news, CRRL General Counsel Bob Benson, QC, VE2VW, will soon be retiring. He served as CRRL General Counsel and as ARRL Associate General Counsel for Canada for 16 years. Tim Ellam, VE6SH, will be appointed CRRL General Counsel at the May 1990 CRRL Board meeting.

PAST DELTA DIVISION VICE DIRECTOR GRAHAM HICKS, W5IHP, SK

ARRL is saddened to report the passing of Graham Hicks, W5IHP. First licensed in 1939, he was ARRL Vice Director of the Delta Division from 1961-1964. Hicks was active in establishing and maintaining emergency communications for the Gulf Coast, especially during hurricane emergencies and was also responsible for recruiting many new hams.

ARRL AWARDS FIRST GRANT FOR HF PACKET RADIO RESEARCH

The ARRL made its first technology grant of more than \$1000 to a team of amateurs headed by Stephen Hall, WM6P, of Simi Valley, California, for research in diversity reception of high-frequency (HF) packet radio signals. Hall's team is investigating: the benefits of diversity reception for HF packet radio; the design of practical diversity antenna systems, modem characteristics, and receiver designs for diversity reception.

Hall's colleagues include Andy Demartini, KC2FF, of Clearwater, Florida; Wally Linstruth, WA6JPR, and Bill Lake, WB6RIJ, of Santa Barbara, California; and Herb Duncan, WB7L, and Peter LaCount, W8UXD, of Sierra Vista, Arizona.

Funds provided under this grant are for purchase of equipment, electronic parts and other out-of-pocket expenses associated with this research. The team members donate their volunteer labor and much of their own equipment in carrying out this work. A discussion of diversity reception and its potential benefits for use in Amateur Radio can be found in the chapter on Digital Communications in *The 1990 ARRL Handbook*.

All letters will be considered carefully. We reserve the right to shorten letters selected in order to have more members' views represented. The publishers of QST assume no responsibility for statements made herein by correspondents.

BIG BROTHER WAS LISTENING

□ The Norwegian DXpedition to Bouvet Island (3Y), one of the rarest DX islands, could have been one of ham radio's shining moments. Well, needless to say, the worldwide spotlight on 14.145 MHz was just too much for some hams to leave alone. To allow some operating "elbow room" during the first two weeks, the Bouvet hams operated 5-kHz down from the bottom of the US phone subband and listened over a wide range of frequencies.

As soon as one errant ham transmitted on the wrong "split-VFO," dozens of "helpful" policemen let him know—right on the Bouvet frequency. Then, each "frequency cop" had to be insulted by others telling him or her to be quiet! That, combined with intentional "CQs," "Is this frequency in use?" "Where is he located?" and other assorted garbage, brought innocent cries of "enough" and "you're disgusting..."—right on the out-of-band frequency. The Mexican and Canadian operators, who had every right to be there, left the frequency in horror. Fortunately, most of the tens-of-thousands who called from within the US band segment resisted giving comments. But the damage is done.... US amateurs now take on the foreign phone band!

Let's hope sanity returns to DXing, and that other hams will still journey thousands of miles to give us all a chance to work a rare country.—*Hank Goldman, WA2OVG, Riverdale, New York*

□ Listening on 14.195 and 21.195 MHz to the 3Y5X Bouvet DXpedition was almost enough to make you want to abandon DXing.—*Fred Roberts, W6TKV, Riverside, California*

□ In 37 years of Amateur Radio I have never witnessed a display of improper operation equaling the violation which accompanied the recent 3Y5X activity from Bouvet Island. A small group of foul-mouthed sociopaths were able to deliberately and maliciously ruin any possible enjoyment the majority of the amateur fraternity may have derived from this expensive and dangerous DXpedition to an extremely remote location.—*Tom Watts, W4CVX, Elizabeth City, North Carolina*

□ I have been listening to the 20-meter band for the past several days while the 3Y DXpedition has been active. The poor operating practices and flagrantly illegal activities exhibited by US stations have been totally disgraceful. Clearly, courtesy and rules enforcement are a relic of the past.—*John Siegel, K4BNC, Marlboro, New Jersey*

GLASNOST: THE GREAT AWAKENING

□ I would like to express my appreciation of

your articles on *Glasnost* and Amateur Radio. I found them very interesting and informative. Your articles have helped to dispel some of the old cold-war stereotyping of Russians that was so prevalent a few years ago. I worked quite a number of Russian operators back in the '70s, but always with mixed feelings; it was interesting, but kind of scary at the same time. Now I can relax and enjoy all the Russian QSOs! Their equipment may be old, but they are good operators. Just recently, I got my first direct QSLs back from the Soviet Union. I was just as thrilled as when I got some of the rare ones.—*Rawson Bennett, WA7NXX, Phoenix, Arizona*

FROM RUSSIA WITH THANKS

□ On behalf of my wife Svetlana and myself, I would like to express our sincere thanks to everyone in the USA who helped to make our recent trip to your country such a fantastic experience. We feel that there is no better way to do this than through QST—the world's premier Amateur Radio publication.

Thanks are due in particular to Allen, WA4DRU, who did so much to make it all possible—taking us to so many places of interest, opening his home to us and in general extending such wonderful hospitality. Thanks are also due to Lloyd and Iris, W6KG and W6QL, for their wonderful hospitality in California, and to Ed, NT2X, for all his assistance. In addition, we would like to extend our thanks to the ARRL HQ gang and in particular to Dave, K1ZZ, and Don, W3AZD, for our memorable visit there.

We hope to see more American radio amateurs in Leningrad in the near future. You are always welcome.—*Vlad Kaploun, UA1CK, Leningrad, USSR*

GEOGRAPHY AND THE RADIO AMATEUR

□ There has been much said about the problem of getting young people and retired people interested in the hobby. We need to get the information into various other channels since there are still many people who do not know what Amateur Radio is.

Recently, a program on CBS entitled, "Where In the World Are We?" dealt with the unfortunate fact that so many of our American young folk know very little about the many countries of the world. Even high school graduates and college students cannot identify places that are common to active radio amateurs! Because geography is not taught the way it used to be, what better way than ham radio to learn! Perhaps some well-recognized public figures could be enlisted to talk about Amateur Radio and how it is such a great medium for worldwide learning.

These ideas came to me while I was looking through my collection of DX QSLs from Iran, Iraq, Armenia, Azerbaijan, Kirghiz, Kazakh, Estonia, Latvia, Lithuania, and most of the other places that are in the daily news reports. Isn't it something special that hams can communicate everywhere even when wars are going on or governments are in turmoil?—*Sam Beverage, W1MGP, North Haven, Maine*

PUT HAM RADIO INTO THE CLASSROOMS

□ On June 3, 1989, the ARRL conducted an educational workshop [at the ARRL National Convention] in Arlington, Texas. From this workshop, the ARRL compiled 25 papers into a book entitled *Proceedings of The ARRL National Educational Workshop* [available from ARRL HQ for \$12 plus shipping and handling]. I've read it many times: Congratulations to the League for a job well done.


I'm conducting a Novice class in my fifth-grade class and I use Amateur Radio right along with the kids' regular classroom subjects. The *Proceedings* have helped me in many ways, and I'd recommend it to any teacher or person interested in starting up a Novice class in an elementary school.

The ARRL's next step should be to get professional educators together to conduct Novice classes. Put on ARRL sponsored teacher workshops and go get more teachers and schools into Amateur Radio. Teachers' conventions are another place that would expose our educators to Amateur Radio.

Once my present class is licensed, I'm going to run another Novice class plus an upgrade class for my kids. Next year, I'll put on a teachers' workshop on Amateur Radio. The momentum is there. I'm sure there are other people out there who will bring Amateur Radio directly into the classroom. Let's put Amateur Radio education where it belongs—into American classrooms for the benefit of the kids and...Amateur Radio!—*Conrad Ekstrom, WB1GXM, Claremont, New Hampshire*

[ARRL's next National Educational Workshop is in June at the National Convention in Kansas City.]

THE DUMMY LOAD: BUY ONE AND USE IT

□ Now that Amateur Radio licensing fees have been deleted from budget reconciliation legislation, each licensee has, in effect, an extra \$35 in his or her pocket. May I suggest that every one who doesn't own a dummy load use that money to buy one? That way, they can stop loading up right on top of stations in QSOs, or who are trying to work rare DX and special-event stations.—*Ralph H. Brock, KG5ME, Lubbock, Texas* 

• *At the Foundation*

In Service to You, the Member

Meet some new faces and learn what's in store for *your* Foundation as we move into a new decade.

By Mary E. Schetgen, N7IAL

Secretary
The ARRL Foundation

The 1990 annual meeting of the Board of Directors of the ARRL Foundation, Inc was held the evening of January 20, 1990, at the Summit Hotel, Hartford, Connecticut. Present at the meeting, which immediately followed the close of the ARRL Board of Directors Meeting (see p 53), were: Foundation President Paul Grauer, W0FIR, reelected for another 3-year term; Vice President Edmond A. Metzger, W9PRN; Secretary Mary E. Schetgen, N7IAL; Foundation Directors Frank M. Butler, Jr, W4RH; Thomas W. Frenaye, K1KI; and John C. Kanode, N4MM (new). Also present were ARRL Southwestern Division Director Fried Heyn, WA6WZO; Delta Division Vice Director Henry R. Leggett; Roanoke Division Vice Director James G. Walker, WD4HLZ; Midwest Division Vice Director L. C. "Chuck" Miller, WA0KUH; and new ARRL Business Manager, Barry J. Shelley. Not able to attend were Foundation Directors Roger W. Franke, K9AYK, our newly elected Treasurer; Ralph V. Anderson, K0NL; Dick L. Eilers, W0ZV; Leonard M. Nathanson, W8RC; Robert York Chapman, W1QV, President Emeritus; and L. Phil Wicker, W4ACY, Honorary Vice President.

Highlights of the meeting included discussions of:

- changes to our scholarship deadline for 1991-92.
- modifications to the Victor C. Clark Youth Incentive Program to promote Amateur Radio club involvement in the school-station funding process.
- AMSAT and its current projects.
- promotional items to encourage donations at hamfests.
- production and distribution of mortuary cards for those wishing to make memorial contributions through mortuaries and funeral homes.
- an approved grant to ARRL for a display case to house ARRL 75th Anniversary historic artifacts/gifts.
- two new scholarships to be approved this year.

Informal discussion at the meeting centered around the encouraging response to our Simple Will Kit, the desire to develop tax-deferred programs for our contributors in addition to those included in our Simple Will Kit, and suggestions for improving the visibility of Foundation programs to the general ham population. The meeting reflected a sense of optimism about our present programs and the direction we are moving in this year—mostly made possible by *you*, our supporters!

Contributors Corner

We wish to thank the following for their generous contributions to:

The Jesse A. Bieberman Meritorious Membership Fund

William J. Findley, W3FEA

in memory of William F. Smith, KX3I

The Victor C. Clark Youth Incentive Program Fund

Jo Ann Melcher, KA6IAH

in memory of Frank J. Melcher, N6BFT

Mr and Mrs Robert D. Browne

in memory of Charles Buckter, W6BOW

Tom Frenaye, K1KI

John Pescatore, WB2EKK

The Goldwater Scholarship Fund

Louis C. Sanders

James M. Webster

Paul and Helen L. Grauer Scholarship Fund

Ralph V. Anderson, K0NL

Helen L. Grauer, N0BCI

Paul Grauer, W0FIR

L. Phil and Alice J. Wicker Scholarship Fund

L. Phil Wicker, W4ACY

The Bill Bennett, W7PHO, Scholarship Fund

George W. Johnston, W6YWA

The New England FEMARA Scholarship Fund

Tri City ARC (CT)

in memory of Henry G. Appleblad, K4GJF,

and Charles W. Austin III, W1INN

The General Fund

James F. Starkey, Sr

John V. Boehme, K4PRK

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Walter J. Sickinger, W2GBT

Harry R. Tinney, WB2FNN

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Thomas J. McCulloch

Kenneth A. Edelstein, KE2EP

Bruce A. Epperson

Gary Alberstadt

Allan M. Schuman, KJ6PL

Joseph J. Urban, N2CQX

Gary and Mary Mayfield

Murgas ARC (PA)

in memory of Murgas ARC Silent Keys

Edward Cartotto, W6ZZN

Dennis G. Collins, K6IFB

Harvey Teplitz, K8CEK

Ted M. Sarchet, W7SZV

W. H. Hobbs, N4VFC

Sigmund G. Bookbinder, N1BDN

Mike Rogers, G4NAR

Herbert D. Yaw, W5BCY

Stoddard Gray, WA3CPZ

Dan Gacek, Jr, KA9ZIM

George W. Falter, K7YKD

Ray Weghorst, W9OBF

R. D. Hudson, Jr, K6LTO

Harold Schelin, N0KDY

Sam Pontier, N6TGU

Dwight G. Simmons, KB8CHW

Jean Clement, HB9AFD

Ellsworth M. Fitch, W2VYI

Robert K. Landry

Richard M. Shaw, Jr, NF4H

Jack G. Dodd

Roland H. Daniels, KA2GER

Bill Kolar, W7AVG

David C. Scull, KD4SV

Paul Marshall

Lawrence P. Provence, KB7EZG

Arnold D. Pherson, KB7FCB

Ted L. Wedzilowicz, KA2HMB

William P. Morrow, N2ADX

G. William Tunnell, W3DVC

John A. Bertuch, KB6NZ

Bradley G. Stewart, KA6PGG

Abraham Russek, XE1JHC

Richard Taylor, WA1TFM

Robert E. Carson, KA1RVX

Lewis M. Konecky, WA2OVC

John J. Paganelli, WA1AWR

William E. Wanamaker

James R. Ordning, W5OWR

Hays ARC (KS)

in memory of L. A. Stapp, W0PHY

As received and acknowledged during the month of December.

QST



THE ARRL FOUNDATION, INC.

"for the advancement of amateur radio"

XT2CW—A One-Man DXpedition to Burkina Faso

Where is Burkina Faso, non-DXers have asked Rudi, DK7PE/AH0G. He'd respond to questions about this West African country by identifying it by its previous name of Upper Volta, with its exotic and typically African-sounding capital of Ougadougou (Wog-a-doo-goo). For several years, the government reportedly was unwilling to issue new Amateur Radio licenses.

In 1988, Rudi sent an application to Burkina Faso requesting permission to operate, never really believing he would get an answer, let alone a license. About six months later, much to his surprise, he received a telegram from ONATEL, the Ministry of Post and Telecommunications in Ougadougou, saying he would get the requested permission upon his arrival. That certainly was unexpected good news.

On August 4, DK7PE departed via Paris and Abidjan (Ivory Coast) to that unique land lying "up the Volta River." All his equipment, except for a fishing rod, arrived. The next day, at the ONATEL office, he was informed that he should probably come back in about a month for his license! Globe-trotting Rudi has learned that patience is one of the most valuable attributes on the African continent. After waiting about an hour, another official hinted that he should try another government section on the other side of the city, even giving him a lift there! This office had a file with Rudi's name on it, and inside it (believe it or not) was the promised license with the call XT2CW!

The hotel manager had no objections to Rudi's hamming plans. The operation started with a half-wave sloper for 160, a multiband Windom for 80 through 10 meters and an additional vertical dipole that could be converted from 15 to 10 meters, all fixed at about 90 feet on the hotel roof.

The W21YX high-normal propagation prediction came true with US pileups on 10 and 15, never-ending European openings and good opportunities to Japan. One evening while he was working a series of US stations on 15 meters, Rudi had to QSY for a 160-meter European sked. After announcing his QSY, he got to 1.830 MHz and heard US stations calling him! After his sked he worked station after station. It seemed a remarkable phenomenon for Rudi to see that band in such good shape during a year with high sunspot numbers, when the MUF is so high that 15 meters is wide open right on the same path!

During the next few days, XT2CW spent more time on top band and had one particularly exciting contact working N9US (RST 559). N9US was running just 1 watt output. Later N9US called him with higher power and his report was well over S9.

On the seventh day of operation, Saturday August 12 at 1420Z, all bands collapsed. After three hours of noise on all frequencies, the bands slowly recovered but were not as good as they had been previously. XT2CW was last heard at 1915Z on 40 meters, working OH2WI.



Rudi, DK7PE, handing out 40-meter CW contacts at XT2CW. (DK7PE photo)

Rudi left Burkina Faso with a total of almost 6500 CW contacts, some on sideband (a few even on FM), with only 15 hours of sleep and a weight loss of six pounds. He left thinking about where to go next.

YEAR-END DIARY

December 28: The Bouvet 3Y5X QSL Manager (Earling, LA6VM) calls on the landline affirming that the operation is indeed taking place! Late that same night, a New England friend calls, beside himself with anger over W phone/CW shenanigans re the operation. He blames the cat calling, deliberate QRM, policeman tactics, nasty manners and so forth on the 5BDXCC award (and its multiband ramifications). It might be considered simplistic to blame deliberate/ignorant operations on an award when it seems more reflective of our current society mores. But, I'm personally sick at what we are doing to ourselves and what we so reveal to those covetous of our frequencies. US hams are licensed, in part, because of their unique ability to enhance and foster international good

will. Writing this on December 30 makes me particularly thoughtful about what these childish/mean/inconsiderate/boorish/rotten antics could all mean in another year and another international frequency conference. Where did this all start? More importantly, where will it all end?

December 30: Gloomy news from both sides of the Atlantic this evening. N1XX relates the sad news that 87-year old Frank, W1WY, has joined Silent Keys. Frank, first licensed in 1922 and a fixture in the CQ Magazine contest program for decades, has been an irrevocable part of our hamming heritage. He was instrumental in developing the format of the impressively popular CQWW Contest and was proud to have become an ARRL 50-Year member in 1972 at a ceremony shared by Barry Goldwater, K7UGA. Bad news heard on the bands—the passing of venerable Ron Perks, G4CP, a gentleman DXer/contester, active in the First Class CW Operators' Club, a true role model and friend who will be deeply missed. A surprise this same day to receive the December 22 *Saturday Evening Post* Society mailing indicating that the February Bouvet special is indefinitely postponed, due to the loss of availability of the ship. A batch of cards from the bureau and a chuckle at the QSL from Vic, UA3SAA, with the slogan "Make DX, Not War!" *Glasnost! Great Expeditions* magazine notes that Burma is now more properly called the Union of Myanmar. (Oh my, will I ever keep this straight!)

CIRCUIT

□ **International DX Convention:** Last call—preregistration for the April 6-8 event at Visalia, California requires postmark by March 23; \$40 to the convention c/o Don Bostrom, N6IC, 4447 Atoll Ave, Sherman Oaks, CA 91423 (includes registration, banquet, brunch, cocktail party).

□ **Bouvet:** SM6BGG's great circle map specially made for 3Y5X is a fascinatingly different look at the world with Africa due north, and Europe beyond, South America NW then the US. It graphically shows why operation was planned from two different Bouvet sites, to have a short path "view" to all populated areas of the world.

□ **March:** The perennial Grenada K4LTA group will be signing J34A, SASE to W5PWG or as noted.

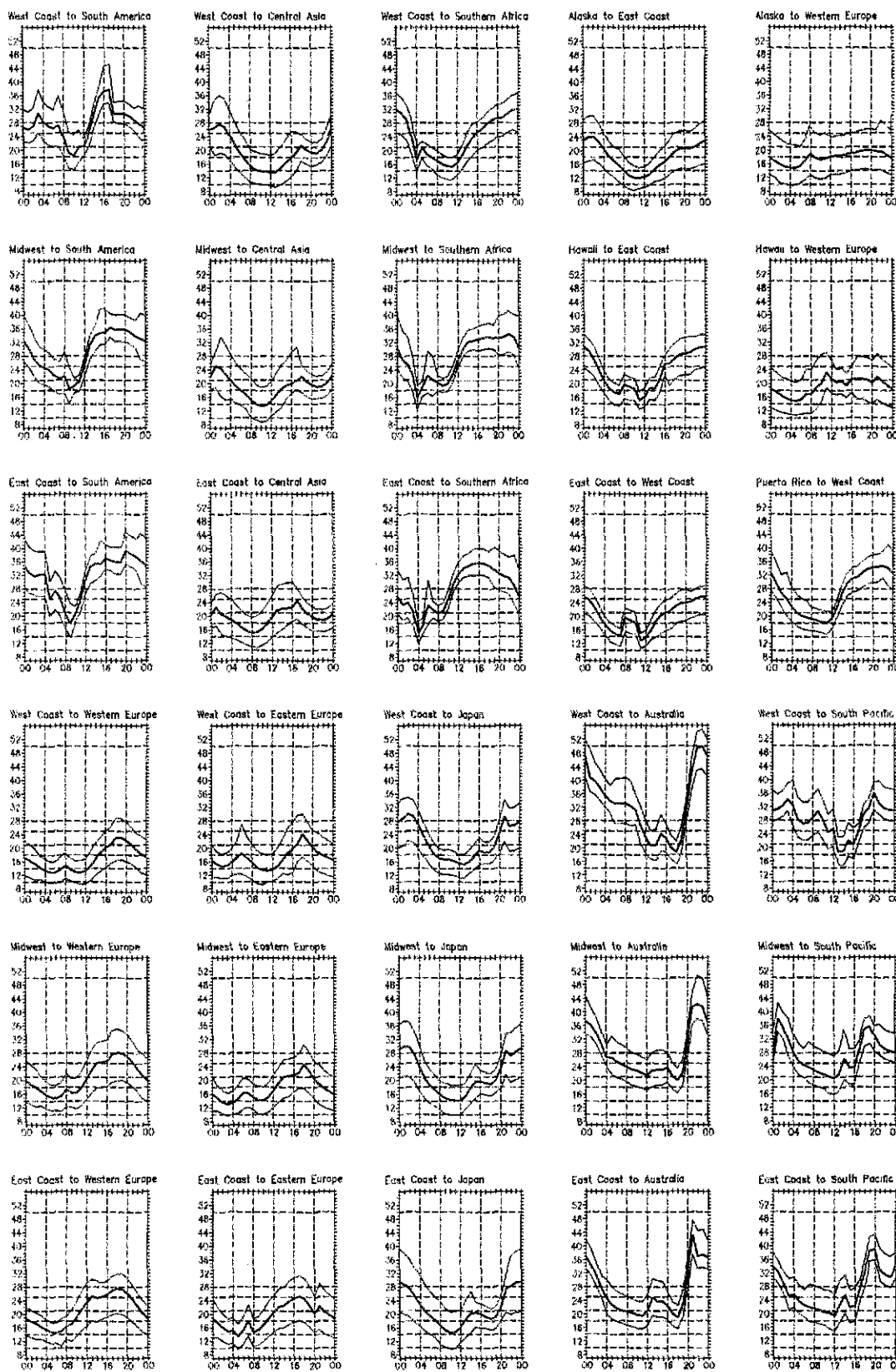
□ **Stamps:** WV4V practices what he preaches and got a quick turnaround A22 QSL return with a Botswana stamp. Check with Brian at DX QSL Associates, 434 Blair Rd NW, Vienna, VA 22180.

□ **An "unsung hero"** is Denny, GW3CDF, who handles pileups in a calm professional manner, taking time out for the weak signals. As Ron, WN3VAW notes, "Denny runs the watering hole, but he doesn't help you drink at it."

□ **New Countries:** Thanks to DX Advisory Committee work, Conway Reef (3D2), a territory of Fiji, and Banaba (T33), part of Kiribati, have been added to the DXCC List by virtue of Point 2(b). Old-timers more easily remember Banaba as Ocean Island, VR1, back in the old Gilbert-Ellice-Ocean Island days. (See ARRL DXCC List for criteria points.)



The *Aurora*, ready to sail for Bouvet with 3Y5X operators (l-r) LA2GV, JF1IST, LA1EE, HB9AHL, and F2CW. (photo courtesy of CX7BY)



When are the bands open? These charts predict this month's average propagation predictions for high-frequency circuits between the US and various overseas points. One chart showing East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or HPF). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or MUF). On 90 percent of the days of the month, it will be at least as high as the lowest curve (optimum traffic frequency, or FOT). 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. The 3rd edition of *The ARRL Operating Manual* contains similar charts for a range of sunspot numbers and times of the year. Sunspot data is derived from *Solar Indices Bulletin*, National Geophysical Data Center (E/GC2), Boulder, Colorado. Curves are generated using IONCAP. These predictions, for March 16 to April 15, 1990, assume a smoothed sunspot number of 183, which corresponds to a smoothed 2800-MHz solar flux of 227.

70 DSE

ANERCOM Final Report, January 1990—Part 1

By Joel I. Kandel, KI4T, Chairman,
ANERCOM

[The following is summarized from the ANERCOM Final Report.]

I. Introduction

This past hurricane season proved to be a test under fire of the ARRL National Emergency Response Committee's (ANERCOM) incipient disaster communications plan. Hurricane Hugo left no doubt what worked and what didn't in our efforts to make the League more responsive and visible during such disasters.

Our work and intent have been infectious, as shown by the actions of the Jamaica Amateur Radio Association (JARA). Under the leadership of Disaster Communications Coordinator Dr Eric Munroe, 6Y5EE, JARA members traveled to islands hit hard by Hugo and helped restore communications. Some of the equipment they used had been sent to Jamaica by the League the year before, in the aftermath of Hurricane Gilbert. We can think of no finer recommendation for the work of the League and this Committee.

During Hurricane Hugo, ANERCOM worked closely with ARRL HQ Field Services Department staff members Rick Palm, KICE, Steve Ewald, WA4CMS, and Luck Hurder, KY1T, to coordinate the League's response. This report summarizes those areas of response and makes recommendations based on that experience.

ANERCOM's last meeting on October 27 and 28 was held at ARRL HQ in Newington, Connecticut, with the above-mentioned staff members. This meeting served two purposes: to review our plans and their efficacy, and to transfer the yoke of responsibility for their implementation from the Committee to ARRL staff. Both goals were accomplished, and all parties are confident that the program will succeed.

II. International Amateur Radio Union

It was fortunate that the International Amateur Radio Union Region 2 Tenth General Assembly was held shortly after the hurricane season. More than ever before, the assembly became a forum for international disaster communications planning and cooperation. In its last report, ANERCOM emphasized that no international disaster communications program can be successful without the full cooperation of the IARU. The IARU passed many resolutions supporting digital communications and international disaster training cooperation.

ANERCOM believes there should be an individual formally designated as disaster communications liaison to IARU Region 2.

III. Served Agencies

ANERCOM and the ARRL Field Services Department have been in close contact with representatives of served agencies. These are the same agencies with which ANERCOM has laid the groundwork in past meetings. For the first time, the American Red Cross headquarters in Washington participated via IATN. Red Cross officials continued using Amateur Radio from the DC area throughout Hugo. Red Cross Disaster Communications Coordinator Mike Riley, KX1B, promises to strengthen Red Cross' presence on IATN in the future as its headquarters station gets better equipped and manned.

A working relationship solidified last year with the Agency for International Development's Office of US Foreign Disaster Assistance (OFDA). Two years ago, during Hurricane Gilbert, OFDA moved off amateur frequencies to avoid interference with communications to its personnel in the Caribbean. This year they successfully used the IATN, where members of ANERCOM patched them through to the islands. In exchange, Arthur Feller, KB4ZJ, of OFDA, was cooperative in supplying first-hand information for WIAW bulletins directly to ARRL HQ. We feel that this is a model of the served-agency/ARRL cooperation that ANERCOM has been working toward. It should be nurtured.

The Salvation Army's Washington, DC, public information office has been given the names and phone numbers of ARRL Field Officials in various disaster areas. This puts the League in a favorable position to help if necessary.

Volunteers in Technical Assistance (VITA) has been in touch with the ARRL Field Services Department and this Committee to establish the location of the IATN net frequency. VITA will have an amateur station at its Virginia headquarters, and will be a valuable ally during disasters. VITA is also licensed to use nonamateur VHF operations frequencies via UoSAT D.

The United Nations Disaster Relief Organization (UNDRO), using 4U1UN as its communications arm from New York City, has also been present on IATN and elsewhere during recent disasters. ANERCOM has not met formally with UNDRO.

This Committee therefore recommends that: (A) ARRL HQ develop a more formalized working relationship with 4U1UN during disasters, and (B) ARRL HQ pursue the upcoming Decade of Disaster Prevention sponsored by the United Nations as a forum for more fruitful interface.

ANERCOM's program of served-agency interface is beginning to attract other organizations interested in working with Amateur

Radio. These include NOTIFY and AMERICARES. AMERICARES has a solid history of disaster and medical relief to stricken areas. Also, DOGS-EAST, the volunteer organization that trains search-and-rescue dogs, has expressed interest in obtaining communication assistance from Amateur Radio.

ANERCOM recommends that the ARRL Field Services Department contact these organizations to create a working relationship.

IV. ARRL Disaster Database

Hurricane Hugo reinforced the need for a computerized data base at ARRL HQ, as outlined in ANERCOM's last report. When ARRL Field Officials' names and phone numbers were needed in affected areas, when Amateur Radio equipment had to be shipped to Puerto Rico and St Croix, and when air transport for the equipment had to be secured, a computerized data base would have expedited matters.

ANERCOM recommends that as the ARRL Field Services Department develops the data base, it does so with the goals of making the system multiaccess and multi-tasking.

V. News Media Interface

ANERCOM continues to believe that the news media have to be accommodated, if only to give the public accurate information rather than hearsay. As in past disasters, the media attached itself to any amateur willing to designate himself or herself an authority. It should be noted, however, that during Hurricane Hugo, more than in any past disaster, Amateur Radio gained the greatest degree of credibility with the public. We believe that this was because of the professional manner in which the International Assistance Traffic Net (IATN) was run, and that it served as a place to monitor unfolding events.

The beautifully renovated WIAW facility can serve as a focal point for media briefing. Networks should be invited to run telephone lines to the upstairs room, where they can patch in televised "remotes" and interface their computers through landline modems to file written reports. It is common for networks and local stations to have this capability at facilities where major news stories originate (e.g., the National Hurricane Center).

ANERCOM recommends that the news media be invited to set up private landlines for news collection at WIAW.

(Continued next month.)

Field Organization Reports December 1989

ARRL Section Emergency Coordinator Reports

Nineteen SEC reports were received, denoting a total ARS membership of 10,456. Sections reporting were: EPA, EWA, GA, IA, ME, MI, MN, MO, NH, NJ, NM, NV, ORG, RI, SD, VA, WMA, WNY, WPA, WWA.

2RN	46	206	4.47	.528	69.4	93.5
3RN						100.0
4RN						100.0
5RN	62	909	14.66	.810	100.0	
6RN	59	415	7.03	.574	93.2	96.7
7RN	62	607	9.80	.747	96.0	100.0
8RN	57	464	8.67	.465	88.0	100.0
9RN	62	559	9.01	.580	93.0	100.0
TEN	62	653	10.53	.740	74.0	100.0
TWN						95.1
ECN						96.7
ARN	31	178	5.74	.150		93.5

*PAN operates both cycles one and two.

ARRL Section Traffic Managers reporting: AL, AR, AZ, CT, EPA, GA, IA, IL, IN, MD, ME, MI, MN, NE, NF, NJ, NT, OK, OR, ORG, RI, SB, SC, SD, SFL, SNJ, STX, SV, TN, VT, WI, WMA, WNY, WPA, WTX, WV, WWA.

WA4RNP	N4SSX	W1BJ	55
N8INP	W8SA	NC9T	N4LST
K7EEEE	N5NAV	61	KA2CDB/T
W9HBI	WB2MNA	N7KLO	KA8ZGY/T
66	KD0YL	WA4TVS	53
KD3JK	KA7WZM	WD4MIS	KA9CTW/T
KB4OPR	W57U	60	51
W8BR	63	KA2UT/T	KA1RSY
65	N8EFB	WB2OEV	50
N0N	W8KWC	KA6TND/T	N2JBA/T
W6OUD	N7LVK	59	K6LRN
KA2ZNY	62	KA2CQX/T	47
N8JVV	W2FR	57	KA1HPO/T
KA9TVU/T	KD0NH		43
64	W8UMH	KA6HJK/T	N2EVG/T
WB1BTJ/T			

The following stations qualified for PSRR during the month of November, but were not listed in last month's column: K16ZH, N7LVK, N9BDL, KC9CJ, W9GJ, W9AW, W9YCV, W9AW, AG9G, W9CBE, KA9FVX, NS9Q, WA0HTN, ND0N, W8OUD. (Oct.) WA0HTN, W8OUD.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	123	92.50	900	1831
TCC Central	85	74.40		719
TCC Pacific				
Summary	208	83.45	900	2550
Cycle Three				
TCC Eastern	62	100.00	72	144
Cycle Four				
TCC Eastern	146	96.05	631	1277
TCC Central	84	83.20	499	1049
TCC Pacific	128	96.20	1026	2038
Summary	358	91.81	2156	4364

TCC Roster

Eastern Area, Cycle 2: KW1U Director. K1EIC W1FYR KA1MDM KT1Q W1QYY KY1T KW1U WA2FJ W2FR NN2H WB2MNA W2MTA N2XJ N3AZW N3EMD N3FM NC3V WA3YLO AA4AT W4FRR N4GHI WB4KSG K4MTX WB4PNY W4SQQ N4SS WA4CPS W7L W8PMJ KA8WNO WB8YDZ VE3ORN.

Central Area, Cycle 2: N8FBW Director. WA4JDH WB5YDD KD5KQ W5YQZ NS5M K5UPN W6CTZ W6GRW AE5I W6FE KF0FI VE5KZ KE5ZV WB8WNI.

Central Area, Cycle 4: K5GM Director. K5GM WB5J W5JDF KM5L K5MXQ N5TC K5TL W5TFB W5TNT KB5W W9CBE NR9K W9LKN KF0FI W8GRW A0NR8 NB8Z.

Pacific Area, Cycle 2: ND5T Director.

Eastern Area, Cycle 3: KN1K Director. N3EMD W3JKX W3OKN AA4AT W7BL K8TFP KA8WNO.

Eastern Area, Cycle 4: KN1K Director. KB1AF W1CE N1FNN W1FYR KN1K W1NIM W1QYY KA1MDM KA1T KY1T KW1U W1UD W2FR W2GKZ NQ2H W2LWB W2RQ WA2SPL W3GL WB3GZU W3PQ KQ3T NC3V N4GHI KB4N WB4PNY W4SQQ N4SS WA4UQ K4WJR K4ZK WB8O W7L W8PMJ KA8WNO N8XX VE3FAS VE3GSC.

Pacific Area, Cycle 4: K0DJ Director. N2IC KA5NNG ND5T W6EOT K6LL W6O WB5ZT KN7B KA7CPT NR7E W7EP W7GHT NN7H W7LG W7VSE KC8D K0DJ K16G K0SN K8TER.

Public Service Honor Roll

This listing is available to amateurs whose public-service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max 30; (2) Checking into phone/RTTY nets, 1 point each, max 30; (3) NCS CW nets, 3 points each, max 12; (4) NCS phone/RTTY nets, 3 points each, max 12; (5) Performing assigned NTS liaison, 3 points each, max 12; (6) Delivering a formal message to a third party, 1 point each, no max; (7) Handling an emergency message, 5 points each, no max; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points max; (9) Participating in a public-service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, upon sending notification of qualifying months to ARRL Public Service Branch, will be awarded a special PSRR certificate from HQ.

432	112	WA3UNX	KB5ADE
KC9CJ	K8BFX	WB7EMO	WA2ERT
186	W8BSYA	94	79
KF5BL	110	KA9FVX	KB7LX
167	KA1GEP	KC4JGC/T	NJ3V
W8DV	W8VOM	W7LG	W7LG
168	109	K8YVG	78
WA2SPL	N1CPX	93	KA8UEQ
161	W1PEX	ND2S	77
WB4DVZ	108	WB1HIH	KF7GB
154	W2DMM	WB4WII	K2ZVI
WB4VMX	W8BKQC	92	KA4BGZ
148	N8BDL	KA4HHE	KA1IFC
WA1TBY	KA1GWE	91	K8CQF
147	N8FNN	WB4HRR	N7BVGW
N4TJT	NC3M	N4JAU	KD9DX
142	W7LBB	W8OYH	76
W39J	K0CNP	KB1AF	W8OYH
137	W8VLC	K3JL	N4MEJ
W8YCV	106	90	N8JL
N4EXQ	K5UPN	K4MTX	75
136	KD8HD	KD8KU	NM3K
N4GHI	N3EMD	89	N8NLW
135	AA4AT	NW3K	K9QBE
K16ZH	WD6GUF	KA8PDM	W8BYPG
134	WA4JDH	N4JTG	74
K8BNU	104	K2YAI	N8KHX
129	N8FOO	87	N1DHT
N3DRM	103	W5CTZ	N8PWA
127	N5MEA	WB5J	K8JDI
WB8UUV	W4JLS	NR9K	73
PAN*	NR9K	86	NS9Q
Region Nets	W2QNL	102	KC2HJ
1RN	125	AG9G	KJ8J
2RN	WB2OWO	WB2ZJF	WA8DHB
3RN	W4ANK	W4QAT	K5NGN
4RN	124	W7GHT	N5PGZ
5RN	W2MTA	101	72
6RN	122	N2XJ	N7CSP
7RN	N5NZH	KA8KPY	W1KK
8RN	121	KA8ARP	71
9RN	W6FO	W4PIM	KA1UCU
TEN	W7VSE	W1KX	KA1S
TWN	120	N2EIA	70
ECN	K14YV	K8GRM	KB2EPU
	118	KA7AID	WB5YDD
	WA2VJL	99	N8CUP
	WB8DOB	KC4BHX	K4QH
	117	WB4KSG	69
	KA1EW	WA8TFC	W7TGU
	KA1EXJ	W8TJ	KA2QOO
	98	WA1JVV	KD2WP
	KK4M	82	N8HSC
	WB2VUK	K3RXK	KA8CPS
	W9CBE	K4NLK	68
	W8W	KB9LT	WA4YYQ
	WA4QXT	97	KA2ZKM
	NS1L	WD4LOO	WB8ZYN
	114	KA2KFJ	W8DKBW
	WA2EPI	W2MTQ	KA7WFW
	W7TVA	WD5GKH	K4VYX
	KF8AU	N6CRV	67
	113	96	K3GHH
	N1FLO	KB4CAU	W82FTX
		W4CKS	K2VX
			WB2QIX

Brass Pounders League

The BPL is open to all amateurs in the United States, Canada and US possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in the standard ARRL form.

Call	Orig	Rcvd	Sent	Divd	Total
N8FBW	0	3149	3149	3	6301
KA8ARP	2579	99	2648	16	5342
WB8TAX	0	1901	1901	0	3802
WD4MIZ	0	1404	1404	0	2808
W1PEX	1	904	1853	25	2583
WB9YPP	0	1380	105	895	2380
K4DOR	110	912	1012	10	2044
KB4N	0	985	983	0	1948
W3IWI	0	872	893	0	1785
K16ZH	34	702	712	34	1482
WA2SPL	32	642	688	65	1407
N3AZW	75	551	526	43	1197
WA4JDH	0	506	575	4	1085
N4HOG	0	541	541	0	1082
K09CJ	26	572	147	326	1071
K4MTX	0	506	508	6	120
N4GHI	1	447	385	35	868
W6FO	6	417	403	25	851
KA1IFC	23	423	341	28	815
WA1TBY	3	383	351	46	783
KB9LT	3	406	339	14	762
W1FYR	55	301	323	5	684
NM1K	195	302	142	23	662
KB3RM	27	285	312	11	635
N4SS	0	330	278	14	622
KA8RCH	35	250	301	30	616
W7VSE	8	335	250	15	608
N5NAV	4	287	303	5	599
NR9K	41	254	283	12	590
K8TVG	4	311	272	1	588
W6GJ	35	297	223	21	576
N3EMD	2	270	299	5	576
KA8CPS	4	291	264	10	569
KY1T	71	276	209	12	568
N4EXQ	12	272	197	78	559
W4JLS	3	276	252	14	546
K4NLK	12	253	271	9	545
WA6ZUD	3	263	263	3	542
WA9W	21	321	189	11	542
KD8KU	41	232	251	16	540
W3OKN	0	253	287	0	540
W2QNL	9	254	237	30	530
NW3K	0	286	226	14	526
WB4QOJ	0	261	261	0	522
W1UD	46	272	225	31	512
K8JDI	—	—	—	—	506
N8FWG	94	189	203	19	505
KF8AU	0	265	233	3	501

BPL for 100 or more originations plus deliveries:
N2DXP 112, WB7EMO 111.

The following stations qualified for BPL during the month of November, but were not listed in last month's column: WB9YPP 2435, KC9CJ 824, K16ZH 548, WA9W 535, W9GJ 512, K8TVG 511.

Independent Nets

Net Name	Sess	Tfc	Check-ins
Amateur Radio Telegraph Society	26	522	393
Central Gulf Coast Hurricane Net	31	149	3179
Clearing House Net	31	220	291
Early Bird Net	31	676	219
Empire Slow Speed Net	31	157	453
Great Lakes Emergency & Traffic Net	31	66	1216
Golden Bear Amateur Radio Net	31	253	1686
IMRA	26	798	1709
Mission Trail Net	31	311	837
NYSPEN	31	107	519
Southwest Traffic Net	31	314	1811
West Coast Slow Speed Net	26	92	343
201SSBN	25	505	299
75 Meter Interstate SB Net	31	1081	1454
7290 Traffic Net	45	513	3484

The 1990s: Decade of Hard Choices?—Part 1

Over the last four years or so, this column has primarily focused on the practical issues associated with using and enjoying satellites. Given the rustling of calendar pages attending the new decade, however, we'll step back this time for a broader view of the issues facing the amateur satellite field in the 1990s. Indeed, with the added perspective we see the outlines of changes ahead. Will they be for the better?

It's said (correctly, I believe) that answers are easy once the questions are well-formulated. In this context, here is what seems to be *the* major question for the 1990s: Will spectrum continue to be available for OSCARs?

The answer is a complex one and not nearly as satisfying as we'd like! On the one hand, we find enormous spectral resources available to radio amateurs. On the other hand, most of the untitled spectral turf is barren for a good reason: It's virtually unusable with current technology. Moreover, avaricious commercial users are positioning themselves to slice off for their own use those Amateur Radio allocations that new technology has recently rendered commercially viable (and thus valuable) turf.

Table 1 shows that the Amateur Satellite service is blessed with a total available bandwidth of nearly 22 GHz! To put that number in perspective, imagine that 10,000,000 radio amateurs get on the air simultaneously using SSB. If each of their signals occupies 2.2 kHz, they'll all fit into 22 GHz.¹

But before we get too excited about all this band space, recognize this: Only 0.03% of that vastness lies below 1 GHz. Moreover, less than 0.5% is below 10 GHz! Yes, the vast, wide open spaces above K band offer space for anyone who can figure out how to use it. This entails two basic problems: (1) While devices that work above 30 GHz are becoming less expensive and more available to radio amateurs, the precise nature of work in the centimetric and millimetric ranges suggests high cost will persist; and (2) with rare exceptions, atmospheric absorption drastically attenuates SHF and EHF signals.

Occasional breakthroughs might encourage predictions of low-cost, solid-state devices suitable for work above 30 GHz. For example, in 1981, a 35-K low-noise amplifier for C band TVRO (4 GHz) might have cost \$2000 or more. I recently installed

Table 1

Amateur Satellite Allocations

ITU Band Number	Symbol	Designator	Frequency	Bandwidth (MHz)	Wavelength
7	HF		7.0-7.1 MHz	0.1	40 m
7	HF		14.00-14.25 MHz	0.25	20 m
7	HF		18.068-18.168 MHz	0.1	17 m
7	HF		21.00-21.45 MHz	0.45	15 m
7	HF		24.89-24.99 MHz	0.1	12 m
7	HF		28.0-29.7 MHz	1.7	10 m
8	VHF		144-148 MHz	2.0	2 m
9	UHF	L	435-438 MHz	3.0	70 cm
9	UHF	L	1.28-1.27 GHz	10	24 cm
9	UHF	S	2.40-2.45 GHz	50	13 cm
10	SHF	S	3.40-3.41 GHz	10	10 cm
10	SHF	X	5.65-5.67 GHz	20	5 cm
10	SHF	X	5.83-5.85 GHz	20	5 cm
11	EHF	X	10.45-10.50 GHz	50	3 cm
11	EHF	K	24.00-24.05 GHz	50	12 mm
11	EHF	V	47.0-47.2 GHz	200	6 mm
11	EHF	V	75.5-81.0 GHz	5500	4 mm
11	EHF	—	142-149 GHz	7000	2 mm
11	EHF	—	241-250 GHz	9000	1 mm

total bandwidth 21,917.7 MHz


Band numbers, symbols and designators: The band numbers and symbols shown are those used by the International Telecommunication Union. For more on the designators, see *Reference Data for Engineers: Radio, Electronics, Computer and Communications*, 7th ed (Indianapolis: Howard Sams & Co, 1985, pp 1-3 and 1-4).

Some bands are secondary allocations; others, exclusively amateur. Some bands are used for uplinks only, others for downlinks only; and some are not available in all three ITU regions. Refer to Table 10.4 of the ARRL's *Satellite Experimenter's Handbook*, p 10-6, for details. Also see Chapter 2 of *The ARRL Operating Manual*, 3rd edition. The FCC Rule Book contains complete details on the FCC rules regulating amateur space operations.

For more information on getting started on OSCAR and information on AMSAT membership and membership benefits, call AMSAT at 301-589-6062 or write: AMSAT, PO Box 27, Washington, DC 20044. Please include a business-size SASE.

one—at a cost of less than \$200—that included a block downconverter! Moreover, the new high electron mobility transistors (HEMTs), available commercially, produce noise figures down to 1.1 dB at 14 GHz and cost less than \$400 each. Such devices weren't available at *any* cost just a few years ago. And there's the potential of power FETs working up to 100 GHz, or higher, for transmitters.

But those familiar with centi- and millimeter-band work know well that precision tolerances on waveguides, connectors and associated hardware command a hefty price. Some precision RF connectors cost over \$100 each. And although it adds luster to the equipment, the gold plating (necessarily) found on many components quickly attenuates your bank account while enhancing the propagation and conduction of RF. So, the cost of operating above, say, 30

GHz, where all that spectrum lies dormant, will likely remain high in the 1990s. 

Strays



QST congratulates...

□ Former US Senator Barry M. Goldwater, K7UGA, on sixty years of membership in the ARRL. Amateur Radio's elder statesman was honored with an award presented by ARRL Southwestern Division Director Fried Heyn, WA6WZO, and ARRL Arizona Section Manager Jim Swafford, W7FF, at the joint meeting of the Quarter Century Wireless Association and the Society of Wireless Pioneers in Phoenix, Arizona, on December 2, 1989.

¹Of course, we'd have to make them all calling CQ on separate frequencies to maximally occupy the band—you know, kinda like 20 meters on a typical Sunday!

and the first day of 1990. Then, for the next 10 days at least, they collapsed altogether. December 28 was a particularly good day for the West Coast. As had happened before, several European stations were worked in southern California. But, this time the northern California jinx was broken, with K6QXY, WA6BYA, W6JKV and K6MYC all working FCIBUU. In a Europe-starved area, this is great news. KC6EDP, Malibu, reports that ZLs were heard during the afternoon of December 31, as well as the following day. Several New Zealand stations also were heard here in Texas the first day of the new year, with ZL2TPY the loudest. A few European stations were also heard here New Year's morning. The afternoon of December 30 witnessed strange conditions indeed. Favorable geomagnetic conditions produced an aurora which apparently resulted in a number of coast-to-coast contacts on 6 meters, with beam headings far to the north of the normal direction. W0JRP, Joplin, Missouri, reports working K7KV while aimed at 30 degrees.

KL7IKV, Anchorage, writes to fill everyone in on 6-meter conditions in the far north. Lynn notes that this is one area of the world in which Europe has yet to be worked. Nevertheless, he has had great success in other directions. KL7IKV's QSO total is truly impressive, with some 1900 6-meter contacts completed during the fall of 1989. This was after almost a complete lack of DX from 1983 to 1988. Most of the contacts have been with Japanese stations, but VK, KH6, KG6, VS6, KH0, DU, HL, KH4, JD as well as VE, W and XE have also been worked. Both Lynn and AL7C have worked all Japanese prefectures, a significant feat indeed.

In addition to an impressive F2 report, WA1OUB passes along an interesting SWL card from a listener in the Northern Asiatic part of

the Soviet Union (grid NO66). The reception was on June 7, 1987, at 1416Z, most certainly via sporadic E. Bob's signal report was 559, and the beam heading noted by the SWL was 8.4 degrees. Calculated distance is just under 5500 miles.


Several accounts have been received regarding 2-meter sporadic E during mid-December. WA4PGM, Farmville, Virginia, FM07, reports working VP5D with 5 x 9 signals (both ways) at 2125Z December 15, after first hearing WA4MJE, EL94. Kyle says that 6 meters was loaded with strong, close-in stations at the time. Since July 1989, WA4PGM has worked 24 states and 74 grids on 2 meters. Operation on 6 meters has brought similar good fortune, with 36 countries, 38 states and 175 grids being worked over the same six-month period. Catching this same opening was WA1ZNY, Topsfield, Massachusetts, who hooked up with two stations: WA4OWC, EL97, at 2129Z, and WB4MJE, EL94, at 2140Z. John runs an IC-271H to a 6-element Yagi and was quite elated with the contacts.

WSFYZ, Minden, Louisiana, still likes to pursue the meteors. Ernie reports completing a QSO with N8CMH, West Virginia, FM09, during the Geminiids, and KA3KHZ, Delaware, during the Quadrantids. This comes after trying to work Delaware for the past 30 years.

The 6-meter contingent is not the only group of VHFers adding new countries to its totals. Many of the 2-meter moonbouncers are getting pretty high on the ladder, too. One is W5UN. Dave says that he worked 13 new countries during 1989, bringing his total to 89. Those added during 1989 were: 4J1FS, CT3M, T20DJ, T30JT, HC5K, V63MB, HD8E, F6EYM/CT, ZK1RS (in both Northern Cook and Southern Cook Islands), FK1TS, ZD8MB and HL9TG. The December issue of *Six Meters and Up*

DXer, published by the RSGB and edited by G4ASR and G4VXE, carries an item relating to a claimed new record for 70-cm meteor scatter. The publication notes that the record has been held by W0LER and W2AZL over a distance of 1642 km (about 985 miles). After success with four skeds, PA3DZL decided that the 1989 Perseides would provide a good opportunity to make an attempt with SM6CEW—a distance of 1864 km (about 1120 miles). After five attempts, some nearly successful, they finally made it in a 1-hour-45-minute QSO on August 12. PA3DZL runs 1 kW to an array of eight 24-element F9FTs. No information was provided on SM6CEW's setup.

VE4MA writes that he is still active on 23-cm EME, with a 12-foot dish and 500-W amplifier. Recent contacts include SM2CEW, UA1ZCL, ZS6AXT (for WAC), OE9XXI, WD5AGO, K2UYH, WB0TEM, W7JF and W0KJY. This brings Bary's station count to 47. Current construction projects include gear for 3456-MHz EME. Authorization has recently been received for operation on 33 cm, so VE4MA should soon be heard off the moon on that band as well.

While attending a West Coast gathering last summer, this conductor had the pleasure of witnessing a very convincing microwave demonstration. K6KLY set up a portable 200-milliwatt 10-GHz SSB rig and 1 1/2 foot (30-dB gain) dish. With this equipment, Russ proceeded to work K6UQH at his home QTH—a distance of about 25 miles. Bill was using a similarly powered rig and antenna on his end. Although the path was through a nearby hill, S-7 signals (with no fading) were observed. In addition to the fact that they could work over this path with such low power, I was impressed by the small amount of drift exhibited by the equipment. I was informed that any drift was in the IC-202 used for the IF. 

FM/RPT

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716-2702
CompuServe ID no. 70645,247

A National DTMF Tone Squelch Frequency?—Part 3

In December, I presented a proposal by Vern Gallinger, W7JAT, of Kingman, Arizona, for a National DTMF Tone Squelch Frequency. With a DTMF decoder installed in a radio, the receiver would remain squelched until the national DTMF tone was received (the tone would be sent only when hams needed assistance). Thus, operators would be able to monitor a repeater without having to listen to incessant repeater chatter, yet be alerted when their assistance was needed.

Your response to this proposal has been overwhelming. Most of it has been positive and has included numerous suggestions on how to fine-tune the system.

Don't Dial 911!

A number of respondents suggested using the digit sequence "911" as the national DTMF tone code because it is already used on a national basis for emergency phone calls and is familiar to all. The fact that it is used for emergency phone calls is a reason why it can not be used for the national DTMF tone code as explained by John Maio, WB2ARS, of Albuquerque, New Mexico, in his concise opinion on the subject.

"For heaven's sake, don't use 911! Our

local repeater (and I'm sure many others around the country) accept a 911 tone combination and automatically dials directly into the city's emergency response center. Another point: Many repeaters use DTMF tones to control functions. These are usually, but not always, preceded by a '#' or '*'. So, why not use the plain '0' for 'operator' as the national DTMF code? Nothing I'm aware of uses a single digit to control anything, and in an emergency, it might be easier to remember just one digit to get a repeater operator to come up on the air."

(Another argument in favor of a single-digit code over a multiple-digit code is that single-digit decoders are less complex and less expensive than multiple-digit decoders).

Seal of Approval Required

The next step is to formally present the National DTMF Tone Squelch Frequency proposal to the ARRL VHF Repeater Advisory Committee (VRAC) and the Public Service Committee so it can be studied and changed. If the committees find merit in the proposal, they can recommend that the ARRL Board of Directors accept the proposal (or a revised version). Once accepted, the proposal would create a standard that Amateur Radio manufacturers could work with.

Meanwhile, as we wait for some official action, we can get prepared for whatever comes down the pike.

Paul Newland, AD7L, has designed a super-duper DTMF decoder that can decode the long "0" as well as multiple-digit tone sequences (for individual selective calling and group calling). It's based on a Motorola single-chip microcomputer (68HC05C4) that costs about \$15. Its target cost for components and a PC board is less than \$45. Anyone interested in his decoder should send him an SASE at PO Box 205, Holmdel, NJ 07733.

For those who don't want to roll their own, two QST advertisers sell reasonably priced DTMF decoders. MoTron Electronics (695 W 21st Ave, Eugene, OR 97405) has the Net-Kall NK-1 (as a kit or assembled and tested) that can be set to respond to any of the 16 DTMF digits. MoTron also has the model Auto-Kall AK-10 that responds to three-digit DTMF sequences. Engineering Consulting (583 Candlewood St, Brea, CA 92621) has a 4-digit sequence Touch-tone decoder that controls a DPDT relay and can be optioned to control four additional relays.

So let's start building and experimenting with the system to find out what works best.

Welcome to Packet Perspective!

Packet radio is still hot after all these years! Although I have been an active packet-radio user for six years, I am not a pioneer of the mode. Packet radio has been around almost twice as long as I've been involved in it, but during the past six years there's been an explosion in packet radio.

In the spring of 1984, when I plugged in a TNC for the first time, there were only four other users in the whole state of Connecticut. They were using one digipeater and one bulletin board. Today, a typical 2-meter packet radio channel in the Nutmeg State sports four or more digipeaters or network nodes, at least one bulletin board, and I don't know how many users. And the growth continues.

I use the "Santa Claus TNC High Pressure Area" as a barometer of packet radio growth. The High moves onto the 2-meter packet radio channels during the last week of December. During that week, there is a mini-explosion of new users on the channels, usually accompanied by a micro-explosion of beacons. Although the beacons subside after the new users learn better, the new users don't go away. Rather, they discover the joys of packet radio operation and go merrily on their way finding their own niche in the world of packet radio. In 1989, the Santa Claus TNC High was typical of past years, so I see no abatement of the packet radio explosion. Not one bit.

Along with this growth comes this new *QST* column—devoted entirely to the world of packet radio. As with the other columns I've conducted for *QST*, this column is *yours* as well as mine. Your contributions are welcome. Whether they come in the form of gripes, complaints, opinions, suggestions, or kudos, my mailbox is always open.

Escape from 1200 Bauds

It looks like 1990 may be the year when high-speed packet radio, that is, faster than 1200 bauds, trickles down to the user level. Much network-level packet radio now operates at data rates of 4800, 9600 or higher, with the average user stuck at 1200. The reason the user is stuck at 1200 bauds is because of the lack of readily available, inexpensive equipment that supports greater data rates. This is changing, as the first part of the new year has already brought us new equipment designed to speed up operations for the average user.

Kantronics has just introduced its DVR 2-2 144-MHz transceiver that is optimized for high-speed data communications and

is ready to connect to a high-speed packet radio modem without modification. Meanwhile, MFJ is touting "turbo" packet radio via a 2400-baud modem that can be added to most TNCs.

Later this year, Tucson Amateur Packet Radio (TAPR) plans to introduce its "packetRADIO," a 2-meter digital transceiver with built-in modems that will provide 9600-baud FSK, as well as the standard 1200-baud AFSK packet radio operation. These new offerings join previously introduced high-speed modems and TNCs from Kantronics and the high-speed modems, TNCs, and transceivers from PacComm. And who knows what other high-speed surprises await us at Dayton and beyond?

With all of the big names in amateur packet radio providing relatively inexpensive, high-speed solutions to the 2-meter packet radio morass, it won't be long before users begin plucking high-speed goodies off their dealers' shelves and installing them in their shacks.

Escape from Hardware Hell

Saturday, not one, but two of my TNCs stopped functioning. Luckily, I was able to revive one of them! The resurrection was easy once I diagnosed the malady. The symptom was that the TNC's receiver was dead. The front panel DCD LED remained off and no received packets were displayed on my terminal, despite the fact that my 2-meter radio's S meter was indicating the reception of packets.

After shutting off the TNC, I began to troubleshoot by checking whether all of the ICs and other components were seated firmly in their sockets. I did this by pressing down on each socketed component. When I powered up the TNC, it functioned normally for a half-hour or so, then its receiver died again.

Back under the hood, I tried to find the specific component that was causing the problem. The MF10 switched-capacitor filter and the XR2211 demodulator ICs were likely culprits, but extracting and reinserting them in their sockets was not the cure. I tried the two filter networks that are mounted on the 16-pin DIP headers that straddle the MF10 IC. Extracting and reinserting the resistor and capacitor filter network (U19 in a TNC 2 clone) exposed the culprit.

Over the three-year life of my TNC, an oxide layer had built up between the DIP header's pins and its mating socket's receptacles. This is caused by an electro-chemical action that occurs between the dissimilar

metals of the pins and the socket and causes the molecules of one metal to migrate and create a new chemical oxide that fills the space between the DIP header's pins and the socket's receptacles. Eventually, the oxide builds up a resistance that breaks the connection between the DIP header and the socket and disrupts the operation of the TNC.

This problem is common where ICs or other devices are mounted in sockets. The temporary solution is to extract and reinsert the device in its socket (a number of times, if necessary) in order to break up the oxide. Solvents that are used for electronic clean-up tasks can also be used to remove the oxide. The ultimate solution is to remove the socket and solder the component directly to the PC board.

Someday, if your TNC dies, check the socketed components. It may save you a trip to the TNC hospital.

Strays

EICO ADDRESS

Reader Ralph Strawbridge of White Stone, Virginia, advises that Eico service manuals and schematics may be ordered directly from the company at the following address: Eico Electronic Instrument Co, Inc, 363 Merrick Rd, Lynbrook, NY 11563.

RID REUNION

The final meeting of the wartime members of the FCC's Radio Intelligence Division will be held at a luncheon on Friday, April 27. The 50th Anniversary of the founding of RID will be formally observed in a ceremony afterward at the White House. Contact Gene Eveslage, K4LJ, 8350 Greensboro Dr, #1020, McLean, VA 22102.

QST congratulates...

□ The Poughkeepsie Amateur Radio Club (PARC) on its 25th anniversary. PARC is an ARRL Special Services Club and is the successor to the first ham club in the Mid-Hudson Valley, the Mid-Hudson Amateur Radio Club.

□ Dr Theodore S. Rappoport, N9NB, of the Virginia Polytechnic Institute and State University, on being awarded the 1990 Young Scientist Award by the Marconi International Fellowship Council and IEEE for achievements in the field of radio propagation. The award, which carries a medallion and a \$10,000 honorarium, will be formally presented at a ceremony in Washington, DC on April 29, 1990.

Hamfest Calendar

Administered By Bernice Dunn, KA1KXQ
Convention Program Manager

Attention: The deadline for receipt of items for this column is the 5th of the second month preceding publication date. Hamfest information is accurate as of our deadline; contact 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 bingo.

Arkansas (Jonesboro)—March 24. *Sponsor:* Jonesboro ARC. *Time:* 9 AM-5 PM. *Place:* Craighead County Fairgrounds Building, two blocks north off Hwy 63 bypass, 2731 Highland Dr. *Talk-in:* 146.01/61, 146.52. *Admission:* free. *Tables:* \$7 each for public, dealers free. *Contact:* Evelyn Castleberry, N5DSY, PO Box 95, Bono, AR 72416, 501-932-1660.

California (Oxnard)—April 7. *Sponsor:* Ventura County ARC. *Time:* 8 AM-12 PM. *Place:* Oxnard Community Ctr, 800 Hobson Way, from Pacific Coast Hwy 1, turn west on 5th Street then south on Hobson Way. *Features:* videotapes, refreshments, free parking. *Talk-in:* 146.28/88. *Admission:* free. *Tables:* advance \$8, door \$10. *Contact:* Bob Bond, WD6BCN, 1420 McGloughlin Ave, Oxnard, CA 93035.

Colorado (Longmont)—April 7. *Sponsor:* Longmont ARC. *Time:* 8 AM-3 PM. *Place:* Boulder County Fairgrounds. *Admission:* \$3. *Tables:* \$7. *Contact:* Bob Dornan, W4ZKU, 1106 Fordham St, Longmont, CO 80501, 303-651-3613.

Connecticut (Uncasville)—March 24. *Sponsor:* Radio Amateur Society of Norwich. *Time:* set-up 9 AM, public 10 AM. *Place:* Uncasville VFW, off Rt. 32 behind Wonder Bread bakery. *Features:* refreshments, auction (bring your equipment to be auctioned), wheelchair accessible. *Talk-in:* 146.13/73. *Admission:* free. *Contact:* Bob Dargel, KA1BB, 203-739-8016.

Connecticut (West Hartford)—March 18. *Sponsor:* Insurance City Repeater Club Inc. *Time:* 9 AM-2 PM. *Place:* American School for the Deaf. *Talk-in:* 146.28/88. *Admission:* \$2. *Tables:* \$15. *Contact:* Chuck Motes, K1DFS, 22 Woodside Ln, Plainville, CT 06062.

Florida (Ft Walton Beach)—March 17-18. *Sponsor:* Playground ARC. *Time:* Saturday 8 AM-5 PM, Sunday 8 AM-4 PM. *Place:* Ft Walton Beach Fairgrounds on Lewis Turner Blvd, across from City Golf Course. *Features:* flea market, commercial exhibits, forums, free parking, RV parking (30 spaces). *Talk-in:* 146.19/79. *Admission:* advance \$3, door \$4. *Tables:* \$10 (one day), \$15 (both days). *Contact:* Playground ARC, PO Box 873, Ft Walton Beach, FL 32549.

Georgia (Columbus)—March 24-25. *Sponsor:* Columbus ARC. *Time:* Saturday 9 AM-4 PM, Sunday 9 AM-3 PM. *Place:* Columbus Municipal Auditorium, 4th Ave and 4th St. *Features:* flea market. *Talk-in:* 146.61. *Admission:* free. *Contact:* Red Hunt, K4DOW, 2221 Wessex Dr, Columbus, GA 31904, (D) 404-327-4516.

Illinois (Grayslake)—March 25. *Sponsor:* Libertyville & Mundelein ARS. *Time:* 8 AM. *Place:* Lake County Fairgrounds, junction Rtes 45 & 120. *Features:* free parking, indoor swapfest. *Talk-in:* 147.63/03, 146.52. *Admission:* advance \$3, door \$4. *Contact:* Bob Dick, NY9E, 708-362-9634 after 7 PM, or write with SASE to LAMARS, Box 751, Libertyville, IL 60048.

Illinois (Rockford)—March 31. *Sponsor:* Rockford ARA. *Time:* 8 AM-3 PM. *Place:* US Rte 20 bypass and Rte 251. Exit south of bypass, entrance on Frontage Rd, west side of Rte 251. *Features:* Amateur Radio and computer dealers, flea market, tailgating, refreshments, free parking, wheelchair accessible. *Talk-in:* 146.01/61, 146.52. *Admission:* advance \$3, door \$4. *Contact:* advance sales send SASE to Rockford Hamfest, PO Box 10003, Rock-

ford, IL 61131, general info contact Joe Roling, N9HEZ, 815-399-6995.

Indiana (Columbus)—April 7. *Sponsor:* Columbus ARC. *Time:* 8 AM-2 PM. *Place:* Bartholomew County 4-H Fairgrounds, located on State Road 11. *Talk-in:* 146.79/19. *Contact:* Marion Winterberg, WD9HTN, 11941 W Sawmill Rd, Columbus, IN 47201, 812-342-4670.

Indiana (Indianapolis)—March 11. *Sponsor:* Morgan County Repeater Assn. *Time:* set-up Saturday 3-9 PM (security provided overnight), Sunday 6-8 AM (all vehicles must be out of the building by 7:50 AM), public 8 AM. *Place:* Indiana State Fairgrounds Pavilion Building. *Features:* VE exams, programs, free parking. *Talk-in:* 144.65/145.25. *Admission:* no advance, door \$6. *Tables:* 8-ft table including space, \$10 each (no space without table will be sold, advance reservations suggested). *Contact:* send SASE before February 23, 1990, to Aileen Scales, KC9YA, 3142 Market Place, Bloomington, IN 47403, 812-339-4446.

Kentucky (Elizabethtown)—March 24. *Sponsor:* Lincoln Trail ARC. *Time:* set-up Friday 6 PM (security provided), public Saturday 8 AM-4:30 PM. *Place:* Pritchard Community Ctr. *Features:* free parking, new dealers, flea market, forums, VE exams (9 AM, bring original license and a copy). *Talk-in:* 146.52, 146.38/98. *Admission:* advance \$4, door \$5. *Tables:* \$5. *Contact:* Chuck Strain, AA4ZD, PO Box 342, Vine Grove, KY 40175, 502-351-1715.

Maine (Portland)—March 31. *Sponsor:* Portland Amateur Wireless Assn. *Time:* 8 AM-2 PM. *Place:* Westbrook Armory across from Westbrook High School on Stroudwater St. *Features:* VE exams, seminars, forums, exhibits, flea market, refreshments. *Talk-in:* 146.13/73, 146.55. *Admission:* \$4 or \$3 if you bring equipment to sell, with free table space while it lasts. *Contact:* Doug Greer, N1EXD, PAWA, PO Box 1605, Portland, ME 04104, 207-874-1230.

Maryland (Timonium)—March 31-April 1. *Sponsor:* Baltimore ARC. *Time:* Saturday 8 AM-5 PM, Sunday 8 AM-4 PM. *Place:* Maryland State Fairgrounds. *Features:* major manufacturers, refreshments, VE exams. *Talk-in:* 146.07/67. *Admission:* \$5 for both days. *Contact:* 1-301-HAM-FEST or 1-800-HAM-FEST.

Massachusetts (Braintree)—March 25. *Sponsor:* South Shore ARA. *Time:* vendors 9 AM, public 11 AM-4 PM. *Place:* Viking Club, 410 Quincy Ave. *Features:* free parking, refreshments. *Admission:* \$1. *Tables:* 8-ft tables available for \$10 each (includes one free admission per table), if paid before March 23. Send to Hal Jones, WBIABM, 48 Saning Rd, N Weymouth, MA 02191. Tables will cost \$12 on the day of the sale (no guarantee of table space unless paid for in advance). Checks should be made payable to the South Shore ARC. Confirmation of check receipt will be sent, no cancellation refund after March 23. *Contact:* Hal, 617-335-5777 evenings.

Massachusetts (Framingham)—April 8. *Sponsor:* Framingham ARA. *Time:* set-up 8 AM, 9 AM for early bird buyers and 10 AM for all buyers. *Place:* Framingham Civic League Bldg, 214 Concord St, (Rte 126). *Features:* flea market, VE exams (preregistration required). *Talk-in:* 147.75/15. *Admission:* \$5 for early bird buyers, \$2 for all buyers. *Tables:* \$12, includes one free admission (preregistration required). *Contact:* for tables Jon Weiner, K1VVC, 52 Overlook Dr, Framingham, MA 01701, 508-877-7166, for exams send completed Form 610, copy of ham license, and check for \$4.75 payable to ARRL/VEC to FARA, PO Box 3005, Framingham, MA 01701, 508-877-0563 evenings.

Massachusetts (Sandwich)—March 10. *Sponsor:* Barnstable RC. *Time:* set-up 8 AM, public 10 AM. *Place:* Rt 6 (Midcape Hwy) east to exit 2 (Rt 130), go right (south) 2 1/2 miles. Site is on right at the Oak Ridge Elementary School. *Features:* refreshments, VE exams, free parking, wheelchair accessible. *Talk-in:* 147.645/045. *Admission:* no advance, door \$2.50. *Tables:* advance \$8, door \$10. *Contact:*

Don Haaker, WA1AIC, 508-778-5673 or Henry Fales, KZ1V, 508-255-2818.

Michigan (Grosse Pointe Woods)—April 1. *Sponsor:* Southeastern Michigan ARA. *Time:* 8 AM-2 PM. *Place:* Grosse Pointe NHS, Vernier Rd, between Mack and Lakeshore Dr. Take I-94 to Vernier, go east 1 1/2 miles to Hamfest. *Features:* refreshments, ARRL forum, DX forum, packet forum, VE exams. *Talk-in:* 146.14/74, PL 12 (100.0). *Admission:* no advance, door \$4. *Contact:* Southeastern Michigan ARA, PO Box 646, St Clair Shores, MI 48080, 313-527-3497.

Michigan (Marshall)—March 17. *Sponsors:* Southern Michigan ARS & Marshall High Photo Electronics Club. *Time:* set-up 6 AM, public 8 AM-3 PM. *Place:* Marshall High School, I-69 to I-94, then east to exit 110; or I-94 to exit 110 (Old US-27), then south and east to school. Follow the signs. *Features:* VE exams (9:30 AM, preregistration required include Form 610, SASE and \$4.75. Make check or money order payable to ARRL/VEC, send to License Exam, PO Box 2, Pleasant Lake, MI 49272, (walk-ins on availability basis). *Talk-in:* 146.06/66, 146.52. *Admission:* advance \$2 (SASE), door \$3. *Tables:* \$7.50 per ft (min. 4 ft), reserved until 8 AM. Send SASE to SMARS, PO Box 934, Battle Creek, MI 49016 or tel Wes Chaney, N8BDM, 616-979-3433.

Minnesota (Rochester)—April 7. *Sponsor:* Rochester ARC. *Time:* 8:30 AM. *Place:* John Adams Junior High School, 1525 NW 31st St. *Features:* flea market, computer and electronics items, speakers, programs, refreshments, free parking. *Talk-in:* 146.22/82. *Contact:* RARC, c/o N0HZN, 2824 NW 24th St, Rochester, MN 55901.

New Jersey (Absecon)—March 10. *Sponsor:* Shore Points ARC. *Time:* dealers 7 AM, public 9 AM-2 PM. *Place:* Holy Spirit High School, Rte 9, 1/2 mile south of Rte 30. *Features:* indoor selling space with ac, outdoor tailgating (weather permitting), free parking, refreshments. *Talk-in:* 146.385/985, 146.52. *Admission:* \$3. *Tables:* \$5. *Contact:* Shore Points ARC, PO Box 142, Absecon, NJ 08201.

New Jersey (Flemington)—March 31. *Sponsor:* Cherryville Repeater Assn, II Inc. *Time:* 8 AM-4 PM. *Place:* Hunterdon Central HS Field House, 1/4-mile north of Rt 31/202 Circle. *Features:* VE exams, refreshments, free parking, limited tailgating. *Talk-in:* 146.52, 147.615/015, 147.975/375. *Admission:* no advance, door \$5. *Contact:* Marty Grozinski, N2SK, 201-788-4080.

New Jersey (Trenton)—March 25. *Sponsor:* Delaware Valley RA. *Time:* vendors 6 AM, public 8 AM-2 PM. *Place:* New Jersey National Guard, 112th Field Artillery Armory, Eggerts Crossing Rd, Lawrence Township, which is located 2 miles north of the I-95/Rte 206 interchange. *Features:* refreshments, free parking, (facility has handicap parking and is wheelchair accessible). *Talk-in:* 146.07/67. *Admission:* advance \$3, door \$4. *Tables:* sellers must provide their own tables. Indoor selling spaces are \$10 (wall space) or \$7; outdoor spaces are \$6. *Contact:* HAMCOMP '90, c/o KB2ZY, RD 1, Box 259, Stockton, NJ 08559 (SASE please).

New Jersey (Upper Saddle River)—March 24. *Sponsor:* Chestnut Ridge RC. *Place:* Education Building, Saddle River Reformed Church, East Saddle River Rd, at Weiss Rd. *Features:* tailgating \$5, refreshments. *Admission:* \$1. *Tables:* \$10 for the first, \$5 each additional table. *Contact:* Jack Meagher, W2EHD, 201-768-8360.

Ohio (Conneaut)—March 11. *Sponsor:* Conneaut ARC. *Time:* vendor 9 AM, public 9 AM-3 PM. *Place:* Conneaut Human Resources Ctr, 327 Mill St. *Features:* refreshments, free parking. *Talk-in:* 147.99/39. *Admission:* no advance, door \$3. *Tables:* 8-ft \$5. *Contact:* Bob Schultz, W8ERQ, 146 South Ridge Rd, Conneaut, OH 44030, 216-593-5490.

Ohio (Madison)—March 25. *Sponsor:* Lake County ARA. *Time:* 8 AM-3 PM. *Place:* I-90 to Rte 528, follow signs north to Madison High School, at corner of Middle Ridge and Burns Rds. *Features:* flea market, commercial exhibits, VE exams, refreshments, forums. *Talk-in:* 147.81/21,

222.90/224.50. Admission: advance \$3, door \$4. Tables: \$5 (6 ft), \$6.50 (8 ft). Contact: Bob Broady, 5777 Fenwood Ct, Mentor-Lake, OH 44060, 216-257-2036.

Ohio (Maumee)—March 18. Sponsor: Toledo Mobile Radio Assn. Time: 8 AM-5:30 PM. Features: major vendors, flea market. Talk-in: 147.87/27. Admission: advance \$3.50, door \$4. Contact: Bob Hanna, K8ADK, 2154 Circular Dr, Toledo, OH 43551, 419-382-2529.

Pennsylvania (Lebanon)—April 7. Sponsor: Appalachian Amateur Repeater Group. Time: vendors 6 AM, public 8 AM. Place: Lebanon Fairgrounds. Features: parking, handicapped accessible, refreshments, VE exams (10 AM preregistration requested). Talk-in: 146.04/64, 146.52. Admission: \$4, ladies and kids free. Tables: with electricity \$8, without electricity \$5. Contact: Homer Luckenbill, WA3YMU, 105 Walnut St, Pine Grove, PA 17963, 717-345-3780; Ron, WB3HIX, 717-345-8667; or Paul, WB3HEC, 717-566-2606.

Texas (Midland)—March 17-18. Sponsor: Midland

ARC. Time: Saturday 10 AM-5 PM, Sunday 8 AM-2:30 PM. Place: Midland County Exhibit Bldg, located east of Midland on the north side of East Hwy 80. Features: refreshments, VE exams. Admission: advance \$5, door \$6. Tables: \$6. Contact: Midland ARC, PO Box 4401, Midland, TX 79704.

Texas (Weatherford)—March 31. Sponsor: Parker County ARC. Time: 8 AM-4 PM. Place: National Guard Armory, 716 Charles. Features: auction, swapfest market, VE exams (10 AM), refreshments, exhibits. Talk-in: 147.64/04. Admission: advance \$2, door \$3. Tables: \$5. Contact: Gary Graham, KG5CW, PO Box 1750, Weatherford, TX 76086.

Washington (Puyallup)—March 10. Sponsor: Mike and Key ARC. Time: set-up Friday 4 PM-9 PM, Saturday 6 AM-9 AM, public 9 AM-6 PM. Place: Pavilion of the Western Washington Fairgrounds. Features: free parking, refreshments, VE exams, free overnight space for self-contained RVs. Talk-in: 146.22/82, 222.52/224.12. Admission: \$3. Tables: table request postmarked before March 1, \$15; after \$18, commercial space \$50. Contact: for

table reservations M & K Swapfest, 13517 117th Ave, NE, Kirkland, WA 98034. For VE info send an SASE to 637 2nd Ave, South Kent, WA 98032.

West Virginia (Charleston)—March 31. Sponsors: Kanawha ARC & Tri-County Ham Radio Club. Time: set-up 6 AM, public 9 AM-3 PM. Place: Charleston Civic Ctr. Features: VE exams, refreshments, ample parking, ARRL/ARES information. Talk-in: 146.28/88, 146.52. Admission: \$5. Tables: \$6, electricity available. Contact: Betty Palmer, WC8S, PO Box 8400, South Charleston, WV 25303, 304-346-1348.

Wisconsin (Madison)—April 8. Sponsor: Madison Area Repeater Assn. Time: set-up 7 AM, public 8 AM. Place: Dane County Exposition Center Forum Building. Features: refreshments, parking, flea market. Talk-in: 147.75/15. Admission: advance \$3, door \$4, children under twelve free. Tables: \$9 in advance plus admission. Contact: MARA, PO Box 8890, Madison, WI 53708-8890, 608-249-7579 (deadline for admission tickets and table reservations is March 31, 1990).

Coming Conventions

NORTH CAROLINA SECTION CONVENTION

March 17-18, 1990, Charlotte

The North Carolina Section Convention is sponsored by the Mecklenburg ARS. It will be held at the Civic Center. Doors are open on Saturday from 9 AM-5 PM and Sunday from 9 AM-3 PM. Admission is \$5 in advance and \$7 at the door. Features include refreshments, forums, VE exams. Talk-in is on 146.34/94. For further information contact Mary Biggs, KA4EXP, 8435 Rust Wood Place, Charlotte, NC 28227, 704-545-0768.

NEBRASKA STATE CONVENTION

March 23-25, 1990, Kearney

The Nebraska State Convention is sponsored by the Midway Amateur Radio Club. It will be held at the Holiday Inn. Features include symposiums covering regulations and practices by the FCC, proper use of a time domain reflectometer by Marshall Borchart of Ricor/Bond, ARRL forum by Paul Grauer, VE exams (Saturday only), exhibitors with new and used equipment, flea market, auction (Sunday). For more information write to Midway Amateur Radio Club, PO Box 1231, Kearney, NE 68848-1231, 308-237-9277.

NORTH FLORIDA SECTION CONVENTION

March 23-25, 1990, Orlando

The North Florida Section Convention is sponsored by the Orlando Amateur Radio Club. It will be held at the Orange County Convention Civic Center. Doors are open on Friday from 12 noon-9 PM (flea market only), Saturday from 9 AM-5 PM and Sunday from 9 AM-3 PM. Admission is \$7 in advance and \$9 at the door. Features include home-built equipment, forums. Talk-in is on 146.16/76. For further information contact Orlando Hamcation, PO Box 547811, Orlando, FL 32854-7811, 407-657-9052 prior to 10 PM.

INTERNATIONAL DX CONVENTION

April 6-8, 1990, Visalia, California

The International DX Convention is sponsored by the Southern California DX Club. It will be held at the Holiday Inn—Plaza Park. Rooms at the Holiday Inn and Lamp Litter Inn are already full. Nearby hotels/motels include: Best Western, 209-732-4561; Motel Astri, 209-627-2885; Sundance Inn, 209-732-6641. Features include contests, forums, seminars, eyeball QSOs. Preregistration is \$40 and must be postmarked no later than March 23, 1990, all subsequent registrations will be \$45. Make your checks payable to International DX Convention and mail your registration and checks to Don Bostrom, N6IC, 4447 Atoll Ave, Sherman Oaks, CA 91423.

1990

March 3-4

Texas State, Brownsville

March 17-18

North Carolina Section, Charlotte

March 23-25

Nebraska State, Kearney

March 23-25

Northern Florida Section, Orlando

April 6-8

41st International DX Convention, Visalia, CA

April 8

North Carolina State, Raleigh

ARRL NATIONAL CONVENTIONS

June 8-10, 1990—Kansas City, Missouri

August 23-25, 1991—Saginaw, Michigan

For further information contact Don Minkoff, NK6A, 213-397-2984.

NORTH CAROLINA STATE CONVENTION

April 8, 1990, Raleigh

The North Carolina State Convention is sponsored by the Raleigh ARS. It will be held at the Jim Graham Bldg, NCS Fairgrounds, Hillsborough St. Doors are open from 8 AM-4 PM. Admission is \$4 in advance and \$5 at the door. Features include refreshments, ARRL booth and forum, home-brew and CW contests, VE exams, hospitality party Saturday night in Convention Bldg. Talk-in is on 146.04/64, 146.28/88. For further information contact Rollin Ransom, NF4P, 1421 Parks Village Rd, Zebulon, NC 27597, 919-269-4406.

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.

Strays



QST congratulates...

Dr John D. Kraus, W8JK, of Delaware, Ohio, on receiving the Institute of Electrical and Electronics Engineers (IEEE) 1990 Heinrich Hertz Medal for pioneering work in radio astronomy and the development of the helical antenna and the corner reflector antenna. The award has only been made once before. It consists of a gold medal, a citation, and a \$10,000 honorarium. Kraus is McDougal Professor Emeritus of Electrical Engineering at Ohio State University and is Director of the OSU Observatory. In 1985, Kraus was awarded the IEEE's oldest medal, named for Thomas A. Edison. Previous recipients of the Edison Medal include Alexander Graham Bell and George Westinghouse. The formal presentation of the Hertz Medal will be made at the IEEE International Convention in Toronto, Ontario, in October 1990. (photo courtesy of W8JK)

Silent Keys

Administered by Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

W1AJI, Philip W. Bourque, Waterville, ME
 KBIC, Robert A. Weigner, Warwick, RI
 W1CSG, Howard Gomes, North Attleboro, MA
 WA1DXN, William K. Brown, Spring Hill, FL
 KA1EKQ, George C. Pierce, Westerville, OH
 W1HRI, Archie R. Bragg, Seabrook, NH
 W1INN, Charles W. Austin, Ashaway, RI
 W1JKV, Kenniston W. Lord, Wallingford, CT
 W1KPN, Florian J. Fox, Stratford, CT
 *W1MAR, Raymond I. Prime, Hampton Bays, NY
 W1MDC, George E. Hood, Sutton, VT
 K1OCG, Ted A. Kobel, Hudson, FL
 K1PNL, Ernest N. Lefebvre, Forestville, CT
 K1PV, Carl E. Edler, Rumford, ME
 W2AXT, Charles Shoreys, Milford, PA
 K2EQQ, Robert Littler, Moorestown, NJ
 KB2GN, Graves H. Snyder, Summit, NJ
 W2ISY, Homer M. Ross, Lincoln, DE
 WA2KMI, Michelina Jamele, Daytona Beach, FL
 NA2P, Harold M. Zimmerman, Holiday, FL
 W2RX, Earnest H. Roy, Buffalo, NY
 W2VTX, Frank L. Bogdan, Deer Park, NY
 KC2WS, Robert G. Thompson, Lake Hurst, NJ
 W2ZWA, Edward O. Johnson, Princeton, NJ
 K2ZYF, James V. Eldredge, Cobleskill, NY
 K3DRV, John E. Charles, Havre De Grace, MD
 W3GFN, Earl Werst, Mertztown, PA
 WB3HYO, James C. Brady, Abbottstown, PA
 W3KTV, Harry P. Smith, Pittsburgh, PA
 W3SI, David M. Turner, Kensington, MD
 W3YGH, A. W. Nyland, Lethian, MD
 W3YNE, Ray W. McDonald, Butler, PA
 W3ZOU, Melvin F. Stambaugh, Chambersburg, PA
 K4EDF, Harry M. Stein, Springfield, AL
 W4EX, Claude W. Bass, Crossville, TN
 WB4FZY, Paul D. Lascell, Englewood, FL
 AA4GJ, William L. McNabb, St Petersburg, FL
 K4GJF, Henry G. Appleblad, Waterford, CT
 W4HFO, Charles P. Chandler, Ashland, MS
 K4JFP, Fritz Fredrickson, Merritt Island, FL
 K4JQD, John L. Martin, Fort Lauderdale, FL
 WB4JTH, James A. Ward, Portsmouth, VA
 WA4JXG, Richard C. Gronberg, Winston-Salem, NC
 *WB4KCI, Willy A. Roelant, Virginia Beach, VA
 K4KGG, Carl F. Scharff, Denver, NC
 W4KTA, George C. McDaniel, Greenup, KY
 W4LGT, Benjamin F. Ginther, Brookneal, VA

WB4LNY, Robert E. Timmons, Orlando, FL
 WA4MMD, Joseph P. Rubino, Cocoa Beach, FL
 K14NT, B. H. Rosenbaum, Royal Palm Beach, FL
 W4QON, Harold J. Klaiss, Orlando, FL
 KC4R, Mack C. Jones, Stuart, FL
 K4SGP, Malcolm B. Henderson, Nathalie, VA
 W4SH, Jacob A. Maxwell, Spartanburg, SC
 KJ4UR, Joseph Oranchak, Hudson, FL
 AF4W, Richard N. Lynn, Alexandria, VA
 K4WJ, Carleton L. Coleman, Wildwood, FL
 AA4XI, Charles F. Beckett, Clearwater, FL
 W5HDU, Tom L. McAlister, Morton, TX
 W5HTI, John W. Roby, Chappell Hill, TX
 W5IGV, Calvin G. Campbell, Archer City, TX
 W5JHX, J. H. Newton, Waco, TX
 WA5KAC, James R. Haufl, Cleburne, TX
 W5LZW, Mervin B. Goodman, Dallas, TX
 N5MOR, Dan Moffett, Malakoff, TX
 NR5P, Archie J. Adkins, Lebo, TX
 KA5RDY, Billy D. Smith, Waco, TX
 W5SSF, A. D. Bryant, Gainesville, TX
 WA5TXN, Melvin J. Fenrich, Leander, TX
 KC6AEQ, R. J. Duffield, Corona, CA
 K6AKT, Robert K. Lee, Whittier, CA
 W6BCM, Cornwell C. Everman, San Rafael, CA
 KB6DZU, Steve Tower, Santa Rosa, CA
 W6DZ, Orin C. Levis, Sacramento, CA
 N6IGB, Eddie S. Futrell, San Leandro, CA
 W6KON, Floyd E. Henderson, Riverside, CA
 N6LLV, Gerard B. Rene, Corona, CA
 W6MDK, Robert G. Mintie, La Puente, CA
 W6QQ, James P. Weathers, Lancaster, CA
 K6TJB, Clifford T. McKinney, Sparks, NV
 K6TYV, Daniel W. Nign, Sierra Madre, CA
 W7BAN, Ralph W. Bedwell, Spokane, WA
 K7GKL, Lowell L. Young, Las Vegas, NV
 NA7L, Albert J. Cherry, Yakima, WA
 KC7RF, George R. Tweed, Grants Pass, OR
 W8BHM, Orval L. Watts, Richmond, IN
 W8GV, Philip Bieglecki, St. Clair, MI
 KB8HZ, Roy H. Kennedy, Salem, OH
 W8JLE, Robert M. Rogers, New Carlisle, OH
 N8KEV, Roy E. Rankins, Athens, OH
 W8LUL, Allan F. Reindel, Fraser, MI
 WA8NXX, Raymond E. Thomas, Vermilion, OH
 WB8YQL, Harry Dudush, Amherst, OH
 W8ZYQ, Clifford H. Williams, Dayton, OH

W9CJN, Wilner R. Erickson, Milwaukee, WI
 N9FTO, Jeffrey K. Schottler, Hudson, WI
 K9JJC, Henry C. Dexter, Richton Park, IL
 NC9I, Harold R. Holloway, Freeport, IL
 K9IZE, Leonard Novara, Murphysboro, IL
 WA9KRG, Roger E. Humke, Quincy, IL
 W9NBL, Edwin B. Rosenberg, Prescott, AZ
 W9PFR, Winston W. Seitz, Decatur, IN
 W9SFL, Laurence A. Knutson, La Crosse, WI
 W9UWH, Rocco De Paul, Arlington Heights, IL
 WB9WGD, Robert E. Brown, Tomah, WI
 W8CQC, George P. Swanson, Cedar Rapids, IA
 N8EGX, Claude E. Fullerton, Carthage, MO
 W8ESW, Clarence C. Bowman, Kansas City, MO
 W8EJZ, William K. Crain, Augusta, KS
 W8MOX, Louis D. Breyfogle, Boulder, CO
 W8VUA, Louis S. Finnegan, Sun City, CA
 *WB8WRG, Arthur L. Flanner, Ottawa, KS
 *WA8ZNN, John P. Donlon, Volga, IA

*Life Member, ARRL

Notes: 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 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 unfortunate 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. Canadian reports should be sent to the CRRH HQ address on page 9.

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, 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.

50 Years Ago

March, 1940

- The cover photo of an antenna switching installation looks a bit elaborate for a ham setup—that's because it is of General Electric's experimental short-wave and television broadcasting setup near Schenectady. Three of QST's editorial staff were invited for a complete tour of the facilities.
- It's even easier (and cheaper, with loktal tubes instead of expensive acorns) to start on 112 Mc. if you use W1JPE's design for a practical converter. It will feed either your basic receiver for a.m. reception, or the family 43-Mc. f.m. set for that mode.
- First word from the Inter-American Radio Conference in Chile is the good news that participating nations agreed to amateur exclusivity (in this hemisphere) of all amateur bands! No agreement was possible on voice and c.w. subbands, however.
- Former Technical Editor Jim Lamb has recovered from a two-year bout with illness and is back on the staff with a new title of Research Engineer.
- The popularity of mobile is focusing attention on noise limiters to reduce ignition interference; W9ZWW shows several applications of the Dickert shunt limiter to various second-detector circuits in common use.
- Climaxing years of experimentation, brothers Bill (W8IFD) and Walter Good of Kalamazoo, Michigan, won the radio-control event at the national model aircraft championship meet. Rudder and aileron escapements constitute the state of the art techniques.
- A reprint excerpt from a Bureau of Standards

circular helps us understand more of the normal and irregular characteristics of the ionosphere which affect wave propagation.

- For his medium-power 10-meter rig, W1IYV broke away from the usual concept of fitting components into the standard relay rack chassis dimensions; he built a chassis to best fit his transmitter design.
- Meters are expensive, yet we need to know what is going on in various parts of today's rigs. W9IBC discusses meter-switching methods to measure both grid and plate functions with one unit.
- Communications Manager Handy warns that the League is indeed serious about strict neutrality in the present European hostilities, and will disqualify any DX contest participant working or even heard calling any station in Europe or such nation's colonies.
- It's not easy, but W8DPY gets two directions from his fixed three-element vertical array by clipping or removing additional lengths of wire to outside elements to change director and reflector functions.

25 Years Ago

March, 1965

- Oscar III is nearing completion, and if you plan to communicate through this relay satellite you'll need to develop your own tracking data to determine when Oscar is within line-of-sight range of your station. W6HEK provides considerable detail in formulas and diagrams to ease our computations.
- W6DKH expands the Oscar encyclopedia by explaining the telemetry system, and how we can de-

termine the satellite's temperature by reading bursts between the regular "HI" identifiers.

- RCA kindly provided a symposium on semiconductor manufacture and operation for a number of the QST staff, as useful background for further amateur application of solid-state devices. A side trip to the company's Astro-Electronics division, arranged by manager W3VQQ, educated the visiting editors on latest ComSat technology.
- The League joined other radio groups in fighting against license fees all the way to the Supreme Court, but unfortunately this highest authority ruled that FCC has the legal right to charge fees, and that the schedule is within reason.
- W1ICP, partially responding to continuing pleas from FCC to help alleviate the problem of harmonics from Novice rigs, has another article on the causes of spurious signals and how a simple filter can virtually eliminate them.
- W4EWL cut a Monomatch down to a size that would replace the clock in his Oldsmobile dashboard, and can keep track of power output as well as s.w.r. while he motors.
- ARRL's voluntary "national calling and emergency frequencies"—one for each voice and c.w. in each major band—are discussed by WINJM with the proposal that they be made "full time" calling-only channels, with a five-minute silent/listening period at the beginning of each hour.
- The December editorial on whether we have too many contests brought an avalanche of mail, excerpts from which fill this month's Correspondence Section. Unfortunately, there is no real consensus.
- The Building Fund is just one rung from its ladder climb to the \$250,000 goal. The less pleasant news is that at the end of 1964, both FCC licensee and League membership totals are down, however slightly. —WTRW

Results, Fourth Annual ARRL 10-GHz Cumulative Contest

I hope everyone had as much fun as I did!—W6HCC

By Billy Lunt, KR1R
Contest Manager

Warren Stankiewicz, NF1J
Assistant Contest Manager

Neither wind, rain, snow nor sleet will stop the mailman, and X-banders are not far behind. They seem to find new techniques to get around almost any obstacle. Ed, W2TTM, learned "that under certain conditions, raising the antenna's elevation as much as 7.5 degrees on one end of a 258-km path brought the signal up 5 to 6 dB; and operating in a downpour can sometimes enhance the signal, as it happened over a 191-km well-known path." While in Ontario for the contest, Bob, N1IW, ran into rain and a rig problem, but this didn't stop him. Bob conveyed, "While holding the horn out the car window in the rain and holding a broken wire on my rig to a terminal with my finger, I keyed the rig for two challenging contacts."

For the 1989 10-GHz Cumulative Contest, 49 entries were received. This figure is down a tad from last year's total of 54 entries, but Steve, VE3SMA, claims that in his area "there was a big increase in activity this year despite limited time available to some of the 'old hands.'"

Southern California not only contributed the most participants but also claimed the farthest QSOs. Phil, W6HCC, Chuck,

WA6EXV, and William, WA6QYR, completed 266-km QSOs to tie for the farthest-DX mark. Long-distance QSOs seem to be plentiful in this year's contest with 10 stations making contacts of more than 200 km. W6HCC finished first for the most completed QSOs, with a total of 78 Qs. WA6EXV wasn't far off the mark, making 71 contacts. WA6QYR was third with 67 QSOs.

Phil, W6HCC, traveled to 15 different sites, compiling 10,320 points for first place. Chuck, WA6EXV, scored 9,272 points, placing second, while Gary, NN6W, finished in third place with 8,222 points.

The ARRL 10-GHz Cumulative Contest is a unique speciality contest. It is spread over two different weekends and one can

operate from many different locations. Two stations can work again whenever either moves to a new location. QSO points



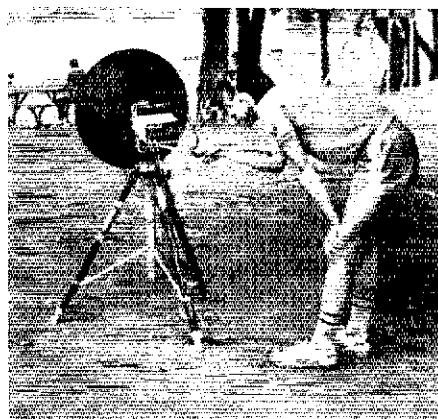
Steve, VE3SMA, setting up his dish.



Bob, W1XP, operated from Mt Monadnock in New Hampshire.



Milt, W6QT, operated a Gunplexer and SSB from Mt Vaca.



VE2HAK is at the controls of the VE2DUB station in FN35.

Contest Corral

Conducted By Mark R. Burke, KA1MIS
Contest Assistant

FEBRUARY

28

West Coast Qualifying Run, 10-35 WPM, at 0500Z Mar 1 (9 PM PST Feb 28). 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 SASE will help expedite your award or endorsement.

MARCH

3-4

ARRL International DX Contest, phone, Dec QST, p 79.

9

WIAW Qualifying Run, 10-35 WPM at 0300Z Mar 10 (10 PM EST Mar 9). Transmitted simultaneously on 1.818 3.5815 7.0475 14.0475 18.0975 21.0775 28.0775 50.08 147.555 MHz. See Feb 28 listing for more details.

9-11

Japan International DX Contest, CW, Feb QST, p 79.

10-11

County Hunter's 10 Meter QSO Party, CW, sponsored by the Mobile Amateur Radio Awards Club, from 1200Z Mar 10 until 2400Z Mar 11 (phone from 1200Z Mar 17 to 2400Z Mar 18). Single ops only. No net or prearranged QSOs. Suggested frequencies: CW—28.150-28.200 (phone—28.330-28.380). Exchange signal report and F for fixed or M for mobile. Work stations once; work mobile stations again when they change county/state lines. Mobiles on county lines count as one QSO and two multipliers. Score one point per W/VE QSO; three points each state/province worked; five points for each DX QSO; fifteen points each US mobile QSO. Final score equals total number of counties worked times QSO points. Awards. Mail entry (for results, send SASE) by Apr 23 to N4FSZ via Callbook address.

Iowa QSO Party, sponsored by the Iowa Section, from 1800Z Mar 10 until 0600Z Mar 11. Work stations once per band and mode. No repeater QSOs. Exchange signal report and county for Iowa stations; section or country for others. Suggested frequencies: CW—1.810 3.550 7.050 14.060 21.050 28.050 MHz; phone—3.875 7.230 14.280 21.325 28.600 50.120 144.200 146.520 MHz; Novice—10 kHz from low ends. Count 1 point for each phone contact; 1.5 points for each CW contact; 3 points for each OSCAR contact; 5 points for each Novice and Tech contact. Iowa stations multiply total QSO points by total sections/countries worked. Others multiply total QSO points by Iowa counties (max 99) worked. Bonus multiplier for each ARRL Iowa Section Official worked (max 8). Awards. Mail logs by Apr 1 to Bob McCaffrey, K0CY, RR #4, Box 228C, Boone, IA 50036.

Wisconsin QSO Party, Feb QST, p 79.

17-18

Bermuda Contest, Feb QST, p 79.

County Hunter's 10-Meter QSO Party, phone, see Mar 10-11 listing for details.

17-19

BARTG Spring RTTY Contest, sponsored by the British Amateur Radio Teleprinter Group, from 0200Z Mar 17 until 0200Z Mar 19. Operate 30 hours maximum. Off-times must be no less than three hours each and must be indicated in log. Single operator, multioperator and SWL categories. Work stations once per band. 80, 40, 20, 15 and 10 meters. Exchange UTC time, signal report and message number starting with 001. Count two points for

RTTY QSOs with stations in your country, 10 points for others. Count 200 bonus points for each country worked per band. For final score, add QSO points \times (total different DXCC countries + W/VE/VK call areas per band) plus (band countries \times 200 \times continents). Use a separate log sheet for each band. Mail logs to be received by May 27 to John Barber, G4SKA, 32 Wellbrook St, Tiverton, Devon, EX16 5JW, England.

Virginia State QSO Party, sponsored by the Sterling Park ARC from 1800Z Mar 17 until 0200Z Mar 19. Exchange QSO number beginning with 001 and QTH (county for VA stations; state, province or DX country for others). Score one point per phone QSO; two points per CW, RTTY, SSTV and packet QSOs. No crossmode QSOs. VA stations multiply QSO points total by the sum of states, Canadian provinces, DX countries and VA counties worked. Others multiply total QSO points by number of VA counties worked. Work the same station on each band and mode for QSO credit. VA stations may contact in-state stations for both QSO and multiplier credit. Mobile stations may be worked in each county they operate from for both QSO and multiplier credit. County line stations count for only one QSO. CW frequencies are 60 kHz up from the low end of 80, 40, 20, 15 and 10 meters; 160 meters; Novice CW bands. Phone frequencies are 3.930 7.230 14.285 21.375 28.375 28.575; 160 meters (except DX windows). Other modes use usual frequencies. Follow ARRL Standard Contest logging guidelines. Mail logs by April 15 to Virginia QSO Party, c/o George Foy, N4DLR, 413 N Argonne Ave, Sterling, VA 22170.

18

Zero District QSO Party, sponsored by the Davenport RAC, Mar 18 from 1800Z-2400Z. Zero-district stations may work anyone; all others work zero-district stations only. Work each station once per band and mode. Mobile stations may be worked again as they change counties. Exchange signal report and state. Zero-district stations also send county. Suggested frequencies: CW—60 kHz up from lower band edges; phone—3.900 7.270 14.300 21.350 146.52 (no repeater QSOs); Novice—3.730 7.130 21.140 28.360; packet—145.010. Count 1 point for phone QSOs, 2 points for CW QSOs and 2 points for packet QSOs. Zero-district stations multiply QSO points by total of states, zero-district counties, provinces and DXCC countries worked. Others multiply QSO points by number of zero-district counties worked. QSO with W0BXR counts for 10 QSO points, regardless of mode. Any station with over 100 QSOs must include a dupe sheet. Club competition for zero district only. Mail logs by Apr 30 and send an SASE for results to W0BXR, 1166 32nd St, Moline, IL 61265.

20

WIAW Qualifying Run, 10-35 WPM, at 1400Z Mar 20 (9 AM EST). See Feb 28 listing for more details.

20-21

AC-DC/CLARA Contest, CW, sponsored by CLARA, from 1700Z Mar 20 until 0500Z Mar 21 (phone, from 1700Z Mar 27 until 0500Z Mar 28). Work stations once per band. No net, list, or cross-mode contacts. Exchange serial number (starting with 001), RST, QTH, and if CLARA or family member. Suggested frequencies: 3.690 7.035 14.035 21.035 (phone)—7.070 14.120 21.300 28.488. Count 5 points for each contact with a member (2 points on phone), 2 points with nonmember (1 point on phone). CLARA family members may be worked once for a 10-point bonus. Multiply points by total number of Canadian provinces and territories (12 max), VE0, and one Armed Forces base abroad. Awards. Send logs by April 20 to Jeanne Gordon, VE2JZ, 5 Wood Crescent, Beaconsfield, Quebec, H9W 1C5, Canada.

24-25

CQ World Wide WPX Contest, phone, sponsored by CQ Magazine, from 0000Z Mar 24 until 2400Z Mar 25 (CW contest, May 26-27). Single ops are allowed a maximum 30 hours operating time; off-times must be at least 60 minutes in length and must be clearly indicated in the log. Multioperator stations may operate entire 48 hours. Phone only, 160-10 meters (excluding the WARC bands). Categories: single op, all band and single band; QRP (5-W output maximum); multiop (multiband only) multi and single transmitter. Multi-singles must remain on a band for at least 10 minutes after making a QSO; multi-multis are allowed only one signal per band. All transmitters must be located within a 500-meter-diameter circle or limits of property; no remote stations. Work stations once per band for QSO point credit, but prefix credit may be counted only once. Exchange signal report plus serial number starting with 001. Multi-multis use separate numbers on each band. QSO points: Contacts between stations on different continents count three points on 28, 21 and 14 MHz and six points on 7, 3.5 and 1.8 MHz. For North American stations, contacts between stations in different countries on the NA continent count two points on 28, 21 and 14 MHz and four points on 7, 3.5 and 1.8 MHz. For non-NA stations, contacts with stations in other countries but on the same continent count one point on 28, 21 and 14 MHz and two points on 7, 3.5 and 1.8 MHz. QSOs between stations in the same country count zero points, but are permitted for prefix multiplier credit. Multipliers are prefixes, and are counted only once. A prefix is the two or three letter/number combination that forms the first part of an amateur call sign, as in W1, G4, DF3, 8P6, etc. Stations operating outside the call area indicated by their call signs must sign portable. The portable prefix counts as the multiplier; for example, AA1K/3 in Delaware counts as an AA3 multiplier. Final score is total QSO points times sum of prefixes worked. Awards and club competition. Mail logs by May 10 (Jul 10 for CW) to CQ Magazine, WPX Contest, 76 North Broadway, Hicksville, NY 11801.

YL-SSB QSO Party, phone, Feb QST, p 79.

27-28

AC-DC/CLARA Contest, phone, see Mar 20-21 listing.

APRIL

3

West Coast Qualifying Run, 10-35 WPM at 0400Z Apr 4 (9 PM PDT Apr 3). See Feb 28 listing for more details.

7

WIAW Qualifying Run, 10-35 WPM at 0200Z Apr 8 (10 PM EDT Apr 7). See Mar 9 listing for more details.

7-8

North American QSO Party, CW, sponsored by the National Contest Journal from 1800Z Apr 7 until 0600Z Apr 8 (phone—1800Z Apr 14 until 0600Z Apr 15). Contests are separate. Single-operator and multioperator. Multiop may be multitransmitter but only one signal per band. No spotting nets for single op. Single ops may operate any 10 hours. Rest periods must be at least 30 minutes long and noted in log. Multiops may work the entire contest. Use only one call sign per contest. Exchange name and state/province/country. 160-10 (no WARC bands). Work stations once per band. Suggested frequencies: CW—1.815 3.535 7.035 14.035 21.035 28.035; phone—1.865 3.850 7.225 14.250 21.300 28.600. Try 10 meters at 1900Z and 2000Z, 15 m at 1930Z and 2030Z, and 160 meters at 0430Z and 0530Z. A valid QSO is two-way logged exchange between a North American station (as defined by CQWW DX Contest plus KH6) and another station. Multipliers are states (including KH6 and KL7), VE call areas (VE1-VE8, VO1, VO2, VY1) and other NA coun-

tries (do not count USA, VE, KH6 or KL7 as countries). Score 1 point per QSO. Multiplier times QSO points for final score. Awards. Send logs, summary sheet and dupe sheets before 30 days after the contest to Dave Prueitt, K8CC, 2727 N Harris Rd, Ypsilanti, MI 48198.

9

ARRL Spring Sprints, 144 MHz.

14-15

North American QSO Party, SSB, see Apr 7-8 listing for more detail.

QRP ARCI Spring QSO Party, CW, sponsored by QRP ARC International, from 1200Z Apr 14 until 2400Z Apr 15. Single band or all band. Operate no more than 24 hours. Work stations once per band. Exchange signal report, state/province/country and ARCI number if member or power out if non-member. Suggested frequencies: 1.810 3.560 3.710 7.040 7.110 14.060 21.060 21.110 28.060 28.110 50.060. Count 5 points for QSO with ARCI member. Others count 2 points for same continent and 4 points for different continent. Multiply QSO points by states/provinces/countries worked per band by power multiplier (1- to 5-W output $\times 7$; under 1-W output $\times 10$). More than 5-W output counts as checklog. If 100% natural power, multiply final score by 2; if 100% battery, by 1.5. Bonus

points for using home-brew equipment (HB): add 2000 points for each band an HB transmitter is used; add 3000 points for each band an HB receiver is used; add 5000 points for each band an HB transmitter is used. Include description of home-brew equipment, commercial equipment and antennas used, and indicate which equipment was used on which bands. Awards. Mail entry (SASE for results) before 30 days after the contest to Red Reynolds, K5VOL, QRP ARCI Contest Manager, 835 Surryse Rd, Lake Zurich, IL 60047.

17

ARRL Spring Sprints, 220 MHz.

21-22

MARAC County Hunters SSB Contest, sponsored by the Mobile AR Awards Club, from 0000Z Apr 21 until 2400 Apr 22. Work stations once per band. Work portables/mobiles again as they change county. Stations on county lines count as one QSO, but multiple multipliers. Exchange signal report, category (fixed, portable or mobile), county and state (for US stations), province or country. Suggested frequencies: 3.880 7.240 14.270 21.340 28.340. Portables and mobiles work below the suggested frequencies; others spread out above the frequencies. Count 1 point for QSOs with W/VE fixed stations, 15 points for W/VE portables or mobiles,

5 points for all other QSOs. Multiply QSO points by total US counties worked for final score. Mobiles and portables calculate their scores both on a state-by-state basis and overall for awards. Mail logs to be received by May 21 (include a large SASE for results) to WA5DTK, 185 Cinnamon Dr, Satellite Beach, FL 32937.

QST QSO Award Party


25

ARRL Spring Sprints, 432 MHz.

28-29

Helvetia Contest

Computer Diskette Media: Items for this column can now be sent on a standard 3.5- or 5.25-inch MS-DOS-formatted floppy disk to ARRL HQ. The file must be in an ASCII format and must contain all information as listed below. The file can also be sent via modem to the ARRL HQ BBS at 203-665-0090.

Deadline: 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 April 1 to make the June issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111. 

Special Events

Conducted By Warren C. Stankiewicz, NF1J
Assistant Contest Manager

Macon, Georgia: The Macon ARC will operate W4BKM 1400Z-2300Z Mar 23-24 in connection with the Macon Cherry Blossom Festival. Suggested frequencies: CW—7130, 14030, 21130, 28130; Phone—7250, 14250, 21320, 28320. For certificate, send QSL and 9- \times 12-in SASE to W4BKM, Macon ARC, PO Box 4862, Macon GA 31208.

Grand Island, Nebraska: The Grand Island ARC will operate W6CUO from 0000Z Mar 2 until 2400Z Mar 4 to celebrate the annual return of the Sand Hills Crane to the Platte River Refuge. Operation will be SSB, CW, packet, AMTOR and RTTY in lower portions of the General bands. Operation is also planned in the Novice bands. For certificate, send QSL no. and SASE to W6CUO, PO Box 642, Grand Island, NE 68802.

Sweetwater, Texas: The Nolan County ARC will operate from 1500Z-2400Z Mar 9-11 during the World's Largest Rattlesnake Roundup. Operation will be in the General 40- and 20-meter bands and the Novice 10-meter band. For certificate, send QSL and large SASE to WR5JB, PO Box 825, Sweetwater, TX 79556.

Ecu, Mississippi: The 7th grade Industrial Arts classes of the North Pontotoc Attendance Center will operate WB5HAZ from 1400Z-2100Z Mar 22-23 to celebrate the first year of their Technology Student Association. Operation will be 14.250-14.275. For certificate, send QSL and SASE to Industrial Arts Department, North Pontotoc School, Ecu, MS 38841.

St Patrick, Ohio: The Farout ARC will operate WB8SMC from 1700Z Mar 17 until 1700Z Mar 18. Suggested frequencies: CW—7335, 7135, 14135, 21135, 28135; Phone—3870, 7270, 14270, 21370, 28370; RTTY—3620, 7090, 14090, 21090, 28370. For QSL, send SASE to Farout ARC, PO Box 9181, Dayton OH 45409-9181.

South Charleston, West Virginia: KE8OJ will operate 0800Z-1600Z Mar 10-11 to commemorate the 75th birthday of the United States Naval Reserve. Operation will be on 3.875, 7.250, 14.250 and the Novice 10-meter band. For certificate, send QSL and SASE to Eric Knapp, KE8OC, 917 Glenn Way, South Charleston, WV 25309.

Piscataway, New Jersey: The Piscataway ARC will operate using their own call signs/VOA from 0000Z Mar 17 until 2400Z Mar 18 to commemorate the Voice of America Relay Station. Operation will be

in the lower General portion of 75, 40, 20 and 15-meters and the Novice 10-meter band. For certificate, send QSL and 9- \times 12-in SASE to PARC, Attn KB2UV, PO Box 1233, Piscataway, NJ 08854.

Cleveland, Ohio: The members of Westpark Radio Ops will operate from 0001Z Mar 21 until 2400Z Mar 24 to celebrate Novice enhancement. Operation will be 28.300-28.500. For certificate, work five Westpark members. Send QSL and 9- \times 12-in SASE to W8VM, c/o Glenn Williams, 513 Kenilworth Rd, Bay Village, OH 44140.

Sayreville, New Jersey: The Raritan Bay RA will operate K2GE from 1800Z Mar 23 until 0200Z Mar 26 in celebration of their 37th year of affiliation with the ARRL. For certificate, send QSL and SASE to RBRA Inc, PO Box 173, Sayreville, NJ 08872.

Anchorage, Alaska: The Anchorage ARC will operate KL7JFU starting 1800Z Mar 3 for approximately 2½ weeks during the 1990 Iditarod Trail Sled Dog Race. For QSL, send SASE to NL7KE, PO Box 670173, Chugiak, AK 99567-0173.


Ireland: The Irish Radio Transmitters Society will operate Mar 17 in celebration of St Patrick's Day. All stations working 20 of the 26 counties will be eligible for an award. For details, contact Joe Duffin, W2ORA/EI8GT, 4 West Central Ave, Moorestown, NJ 08057.

Gaithersburg, Maryland: The NBS BRASS will operate K3AA from 0000Z Mar 24 until 2400Z Mar 25 to commemorate the 88th anniversary of the National Bureau of Standards (now renamed the National Institute of Standards and Technology). Approximate frequencies are 20 kHz up from the lower end of the 80, 40, 20, 15 and 10 General bands; Novice CW and phone. For certificate, send QSL and SASE to NBS BRASS, National Institute of Standards and Technology, Gaithersburg, MD 20899.

Computer Diskette Media: Items for this column can now be sent on a standard 5¼- or 3½-in MS-DOS formatted floppy disk to ARRL HQ. The file must be in an ASCII format and must contain all information as listed below. The file can also be sent via modem to the ARRL HQ BBS at 203-665-0090.

Deadline: 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 April 1 to make the June 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 or certificate from any of 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. If sending for a certificate, use a 9- \times 12-in 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 both your QSL 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 will often print their cards and/or certificates after the operation is over so they will know how many to order. 

Strays



CQ DR HOWARD, DR FINE, DR HOWARD...

☐ When Prince William Hospital in Manassas, Virginia, had its telephone service interrupted during recent renovations, Amateur Radio operators came to the rescue to provide standby communication services. Eleven members of the Ole Virginia Hams Amateur Radio Club volunteered their time and effort, and were strategically stationed at various key points throughout the hospital. The Manassas repeater's autopatch was effectively used to summon doctors and provide routine communications.

The ARRL Field Organization Forum

ATLANTIC DIVISION

DELAWARE: SM: Walt Dabell, KD3GS—ASM: Bill Ryan, WA3DPJ. I gave a talk on traffic handling at the KCARC meeting in January. Hope to hear some of you on the Delaware Traffic Net. KCARC is talking about sponsoring a Fox Hunt this spring. They will offer a trophy to the winning team. The only rule I know of is the DFing equipment must be home-brewed. More info on this event will follow or you can contact the KCARC at PO Box 1000, Dover. The DEX node is now cross linked from 145.05 to 221.01. Speaking of DEX, I would like to welcome Delaware's newest ARRL affiliated club, The DuPont Experimental Station Amateur Radio Club. These are the guys who are running the DEX nodes on packet. Thanks and welcome aboard! Dec net rpt: DTN stns 345 ftc 44 in 21 seans, DEPN stns 49 ftc 13 in 5 seans, SEN stns 53 ftc 6 in 4 seans. Traffic: W3QQ 75, WB3DUG 46, K3YBW 30, K3GRQ 23, K3JL 23, W3WYI 19, W3FEG 18, KD3GS 13, N3FLD 5, K3ZXP 4. TOTAL 241.

EASTERN PENNSYLVANIA: SM, Kay Craigie, KC3LM—ASM: WA3PZO, KA3A, KO3B, K3ZPD. SEC: KB3YS. ACC: KC3OB. OOC: W3IS. SGL: WA3IAO. STM: BM: KB3UD. PIC: W3ZKV. TC: W3FAF. By the cover date of this QST, we'll know who is to be the new Section Manager, effective April 1. I would like to thank both candidates and all League members who voted, for your active participation in the election process. Eastern PA hamfest season begins with the optimistically-named York Springfest in Dover on March 4. They have plenty of indoor area, so don't let weather keep you away. KC2EG, K3ARR, and K3QYH have been added to the ORS roster. We hope former SCM W3HK is back in good health by the time this ink's dry. Ordinarily, I have not listed Section Keys in this column, because it would be impossible to avoid giving offense by failing to mention someone. However, the passing of ORS N3AZW last December cannot go without comment. Despite physical disabilities, Andy was EPA's regular member of Brass Pounders League and participated in many NTS and independent nets. In addition, he put his superbly-equipped station at the disposal of District 1 ARES. Andy first learned message-handling as a Technician on the Mid-Atlantic ARC local VHF net, trained by KD3AO. His interest in message handling led Andy to upgrade to Advanced, and he eventually became a 3RN Net Manager and member of TCC. All this happened in about a half-dozen years. The many traffic handlers who have stepped forward to cover Andy's duties are to be commended. Special thanks go to W3IVS, who made certain all messages remaining on Andy's desk were cleared and turned in Andy's final SAR. Turning to a happier topic, the Atlantic Division 1990 "Amateur of the Year" award nominations are now open. Let's have plenty of good nominations from EPA, as we did last year. KC3LM has info on how to nominate someone for this prestigious service award. N3CZB has retired from active duty as an OO. We thank Louis for his many years of good judgment and quiet service. OOC W3IS spoke on the new Part 97 at Harrisburg RAC. STM/BM KB3UD spoke on packet radio at Lehigh Valley ARC. Endless Mts. 1990 officers are WB3IWZ, K3ATOV, K3AUXV, and K3AQFA. Good to see KC3FO's West Branch ARA newsletter back in print. Holmesburg's members are enjoying the new northeast repeater input. December Traffic: N3AZW 1197, N3DRM 363, W3JXK 279, N3CD 142, W3KAG 114, W3JPK 112, N3EFV 98, W3DP 85, K3AMVM 84, AA3B 83, WA4U 78, W3NNL 76, W3AEDH 74, K3ASKT 74, W3ZTD 72, KD3AO 47, W3EVL 46, K3TX 42, K3UR 38, K3AROF 36, N3GXK 34, W3BNR 31, W3KOD 24, N3COY 21, K3ARR 18, W3CL 12, K3QYH 11, N3FGC 10, W3FAF 9, K3NB 9, W3ADE 5. Nets (QNI/QTC): EPA 508/223, EPA/ENT 523/340, PTTN 196/50, MARCNET 67/5, MARCIN 128/74, SEPATN 115/30. @BBS: @WA3TSW 487, @K3RLI 457, @WB3JOE 190, @N3ET 5.

MARYLAND-DC: SM, Ken Cohen, N3CF (@ W3IWI)—ASM/PIC: K3JE. ASM/ACC: WA3YLO. OOC/BM: N3BP. PIC: N3BMB. SEC: K3NU. TC: W3VVA. STM: N3EGF. SGL: KW3X. A MDC ham, Ron Parise, WA4IR, will be an astronaut aboard the shuttle Columbia, and will operate pvt using a SAREX "QSO machine" worked on by W3IWI and N2WX. W2FA, Goddard trustee, MDD NM, MEPN Sec'y and former SM became a Silent Key. Karl will be sorely missed. K3GHH is now MDD NM. N3FX continues FB job with ARES and work on antennas. We welcome C-CARS and its youth group as an affiliated club. PR idea: have ur local cable channel show the ARRL film "New World of Amateur Radio," which may be borrowed from HQ. WITH THE NETS: NET/MGR QND/OTC/QNI: MSN/K3CY 31/64/352, MEPN/K3RXK 30/188/749, HOCARES/WA1QAA 2/3/12, Traffic: W3IWI 1765 (BPL), N3BP 422, K3GHH 399, K3JE 320, WA3YLO 288, K3ET 276, K3CY 254, W3FZV 181, K3AF 176, K3RXK 142, N3ET 128, W3AEP 113, K3AENQ 102, WB3BM 101, N3GTY 72, N3TS 72, N3CZ 69, N3RQ 67, KD3JK 64, KD8M 48, K3USO 43, W3BFF 36, W3DQI 36, W3YVQ 34, K3ORW 31, K1BGT 27, W3ZNV 25, N3EGF 24, W3GYW 10, WA1QAA 5, P3HR: WA3YLO 86, K3RXK 82, K3CY 80, K3GHH 67, KD3JK 66.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—SEC: W2HOB. STM: W2UUVB. ACC: K2JXE. TC: N2BQT. PIC: KA2RAF. SGL: VACANT. BM: VACANT. OOC: WA2HEB. ATC's: K2JF, KA2RJA and WB2MNF. We have a new SEC in the section and he is Boyd Prestwood, W2HOB, of Mt. Holly. Boyd is a past SEC and has much experience in the field of emergency communications and emergency preparedness. Boyd replaces George Ford, K2QJL, who will be moving out of our area very soon. Boyd's address is: 8 Dogwood Dr., Burlington 08018. I'd like to thank George for his devoted work as SEC for over 5 1/2 years. Good luck, George VE testing in Bellmawr on March 15. See February, 1990 QST for full details. The SNJ Section Staff Admin. Net meets the last Mon-

day evening of each month at 9 PM on the 147.345/975 repeater in Waterford Works. Why not give a listen and see what your section leadership is up to? Speaking of the 345 repeater, I forgot to mention last month that the Southern New Jersey VHF Net now meets on this repeater every evening at 10:30 PM. Whatever part of the section you live in, you should be able to QNI. Until next month, 73. Traffic: W2UUVB 365, KB1SD (PBBS) 344, WA2CUW 145, WB2ZJF 137, KB2CDB 32, KA2CQX 30, WA4JRP 23, W2FFE 12, N2IPH 13, K2OG 4, WA2EMJ & WB2SYJ 3, KA2YKN, W2HOB & KE2EH 2, WA2SG & N2HQL 1.

WESTERN NEW YORK: SM, William Thompson, W2MTA—A hearty thank you to all radio clubs in Western New York section for their promotions to both their membership and the general public. Presently there are 65 affiliated clubs on file here. Of these, 49 filed 1989 Annual Reports. Some 29 sent their newsletters to the Section Manager...other club newsletters would be appreciated too. Another seven clubs were sending newsletters, maybe they stopped publishing. During the past year some 18 clubs had OUTSTANDING publications. They are: BAPA FACTS, BULL THISTLE BUGLE, COHERER, GRAM NEWS, HILTOPPER, KODAK PARK, LARC LONG, WIPAC, CVARC, PACKET NEWS, PROS NEWS, RAGS REVIEW, DRUMMERS' RUMBLING, SALT TABLET, SMOKE SIGNAL, SPECTRUM, STATIC SHEET, TOROID, and WNYDXA REPORT. Keep up the good work, amateur radio would be lost without your efforts...All of you Public Service Honor Roll: N2EIA, N2EVS, W2FJL, W2FR, N2NH, K2CHJ, WB2MNA, W2MTA, WB2OEV, WB2OWO, WB2QIX, KA2QOC, ND2S, KA2UTI, NJ3V, KD2WP, K2YAI, KA2ZKM, KA2ZZN. BPL December to W2MTA.

NET NAME	QNI/QSP/OND	NET NAME	QNI/QSP/OND
NYSEM0	118-009-05	NYSR CW	025-005-05
NYSM/CW	312-180-31	NYSR/CW	428-287-31
WDMN*	418-184-31	BLUCLINE	100-013-29
NY PHONE*	175-140-28	JCRACN	354-022-26
ESS CW	453-157-31	TIGARDS	027-004-03
NYPON*	626-289-31	VHF THIN	045-000-04
NYSPT&EN	519-107-31	BRVSN	280-002-31
LCARES	052-000-04	CNYTN*	293-072-31
OCTENVE*	778-143-31	OCTENL*	320-050-31
Q Net	423-001-30	Pathfinder	251-003-29
STAR*	398-053-31	Earylbird	190-000-21
QARCN	055-003-04	QRTN	027-000-04
WDNE*	507-193-31	WDNL*	408-145-31
229 NET	015-000-04	NYSL/CW	566-229-31

*NTS Net. Packet Node Reports (K1TST): NA2B 2/207, KA2JXJ 3/4. CLUB OFFICERS: Drumliners N2CMA, KB2GYP, WA2SOK, N2JIM: MOARC WP2V, KB2GJA, WB2CLK, KB2FGK, W2BWNV: SDXKA W2VO, NT2D, WB2CKI, KB2G; TCARC N2GFW, N2ISU, KA2WFK, KB2BON: UARC KB2BRF, WA2TVE, WA2FSU, WA2AZA. 1990 CLUB ANNUAL REPORT FORMS will be arriving at clubs soon. Hamfests: Horseheads Feb. 24, Drumliners Mar. 31, Oswego May 5, Rochester May 18-20, Depew June 3, Rome June 3, Batavia July 8, Elmira Sep. 29, Syracuse Oct. 13. Again this year at Dayton Hamvention, WNYDXA will have Hospitality Suite April 27-28 in Stouffville Suite 325. OO Reports: N2FHT. Appointments: (EC) KA2HYO Otsego County; (NM) N2EVS Western District Nets; (ORS) KA2AON. Many thanks to WB2OWO for excellent performance as Net Manager for more than five years of outstanding WDN performance. Thanks to K2VTT for past nine years as Otsego County EC. Here's to the idea of March, may we see improved courtesy in use of Band Plans...and may there be smarter spectrum usage in our future. Traffic (Dec.): W2MTA 640, NA2B 418, WB2OWO 415, NJ3V 373, K2YAI 327, WA2JF 309, K2CHJ 259, W2FR 252, WB2JLH 251, WB2MNA 242, N2EJA 240, ND2S 235, NN2H 142, KA2ZZN 136, KA2ZKM 128, KD2WP 106, WB2QIX 99, KA2QOO 96, WB2OEV 95, KB2EOQ 83, KA2UTI 82, W2UYE 82, WA2UJX 76, KA2SJG 59, AF2K 55, KA2DBD 50, N2EVS 46, K2G2 42, W2DNL 42, WB3CUF 28, N2DLN 18, KA2JXJ 10, W2PHQ 10, WA2OEP 4.

WESTERN PENNSYLVANIA: SM, John T. Fleming, N03M @ N03M—ASM/SGL: KA3OEM @ NM3G. SEC: WA3UFN @ WA76SO. STM: WA2QXA. BM: KC3ET @ KA3NVP. TC: N3EFN @ KA3AI. OOC: K3XV. ACC: AK3J.

NET	QNI	QTC	SESS	KZ	TD	MNQR
WPA ARPSC	249	134	31	3585	5:00PM	N03M
WPAACW	423	167	31	3585	7:00PM	WA3UNX
WPAFTN	180	85	22	7040	1:00P	WA3HLN
KFN	234	226	73	3958	5:00PM	N3EMD
PFN	518	128	31	14688	8:00PM	KA3BGC
WPA2MTN	254	101	27	14613	9:00PM	WA2ZSC

I am sorry to report the passing of KD3COO and W3YNE. Our thoughts and prayers are with their families and friends. I am happy to announce the appointment of WA2QXA as Section Traffic Manager. Ted can be found on both SSB and CW and will be accepting the Station Activity Reports for the Section. I am still looking for a Public Information Officer, but I hope by the time that you read this column that I will have filled the vacancy. A new Section net has been started on Sundays during the "school" season. The WPA ARPSC net is an opportunity for the Section appointees to meet and plan section activities. Congratulations to the new officers of the Port Venango Mike and Key Club, Pres. - NV3B, VP - N3GSC, Sec. - N3FPA, Treas. - N3HMB. At Chrm. - K3MHB and the Crawford Amateur Radio Society, Pres. - KA3OEM, VP - N3FKE, Sec. - K3TLP, Treas. - K3YAK, Dir. N3EFN and KB3EX. Groups from both Erie and Pittsburgh visited their local hospitals and gave the children there a chance to talk personally to "Santa." I would imagine that it was also done by other groups in the Section. Thank you for your time and dedi-

cation to helping these youngsters. We all know that mental attitude has a lot to do with health and recovery. Hopefully your small effort will help their recovery. Now that it is 1990, do you know that there will be no expiring ham licenses for 5 years? It was 5 years ago that the US went to 10 year time period. December traffic: N3EMD 576, W3OKN 540, N03M 310, N3FM 274, WA3UNX 159, N3AES 139, W3NGO 136, KA3OEM 119, WA3DBW 102, WA2QXA 83, KA3VBY 60, W3RUL 57, KC3YE 41, K3CHR 26, W3KUN 25, K3LTV 16, WA3QNT 12, KA3EGE 11.

CENTRAL DIVISION

ILLINOIS: SM, Dave Carlson, AA9D—SEC: W9QBH. BM: K9EUI. ACC: WB9SFT. STM: K9CNP. SGL: K9IDQ. TC: N9RF. OOC: W9TT. PIC: W9EWA. DEC: W9EBQ.

NET	FREQ	TIME
ISN	3905	1800 DAILY
ILN	3680	1830,2200 DAILY
ITN	3705	1900 DAILY
CTN	147.69/09	2100 DAILY
ILARES	3905	1630 1ST, 3RD SUNDAYS
ILLINOIS INDEPENDENT NETS		
IEN	3940	0900 SUNDAYS
ILPN	3855	1845M-F, 0830 SUNDAY
NCPN	3915	0700 M-SAT
NCPN	7270	1215 M-SAT

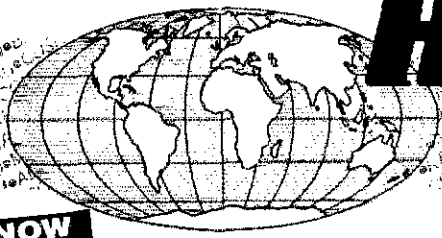
December was the month for club elections in Illinois. Congratulations to the following new/returning officers: Metro Amateur Radio Club - Pres., NE9H; V.P., N9HEL; Treas., W9FKC; Sec., W9LYA; Moultrie Amateur Radio Club - Pres., WA9OWY; V.P., W9LYN; Sec/Treas., WC9V; North Shore Radio Club - Pres., KB9ONU; V.P., N9CHQ; Sec., W8LVN; Treas., W9RS; Amateur Cross Link Repeater Association - Pres., W9FXP; V.P. KA9SUN; Sec., KA9VPK; Treas., N9JJA; Joliet Amateur Radio Society - Pres., W9IBH; V.P., AD9Y; Sec., W9BACQ; Treas., NC9T; Western Illinois Amateur Radio Club - Pres., NA9C; V.P., KA9WUR; Sec/Treas., N9IRT. The Chicago Traffic Net (CTN) recently ceased operation due to lack of participation. Thanks to KA9QXI and WB8RFB for managing the net, and to all those who checked in and/or handled traffic from CTN. Fox River Radio League members KE9GG, N9FWM, W9NJP, KB9CIN, and WA9TRG helped spread some Christmas cheer to children at local hospitals by letting them speak directly (more or less) to Santa Claus. Next year, its ATV and costumes. Traffic: KC9NP 265, W9HLX 254, W9HOT 227, W9LWH 211, W9D9CIR 190, WA9VLC 167, N9SF 151, W9HBI 151, K9QEW 97, W9HQW 72, W9STVD 72, W9K 65, N9DR 55, KA9TVU 51, WA9SLT 46, NC9T 45, KE9D 38, KA9CTW 36, W9JUM 15, WA9AXL 13, N3AIA 7, WA9URM 7, W9NLN 6, W9VEYM 6, @WB9MJN-BBS, 303, @N3AIA-BBS, 17.

INDIANA: SM, Bruce Woodward, W9UMH—SEC: WB9ZQE. STM: WA9OHX. ACC: NX9I. TC: WA9JWL. SGL: WA9VQO. BM: W9OCL. PIC: N9IPA. PM: WB9AHJ. NM's: ITN KA9EVI, QIN K9JL, ICN NR9K, VHF W9PMT, IWN KA9ERC. DECEMBER Net Reports:

NET	FREQ	TIME/DAILY/UTC	QNI	QTC	QTR	SES
ITN	3910	1330/2130/2300	2797	429	1997	70
QIN	3656	1430/0000/0300	438	258	1157	62
ICN	3705	2315	133	71	580	26
IWN	3910	1310	1500	338	31	
IWN VHF BLOOMINGTON			587	465	31	
IWN VHF KOKOMO			774	191	31	
IWN VHF LIGONIER			451	820	31	
HOOSIER VHF NETS (15)			3253	148	4697	167
D9RN for DECEMBER 362 QTC 62 SES						
by WA9OHX, K9ZLS, K9GBR, N9DWU, K9CGS, WB3HWU.						
CAND for DECEMBER 852 messages in 31 ses. D9RN 100%						
by K9ZLS, N9DWU, WA9OHX, SILENT KEYS: HARRY BUTLER W9FU INDIANAPOLIS AND LOY APPERSON, W9FWF KOKOMO. APPOINTMENTS: CHARLIE APPELSTADT, N9GWS EC FOR VANDERBURG COUNTY. NTS SERVICE AWARDS WERE PRESENTED THIS MONTH TO DON SMITH W9EPT, ALLEN RUTZ WA9GKA, BRIAN STRAUP N9CQ, BRUCE CLARK KA9OCC, RONALD POGUE KD9QB, MARY BOETCHER WA9UXP, AND JOHN HARTMAN N5AAA. EC REPORTS: W9N9, N9DTG, WA9OQT, WA9HEE, WB9NCE, W9CFI, KA9ZOR, KB9AVS, KA9KOG, W9EPT, N9FMO, N9GKQ, N9GXS, N9ADS, W9GKE, WB9ZQE, W9BAVQ, WB9RVN, AND KA9FDF. PACKET BBS REPORTS: WB9SYK 3090, KD9CB 1797, WA9UXP 2017, N9BAC 1875, N5AAA 1592, KA9OCC 2. Public Service Reports: Floyd County Harvest Homecoming Parade KA9DFC EC. N9FOZ reports 383 hours with 5 accidents, 6 traffic lights, 2 debris on road, 2 reckless drivers, 5 stalled cars, 2 weather nets, 1 RR crossing. Traffic: NR9K 590, N9DWU 257, K9JL 196, WA9OFC 142, W9ZGC 132, WA9OHX 113, W9UMH 105, K9GBR 103, N9BAC 103, WB9QPA 94, WA9UXP 84, N5AAA 65, W9PPO 62, KB9WB 49, K9ZLS 44, W9OCL 43, N9HZ 39, N9BS 33, W9EHI 30, WB9SYK 28, KD9CB 24, K9ZBM 21, NX9I 19, W9D9WD 18, KD9DU 16, K9FIE 15, W9PMT 14, W9HII 14, KD9DI 12, KW9C 12, N9DTG 11, W9CNE 8, KB9SU 8, WB9IHR 7, AB9A 7, WB9NCE 7, W9KMY 6, K9OUP 5, WA9JNC 4, W9DX 4, KB9GK 4, WA9OIZ 3, N9ZS 3, KA9ZOD 3, W9RTH 3, N9FMO 2, KA9OCC 2, W9DCIV 2, K9ML 2, W9OZJ 1.						

WISCONSIN: SM, Richard Regent, K9GDF—SEC: W9ZAG. STM: KC9CJ. ACC: KA9FOZ. BM: WB9JSW. OOC: NC9G. PIC: K9ZZ. TC: K9GDF. The Wisconsin QSO Party starts at noon on March 10th. Join the on-the-air fun, meet other Wisconsin amateurs and friends, give the Wisconsin QSO Party a try, and check information in QST Contest Corner or ask other amateurs for details. Milwaukee RAC exams on March 7th at

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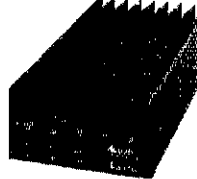
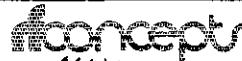
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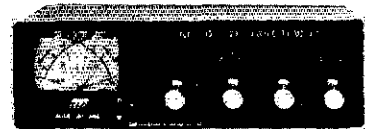
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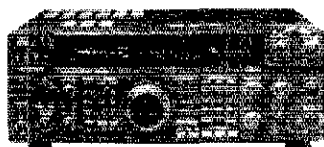
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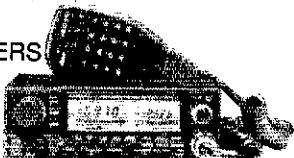
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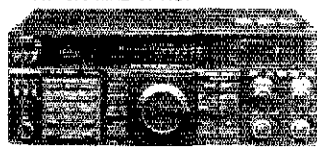


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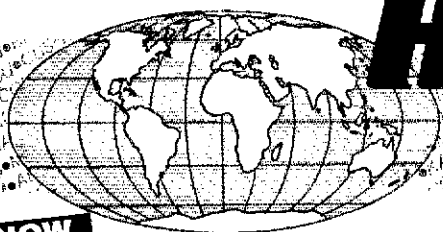
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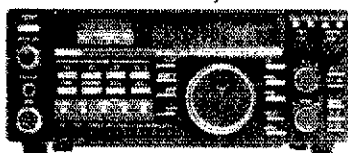
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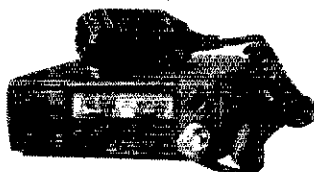
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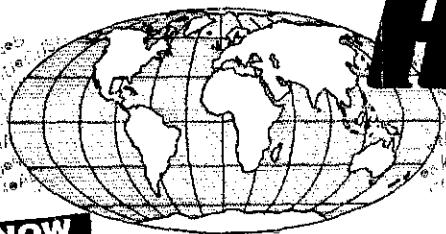
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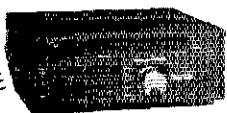
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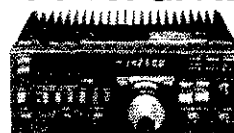
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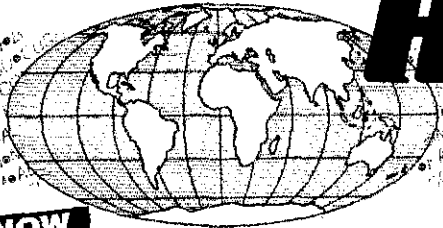


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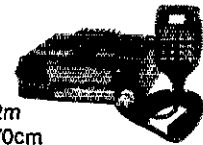
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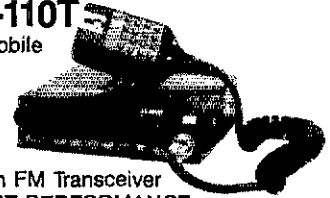
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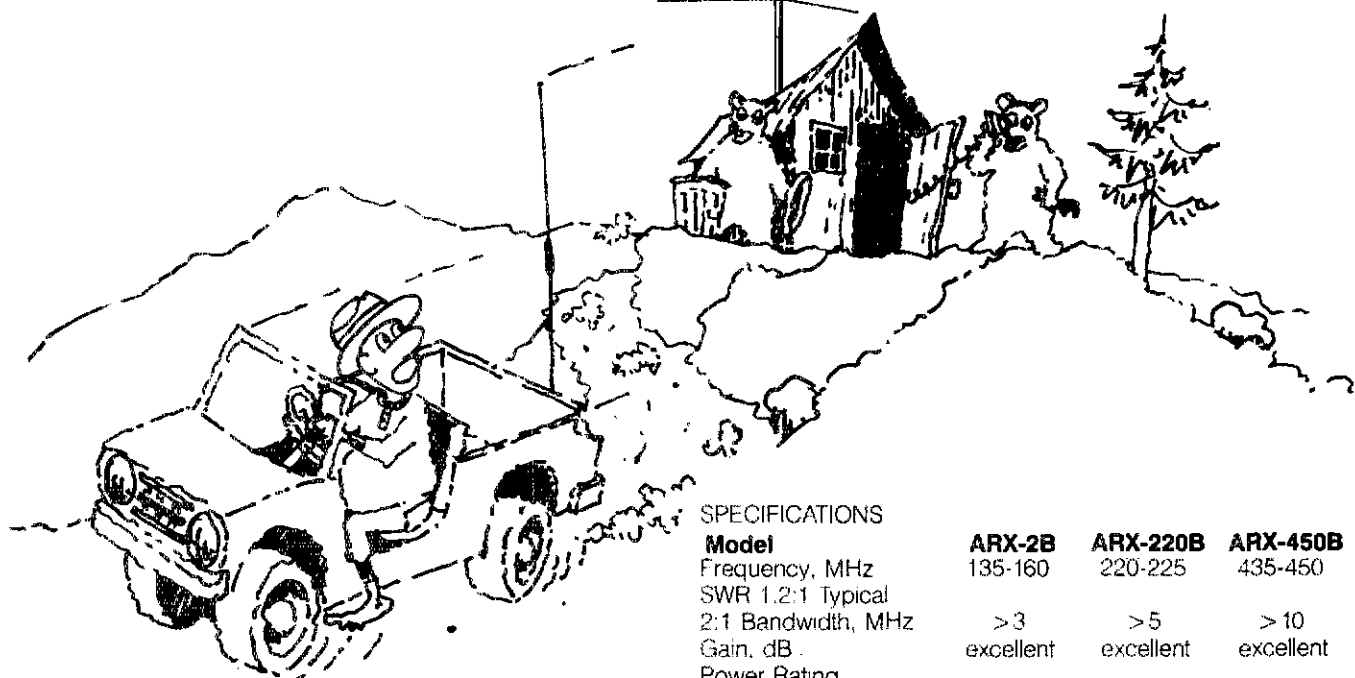
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2:1 Bandwidth, MHz			
Gain, dB	>3 excellent	>5 excellent	>10 excellent
Power Rating, Watts FM	1000	500	500
Radiation Angle, Deg.	7	7	7
Horizontal Radiation Pattern, Deg.	360	360	360
Height, ft. (m)	14 (4.3)	9.3 (2.8)	4.9 (1.5)
Weight, lbs. (kg)	6 (2.7)	5 (2.3)	1 (.45)



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MA-40	40'	21'6"	2	242	3" sq.	4 1/2"	\$ 809.00
MA-550	55'	22'1"	3	435	3" sq.	6"	\$1389.00
MA-550MDP*	55'	22'1"	3	620	3" sq.	6"	\$2909.00
MA-770	71'	22'10"	4	545	3" sq.	8"	\$2509.00
MA-770MDP*	71'	22'10"	4	830	3" sq.	8"	\$3969.00
MA-850MDP*	85'	23'6"	5	1128	3" sq.	10"	\$5349.00

*MDP models complete with heavy-duty motor drive with positive pull down.

FREE STANDING CRANK-UP TOWERS

Will handle 18 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
TX-438	38'	21'6"	2	355	12 1/2"	15"	\$1019.00
TX-455	55'	22'	3	670	12 1/2"	18"	\$1539.00
TX-472	72'	22'8"	4	1040	12 1/2"	21 1/2"	\$2529.00
TX-472MDP**	72'	22'8"	4	1210	12 1/2"	21 1/2"	\$4069.00
TX-489	89'	23'4"	5	1590	12 1/2"	25 1/2"	\$4399.00
TX-489MDPL*	89'	23'4"	5	1800	12 1/2"	25 1/2"	\$6599.00

*TX-472MDP includes heavy-duty motor drive with positive pull down. TX-489MDPL comes with heavy-duty motor drive with dual level wind and positive pull down. (Both motor drive models include limit switch brackets).

FREE STANDING HEAVY-DUTY CRANK-UP TOWERS.

Will handle 30 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
HDX-538	38'	21'6"	2	600	15"	18"	\$1319.00
HDX-555	55'	22'	3	670	15"	21 1/2"	\$2309.00
HDX-572	72'	22'8"	4	1420	15"	25 1/2"	\$3959.00
HDX-572MDPL*	72'	22'8"	4	1600	15"	25 1/2"	\$6049.00
HDX-589MDPL*	89'	23'8"	5	2440	15"	30 1/2"	\$7919.00

*Includes heavy-duty motor drives with dual level wind and positive pull down.

HDX-572MDPL includes limit switch brackets only. HDX-589MDPL includes limit switches and limit switch brackets.

FREE STANDING "LOW PROFILE" COMPACT CRANK-UP TOWERS.

Will handle 18 sq. ft. antennas at 50 MPH winds. (TMM-433HD handles 24 sq. ft.)

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
TMM-433SS*	33'	11'4"	4	315	10"	18"	\$1089.00
TMM-433HD*	33'	11'4"	4	400	12 1/2"	20 1/2"	\$1319.00
TMM-541SS*	41'	12'	5	430	10"	20 1/2"	\$1429.00

*Hy-Gain and some Alliance rotors when installed inside tower will restrict retracted height by approx. 24". Most Kenpro models allow full retraction.

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Prices are FOB, factory, Visalia, CA. Prices and specifications are subject to change without notice.

7:00 P.M. in Wauwatosa East High School, reservations with W9JK. Wisconsin Nets Association meeting is March 10th, details from Chairman WA9W. Badger Examiners exams March 17th at St. Nicholas Parish in Milwaukee, info from W9IM. Walk-in exams March 31st at Credit Union Building in Menomonie, info W9FI. Section Traffic Manager, KC9CJ, who presented 50-year ARRL affiliation award to Green Bay Mike and Key Club, says "Impressive club with commitment and enthusiasm, they made me feel welcome there." N9BDL of Lake Tomahawk, extremely busy traffic handler during last year, checked into 1,947 various nets and was net control station an astounding 443 times! The West Allis RAC has a net every Tuesday when there is no club meeting, at 8:00 P.M. on 145.17 MHz. Sorry to report Silent Keys Dr. Henry Twelmeier, KA9PCB of Wauwatosa and Phil Laeser, W9ECL, retired from WTMJ. The Northeast Wisconsin Radio League has new officers: Pres. WF9H; V. Pres. KB9ALN; Sec. 7 Treas. N9BPO, meets first Wednesdays at 790 Packer Drive in Green Bay, and holds a net Tuesdays on 147.27 MHz. Thought of the month: No matter what goes wrong, there is always somebody who knew it would. Traffic: WB97PY 2380, KC9CJ 1071, WG9J 576, WA9W 542, W9CBE 420, W9KLN 372, W9YCV 292, K9GDF 167, N9BDL 162, KA9KLZ 130, KA9BHL 106, W9UCL 103, KA9FVX 99, AG9G 92, KE9LX 73, K9AKG 83, W9NGP 54, N9BCX 52, K9FH1 51, N99Q 45, W9AIC 42, K9EP 40, K9UTQ 35, KA9VIA 27, K9KSA 18, K9ANV 17, W9ODV 17, W9UW 10, K9BED 4, W9PVD 4.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, KC8T—December wound up a good year for MSN. For December we set a new high of 30 stations reporting SARs. That's great! Keep it up and I know there could be more too. The total traffic handled for the month was a whopping 8,207! And, on top of that, our Ombudsman, Mel, N8FOO, predicts that our Indian winter will continue. I don't know if he's right or not. But, a consumer Up-date from the Wall Street Journal says that February will see maximum levels of Solar flares and Solar storms which may disrupt telephone communications and possibly power distribution systems. They didn't say anything about NTS and traffic handling. It might turn out to be a month where we will be involved in high levels of futility if such things do come to pass. In the meantime we will enjoy our current successes. That's it for this time Gang. Until next time, 73 es GL. Jim Swisher KF8FI, STM.

NET	FREQ	TIME	QTH/OTC/SESS	NET MGR.
MSN1	3685	8:30P	307/24/31	KD8NH
MSN2	3685	10:00P	284/103/31	K8QBE
MSN**	3710	6:00P	416/51/31	KA8BY
MSPN	3680	12:05P	382/211/27	WA8TFC
MSPNE	3680	5:30P	1038/384/31	KC8T
PAW	3629	9:00A	3673/339/119	WD8BAC
MAW	3680	6:00P	322/189/21	KD8CI

**MSSN additionally sent 42 training messages. Alt. Freqs. MSN1 and MSN2 - 7070; MSPN - 7232. Traffic: KA8ARP 5342, WA8TFC 473, W8GRW 386, KF8FI 381, N8FOO 204, KA8PDM 173, W9DM 167, WD8GUF 110, KT9I 104, NK8HH 97, KD8NH 88, NR8S 81, KA8BY 74, WA8ONE 69, KD8CI 57, KD8GI 57, NA8JV 55, N8FG 53, NJ8P 45, KC8T 35, KA8VQN 35, NK8CM 29, KA8CDO 21, N8GNN 18, K8WPK 15, KB8RW 14, N8FKU 9, W8KYG 7, KA8JF 5, KA8FPM 3.

NORTH DAKOTA: SM, Bill Kurtli, W8CM—Peace Garden Hamfest coming up in July 6-8 good weekend of camping in the Turtle Mts. I had the pleasure of being at the planning meeting in Minot with the Dickinson Devils Lake and Canadian 1990 Committee & you can bet they have one Whopper coming up. Dakota Division Convention in Fargo Sept 28-30, 1990. Your SM has been on the disabled list for the last week with a broken down foot but I am trying to make the best of it by reorganizing my shack, doing paperwork etc. Maybe I will even have time to learn how to use a data base program. Congratulations to WD8DAF on getting his Extra, WB8AWF & KB8DYA for General and N8KOF for his new call and Technician License. Devils Lake area Hams had a busy year again providing Communications for the Fishing Tournament. Dog sled races, several SKYWARN sessions & a hamfest. Good work fellows. We all wish W8ZQJ a speedy recovery from a slipped disk operation, also a belated congratulations to WB8VHW & xyl on their 1st child. Traffic: KA8FPM 303.

NET	FREQ	TIME	SESSION/OTC	MGR
Goose River	1895 kHz	9 AM Sun	58/1/1	NT8V
DATA	3841 kHz	6:30 Da	29/758/49	N8UJR
WX NETS	3941 kHz		58/504/54	W8GFE

Storm Net 3941 9 am 12:30 am, Monday to Sunday W8CM

As needed during storms only

SOUTH DAKOTA: SM, R. L. Cory, W8WYM—ASST. SM: WA8PPR, N8ABE. SEC: KA8PY, STM: KD8YL. South Dakota hams will have two Ham Conventions to go to this next summer with the first at Hot Springs in Aug 17 and 18 and there will be a Dakota Division Convention in Fargo on Sept 28-30 with more details to follow as they become available. KD8YL reports a upward trend for December with checks on the Novice net. Burghardt Amateur Center has been honored for their contributions to the S. Dak. Centennial Wagon train last summer. Lark Club at Watertown is conducting Novice classes. Charlie Rodgers W8QQN Zero District QSL manager said negotiations are under way to possibly move the bureau from Omaha to Kansas City as he would like to retire from it after 10 years of service. Our thanks to Charlie for an excellent job. Total Traffic reported for December was 700.

DELTA DIVISION

ARKANSAS: SM, Bob Harmon, W5SEP—CAREN 1990 officers are: Pres. Richard Brownlee, KA8VY, VP. Bob Hancock, KD5DB, Secy-Elmer Langston NS0CG, Treas-Wayne Mahner, WA5LUY. Congratulations to Russellville Radio Club for introducing amateur radio to over 100 4th-grade students. Our Arkansas ARRL affiliated clubs now number 17 with 840 members. HELP-would all present ARES members please drop me a line to be included in database. HogNet Packet Radio Association and other packet operators have built and installed a secondary network on 146.810 linking Little Rock and Fayetteville. Purpose is primarily to move BBS traffic between Little Rock, Ft. Smith, and Fayetteville, and get it off 145.01. Both ends have dual-port Netrom or Thetnet nodes on 145.61 and 145.01. Little Rock aliases are LI701 (.01) and HOG (.61). Fayetteville aliases are ARHOG (.01) and HOG (.61). These changes have done much to relieve congestion on 145.01. For more information, contact Chuck KA5BML.

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PS-35 Internal power supply..... 219.00 199⁹⁵
FL-63A 250 Hz CW filter (1st IF).... 59.00
FL-52A 500 Hz CW filter (2nd IF).... 115.00 109⁹⁵
FL-53A 250 Hz CW filter (2nd IF).... 115.00 109⁹⁵
FL-70 2.8 kHz wide SSB filter..... 59.00
RC-10 External frequency controller 49.00



IC-735 HF transceiver/SW rcvr/mic.... 1149.00 999⁹⁵
PS-55 External power supply..... 219.00 199⁹⁵
AT-150 Auto. antenna tuner (Special) 445.00 369⁹⁵
FL-32A 500 Hz CW filter..... 69.00
EX-243 Electronic keyer unit..... 64.50
UT-30 Tone encoder..... 18.50

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IC-726 10-band xcvr/6m/5-30MHz rx 1299.00 1129

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IC-2KL HF solid state amp w/ps..... 1999.00 1699

IC-4KL HF 1KW out s/s amp w/ps..... 6995.00 5995

EX-627 HF auto. ant. selector (Special) 315.00 269⁹⁵

PS-15 20A external power supply..... 175.00 159⁹⁵

PS-30 Systems p/s w/cord, 6-pin plug 349.00 319⁹⁵

MB Mobile mount, 735/751A/761A.... 25.99

SP-3 External speaker..... 65.00

SP-7 Small external speaker..... 51.99

CR-64 High stab. ref. xtal; 751A, etc.... 79.00

PP-1 Speaker/patch..... 179.00 164⁹⁵

SM-6 Desk microphone..... 47.95

SM-8 Desk mic - two cables, Scan..... 89.00

AT-100 100W 8-band auto. ant. tuner... 445.00 389⁹⁵

AT-500 500W 9-band auto. ant. tuner... 589.00 519⁹⁵

AH-2 8-band tuner w/mount & whip... 758.00 689⁹⁵

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IC-375A 25w 220 FM/SSB... (Closeout)	1399.00	799 ⁹⁵
IC-475A 25w 440 FM/SSB/CW w/ps	1399.00	1199
IC-475H 100w 440 FM/SSB/CW.....	1599.00	1369
IC-575A 25w 6/10m xcvr/ps (Special)	1399.00	1129
IC-575H 25w 100w 6/10m xcvr.....	1699.00	1469

VHF/UHF/1.2GHz mobiles	Regular	SALE
IC-28A 25w 2m FM, TTP mic (Closeout)	469.00	379 ⁹⁵
IC-28H 45w 2m FM, TTP mic... (Special)	499.00	389 ⁹⁵
HM-14 Extra TTP microphone.....		59.00
UT-28 Digital code squelch.....		39.50
UT-29 Tone squelch decoder.....		39.50
HM-16 Speaker/microphone.....		34.00



IC-228A 25w 2m FM/TTP mic (Special)	509.00	379 ⁹⁵
IC-228H 45w 2m FM/TTP scan (Special)	539.00	429 ⁹⁵
IC-448A 25w 440 FM/TTP mic.....	599.00	519 ⁹⁵
UT-40 Pocket beep function.....		45.00
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UX-59A 6m, 10w band unit.....	349.00	319 ⁹⁵
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IC-2500A 35w, 440/1.2GHz FM mobile	999.00	869 ⁹⁵
IC-3210A 25w, 2m/440... (Closeout)	739.00	499 ⁹⁵
IC-2400A 45w 2m/35w 440 FM/TTP	899.00	789 ⁹⁵

AH-32 2m/440 Dual Band mobile ant 39.00

AHB-32 Trunk-lip mount..... 35.00

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RP-1510 2m 25w repeater..... 1849.00 1649



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IC-2SA 2m HT.....	419.00	369 ⁹⁵
IC-2SAT 2m HT/TTP...	439.00	389 ⁹⁵
IC-3SAT 220 HT/TTP	449.00	399 ⁹⁵
IC-4SAT 440 HT/TTP	449.00	399 ⁹⁵
IC-2GAT 2m HT/TTP	429.00	379 ⁹⁵
IC-4GAT 440MHz, TTP	449.00	389 ⁹⁵
Special ..		
IC-32AT 2m/440 HT	629.00	539 ⁹⁵

IC-12AT 1.2GHz FM HT/TTP... (Closeout)	473.00	349 ⁹⁵
IC-12GAT 1w 1.2GHz HT/batt/cgr/TTP	529.00	469 ⁹⁵

Aircraft band handhelds Regular SALE

A-2 5W PEP synth, aircraft HT..... 525.00 479⁹⁵

A-20 Synth. aircraft HT w/VOR..... 625.00 549⁹⁵

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Accessories for IC and IC-O series Regular

BP-2 425mah/7.2V Nicad Pak - use BC35.... 49.00

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BP-5 425mah/10.8V Nicad Pak - use BC35 65.00

DC-1 DC operation pak for standard models 24.50

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Icom BP-7 (500ma) \$29.50
Icom BP-8 \$29.50

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—ASM: K5ECX, ACC: K5KR, SGL: K5SSL, TC: W5RWF, OOC: W54ICV. Packet: W5ASD, STM: W54FDT. The new leaders of the Baton Rouge ARC are: Pres: Herb Ramey: K5SAQ, VP: Pat Patterson, W5ATZU, Sec: Bo Smith, K5GKN & Treas: Tom Stevens-N5ADP. Don't forget to mark your calendar for the Lafayette Hamfest on March 10 & 11. It will be held again in the Holiday Inn Holiday located on US 187 just off Interstate 10. It's always a top notch hamfest with plenty of forums, swap tables and dealers. I hope you will join me at the ARRL Forum for a discussion of emergency communications in Louisiana. Recent ARRL Leadership appointments in Louisiana are: James Childress-W5SRKD as District Emergency Coordinator for Orleans, Jefferson, St. Bernard, St. Tammany, Plaquemine and St. Charles Parishes, Jack Boudreaux, N5OKV as Emergency Coordinator for St. Mary Parish. Interest in emergency communications is growing in Louisiana but much more help is needed to attain an effective network. Recently elected officers in the Southeast La ARC (SEARC) in Hammond are: Pres: Don McEwan, W1DK, VP: Bob Prie, W5FBS, Secty: Bob Mixon, K5GSW & Treas: Ernie Bush, N5NIB. National Traffic System message handlers in La are doing a first-class performance. DRN-5 for Dec 89, 998 msg in 62 sessions with La represented 82% by K5WOD, W54FDT, N5CNK, N5LRZ, K5FVV, W5SWBZ & K5APOL. CAND for Dec 89, 1267 msg in 31 sessions. DRN-5 100% by K5WOD.

MISSISSIPPI: SM, Butch Magee, K5DE-ASM: Mark Henry, W5GHW, STM: Jim Leist, K5WV, SEC: Bill Fryer, N5DVR, SGL: Richard Redd, K5WVX, BM: Bill Gearhiser, W5EPW. The Mississippi Section had an exciting month of November and December with exercises going on right and left. Nothing got into print to speak of because my lines were cut so much in QST. Big issues for Jan. and Feb. I hope this one makes it in total. SE Lounds county participated this month in a search for an elderly lady who just walked off and disappeared. The woman was not found, but the following stations aided law enforcement with the search: Scott K5SGOU, Steve N9CFV, Bob W54CZV, Chuck K54ECY (removed his repeater to the site), NM5D Wayne, N5NXY Lynn, N5FFE Larry, N5FFA Keith, N5LOC Steve, N5MPC Andy and N5NUE Nancy. Many thanks for the effort to all. The Mississippi Section SET report will go in this month (31 Jan) and by all appearances we will show a good score year, exceeding past performances. Good Show! We have a new DEC, Joe Wood AJ8X and a new EC, Steve Earnest W5VD. Both of these men are members of the Laurel ARC. This fine group has really done a great job in community and emergency service assistance. We salute you. Yours truly finally got into packet this month. Jim, W5HTV and Bill, W5SXX came to my rescue. I think the problem was in the cockpit all along. Ya hear me? Thank you both for the help and thanks to the traffic handlers and the net managers for the following GREAT reports. Traffic: W5OXA 15, K5F5MQ 72, N5SM 263, W5DEJ 43, K5T5Z 97, K5SW 665, W5JDF 253, N5OBF (NEW STN, BRIAN).

TENNESSEE: SM, Harry Simpson, W4M1—Eastern Assistant Section Manager and Public Information Officer is W4TYU, Western Assistant Section Manager and Affiliated Club Coordinator is K4CXY, New Section Traffic Manager is W4LAL like Musselman, replacing NG4J Anita Teffeller, who has served us long and well, but finds herself short of time during a career transition period. Anita deserves our sincere thanks for her efforts, and she will be back! Section Emergency Coordinator is K4UVH, Official Observer Coordinator is K4LSP, Technical Coordinator is W4HHK, The Morning TN Phone Net Manager is W4GZZ Milton Fanning, replacing long-time hard-working W4PFP John Fite who wanted to take a rest. The net is on 3980 kHz with early sessions at 6:40 AM Eastern, regular sessions at 7:45 AM Eastern Monday thru Friday, at 9 AM Eastern on Saturdays, Sundays and Holidays. Evening TN Phone Net Manager is W4HKU Wyfodean England and sessions are Monday thru Saturday at 8:30 PM Central. CW Net Sessions are on 3635 kHz at 7 PM Central, Monday thru Friday. W4LAL has not yet appointed a new CW Net Manager and is still acting as same. Other changes will be announced as they occur. I am sorry to announce the passing of W4HDP Ray Evans of Rockford and K4VFC James R. Marshall of Shelbyville, and N4TV, Chester Brent, of Oak Ridge. Traffic-wise, CAND Manager K5CPN reports 31 sessions, 1267 messages, with K4WWQ representing DRN5 at ALL sessions. That's not all - DRN5 Manager W5YDD reports 62 sessions with 998 messages and TN represented by K4WWQ at 81% of the sessions! Congratulations to Harmon from all of us. Other Net reports:

NET

NET	Sess	Checks	Traffic
TN Morning	31	2084	69
TN Evening	29	2084	92
TN CW	22	145	52
W TN WX	31	993	483
Maury Co. 2-mtr	30	334	8

Traffic: W4DDK 154, K4WWQ 142, W4FMR 135 (and BPL), K4WOP 81, W4GZZ 63, W4TYV 59, W4LAL 58, K5KDB 52, W4M1 36, W4MRD 26, W4PFP 25, W4HKU 22, K4UWW 7, W4PSN 6.

GREAT LAKES DIVISION

KENTUCKY: SM, John Thomas, W4MT—Asst. SM: K44WN, SEC: W44NHQ, STM: K44MTX, (Dec) KY Colonels ARC is having a hamfest on April 14th. An ARRL Forum is planned. Traffic totals for the various nets are up due to holiday traffic. Our new Director and Vice Director have begun publication of a division newsletter for use by all club editors. If your club would like to get on the mailing list, let your director know. His address is on page 8 of any QST. NKARC Ham-O-Rama is June 10th.

MAKPEN 1722 171 31 W44RWU
KTN 1178 114 31 K44FRA
KYN (Both) 367 143 82 K44VX/K28Q
TSTMN 438 27 31 K28Q
KNTN 216 72 41 K44UJA
KRN 493 19 1 K44NLY
SAR (Dec): W44RWU 125, K4VHF 122, K44UJA 101, K44WN 69, W44GQ 43, K44VX 41, K44MTX 30, N44AF 19, W44ZDU 18, W44AUN 15, W44HLW 14, N44PEK 14, K44OH 13, W44PB 19, W44EBN 8, W44CQF 4, K44A 3, PSHR: K44MTX 74, K44OH 70.

MICHIGAN: SM, George E. Race—W88BGY (@N8FTY)—ASM: W41LRL (@W41LRL), STM: W88KQC (@N8TR), SEC: K44CQF, (@N8JAT) SGL: N8CNY, TC: W8YZ, OOC: W42AJQ, ACC: N8JVA, PIO: N8KBA. From our SEC: K44CQF comes the

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FL6/100	100	55 MHz	63 MHz	50 db	6 meter	\$34.50*

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Built-in adjustable ALC circuit keeps your exciter from overdriving your AL-80A. The result? A clean signal without flat-topping.

A standby switch prevents harmful thermal shock to your 3-500Z filaments by keeping them lighted when you're operating barefoot.

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The guts of the AL-80A is its heavy

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A husky 22 pound power transformer using a high silicone steel core, computer grade filter capacitors totaling 26 ufd, heavy duty bleeders and ten 3 amp, 1000 V power rectifiers give a stiff 2700 volts fully loaded.

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The AL-80A special Step-Start Inrush

picture of the operating condition of your AL-80A. They let you know right away if there is a problem.

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The Multi-Voltage Primary in the AL-80A transformer lets you compensate for too high or too low line voltage.

With the AL-80A you get the longest component life and peak operating efficiency -- regardless of your line voltage.

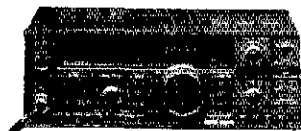
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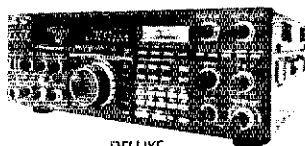
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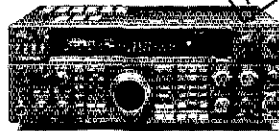
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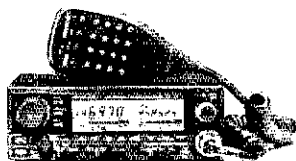
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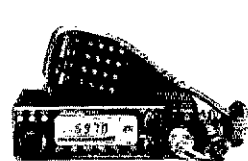
TH 225A



TH 25AT



TM 231A



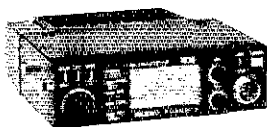
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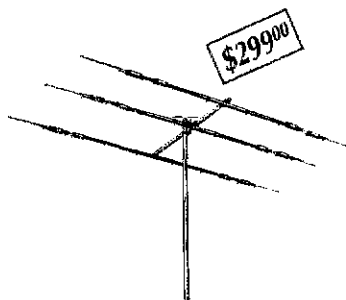
FT 212 RH



FT 747 GX

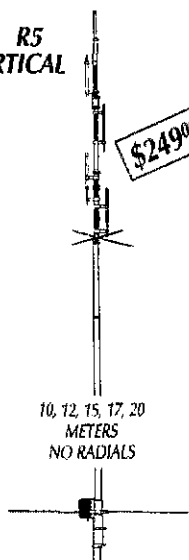


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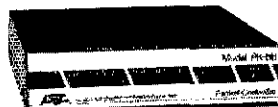
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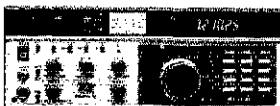


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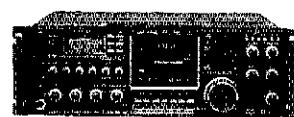
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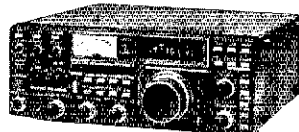
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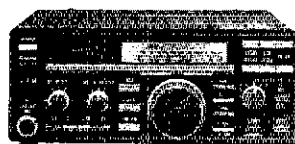
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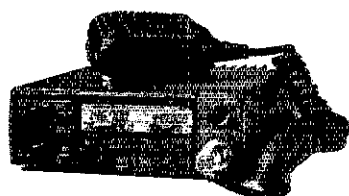
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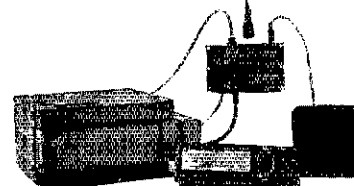


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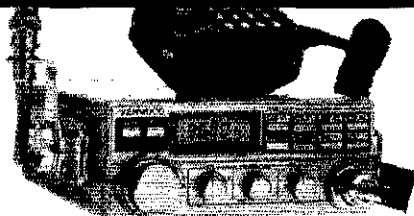
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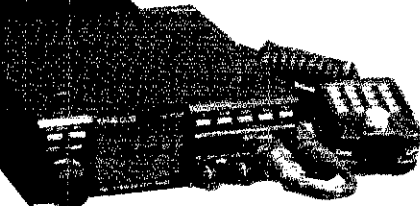
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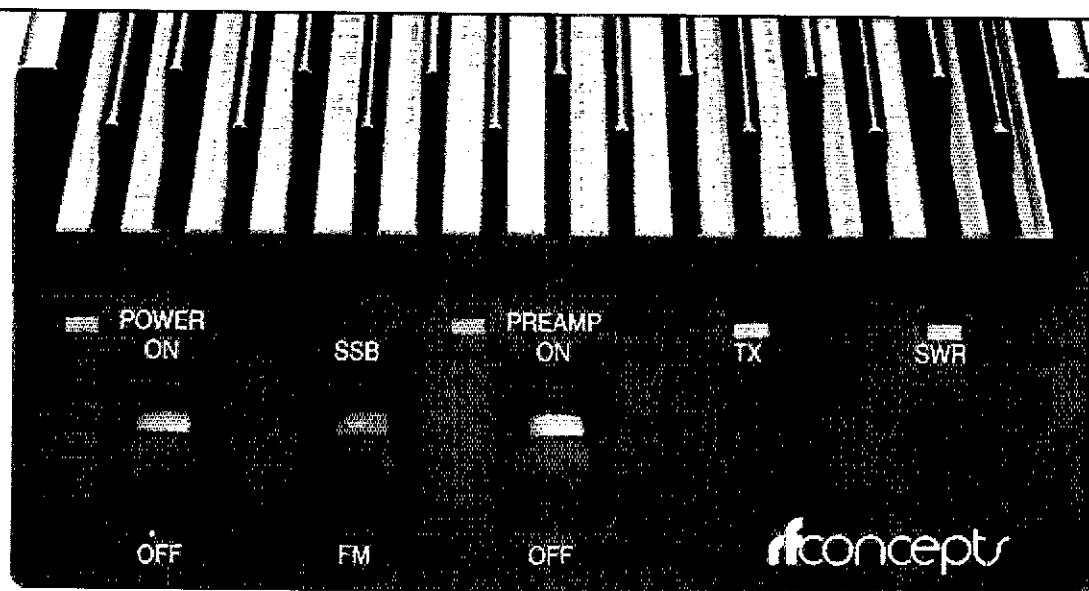
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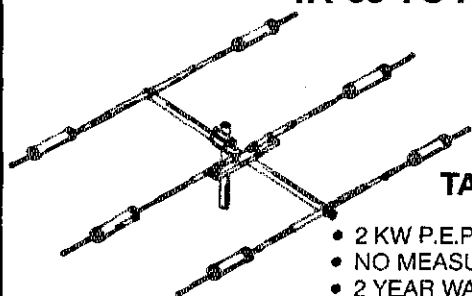
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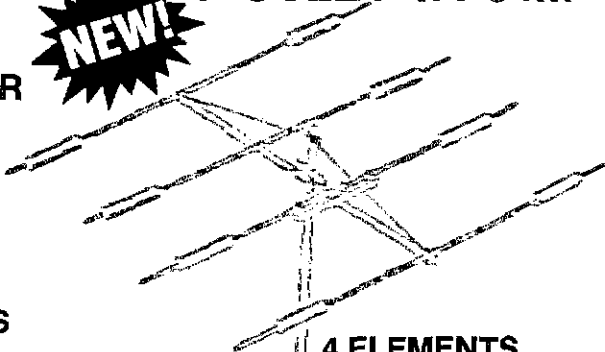


TA33/34 FEATURES

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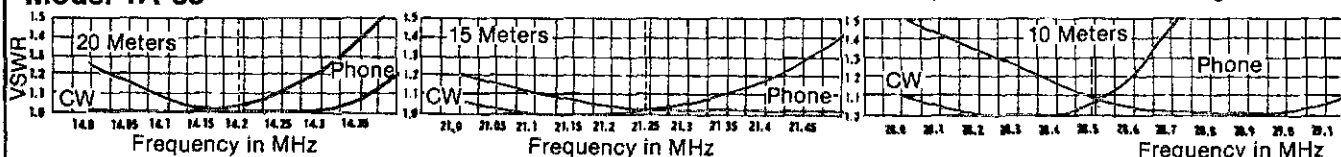
4 ELEMENTS ALL ACTIVE ON 10/15/20 Specifications:

Boom:	21'
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Sq. Ft.:	6.9
Windload:	164 lbs.
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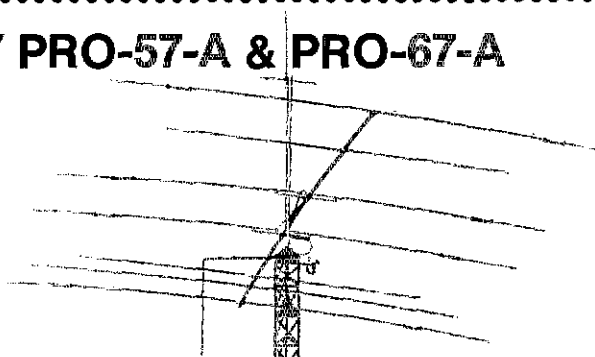
TA-34-XL uses a 2" heavy duty boom. Heavy duty hardware. No strut. Performance and specification the same. XL total weight 65 lbs.

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Model TA-33



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N8CW 5, KA8VYT 5, WA8RLB 5, KB8DUX 3, WA8NZE 3, N8HPU 3, KB8FYB 3, KA8VIT 2 (Nov.) KB8FSR 47, K8ES 14, W8QZK 2, W8XT 2, W8DCSP 1.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—STMASB: K2ZM, SG: WA2YM, ACC: KV2A, SGL: KB2HQ, BM: WB2XIB, PK: KB2TM, COC: N2DVC, ATC: WA2VGM, ASM/PACKET: N2TR, ASM/NWSLT: WB2NHC, NET REPORTS FOR DECEMBER: 1989 (CHECKING/TRAFFIC PASSED): CDN 65/112, ESS 453/157, HVN 321/105, KYP 175/140, NYPON 628/299, NYSE 428/283, NYSL 368/229, NYSM 312/190, SDN 292/137, CLUB NEWS: Albany ARA's K2C(hristmas), (reel) and N1C(hristmas) (card) operation netted 1000+ QSO's. They held a K2VY QLF contest in January. Saratoga RACES held a meeting with Northern Dist. RACES at their EOC in Glens Falls. Schenectady ARA had a presentation by Mark Klein of Tektronix on modern test equipment. They congratulate N2SB and WB2KHH upgrades and new member W1HJ, WA2GYH and his crew have done an outstanding job at HVCC graduating 75 new hams within the past four years. Congrats Bob. Some of you send me your monthly newsletters. Each one is excellent. I read each one and attempt to extract info for this column from each of them. All those editors are to be commended for an excellent job! With the new desktop publishing programs for computers, the job is certainly a bit easier but it still requires time, effort and input from the club officers and members. A newsletter helps to keep those who cannot attend the meetings aware of club activities and what they missed. And offer your editor a hand! If your club does not have a newsletter, try to find someone to start one. If you need some help, give me a call. Perhaps I can offer some suggestions. Good luck! And keep those newsletters coming! DEC. PSRR: N5MEA WB2VUK WE2G K2ZVI KB2EPU WB1BTJ N2JBA, Dec. Traffic: N5MEA 329, K2LYE 197, WB2VUK 175, K2ZVI 142, WB2IV 132, WA2JSO 108, WA2YBM 82, KB2EPU 68, WA2GYH 53, WE2G 40, K2ZM 40, W2DK 38, WB1BTJ 30, W2FM 30, N2FTR 20, N2JBA 17, K2HNW 7.

NEW YORK CITY-LONG ISLAND: SM, Walter M. Wenzel, KA2RGI—ASM: N2GGR, ACC/PIO: KA2LC, SEC: WA2UJ, STM: K2MT, COC: N2BT, TC: W2QVU, BM: W2JUK. The following are traffic nets in and around the section that handle NL:

NET	FREQ	TIME	DAY	MGR
BAVHF	146.350/R	2000	DLY	K2TWZ
NCVHF	146.745/R	1930	M-F	N2IMP
NCVHF	146.805/R	1930	S-SU	N2IMP
SCVHF	145.370/R	2000	SU-F	KA2JMA
NYP	3.925 MHz	1900	DLY	W2MTA
NYPON	3.913 MHz	1700	DLY	KA2UBD
NYSM	3.677 MHz	1000	OLY	N2EIA
NYSIE	3.677 MHz	1900	DLY	N5MEA
NYSIL	3.677 MHz	2200	DLY	W2YGV
NLT	28.450 MHz	2100	WED	N2IMP
ESS*	3.580 MHz	1800	DLY	W2WSS

*Independent Net, recognized by NTS, local times.

*** PACKET NODE STATIONS ***

A12Q 4-Freeport 145.010 Nassau, W. Suffolk W2HPM 4-Farmingville 144.970 Central Suffolk NR2L 4-Water Mill 145.090 Eastern Suffolk WB2IBO 4-Massapequa 145.030 Backup for A12Q 4 VE LISTINGS: LIMAARC - second Saturday of each month at 9:30 AM at Baiten Hall, NY Institute of Technology, Old Westbury - contact Al Jones, W2ZDB 516-876-6790 SUFFOLK COUNTY VE TEAM - second Saturday of each month at 9:30 AM at the Suffolk County Community College, Islip Arts Bldg., Selden, NY - contact George Sintchek, WA2VNV 516-751-0894; GRUMMAN ARC - second Tues. of each month, at 5:00 PM at the Grumman Rec. Center, Bldg. 800, South Oyster Bay Road, Hicksville, NY - contact Howard Liebman, W2QVU 516-354-6881; GREAT SOUTH BAY ARC - fourth Sunday each month at 12 Noon at the Babylon Town Hall Office Annex, 281 Phelps Lane, North Babylon, NY - contact Walter Wenzel, KA2RGI 516-857-5728; If your group holds regularly scheduled license exam sessions and/or classes let me know so they can be added to this listing. With the spring approaching we are all thinking about the warmer weather to repair those winter problems to our radio systems. If you have an event, hamfest, classes or other happening please let me know of it about two months in advance so I can get it into the column here. If there is anyone out there that is interested in assisted on a section RFI/TFI committee please contact me for more information. The section is also looking for people who are avid and experienced DFers. I am also looking for any persons who are active in emergency relief communications and are not part of the NY/C/LI Section Relief operations. Please contact me if you are able to assist in any of these areas or if you would like any more information.

NORTHERN NEW JERSEY: SM, Rich Mosseson, NW2L—AKDETH, ASM's: KA2F/Hecurment (Vacant)/Youth Pgm. N2IGQ/Vol. Counsel NW2S/NW KY2S/SE KC2ZA/SW, ACC: WA2QYX, BM: K2ULR, CO/AAC: KA2BZS, PIO: NW2L, SEC: WB2HBZ, SGL: W2KBS, STM: K2VX, TC: W2VY, HAM RADIO INFO LINE: 201-680-1585. Welcome to new ASM Frank Terranella, N2IGQ, who will be a central resource for information on Volunteer Counselors and ammunition for battling unjust laws & reg. W2VY is new Technical Coordinator, leaving a vacancy in the ASM/Youth sch. If you're interested and involved in some way with youth &/or education, please let me know. Tnx KA9Q for taking on the TC job last year. My friend & colleague, W2SBOR, just gave me a "surplus" 10-m FM rig... getting me excited about the prospect of trying something new in ham radio. This is my 20th year as a ham, but the excitement never fades, and there's still plenty out there I haven't tried. I'll bet the same goes for you, too, whether you're a brand new Novice or an old-old-timer. Why not make a "new decade" resolution to try something new this year? Better yet, introduce someone else to something new. Share the excitement! Some starting points: an active ATV group in Bayonne, a 10m repeater group in Sussex Co.; perhaps someone in your club who's into something different. Try a "ham specialty night" and see what you can learn...and teach. Don't belong to a club? Call me for the name of one nearby or for help in starting your own. Reminder: 7-8-90... the sequential date of the century AND the date of the 1990 ARRL Hudson Division Convention, at NY Inst. of Technology in Old Westbury, NY. Don't miss it! Additional Field Organization appointments: OBS: W2QF, ORS: WB2GJE, OES: K2GQ, PIA: WB2JGZ, all from IRAC. Welcome. Congrats to all traffic handlers for a great December - 18 stations report passing

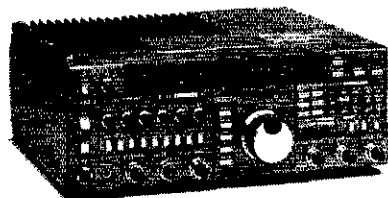


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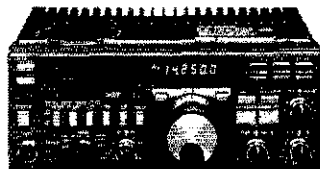
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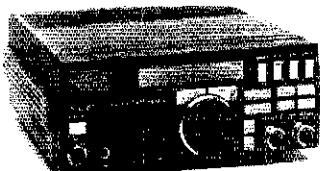
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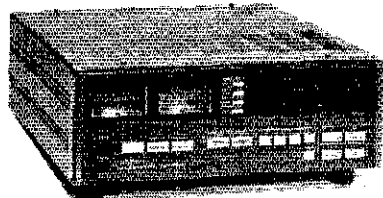
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FRB-757 External relay box	14.00
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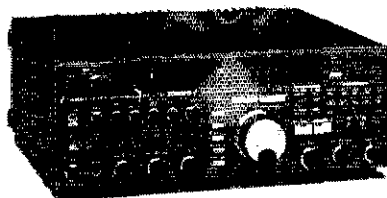


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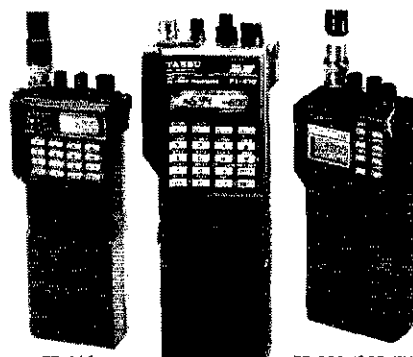
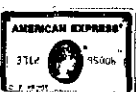
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FT-4700RHT/C8 50/40W 2m/440 FM/TTP	799.00
AD-2 50w 2m/440 duplexer.....	48.00

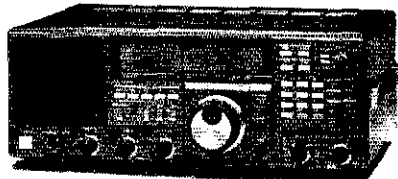


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FRT-7700 Antenna tuner.....	77.00
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3,131 messages and 16 quality for Public Service Honor Roll. Double congrats to W2QNL & N2DXP for achieving BPL 3rd straight for DXF, who qualifies for a medallion. Net Activity:

NET	FREQ	TIME	SESS	QNI	QSP
NJM	3895	1000	31	236	139
NJNE	3895	1900	31	229	140
NJNL	3895	2200	31	147	43
NJPN	3950	1800	38	331	145
NJSN	3735	1830	30	174	53
NJNVE	146.895	1930	31	534	134
NJNVL	146.480	2230	31	238	113
OBTTN	147.120	2000	31	213	149
NJTTN	223.880	2100	31	288	112

Dec. Traffic: W2QNL/530/128, WA2EPI/346/114, W2MTO/225/97, N2XJ/243/101, KE2JX/224/87, N2DXP/210/63, WB2FTX/171/67, KA2JF/161/97, WR2E/153/85, W2DMM/145/108, WA2PAC/145/99, W2RRX/139/94, KA2INE/98/81, KB4CYC/64/70, K2VX/63/67, WA2CLT/36/, W2CQ/22/, W2XD/19/. Become a "Ham," a "Helpful Amateur Monitor." Contact KA2F or NW2L to find out how YOU can help assure the future of Amateur Radio. 73.

MIDWEST DIVISION

IOWA: SM, Wade Walstrom, W6EJ—SEC: KD8BG, STM: WB6AVW, ACC: NU8P, OOC: WA6QMU, BM: KNIR, TC: K0DAS, SGL: WR6G. The Fort Madison ARC is planning to operate an HF station in the local high school science classes as part of the ARRL School Club Round Up. KA6JAW reports an update to the east central Iowa packet network. The network provides a link between the Quad Cities and Dubuque plus aids in linking between the Quad Cities PBBS and Cedar Rapids PBBS. W6ZUZ and KA6TYP were vacationing in 6W land and planning to contact the SW Iowa ARA faithful while there. Now call reported is N0LBJ. WA6NDD has retired as a teacher and ham club advisor at Wood Junior High in Davenport. Thanks for your many contributions to amateur radio, Ted, and happy retirement! The Southeastern Iowa Technical Society has been formed and WB6YHB is the new president. Officers of the newly formed KA6BA Temple Ham Radio Unit are WA6QBC, President, KD8AE, Vice President, and KA6AG, Secretary/Treasurer. KD8FN is the DMRAA Ham of the Month for December. Congratulations, Mark. K0CKZ is the winner of the 1989 Winthrop M. Mager Award. Congratulations. Petal Thanks to DMRAA, ELDXA, CVARC, SW Iowa ARA, FDARC, FMARC, and DRAC for their club newsletters! Regrettably, KA6JA became a Silent Key in December. Traffic: WB55 178, KA6AF 174, N4UL 123, K6CNM 118, K6GP 62, WB6MCX 50, K6PT 38, WB6AVW 34, WB6OKA 13, WB6GN 4.

KANSAS: SM, Robert M. Summers, K8BXF—SEC/SGL: N8BLD, STM: W6OYD, ACC: K8BXF, TC: KA8HEP, BM: K8JDD, PIO: WB6WSG, OOC: K8BXF. Net activity for the month of Nov. '90:

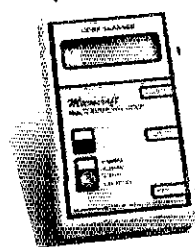
NET	QNI	QTC	MGR	FREQ	DAY	TIME
K5BN	1480	138	WB6FC	3920	daily	0300Z
K5PN	424	39	WB6FC	3920	MWF	0645Z
			"	3920	S-Sn	0800Z
K6MWN	729	636	WB6YVZ	3920	daily	0700Z
K6WN	1163	747	WB6YVZ	3920	daily	0001Z
CSTN	2035	91	WB6E	7253	M-F	1830Z
			"	3920	Sn	1430Z
QKS	157	48	WB6ZNY	3610	daily	0100Z
			"	3610	daily	0400Z
QKS-SS	47	25	WB6MYM	3735	T Th S	0130Z

Election of officers for 1990, Hiawatha ARC, Pres: WA6GDY, VPres: K8BDU, Sec/T: K8APW and Act Mgr: WB6C. Jayhawk ARS, Wy Co: Pres: W0BE, VPres: N6HYG, Sec/T: WR6M and Bd mbrs K8BXF and N6GMT, PKARC, Leav Co: Pres: KA6VVT, VPres: K8BELZ, Sec: K8EDA, Tr: N6KOA. I will continue listing recently-elected officers next month. We still have several vacant EC positions to fill. Traffic: KA6RCH 616, K8BXF 281, N2ZM 224, WB6F 200, N6KQJ 156, WB6FC 135, W6R 85, WB6ZNY 80, W6Y 70, W6OYH 69, N6ZD 67, K8BYQW 65, WB6YVZ 64, K8BEEB 63, WB6YM 32, K6XN 31, W6YXK 28, W6TJU 20, W6BQ 17, W6MYM 16, W6CHJ 7, W6E 7.

MISSOURI: SM, Bill McGrannahan, K8ORB—December is the time to look back at the many accomplishments of the MISSOURI SECTION during 1989. A time to consider the thousands of hours that the ham community has devoted to public service and to our fine hobby. Certainly it is time to say thank you to all of you. First, thanks to Ben Smith, K8PCK, for his leadership during the first six months and beyond. Then there is the Section Level Staff: ASM Roger Volk, K8GBG; SEC Jim Schroeder, K8BEM; AAC Denise Hagedorn AJ6E; PIO James Barger, WA6FOK; OOC Carl Hohenberger, WB6BZP; STM John Seals, WR6R; BM Charley Konop, W6OLQ; TC Mac McKenzie, K4CHS and SGL Em DeCamp, K8JUD. And finally, congratulations to all the folks in the field who make the MISSOURI SECTION outstanding: the section appointees, the traffic handlers, net managers, net controls, repeater workers, packeteers, VEs, hamfest volunteers, public-event workers and so many more—THANK YOU ALL! St. Charles ARC manned a Christmas message center which was quite successful. SW Mo ARC did "Operation Santa Claus" at their local hospital again this year. EMERGENCY COMMUNICATION COMMENDATIONS were awarded Bill Tucker, K8VNB, and Paul Barber, WB6ETF. Four became SK this month: N8CFB, W6OLO, K6FJ and WA6OGB. My packet station on full time-145.010, NETS: MEOW Sessions 31 QNI 716 QTC 204. Mgr: W6BELL; MON 82/247/218 AIG: MOSSB 31/857/178 WB6WLU; ZEN 4/60/0 W6BELL; STMTN 4/48/0 K8RPG and 4/58/3 (Nov): HBN 21/422/28 K8DSQ; CMEN 4/55/0 K8PCK; PHD K8BARC 3/83/1; W6OLQW; SARF 4/57/0 N6GOU; JCREP 4/61/0 W6ORI; STLARS 4/217/3 K6VEX; QCWA 35 4/75/0 WB6HK; CARL 3/28/0 WB6WLU; KCARES 5/63/0 K6UAA. Traffic: N8FBW 6301, W6XK 1845, W6YJX 651, N8Q8 569; WA6HTN 251; AIG 250; N6DN 236, K8ORB 211, W6UD 94, K8BEM 83; WR6R 81, KA6RA 70, WB6MA 64, WB6WLU 37, K8PCK 37, K8BAH 33, K8BAH 33, WB6CJB 28, W6RL 17, W6J 4.

NEBRASKA: SM, Vern Wirka, WB6GQM—The Nebraska Section has a new ARRL affiliated club. We welcome the Elkhorn Valley Amateur Radio Club to our list of affiliated clubs. Robert W. Staub Jr., WB6YWO of Hoskins is the Elkhorn Valley Club president. Our Affiliated Club Coordinator, Larry Lehmann, K8BDA of Albion, delivered the hand-lettered charter to the Elkhorn Valley Club during February. Poor propagation during the daylight hours on 75 meters limited the QNI and QTC totals for 1989 on the Nebraska Comuskar Net. Net Manager, Kenneth Albright, WB6GMQ of Orleans, reported a 1989 total QNI of 7976 which was down from the 12,707 QNI total

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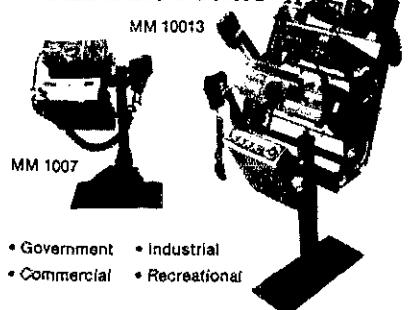
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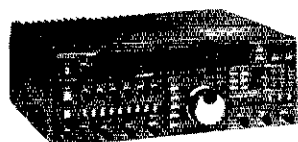
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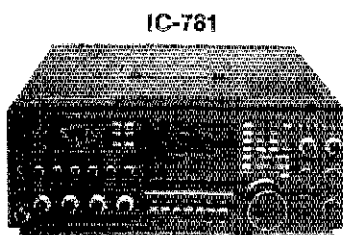
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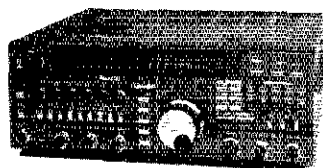
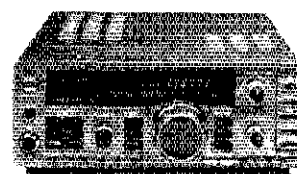
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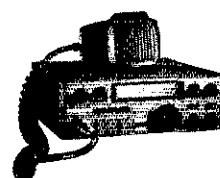


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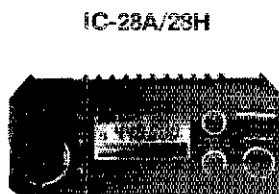


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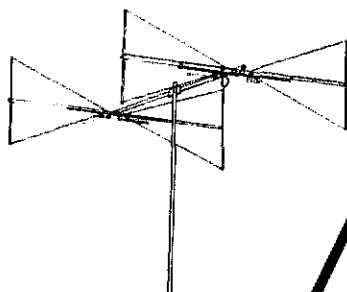


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of 1988. The Net Manager position for the Cornhusker Net remains open as well as a Friday net control station. If you can devote some time to the Cornhusker Net in either of these capacities please contact our STM or your SM. The Nebraska Cornhusker Net meets daily on 3980 KHz at 1830 UTC. The York News-Times of York featured Jack Crowdell, WA8BOK of Benedict, in an article which had the headline: "Crowdell Epitomizes Ham Radio Operator." WA8BOK holds ARRL Field Organization appointments for Emergency Coordinator and Official Relay Station. Crowdell is a member of the Blue Valley Amateur Radio Club. Traffic: K0DKM 261, WA8BOK 42, WD8EWH 29, K0DQX 17, WB8QGM 12, WC8O 6, NF8N-BBS 19, K0BOY-BBS 114.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Caesar Rondina, N1DCS—ASM: KB1H, STM: K1E1C, SEC: N4GAA, OOC: KY1F, ACC: NK1J, TC: W1HAD, BM: N1API, PIO: W1ACMF, SGL: K1AH. Spring is getting closer and closer. Now's the time to plan that antenna work we didn't do last year. Our new packet network has now been in place for some time, and I am glad to report that it is now tried and true. Once again thanks to all sysops for their cooperation. Congrats to MAREC for their many successful Novice classes. Congrats to KB1H, nice article on vertical antennas in the Sinepost Newsletter. Nice article on NCS procedures by KY1F in the CPN newsletter. I am proud to say that our STM, NM's and NCS's are all great believers in training. That is so critical if we are to be ready when a disaster strikes. Great job NTS people. While on NTS, CT had 96.8% rep in 1RN cycle 3, and 99.1% in cycle 4. Nice article by NZ1M in the ZARC News on DX. On another front, the Connecticut Council of Amateur Radio Clubs is doing well, and is still looking for more CT clubs to join. This organization is a great idea and has my full support. I urge any and all clubs that have not yet gone to a meeting, to do so. For more info, you can contact Dick Grillo, KB1XL in Willimantic. Also every first and third Tuesday there will be an on the air meeting of the Council at 9:00 PM. EDT on 3.965. Congrats to WHARA, Stamford ARC for their renewals as Special Service Clubs. Also nice job to the WHARA, they are presently assisting the American Red Cross in setting up a complete disaster communications center at one of the local chapters. I am sure this positive move will be beneficial to both the ARC, the Amateurs and the public. 73 for now... Caesar

NET	SESS	QNI	QTC	NM
CN	62	357	281	W1WCG
CPN	31	441	183	KY1F
NVTN	31	347	147	K1HEJ
WESCON	31	487	202	K1GWE
RTN	31	217	59	W1FCA

PBBS REPORTS: CT Section Traffic Node: N1DCS-4 BBS, KY1T NM Received 723, Forwarded 102, Total 1302. Traffic: NM1K 682, KY1T 568, W1EPW 365, W1WCG 257, K1E1C 219, K1GWE 207, K1AJAN 185, KY1F 121, N1GEP 112, K1UCU 93, K1HEJ 80, N1GRF 78, N1API 67, N1GKJ 64, W1WP 64, W1K 36, W1YUA 34, W1VOL 32, NX1Q 31, K1ATBM 28, W1KYD 28, W1BDN 20, KB1ZC 17, K2ZOL 26, NY1V 15, N1BOW 9.

EASTERN MASSACHUSETTS: SM/SEC, Barry Porter, KB1PA—STM: W1ATBY, ACC: N1GTE, BM: K1INOL, CO/AA: AG1F, SGL: K3HI, TC: K1IU, PIO: K1HLZ, EMISS Hotline: 817-437-0111

Net	Mgr	Freq	Time(EDT)	Day	Sess	QTCQNI
EMRI	K1GEP	3658	1900/2200	DY	62	298/355
EMRIPN	W1TC	3915	1730	DY	30	101/134
EMRISB	N1CVE	3715	2100	DY	26	44/76
EM2MN	N1DUB	8323	2000	DY	26	155/342
HRTN	N1FLO	0484	2230	DY	31	144/336
CTN	K8IAF	745/045	1930	DY	31	117/284
NEEPN	W1FRM	3946	0830	SUN	5	8/44

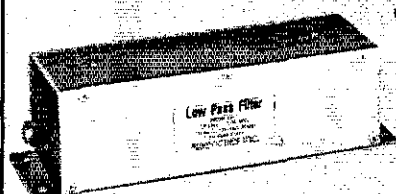
A new decade begins. It makes me wonder...Will Ham Radio exist in 10 years? Not unless each of us commits some time to its promotion and preservation by conducting themselves in the highest traditions of the hobby. 10 years ago, when it came to emergency and disaster communications, Ham Radio was the only game in town. Today, we no longer have a monopoly in this area. Ham Radio operators used to be on the cutting edge of technology. Today, we are being rapidly passed by, and our communications efforts are looked upon as quaint. Recently, I had to stop myself from giving a packet demo to a group of computer users who are "into" telecommunications. Why? There people use multi-tasking networks at 9600 baud and above. It would have been too embarrassing to show off the Ham "state of the art" 1200 baud system. Can we do better??? YES. Do we have the Spectrum space to do so? YES. Do we have the people to do the experimenting? Maybe...but we need more involvement. The spectrum I am talking about is in the microwave area. I know 3 people who have ever used this band space. Soon, many of the groups who have left us in the dust technology-wise, will be looking to this band space and seeing its non use will be looking to have it reassigned for their use. If each of us doesn't act, the 90s will be a decade where the number of silent keys outnumber the number of new amateurs. Each of us has to make a commitment to get more people involved in our hobby. Our ability to enjoy this diverse hobby of ham radio faces some incredible challenges in the next 10 years. We can meet them and prosper as hams only if each of us will take a little time and get more involved. Have you done anything to enhance ham radio's reputation this month? Please express your opinion on amateur radio issues to your section or division staff. We appreciate your input. Traffic Totals: K1E1C 68, K1PEP 70, N1AJJ 86, K1GEP 311, KW1U 287, K1SEC 22, KB1AF 310, W1ATBY 783, KB1EB 14, K1R5Y 59, N1FWV 101, N1FLO 291, K1ADJ 17, K1MDM 143, NV1B 16, K1ABO 31, N1GZQ 101, K1UXB 24, W1FNM 83, K1BZD 59, W1TC 144, K1UGM 1492.

MAINE: SM, Ted Bonesteel, W2ERT—35 Maine amateurs, led by ASM (packet) Ron, N1AHH, conducted a packet test to determine simplex capabilities throughout the State. Operations conducted showed that 4 groups were able to work together but unable to connect to each other. Several stations tested HF to provide connecting capabilities between the groups. Tests will continue in the future with packet. Similar tests should be conducted using 2mtr FM to determine capabilities without repeaters. Upcoming exams: Mar 10, Sat, 9AM, Bangor, K1AG, 947-4051-0336; Mar 23, Fri, 8:30PM, Augusta, N1BCF, 623-4249; Mar 31, Sat, 9AM, Auburn, K1MZB, 268-4820. Net Activity: Sea Gull/K1GUP/Sess 26/Checkins

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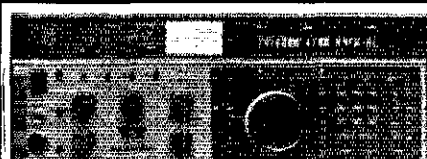
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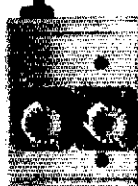
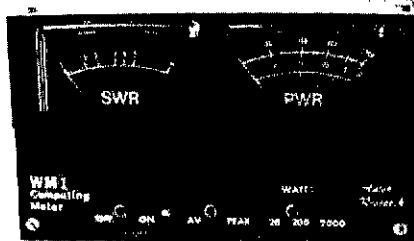
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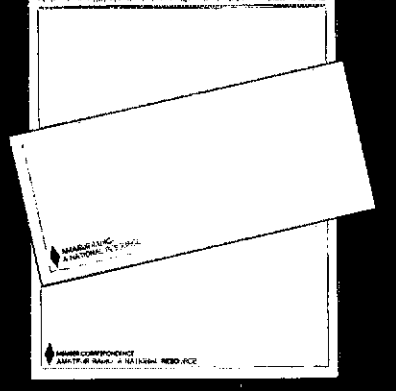
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823/Traffic 254; Pine Tree/W1KX/31/355/209; Hancock/WA2ERT/3/25/2; Arrostock/WA1YNZ/4/63/8; Cumberland/K1ODT/4/53/33; Central Maine/N1DZ/9/229/18; Maine Public Service/KA1LPW/5/82/6; Kennebec/KA1LPW/5/91/2. Maine liaison stations had another outstanding month: cycle 2/100%, cycle 3/100%, cycle 4/96.8%. Station Activity: W1KX 256, KA1FEB 186, N1GND 186, KA1ODT 135, W1BMX 108, NR1F 102, K1UNQ 89, WB1BYR 82, W1VEH 77, WA2ERT 68, W1JTH 52, N1BCF 51, WA1YNZ 44, W1OTQ 37, N1PPP 36, ND1A 28, KB7ECP 11, KA1RFD 7, AF1L 4.

NEW HAMPSHIRE: SM, Bill Burden—ASMs: W1NH. Dx and contesting, KX1L. Youth activities, WB1HBB: State organization liaison. Welcome to the New England Packet Radio Assoc as the newest ARRL affiliated club in NH! The NH QSO party promises to be hotly contested this year with several clubs vying for top score. Also, we will have a handsome plaque for the 1990 winners as a further encouragement. WB1QXM reports that CVFMA held a VE session in Dec resulting in 4 new Tech's, 1 new General, 1 new Advance and 1 new Extra. Congrats to PIO Phil WA2MBQ on being appointed chairman of the ARRL Public Relations Committee by League Pres W4RAI Phil's committee will be recommending improvements in how we get our message out to the general public and ways to improve our public image. If you have any comments or ideas, please contact Phil. Congrats to Jim W1FZ and wife Beulah on being named "Persons of the Year" in Farmington. Jim is a member of GBRA. NARC awarded its annual "Distinguished Service Award" to Don, N1AKS, for his efforts in support of the VE program in 1989. Congrats, Don! I visited SVARC in Dec and spoke on ARRL activities and Satellite operating. Thanks to outgoing pres W1FJH for the invite and congrats to new pres WA1TKH. An extract from the North East Digital Assoc recommends that interested persons can get more information by contacting: NEQA, PO Box 563, Manchester, NH 03103-0563. W1FYR is looking for Hams interested in becoming Official Bulletin Stations to support the distribution of bulletins and other information around the state. Packet distribution is still limited, and we need to develop a cadre of OBS volunteers to use innovation and imagination to get information out to more of our fellow Hams! And CNHARC will be coordinating a public service event in support of a dog-sled race in Feb! Sorry, no more room—I will provide a more detailed report on all via packet—check your local BBS! Traffic: Nets: VTNH 282, GSPN 122, GSFN 90. Stations: W1PEX 2583, KB4N 1948, K1TQY 374, N1CPX 249, KK1E 91, KA1GOZ 84, KA1ROH 73, W1ALE 68, N1ALM 31, WA1YZN 27, K1IM 26, K1ACL KA1HPO 24, KA1SXM 18, N1CUG 16, NU1A WB1HBB 10, NE1J 8, KA1PFS 6, N1BAP N1NH 3, KA1KFX 1. BPL: W1PEX, KB4N, W1FYR. PSRR: W1PEX, N1CPX, W1ALE, KA1HPO.

RHODE ISLAND: SM, William M. Foss, KA1JXH—National QCWA office awards W1CPI for being on the air for 75 years. Quahaug repeater network holds its RACES drill 1st & 3rd Wed of the month on 145.17, 223.82, 224.56, 224.92, 440.25, 441.2, 447.525, 448.675, 449.225, 909.6, 909.7, 909.8, 909.9, 1291.2, 1291.3, 1291.4. Traffic: KA1KML 299, PSRR 92, W1EOF 240, KA1JXH 181, PSRR 85.

VERMONT: SM, Frank Sultor, W1CTM—ASM (Education) WB2MIC. ASM (Packet): K1AUE. SEC: K1LOO. STM: K1TQ. SGL: WB1AJG. TC: W1A1M. Latest info from division cabinet meeting held 1/19/90 is as follows: we can still use 220-222 MHz until FCC says no to, expect no-code FCC NPRM to be issued very soon, no word from FCC on 6-meter repeater or beacon NPRM's Canadian no-code rules to take effect 9/1/90, FCC is now involved in the 14 MHz net interference problem, OO program has minimal impact on deliberate interference problems, ARRL membership fee likely to increase to \$30/year, QST likely to have less pages, disaster plans to allow third-party emergency traffic to all countries is being evaluated by ARRL. Deerfield, NH, fest sked is 5/12 & Boxboro, MA. Fest sked is 10/12-14. Conn Valley FMA officers are: KL7DN (President), KA1PVS (VP), W1GUA (Treasurer) & KA1III (Sec). Their next VE exam is sked 3/3/90 in Newport, NH. SGL WB1AJG (Bob) with the help of 2 financial backers provided the required \$2K to enable the new ham plates to be issued—you too can have new vehicle ham plates & help avoid a state deficit. Contact Bob @ 433-8712 for details. WA2SPL (Joe) reports his packet BBS handled 69,788 messages in 1989. Burlington ARC club logo contest winner was K1HGY (Jack). N1DMP (Joe) reports that VT-ETV will air ARRL videos. ARRL club net meets Sundays @ 20:00L on 28.403 MHz. Congrats to former SM N1QCE (Jon) & XYL (Karen) on the arrival of their new harmonic (Justin) on 12/5. Support of VT-ETV was provided by WA1SQO (Karen), KD1R (Ralph), N1EXY (Tom) & WA1UUV (Jim). Tnx to all who voted in the SM recall election—That's what makes democracy work! VT traffic report: WA2SPL 1407, K1TQ 428, N1DHT 374, N1GMD 246, WA1JVV 191, KC1KI 59, NB1A. VT Net report: VTNH 31/232/262, CAR 26/609/51, GMM 26/563/27, VTPHN 5/88/12, Twin State EFMN (Ascotney) 4/46/0, tri-state EFMN 4/62/6, CVFMM 5/69/4. Tnx to all section staff for ur support.

WESTERN MASSACHUSETTS: SM, Bill Voedisch, W1UD—OO/RFI: N1CM. PIO/ACC: K1BE. SEC/SGL: WB1HJH. TC: KA1JMM. STM: W1KK. The principle topic for the MARC was field day. They've reserved Mt. Wachusett again this year. Even with some restrictions concerning the placing of the antennas, it should prove to be the best place that could be found in central Mass.—KA1SPO, K1BJV, W1VLN and James Garrett are to be congratulated. Most of us use our old rigs as a backup unit or sell or trade them when we buy our new "rice boxes." These fellows donated enough equipment to make two complete stations, including antennas and tower, to the Explorer Post 73. Now these young people can operate on all DC bands at the KW level. Here's a great idea. Mark, KA9LXP, of CMARA has prepared three hospitality packages. They are 1. For prospective members. 2. An introductory package. 3. A Membership package. These three packages introduce and give the facts about becoming a member of CMARA. More clubs should have an organized program like this. I've seen potential hams and members come to club meetings and nobody even talks to them. Needless to say, this is the last time this potential members is seen. Thanks Mark for taking the time to put something like this together. It may catch on which clubs in the area.—TRAFFIC: KA1IFC 815, W1UD 574, KA1EXJ 334, KA1QFV 84, W1KK 62, W1SJV 50, K1JHC 44, NX1K 42, WA1OUB 39, NM1U 31, KA1TDL 30, WB1HJH 22, K1L 16, W1ZPB 5, W1GQP 3, WA1OPN 2.

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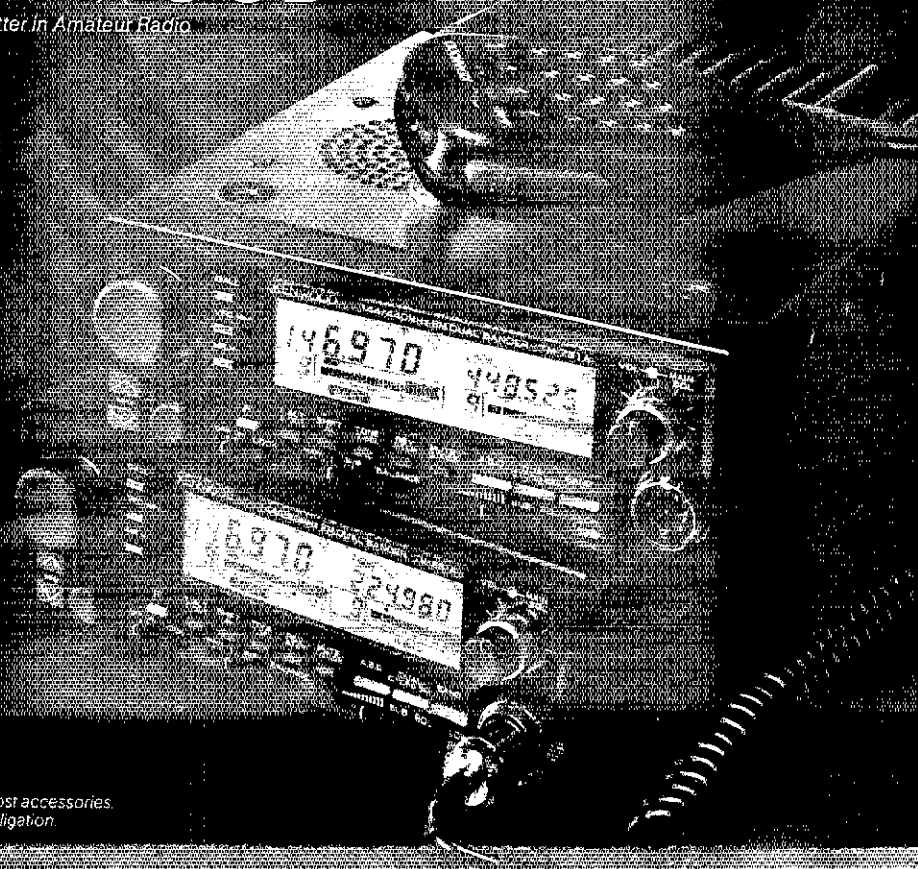
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NORTHWESTERN DIVISION

IDAHO: SM, Don Clower, KA7T-ASM: K7REX, SEC: N7MAL, STM: W7GHT, OOC: W7BCYO, ACC: N7BI, PIO: W7GE. If you happen to like DX, you probably have been chasing 3Y5X the first week in Jan. The conduct of U.S. hams during the pile-ups was embarrassing. I have never heard so much garbage. It would be hard to argue the point that we need any frequency allocation. We as hams need to correct our own problems. Even if we have to report a ham, we know we had better get to cleaning up our act before someone else starts. We don't need these types of people in our hobby, it would be nice to see the ARRL take the lead in correcting the problem. Traffic: W7GHT 564, KA7WZM 106, WS7U 87, N7MAL 76, 73s Don

NET	SESS	QNI	QTC	MNGR
FARM	31	2270	106	W7GSM
NWNTN	31	940	22	W7VAO
CD	21	587	23	K7UBC
IMN	31	256	187	KA7EEE

MONTANA: SM, Pete Peters, KF7R-SK: Jack W Baker, WA7DYO, East Glacier, W7YM, Bob Foster a practicing attorney in Bozeman has volunteered his services and ARRL has accepted Bob as a Volunteer Council; thanks Bob. Helena has a new auto patch on 146.25/85 repeater K7TQM, Jim Aldrich has been visible on TV doing Public Service Announcements. Helena City Officers, Pres WB7ETT, V Pres N7JV, Sec/Tres N7MUX, Great Falls Club Officers, Pres N7KOR, V Pres N7HKU Sec KF7LL, Tres W7NBB. New Novices: Dennis Hoeger, Robert Williams, Mark Lund, Jack Myers, Joseph Mangiantini, Tom Stenzel, Patricia Ramthorn, Karen Christiansen, Ewan Drayer, Ken Phillips, Don Regli. PSRR, W7TGU 69. Traffic: W7TGU 1530, KA7YYR 395.

NET	QNI	QTC	NET MGR
MSN	99	5	KF7R
MTN	1957	188	N7AKA
IMN	256	187	KA7EEE

OREGON: SM, Randy Stinson KZ7T-ASM: W7FBP, ASM: W7BEMO, STM: W7VSE, SEC: K7VF, PIO: K7CYN, SGL: KA7KSK, ACC: W7FQ, OO: W7NW, STC: N7ENI. I became aware of a very interesting public service event in Lane County. The Lane Amateurs Public Service (LAPS) Group help the Ski Patrol in the Willamette Pass Resort area from November until April every year and have done it for the past five years. They are up there every weekend and drive 100 miles round trip. They have two hams at the Ski Patrol office and two hams stationed in Eugene for any phone patch that would be needed for an emergency. To me that is some kind of dedication and I am glad I found out about it. Thanks Tom, KA7TAM and Fran, W7TWD, for starting the operation. Another nice note is the SET (Simulated Emergency Test) held in Clackamas County. The scenario was lost hikers on Mt Hood. The hams operators were involved for the first time thanks to Curley, WA7TIC and Dale, W7FBP. They used both two meters and packet. We had another SET from the Trojan Nuclear Plant in Rainier and the hams had their packet system running for the first time. Paul, W7BBG, packed up his gear and went to Rainier and did just a great job. Because of all of the interest in packet by the counties the EOC in the State Capital has the BBS running 24 hours a day. If you would like any information about upcoming tests, put on by the State or have comments (Ham Related) for the Capital, connect to K7MYU via the node Salem on 145.650. I would like more information about club activities in your area. You can drop me a line or send it by packet. I check the W7XI and W7RLL BBS twice a week. Bron, KM7R, has resigned as Assistant Section Manager because of job commitment. I would like to thank Bron for all of the work she put in on the packet system. Traffic (P/F) Packet: W7VSE 608, W7BEMO 307, KA7EEE 299, W7ODG 188, N7BGW 177, N7DRP 137, W7XJ 123P, W7LNE 94, W7VMS 74P KA7DEF 61, KA7FW 42, KA7AD 29, W7DAN 12. Late Nov. W7DAN 61.

EASTERN WASHINGTON: SM, Tom Plaisance, KQ7PH-STM: W7GB, SEC: WA7CBX, OOC: W7LKR, ACC: NQ7M, SGL: KD7AC, TC: W7DBV, ASM & WEN NM: KE7WG. The Hamfest calendar for the next six months of 1990 includes: Mike and Key Puallup Swapmeet March 10th, Walla Walla Swapmeet March 25th, Spokane Hamfest April 7th & 8th, Yakima Hamfest May 19th & 20th, Wenatchee Hamfest June 2nd & 3rd. Support your local radio club, without their efforts these get together for amateurs would not take place. Congrats to STM Don Callick on his 5BDXOC plaque. Don Felgenhauer, K7BFL, from Spokane is the new Wa. Sec. CW Net Recorder for 1990. New Officers for the Yakima Amateur Radio Club, W7AQ 1990 edition Pres. Jo Whitney, KA7LJC, VP Mark Tharp, KB7HDX, SEC. Roger Wilson, N7NPL. Treas. Floyd Schmidt, KA7KAX, Trustee KF7UW, Directors KA7IAY, WA7E, N7HHU, KB7ATN. Yakima County ARES reports 1720 volunteer hours in 1989. SEC WA7CBX reports ARES 190 Public Service hours for December. 73, KQ7PH @ N7HHU BBS. Traffic: W7GB 341, WA7YEN 419, W7LBK 98, N7HXT 16.

WESTERN WASHINGTON: SM, Mary Lewis, W7QGP-STM: KD7ME (@K7KNZ), SEC: NM7N (@N7HFZ), SGL: KD7AC, ACC: W7QGP, TC: W7JWJ, Rush Drake, W7RM has resigned as ARRL Director 12-31-89. Rush had a heart attack 12-5-89, but is improving rapidly at the home of his son in Portland, OR. Bill Shrader, W7QGM, of Medford, OR, advances to the position of Director. Mary Lou Brown, N47N, of Guemes Island, WA & Western WA Sec., a position she will continue to hold, was appointed Vice Director. New officers elected for the following clubs: Chehalis Pres NQ7S; 1st VP N7MOU; 2nd VP KA7ODR; 3rd VP KA7MRU; Secy KA7JPK; Treas W7ATP; Radio Club Tacoma Pres K7JF; VP W7LGD; Secy W7KFN; Treas W7BUN; B.E.A.R.S. Pres KE7MP; VP W7KPK; Treas N7LJG; Secy resigned due to work sked change: West Seattle ARC Pres K7JBZ; VP WA7SXB; Secy W7GJW; Treas K7JBZ; Issaquah ARC Pres KA7TTY; VP KE7XT; Secy & Treas KA7GK; JCARC Pres KF6XT; VP KA7MNH; Secy N7TPT and Treas N7FK. The clubs invite your visits. Northwest Chapter 4 of QOWA will hold annual spring dinner at Lewis and Clark Hotel April 28. Mike & Key Swapmeet March 10 at Puallup fairgrounds. KE7AV is looking for local amateurs interested in working the 233.88 MHz repeater in Mount Vernon which offers autopatch facilities. If interested call 424-1228 (Doug). I stated in my Sept report, which was Dec issue, I can only report material received. No Tr reports no listing. 12-89 KA7J 17, K7CLL 11, KA7CRN 24, N7CSP 206, W7EJ8 51, K7R7 173, KB7FLT (NOV) 3, N7GJG 139, W7IGC 442, W7LG 222, W7PRT 39, (NOV) 16, K7SUX 336, KA7TTY 88, W7TVA 275, K7UQH 134, 33 & 73.

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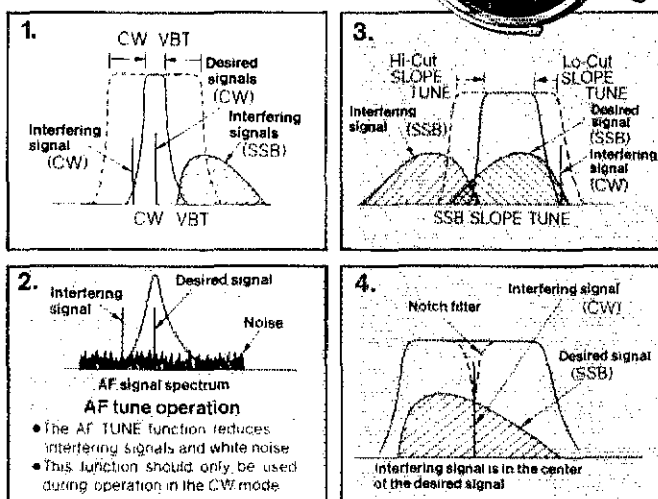
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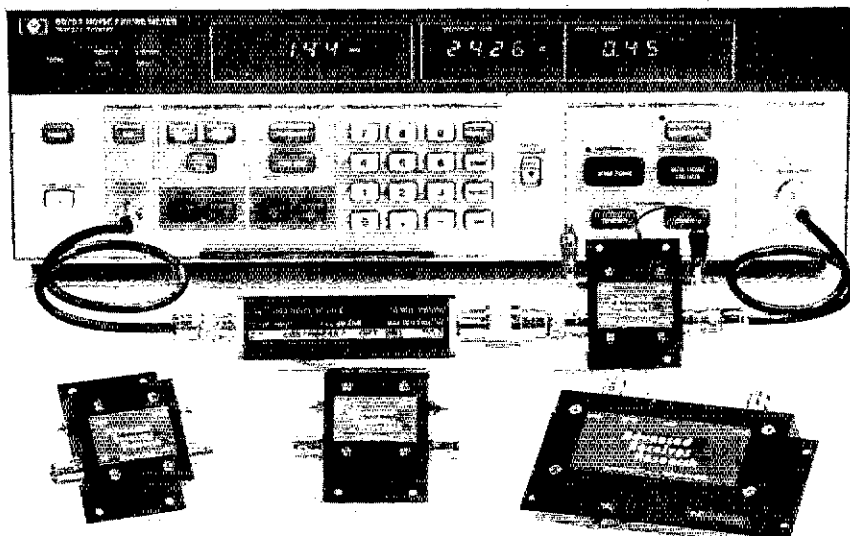
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P50VD	50-54	<1.3	15	0	DGFET	\$29.95
P50VDG	50-54	<0.5	24	+12	GaAsFET	\$79.95
P144VD	144-148	<1.5	15	0	DGFET	\$29.95
P144VDA	144-148	<1.0	15	0	DGFET	\$37.95
P144VDG	144-148	<0.5	24	+12	GaAsFET	\$79.95
P220VD	220-225	<1.8	15	0	DGFET	\$29.95
P220VDA	220-225	<1.2	15	0	DGFET	\$37.95
P220VDG	220-225	<0.5	20	+12	GaAsFET	\$79.95
P432VD	420-450	<1.8	15	-20	Bipolar	\$32.95
P432VDA	420-450	<1.1	17	-20	Bipolar	\$49.95
P432VDG	420-450	<0.5	16	+12	GaAsFET	\$79.95

Inline (rt switched)

SP28VD	28-30	<1.2	15	0	DGFET	\$59.95
SP50VD	50-54	<1.4	15	0	DGFET	\$59.95
SP50VDG	50-54	<0.55	24	+12	GaAsFET	\$109.95
SP144VD	144-148	<1.6	15	0	DGFET	\$59.95
SP144VDA	144-148	<1.1	15	0	DGFET	\$67.95
SP144VDG	144-148	<0.55	24	+12	GaAsFET	\$109.95
SP220VD	220-225	<1.9	15	0	DGFET	\$69.95
SP220VDG	220-225	<1.3	15	0	DGFET	\$87.95
SP432VD	420-450	<1.9	15	+12	GaAsFET	\$109.95
SP432VDA	420-450	<1.2	17	-20	Bipolar	\$82.95
SP432VDG	420-450	<0.55	16	+12	GaAsFET	\$109.95

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PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, W63FCV, SEC: W6LKE, STM: K6APW, OOC: K6TI, TC: N6AMG. Congrats to W6DOB on his retirement and for making BPL VFB on both counts! Joe reminds us of the following net schedules, all times PST: DRN6, 7275, 0945 & 1530; DPAN, 14345, 1030 & 1430; NCN1, 3630, 1800; NCN2, 3705, 2030; NCNV, 145.41, 1930; RN6, 3655, 1945 & 2130. K6APW says he could use a few more check-ins on NCN. Try it, you'll like it! OOC, K6TI, would like to have a few more applicants for the Amateur Auxiliary. Drop him a line c/o league HQ if you are interested. CCCC welcomed new members N6VDW, N6VOM, K6EJL. BARC members took part in a Solano County simulated emergency exercise. VVRC has grown to 140 members, with 28 still working on their licenses. They sure must be doing something right! LARK's Novice class had an average of 28 in attendance at the first two sessions. FBI HRC welcomed new members K6GNI & W6BIRJ. EBARC's new officers: WA6TNI/P, W6DOB/1VP, K6BHR/2VP, N6VMK/3VP, W6O/S, and NU6W/T. The club welcomed new members WA6JQT & K6CYF. MDARC's new officers: N6CUK/P, K7SDF/V, N6SWP/S, N6TDJ/E, K7BY & K7BX/BOD. Dec tlc: W6DOB/647/BPL, W6VOM/253, K6APW/138, W6BUX/39.

NEVADA: SM, Joe Lambert, W8XID—ASM: Curly Silva, K7HRW. SIERA has been very active recently. They are enrolling their ARES/RACES members in the VIP program (Volunteers in Fire Prevention) which is administered by the Nevada Division of Forestry. Radio hams will provide communications. SIERA & SNARS members made a substantial contribution to the Washoe Co. RACES exercise held in November. SIERA has also completed another NET control class and is continuing to give VE exams. Eight out of 12 applicants passed tests in recent SNARS VE exam. K6THXU has bought the 148.70 repeater in LV. It is open and all are welcome. The CONDOR repeater in LV provides an open (to all hams) communication system which covers most of the state of California. Give it a try. For a CONDOR map and other info, send SASE to W6GHI, POB 73, Summitland, CA 93067. Dec. Traffic: N6IA 498, K6AM 81, K7GB 46, W6IEM 48, N7KLO 29, WA7AGE 16, K7OK 8.

SACRAMENTO VALLEY: SM, Jettie Hill, W6RFF—The Section Staff has been completed with the appointment of Walt Cross, K6BEP, as the Section Emergency Coordinator (SEC), Jeanne Cross, K6BEOH, as the Affiliated Club Coordinator and Phil Batson, N6MSZ, as the District Emergency Coordinator for the Northern Counties. Thanks to all who have agreed to fill one of the section positions! Al Blagier, WA6WJZ, the Section Traffic Manager asks that anyone in the section that handles traffic to send a report to him at the end of each month of their traffic totals. He can be reached on the 148.85, W6RHC, repeater in Chico. The Sacto Valley Section Net meets the first Sunday of each month at 8 PM on 148.085 + on W6AXM/R (Yuba Sutter). The River City ARCS continue to hold classes and exams, but at a new location, Encina High School, 1400 Bell St. Sacramento. Call 483-3293 (days) or 925-0159 (nights) no calls on weekend. Please send activity reports by the first of the month. Traffic: WA6ZUD 542, WA6WJZ 235, N6CVF 165, W6CFQ 134, K6JM 110, N6DOJ 91, K6SRF 95, N6LAM 44, W6RFF 37, W6BUNC 6, K6BWIJ 5, W6BSRQ 4. (Nov.) W6RFF 27.

SAN FRANCISCO: SM, D. Wilson, K6LRN—W6ZUB passed away in Dec. Our condolences to XYL Lola, N6GLJ and the rest of Bill's family. K6KJQ has also joined Silent Keys. Sonoma CRA, Inc. 1990 Officers are: Pres-W6TLK, N6PTM-VP, Secty-N6LAL, Treas-K6BBSI, Mbrs at large-N6DDK & W6BFRZ. N6PTM was selected SCRA member of the year—congrats! K6SFX and K6BUQT were "Santa" and "helper" at Ridgewood School in Cullen. A6BLZ & K6VHP completed teaching 1st RF Communications course at Humboldt SU. SHARC elected K6BLAG. Pres, W6AQJ-VP Accty-treas-K6NNQ. Contact So. Humboldt ARC at Box 701, Redway, CA 95560. Redwood ARC 1990 Officers: K6KGA-Pres, W6MYF-VP, Secty-K6ATD, Treas-W6BZT, Fortuna ARC: K6BKC-Pres, W6ZKX-VP, Secty-K6BFF, WA6TVQ-Treas. Marin ARC: W6FQO-Pres, N6VAW-VP, K6BLAR-Secty, N6NSH-Treas. N6AQY & W6JPA-Dir. Mark the boards as well as the case of your radio. There have been instances where radio comes back from repair with different boards. This could be a problem if you have modified radio, like for MARS, etc. Traffic: N6FWG 505!

SAN JOUQUIN VALLEY: SM, Byron Smith, WA5YLB—Asst. SMs: K6YK and W6TRP. SEC: W6BU, STM: N6AWH. 1990 brings lots of changes for clubs. Note the following club officers: SARA - Pres Phil, W6BFX, V.P. Oliver, K6BYZ, Sec Linda, N6REB, Treas Al, N6SAE, Fresno ARC Pres: W6ZLA, V.P. N6JCW, Sec: N6SIV, Treas: K6CBBS, CARB: Pres W6QVI, V.P. W6BPH, Sectres K6BOZ, Net Mgr W7WYV, SPARK Pres Scott N6RGV, V.P. Burt W6FGC, Sec Carol K6OC Treas Gert K6VFO, E.C. Fred W6BWF. S.S.A.R.S Pres Darrell N6MTK, First V.P. N6GLQ Sec V.P. Al W6KQ, Sec Ray K6KMB, Treas Caroline Parsons. Sorry to report the following Silent Keys: W6YV Dr. Ronald Bailey, George Craine K6BKW. When traveling through the town of San Andreas look for the signs telling about their local repeater. K6BESL made WAC on 10 meters. Traffic: K6BESL 14, W6DPD 19. Please send me your club's newsletter.

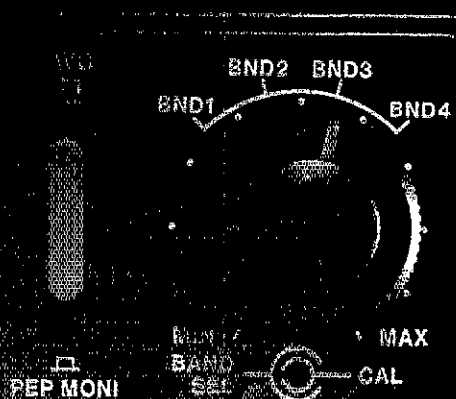
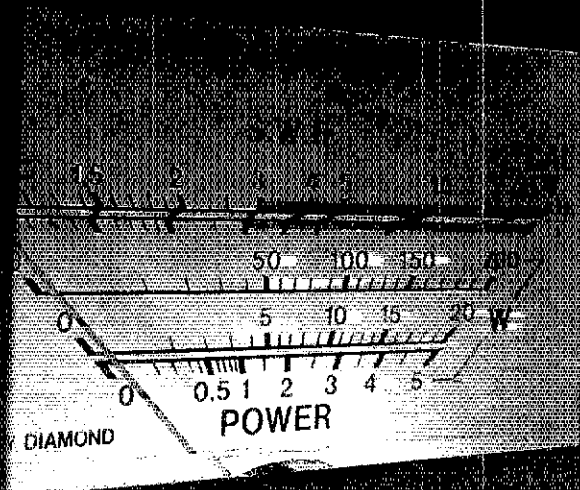
SANTA CLARA VALLEY: SM, Glenn Thomas, W6SW—SEC: N6JQJ, TC: W6PWW, STM: N6JLJ, PIO: N6HMO, ACC: W6MKM, BM/(vacant) OOC: K6AS, DECEMBER - A busy holiday season for us all this year...many clubs held holiday banquets, including the San Mateo Radio Club, the Navel Postgraduate School Amateur Radio Club in Monterey and the Gabilan ARC in Gilroy...the EMARC group heard from Ben, W6FRM, on transmitter hunting techniques. A very interesting program indeed as evidenced by the fact that it lasted two hours and would've gone on longer had not some folk decided to call a halt to things before morning came!...The Santa Clara Valley Section Amateur Auxiliary office a formal agreement with the San Francisco FCC field office this month. If you are interested in the FCC Amateur Auxiliary/OO program, contact our OOC, Steve Wilson K6AS for details...Yours truly spent so much of December traveling that I don't have a whole lot more info this month, but next month promises to be very busy! 73 'till then. Traffic: NR7E 173(0)-PSHR 50. Phone numbers: (408) Amateur Radio Classes/Clubs (408) 971-1424, License Exams (408) 984-8353 (ARRL VEC) or (408) 255-9000 (Sunnyvale VEC).

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200 Watt SWR/Power Meter, 140-525 MHz

P.E.P. / Average Power Switch

*Accuracy FS: 10%

*Insertion Loss: 0.2dB

*Lighted Meter

*Minimum power

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*Sensor 1: 1.8-180 MHz; Sensor 2: 140-525 MHz

*Insertion Loss: 0.3dB *Power Ranges: 5W/20W/200W

*Accuracy FS: 10% *Lighted Meter

*Dimension: 6.1" x 2.7" x 4.5" *Weight: 2 lbs.

200 Watt SWR/Power Meter, 1.8-200 MHz

*Accuracy FS: 10%

P.E.P. / Average Power Switch

*Insertion Loss: 0.2dB

*Minimum power SWR Test: 1W

*Lighted Meter

3 KW SWR/Power Meter, 1.8-60 MHz

*Power Ranges: 30W/300W/3KW

P.E.P. / Average Power Switch

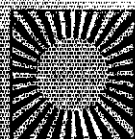
*Insertion Loss: 0.1dB

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ICOM Antenna Tuners: A Decade Ahead!

One of the most popular accessories in amateur radio today is the automatic antenna tuner. The applications for this versatile unit continue growing on a daily basis. Some amateurs may not be aware of this unit's numerous benefits, however, so this month's Tech Talk takes a closer look at antenna tuners in an eye-opening manner. We are confident you will find this discussion quite informative and beneficial for increasing your on-the-air operating enjoyment and success.

Explained in the simplest of terms, antenna tuners are adjustable impedance matching units. They assure an optimum RF match and low SWR between your transceiver and its antenna so full transmitter power can be delivered into the antenna's feedline. Understand that no antenna tuner directly improves an antenna's signal radiating abilities; it simply ensures maximum transceiver RF output is directed toward the antenna. Radiating that power effectively is the antenna's purpose.

Newer amateurs may ask why an antenna tuner is used when a standard 50 ohm-output transceiver is connected to a commercially manufactured 50 ohm antenna. Are not the two impedances identical and a low SWR eminent? Maybe, but not necessarily. Any antenna is susceptible to field-installed variations caused by trees, rooftops, ground conductivity, nearby automobiles, etc. Many antennas are also narrowbanded and their SWR's rise significantly between SSB and CW band segments. Every setup has its own idiosyncrasies but an automatic antenna tuner mates its rig and antenna into a smooth working combination.

There are two basic types of antenna tuners: manual and automatic. Manual tuners are usually credited with the widest range for matching unusual antennas, but the time required for their adjustment and determining which of two or three "low SWR" settings should be used is not attractive for serious DX'ing or high score contesting. Being tuned and ready for no-fumbles action always yields the highest returns! Automatic antenna tuners are faster and more accurate in adjustment, but some units only match a

limited range and/or require surprising amounts of operator interaction.

ICOM's automatic antenna tuners, however, are world-famous for their wide range single operation (press one button and talk!), and high sensitivity (they self-reference and tune even when you run low power). Now that is effectiveness!

Automatic antenna tuners are factory-installed in ICOM's deluxe IC-765, IC-781 and IC-761 HF transceivers, and in the new IC-4KL 1000 watt-output linear amplifier. ICOM's automatic antenna tuners include the AT-500, AT-150 and AT-100 base tuners, plus the AH-2 and AH-3 mobile tuners that install in your auto's trunk. When activated, each unit immediately presets to nominal impedance matching conditions for your selected band. During the first instant of your initial transmission, the base tuners check for an optimum match and perform final "tweaking adjustments."

Automatic antenna selection is also featured in ICOM's base station tuners, and this deluxe function is easily integrated in ICOM's tuner-equipped transceivers by adding an optional EX-627. The EX-627 simply plugs into a rear socket on its mated transceiver, and it automatically selects the proper antenna according to your band of operation. The EX-627 selects up to 7 antennas, and you set antenna/band combinations to fit your station (like separate or multiband beams for 20, 15 and 10 meters, dipoles for 80 and 40, etc.), with jumpers under the EX-627's top hatch. Contesters love it!

Since the previous discussion was generally technical in nature, we invited various owners of ICOM tuners to share their opinions and experiences in an informal manner. Several operators told us their ICOM tuners consistently worked with high SWR's that left competitive units cycling and hunting for a good match. Others reported fully automatic antenna selection and tuning took a few seconds to accept, but not they will not use anything less. Probably the most unusual description of ICOM tuner effectiveness came from noted CQ columnist K4TWJ. Dave reported the automatic antenna tuner in his IC-761 matched

even worst-case SWR's, so he used it to load the metal bedframe in his temporary townhouse QTH and made several good contacts on 30 and 40 meters. Dave used a "home-brewed tee match" by clip lead-connecting the coax feedline's shield and center conductor 14 inches apart at the bedframe's corner. The rig and bed were in separate rooms, so 34 feet of coax was used for interconnection. SWR without the ICOM tuner in-line exceeded 8-to-1 (forward and reflected power were almost equal!), and the SWR dropped to 1.3 to 1 when the tuner was activated. Full transceiver output could then be delivered to the bedframe, but power was voluntarily reduced to 30 watts to minimize RF heating effects. Signal reports were not outstanding, but that was the bedframe/antenna's deficiency in radiation; not the tuner's fault. It performed admirably!

Automatic antenna switching and tuning with ICOM equipment is indeed delightful. You are free to operate multiple bands by simply dialing a desired frequency on your transceiver, and support units follow your lead. You start rather than join DX pileups and catch "new ones" before others even get their gear ready to call. Setting up your own 1990-style station is also a cinch. ICOM transceivers and accessories interconnect in less than an hour's time. Go for it, and enjoy an exciting new dimension in amateur radio today!

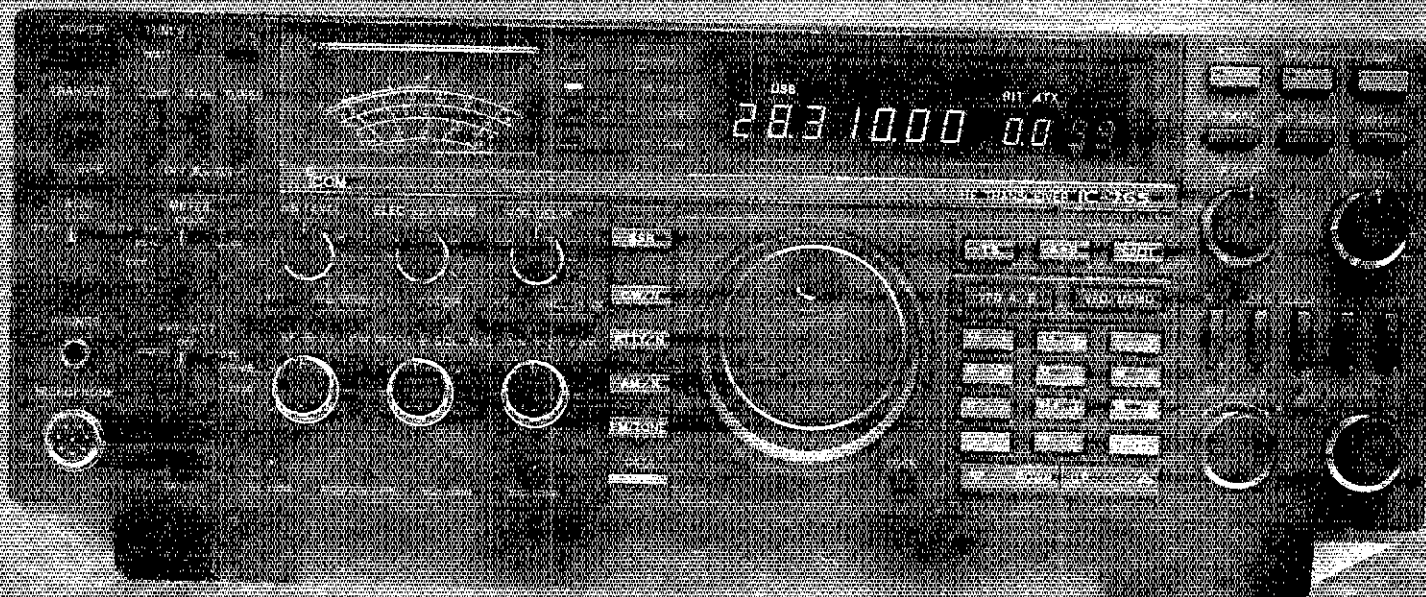
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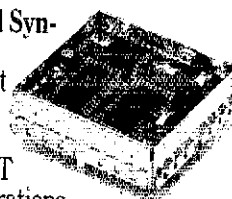
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NORTH CAROLINA: SM, W. Reed Whitten, AB4W—ASM: AB4S, SEC: N4MYB, STM: K4NLK, BM: K4YV, ACC: WC4T, TC: K4AOX, SGL: KE4ML, PIO: W4NEW, Bob Southworth, K4YV, has agreed to be our Section's new Bulletin Manager. During an emergency the OBS system relays NC Bulletins which keep the Section updated on the extent of ARES involvement and anticipated needs for assistance. Bob asks that amateurs throughout the NC Section contact him about an Official Bulletin Station (OBS) appointment. Bob was first licensed 52 years ago and has served in many positions in the ARRL Field Organization. In the VA section he was SEC, EC, Net Manager of both the Phone & CW Net, and an Asst. Director. He built the first 2 M repeaters in both Charlotte (34/94), and in Farmville VA. Bob is currently active on packet radio, NTS phone and CW nets, and is Secretary of the Mecklenburg ARES. Prior to Hurricane Hugo's arrival in Charlotte Bob had operated the club's W4BFB HF station at the Red Cross handling H&W traffic from the islands. After Hugo passed through, he (and many others) provided emergency communications for six more days. Bob is also involved in setting up an Amateur station in a city sponsored children's science museum, Discovery Place. [BT] Many thanks to K4IWW who served as NC Bulletin Manager for almost six years. Will has resigned from this position, but will continue as Net Manager for the Carolinas Net, the combined NC & SC CW NTS net. [BT] The Governor of North Carolina, James G. Martin, Jr., wrote the Chairman of the House Budget Committee strongly opposing the amateur fees in the Omnibus Budget Reconciliation Bill of 1989. In his letter he referred to our involvement with the State Emergency Response Team (SERT) and cited many instances in which Amateur Radio has provided the ONLY means of emergency communications, both in our State and throughout the country. K4ANJB (XYL of AB4OZ) was instrumental in getting this letter initiated. [BT] Many antennas damaged by Hurricane Hugo are being repaired and many repeater antennas damaged by ice will need extensive repairs. Help your repeater groups and join in some antenna parties for your fellow hams. [BT] The Mecklenburg Amateur Radio Society sponsored Charlotte Hamfest is scheduled for March 17 & 18. [BT] Congratulations to the traffic nets for handling the Christmas traffic load. Congratulations also to Wake Tech AEC which has qualified for BPL for the last 8 years during December [BT] Quarterly traffic report, October - December 88:

Net	QNI	QTC	QFC	QND	Ses	Net Mgr
CEN	1675	591	536	1080	92	WB4WII
NCNM	1013	527	429	1466	92	WD4MRD
CN	1687	898	838	3801	184	K4IWW
CSN	889	84	80	2089	92	AA4MP
CNCTN	2948	308	233	1084	92	W4AMNR
PCTN	1020	643	546	1886	92	K87LX
RARS	1111	75	73	1771	92	KA4BJ
M2MEN	1381	90	69	847	85	K4FMZ
CFEN	1340	75	75	1628	92	W4EHR
PETN	941	161	138	990	86	W4HRR
THEN	1188	144	107	832	86	K4ALHW
ACARES	144	10	10	123	15	K4ULA
PECEN	122	1	1	160	8	K4AKOZ
Totals	15,237	3,606	3,135	18,477	1,107	

December traffic: K4NLK 545, K4IWW 412, N9CGD 249, W4EAT 231, K4YV 225, K4EYF 133, K3TX 175, N4JTG 168, AB4S 141, N4YFU 85, W44HRR 80, K4AGZ 75, W4D400 71, N4LS7 70, W4NEW 56, N4SHE 53, W4BUTM 53, W4MDR 51, K4GI 50, N4SVZ 45, W4WII 41, N4UE 41, W4EHF 40, K4N4J 39, N4SSX 38, N4YV 36, W4AMNR 35, W4LWZ 29, N4VHU 27, K4MBN 26, K4CGK 26, AB4W 25, K4YJB 24, K4AIF 23, W4KLF 15, W4ZEDN 14, W4BDCX 13, N4UOE 13, N4WRR 11, K4AJKB 5, N4K4 4, W4ANDF 4, W4B4MG 2 [AR].

SOUTH CAROLINA: SM, Ned Moeller, N4FVU—Many ARRL Affiliated Clubs award "Ham of the Year" recognition to its outstanding members. The Anderson RC awarded special recognition plaques to two of its supportive non-members. K4ALRM received recognition for being the S.C. SSB Net Manager throughout the Hugo Communications Emergency. Official Observer W4DRF was praised for his reporting of non-licensed 2-meter band intruders. Columbia ARES' "Ham of the Year" was awarded KE4VT. WF2G received the ARRL Merit Service award. During SEC K4AFP's absence Feb 4-Mar 17, N4FVU will be Acting SEC. ARRL President W4RA appointed PIO AB4ID to the Public Relations Committee. Vice-Director W4HLZ presented his Critique of the Hugo Communications Emergency at the Jan ARRL Board Meeting. Twelve recommendations in the Critique were offered for adoption by the Board and the ARRL staff. Nov Traffic: K4FL 278, Dec Traffic: K4FL 557, W4ANK 125, N4MEJ 76, K4ALRM 50, W4DRF 22.

VIRGINIA: SM, Claude Feigley, W3ATQ—STM: N4GHI, SEC: W44ZTR, ACC: K44UY, OOC: W8IRT, TC: N4UA, PIO: AA4VP, SGL: W4UMC, BM: W3ATQ.

VTN	1 PM	3807/7280	W4JLS
VSNB	6 PM	3947	K4B8R
VSN	6:30 PM	3680	W4TZC
VN(EARLY)	7 PM	3680	N4GHI
VN(LATE)	10 PM	3680	W4AKSG
VLN	10:15 PM	3947	NW3K
SVEN	7:15 PM	148.82	NJ3H
STARES	9 PM	148.97	K4JVT
DEC/EC	9:30 (3rd Wed)	3947	K4ANWK

STM, N4GHI, has named KB4WT as the Section Data Manager. One of Lynn's duties will be to monitor the section's PBBS to ensure that NTS traffic is being picked off the PBBS for delivery. In order to establish a data base of the moved via Packet N4GHI has suggested that when sending her your monthly tic report, report the total tic as follows. If you handled 50 mgs by CW and/or SSB and 10 mgs via Packet, report your TOTAL as 60/10. DO NOT SPLIT orig/rcvd/sent/divid totals. SEC, W44ZTR, sez WB4PEA has successfully passed the Certified EC exam. Also, N4FNT, is appointed an OBS. On Dec 14th, KB4PW, DEC for South Piedmont District, received a call from the Red Cross to supply communications for a fire at an apartment for the elderly. Communications were established between ARC headquarters and 2 evacuation centers. KB4WT, K4ALW, W4Y4D and K4EVL participated with K4CIUP, W4OLD, K4ANNE, W4ZEIN, K4GTR and K44PR. During the emergency 4 died, 17 were hospitalized and 200 were evacuated. NC48 reports that after 5 years of operation, the SVARC VE exam group has given exams to 289 candidates with 179 (59.8%) of them upgrad-

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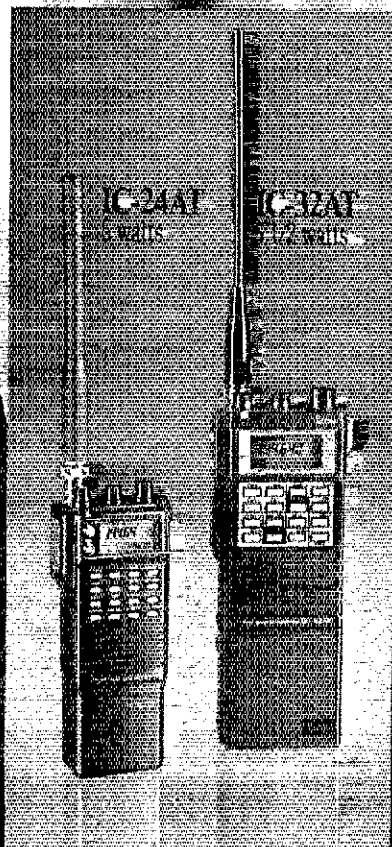
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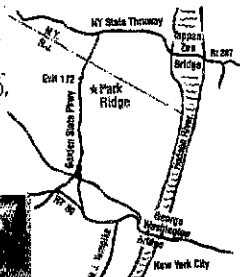
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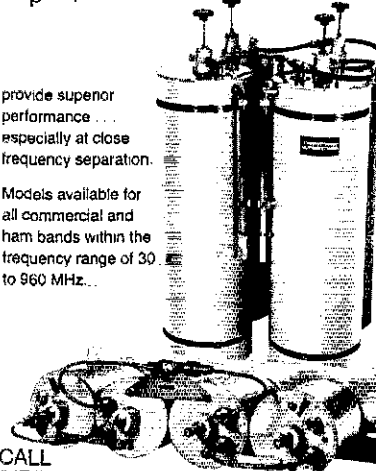
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ing after taking 436 exam elements, 22 different VEs assisted in the program. The Commonwealth of Virginia has fully equipped the EOC at Richmond with amateur HF, VHF, Packet, and/or RTTY facilities. WB4ZTR, has named N4EXQ as the State EOC/RACES Radio Officer. Under Earl's guidance procedures will be developed for the operation and maintenance of these facilities. It is hoped that the equipment will be in operation in early January 1990. Upcoming VE exams—Mar. 3, Richmond, contact N4RPI, 804-233-8481 - South Peninsula ARC, contact W4RTZ, 804-858-8031 - Apr. 7, Williamsburg, contact W4JX, 804-253-2811. Traffic: WB8TAX 3802, WD4MIZ 2808, KD4DOR 2044, N4HOQ 1082, K4MTX 1020, N4GHI 888, KB3RM 835, N4EXQ 559, W4JLS 548, NW3K 526, WB4QOJ 522, W3ATQ 497, AA4AT 331, WB4D 306, W4SQO 303, N4TJT 296, N5DST 269, K4BGZ 261, WB4VMX 235, N4UWX 228, AA4QL 215, WB4PNY 169, WD4MIS 155, N6GVG 149, KD4NH 145, WB4ZNB 121, K4JVT 113, KB4KSG 109, WB4EDB 108, KB4CAU 91, N6ANQ 85, K4ABR 81, WB4ZTR 77, N4FZA 71, WB4FLT 67, K4MLC 61, N4KSO 44, WB4DQZ 41, K4JAL 38, K4JM 31, K4KL 27, K4GR 21, KB4OPR 20, WB4UHC 19, KB4NGO 18, WA4TVS 17, K4MLD 16, W8SA 15, KC4JGC 14, N4FNT 13, KB4WT 9, W4HU 8, W44DTE 8, N3RC 7, W4TZC 4, W4HE 3, W41VRL 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: N8FXH. SGL: K8BS. TC: K8LG. CC: W8BFLF. Repeater Coord. WB8DGY. Regret to report that Willie, W8EKC has become a Silent Key. Ann, K8ZGY, reports that he is badly needed for the Novice Net. Paul, K8BWW is new EC for Greenbrier Co. WV ARCS closed the year with 673 members. Thanks George, K8QEW. Terry, W8BV is new Pres. of KARC. K8KFC's new 80/40 Mtr. antenna is working well, after some start-up problems. Hope everyone enjoyed Fayetteville HF. It's always a welcome event as we look forward to spring.

NET	FREQ	TIME	QNI	OTC	SESS	NM
WVFN	3865	8:00	1270	156	31	WD8DHC
WVNE	3567	7:00	271	129	31	K2BQ
WVNL	3567	10:00	164	48	31	K2BQ
WVMD	7235	11:45	821	93	31	W8DV
WVRN	3640	6:30	258	47	30	K8LG
WVRN	3730	7:30	49	21	23	K8ZGY
Hillbilly	14290	NOON	205	20	5	W8YP

Traffic: K8WMO 805, K8TPE 537, W8BV 520, W8TL 376, N8GJO 308, W8YP 255, W8DHC 141, K8QEW 89, K8ZGY 53, N8FXH 24, K8KT 21, K8OGF 9.

ROCKY MOUNTAIN DIVISION

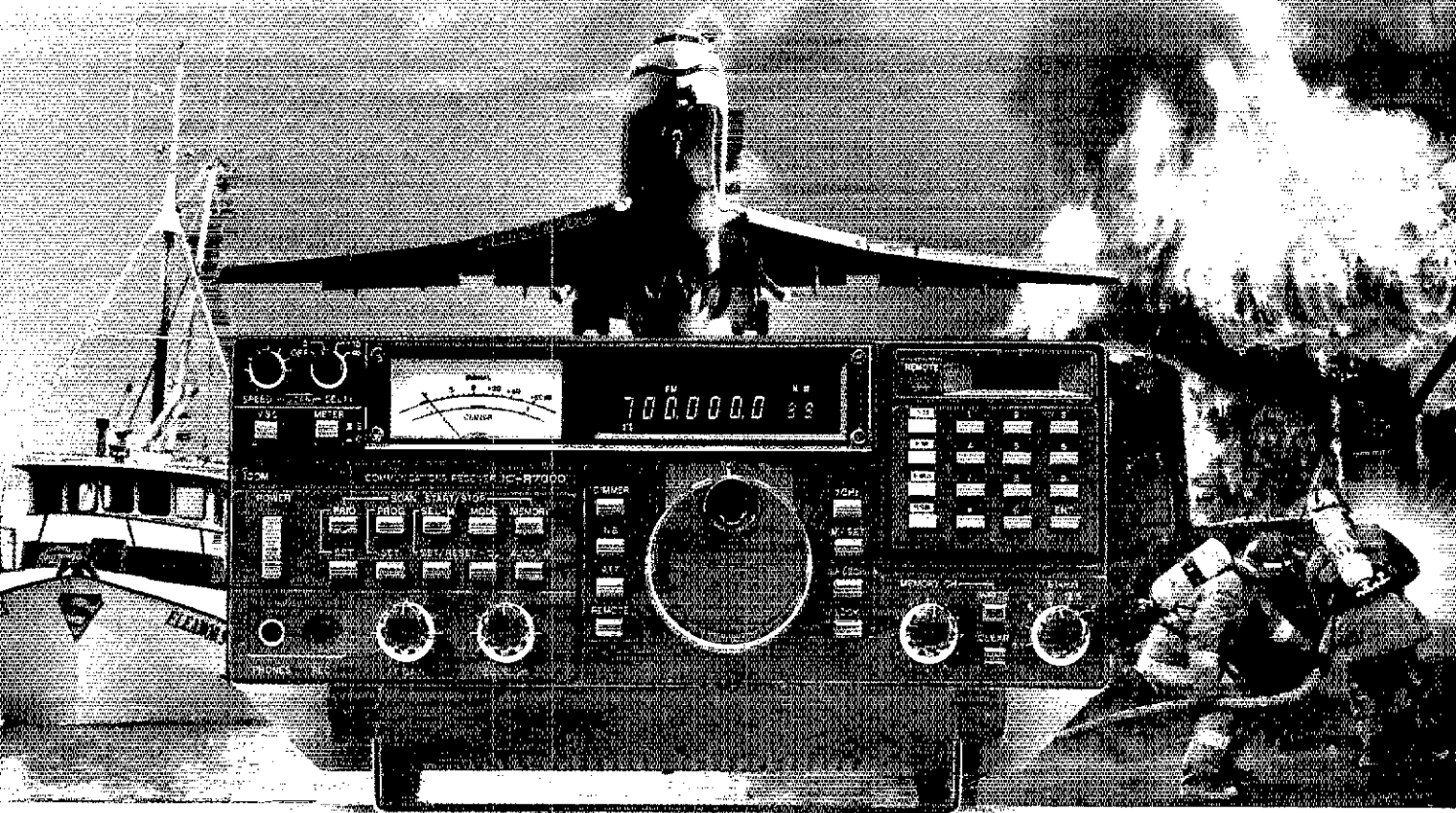
COLORADO: SM, Edie Sheffield, K8MQA—SEC: K4UBU. STM: K8BZ. ACC: W8BDUV. OOC: K8CDNV/WJR. PIO: W8BFB. SGL: W8HNP/W8HNP. TC: W8JF. BM: K8VVKM. I am happy to report that the ham radio equipment stolen from the DRC station of W8TX at the Mile Hi Red Cross on Christmas night was recovered approximately a week later when the thief had another run in with police trying to break into one of the local ham gear shops. The club station will be fully operational again for emergency communications. Congrats to Western Colorado ARC members and Aurora Repeater Assn members for supplying communications for the Parade of Lights in Grand Junction and Denver. Received a newsletter from DARC, look for the 1st annual Swapfest in Durango on June 16th. A reminder to all clubs that the 1990 Annual reports are being sent out. Please get ur updated info in as soon as possible, and be sure to include the SM on your newsletter mailings. Congrats to W8JF who will celebrate 60 years as a ham the 1st of March, and will put his "Old Time" transmitter on the air March 1 & 2 and again on March 6 & 8th on 40 & 80 meters SSB & CW. 73. K8MQA. NETS: Col: QNI 1156, QNF 993 QTC 114-115, 31 sess CWN; QNI 55, QNF 214, QTC 47, 31 sess. CWXN: QNI 1671, QNF 2700, QTC 1367, 31 sess. HNN: QNI 1951, QNF 1202, QTC 203-704, 31 sess. NCTN: QNI 188, QNF 332, QTC 117, 25 sess. SCTN: QNI 293, QNF 450, QTC 36, 30 sess. Traffic: N8BQP 1737, K8HOA 1202, N8LVI 602, N8HFZ 601, K8VFK 538, W8JF 492, W8G 298, K8WIE 282, W8DAUN 178, K8SN 144, N8GVC 128, N8CYR 78, K8BZ 36. (Nov.) K8TER 55.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K5YEJ. DE: W5HCB. STM: N5DT. NM: W5UNC. KASNNQ, W5QNR, TC: W8GY. ACC: K5BEM. Southwest Net meets daily, 3583 @ 0230 UTC, handled 110 msgs with 121 checkins. NM Roadrunner Net meets daily, 3939 @ 0100 UTC, handled 95 msgs with 1328 checkins. NM Breakfast Club meets daily, 3939 @ 6:30 AM, handled 154 msgs with 960 checkins. Yucca 2-mtr Net, 78/18 handled 6 msgs with 462 checkins. Caravan Club 2-mtr Net, 68/06 with 86 checkins. SCAT Net, 68/06 handled 6 msgs with 567 checkins. Info Net 12/72, with 78 checkins. Trx to all the Net Managers, the Net Control Stations, and all the loyal members of the Nets for their hard work and dedication during 1989. Special thanks to K5BIS, ASM for NM and his hard work this past year. We all hope that your 1990 will be a pleasant and successful year. Vy best 73, JTK. Traffic: K5FVF 191.

UTAH: SM, Rich Fisher, N57K—SEC/STM: Jim Brown. PIO: Lon Stuart. Many things are happening in Utah, and I would like to hear from you on what it is. Davis County will be moving the 147.04 repeater to Antelope Island soon. We are working on repealing the license plate 30.00 fee. I hope when you read this it will have happened. The 148.90 repeater is on emergency power if needed, and has a very good autopatch. Weber, Davis, Boxelder Cache, Salt Lake and Utah Counties are very active. Have a good new year. Traffic: N7JLC 71, N7IE 61, N57K 42, N7ASY 33, N7AG 25, N7UJN 17.

WYOMING: SM, Jim Ralsler, N4GVV. ASM: Steve Cochran, W4TH. SEC: Jim Anderson, W7TVK. STM: Dan Ransom, K7MM.

Net Cowboy Freq Time Days QNI/OTC Mgr
3923 545p M-F 715/20 WB7K
Pony Express 3923 800A Su 237/3 W7MZW
Traffic: K7SLM 14, 1989 saw Dick, K7CAR, "retire" as net manager of the Cowboy Net after 6 years at the helm. TNX Dick for a job well done. Mac, WB7K, has taken over as NM, in addition to several other duties. As heard on the nets, we are in need of control operators to assist both Mac and Morris. How about you volunteering? A "pirate" operating NE WY has been noted on several of the 2-meter repeaters. I'd like to know if similar problems exist elsewhere in the state. This is a situation that demands attention if we are going to maintain the traditional high standards on the amateur bands.



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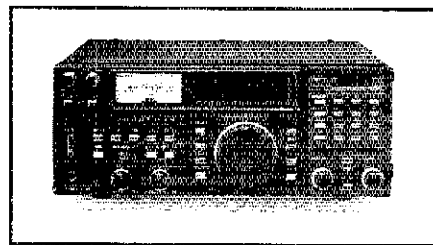
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SOUTHEASTERN DIVISION

ALABAMA: SM, James Spann, WO4W—ASM: W4XI. SEC: KB4GDN. STM: W4PIM. PIO: KB4KCH. ACC: AA4BL. OOC: KF4VS. SGL: N4FRQ. BM: KA4ZXL. Note that traffic reports at the end of this column - it seems as though activity and traffic handling on our section nets are still on the upswing. Let's keep this trend going - please make an effort to check into ASN, ADN, or the ATNM...and learn more about handling formal traffic. As of this writing a number of our packet backbone nodes on 433.80 MHz are down...which isn't helping things concerning BBS forwarding. UHF activity continues to increase...the 443.75 MHz repeater in Birmingham now has frequency agile remotes on 10 meters, 2 meters, and 440 MHz. Other excellent UHF repeaters with remote systems include 443.95 MHz in Demopolis, 443.325 MHz in Huntsville, and 444.525 MHz in Alexander City. This is my last report as SM of Alabama. Our new SM, Mildred Cullen, AA4XF, already has her "team" in place, and her reports here will begin next month. Thanks again for all your support, and giving me the chance to serve the amateurs in this great state. BPL: WA4JDH. PSRR: WA4JDH, W4PIM, W4CKS, W4QAT, WA4RNP. Traffic: WA4JDH 1085, W4PIM 268, W4CKS 203, W4QAT 134, WA4RNP 53, WB4MMD 39, W4XJ 23, WO4W 12.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM: KC4MJ. SEC: NC4E. STM: WB4WQL. PACKET: W4QO. ACC: KM4IH. BM: AA4UA. OOC: W8BLA. PIO: WA4LLE. SGL: WB4UVV. TC: W4ZTL. Well here it is March again & time for the Ga section's 3rd largest HAMFEST. On the 24th & 25th it's time to come to Columbus & at the usual place, the Municipal Auditorium at 4th Ave & 4th St. CU there. March & April also brings us some nasty WX so let's be prepared & see that the local ARES groups are ready if needed to serve the citizens of this great state. As of this writing following made PSRR during Dec: WB4DVZ, KC4BHX, KA4HHE, WB4WQL & WA4YYQ. Southern Piedmont ARC (SPARC) elected the following slate of officers: Pres: K4HCA, VP: KB4DTA & Sec/Treas: KA4KWC, Sec: KC4EKE, Treas: KC4ELV, Tech Comm: N4EMM, Act: KA4OWE, NM: KC4CGY, Edit: WA1KMS. Jesup Amateur Wireless Society slate is Pres: N4VAD, VP: KA4PCN, Sec/Treas: N4JFO & Prop: N4PJR. Atlanta Chap QCWA elected KC4MJ as Pres, VP: KK4PY, Sec: W4NZJ also Treas, Dir are: W4HAH, W4BIW, NM: K4VN, QCWA net meets on 3855 kHz Sat at 0900 local. Dalton ARC Pres is: N4OTC, VP: N4TFE, Treas: KM4DQ, Sec: KC4HUR, Dir: KK4KL, KJ4BS, WA4TIV, K4IG & KE4LN. Amateur of the year is N4OTC. Warner Robins elected WB4UHL as Pres, VP: WB4KQP, Sec/Treas: KC4WU, Prog Chm: WL7ACY, Dir: NP4PO & WL7ACY & Amateur of the year is WD4ENO. Tocon ARC officers are: Pres: WA4NRU, VP: WD4CUK, Treas: KA4DIP, Sec: KB4HCB. I want to congratulate all of u new leadership officers & wish u the best of luck during your tenures. Also keep up ur ARRL memberships to keep ur club as an ARRL affiliate. Also strive to become a (SSC) SPECIAL SERVICE CLUB which has lots of benefits. For further info contact KM4IH who is the Club Coordinator for the Georgia Section. Once again God bless & 73. Eddy Traffic: WB4DVZ 253, KA4HHE 237, KC4BHX 141, WB4WQL 122, N4UJ 63, WA4ET 31, WA4YYQ 30, WA4TIX 29, N4MWR 21, K4BAI 3.

NORTHERN FLORIDA: SM, Roy, N4ADI—TO: Ed, W6RAO. ACC: Dick, WA4BIM. OOC: John, AB6I. SEC: Rudy, WA4PUP. STM: Cotton, KB9LT. ASM: Bill, KB4LB. ASM DIG-ITAL: Al, K4CY. SGL: John, KC4N. PIO: Petey, WA4POU. BM: Dave, N4GMU. The FLORIDA MIDDAY TRAFFIC NET which meets daily at 1700Z near 7247.5 kHz has WANFK as its NM also has 7 NCS to run the daily net. We need to thank and recognize these seven hams who give up their time to do the work. Monday, N4UF (WA4STV) Billy; Tuesday, WB4WYG Bill; Wednesday KC4VK Charlie; Thursday N4ADI Roy; Friday WA4OXT Walt; Saturday W4DWN Walt; and Sunday KC4FL John. These volunteers are assisted by others who carry our outgoing traffic to RN5D and D4RN and EAN, and others who bring traffic into Florida from these same nets, as well as QFN, NFPN and others. FMTN has been serving the two Florida Sections since 1957 and will continue to do so for many years to come, as long as we have people who are willing to assist their fellow hams in this endeavor. Our sincere thanks to these people, as well as those who serve the other CW and Phone nets of the National Traffic System. Next month I will announce the new Club Officers that haven't been printed in this column who are known to me, 73. N4ADI, Traffic: KB9LT 762, N4SS 622, WA4OXT 497, KC4CSD 373, WC4D 350, N4JAQ 347, AA4FG 305, K4UBR 300, KC4FL 243, K4PB 181, N2AOX 135, W4KIX 132, W8IM 126, WA4EYU 111, N4GMU 104, N4QYS 84, W1UKR 84, N4DY 74, NF4O 64, K4CQ 58, N4JHI 57, W4UEA 50, K4BI 46, WA4T 41, N4NKI 41, WB4TZR 37, K4UTY 36, WD4EQB 34, N4ADI 32, N4OZD 30, WA4VLX 25, WB4MMH 22, K4HS 21, KC4HE 21, N4KOX 14, KB4OBP 14, WB4BPQ 12, K4QOF 12, AA4FW 12, WD4SGB 12, WA4PUP 12, N4UF 11, N8HW 11, WA8KE 10, KC4CSX 8, WA4NKA 8, KC4ERB 8, N4ENV 6, KC4EYD 5, WA4STZ 5, N4OOF 2.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—STM: K4ZK. SEC: W4SS. TC: K4I. BM: WD4KBW. PIO: N4BPF. AAC: W4TAH. OOC/AAC: K4EUK. SGL: KC4N. PKT MGR: K4CY. Congrats to the PIRATES, Pine Island Radio Amateur Technical & Experimental Society, a newly organized club. In addition to their regular activities they intend to provide quick communication from the barrier islands in the event of storms and come to the aid of boats in distress in the Gulf. The Martin County ARC, Common Emitter reports that their goal of a 250 membership roster during the 1989-1990 fiscal year is nearly reached - there are presently 238 members with several applications awaiting approval. The Gator Chapter of the QCWA reported 32 members and guests at the Christmas meeting held at Stacey's Buffet in Clearwater. The Everglades ARC, Beam states that the preliminary figure for the Flamingo special event is close to 300. Also indicated was that AA4CH will give a discussion on traffic handling at the next meeting. The Fort Myers ARC, Modulator indicates that the club has a bus going to the Miami Hammock on February 3rd. Other newsletters received included the Englewood ARC, the Southwest Florida Traffic Net and the South Brevard ARC Spark. WT4F sent a message stating eight Polk County hams originated and sent 121 holiday messages from nine different nursing homes. Be sure to check WA4EIC's PSRR score - he had a whopping 173 deliveries for a total score of 2451! KM4VC, EC Arcadia, writes that contact has been made with all police and fire departments in the city and county as well as the Red Cross and the civil defense director. Liaison has been established with NTS and plans are being made to give

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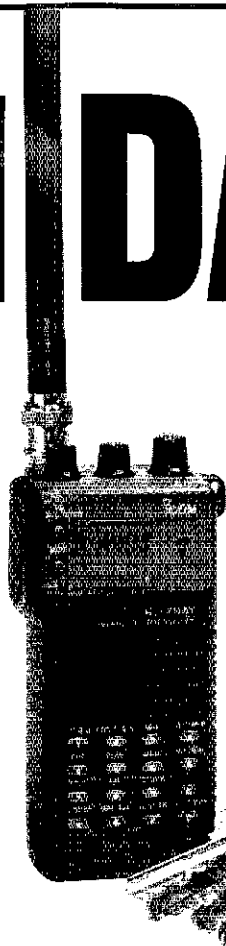
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shows at the local high school during January. N4HHP, RACES Officer for Broward County sent a packet message stating that the Oakland Park government called out RACES Christmas Eve to help look for a kidnapped child. There was a mixed group of hams and cb'ers who worked well together and considering the evening they were called out, gave it their best in a very professional manner - the good news is that the child was found in an abandoned vehicle in about one and a half hours. N4TTF, Editor of the *Scuttlebutt*, a Waterway Radio & Cruising Club Publication sent me a copy of their special Hurricane Hugo issue - the list of boats and their status in the aftermath of Hugo was astounding - but the stories related by three couples during the storm were absolutely cliff-hangers. Much too lengthy for me to include here but hopefully these stories of personal experiences during Hurricane Hugo in St. Thomas, Culebra and Georgetown, SC will be made available for all to share. Letters of commendation to the net were also included, one in particular from the Commander, Seventh Coast Guard District, Miami, FL which expressed his appreciation for the enthusiasm and professionalism exhibited by net members - he pointed out that their searches often extended to remote areas not accessible by other means of communications. Received a packet message from N2WVX, formerly of Palm Bay - he is now a 1st year law student in the Tampa area. Howie was a member of QFN and then became one on the pioneers in packet radio. Congrats to WA4EIC who was selected as HAM OF THE YEAR by the Lee County hams. WD4KBW, Bulletin Manager reports 180 bulletins sent and received by W4DL 44, WA4EIC 57, W4TF 56, WD4KBW 16 and WA9VND 7. The ARRL Information Net meets on 3940 KHz every Saturday morning at 8AM to enable amateurs in the State of Florida to meet with and communicate with their elected and appointed officials - please join us and/or listen. 73 de WA4PFK Traffic: W3CUL 3648, W3VR 1395, WA4EIC 805, K4SCL 712, KB6ECH 674, K4ZK 570, K4FQU 564, WA9VND 528, WA4PFK 491, AA4HT 170, K4IA 436, K4EUK 372, AA4BN 339, AB4EA 299, KB4KV 294, N4KFW 221, K4AFZ 208, WA4NBE 201, W4TF 201, WA4RUE 192, WB4WYG 188, W4NFK 188, K4DGR 174, N4MML 168, W4DL 168, WA4UO 164, W4TAH 157, AA4CH 146, K3KT 137, W4DWN 128, N4ET 124, KB4WBY 105, K4CVK 97, N4HAS 94, N4ORZ 86, KB4MOC 82, W3WAM 75, W1NJJM 73, K4A4YS 69, WD4KBW 64, K4Z2W 56, K4F4RL 48, KB4AXG 48, K2OYG 45, N1EGN 41, KB8BDL 39, K4GQV 35, WA4UQO 32, N4XGQ 26, K4MCM 25, K9EHP 22, N4VLH 19, KB4HAY 18, AB4BC 15, W3TLV 15, W4VQC 14, K4GVI 11, KB4TIU 10, K4GMX 10, N9GDV 9, K4A5IH 9, K4AGDU 8, N4ILN 8, N4OJA 7, W4MFD 7, N4ABC 7, W4NSY 6, W3JR 5, N4RHJ 5, N4MFE 4, N2FEL 4, N4PSV 3, K4UUIR 1, WB8HYC 1, AA4IF 1.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—ASM: K7OMR. STM: W7EP. NM: K7POF, KGLL. Hope Santa was good to all of you. K7P reports receiving a new IBM clone as well as a Pakratt computer interface. That's making out like gangbusters! Most clubs had Christmas dinners or parties. Let's all resolve to make 1990 the best year ever for the AZ Section. Received a few replies to my plea for volunteers from local clubs to form TVI committees to assist amateurs and their neighbors in solving problems. The FCC often requests help from us in this area, and it's one way we can ensure our image with both the FCC and the general public. In the Phoenix-Sun City area we have the following volunteers recruited by the WVARC: Joe Nowakowski, W7PFG, Ch'm. 584-6117; Mike Nelson, KB9MJ, Glendale, 488-0967; Dick Howe, K7QCS, Peoria, 979-4662; Bill Thissell, K7VZP, Phoenix, 942-6352; Dan Ford, WA2YNE, Phoenix 938-6688; Charlie Nuzum, W7GP, Sun City, 933-8838; Tom Watts, N7YS, Sun City, 972-6589; (Thanks, WVARC "Short Skip.") In the Kingman area, we have the following representing the Hualapai ARC: Carl Harnisch, WA7OPQ, 753-5218; Charlie Ellis, W6PNM, 757-7553 (H) 753-0883 (W); In the Bullhead City area, our erstwhile OO and ATC, N2ZD has volunteered. His name and number: Art Palmer, N2ZD, Bullhead City, 758-5542. In Tucson, we have our TC, Bill Jordan, K7JL who is willing to help on TVI problems. His no. is 297-1866. Thanks a bunch, OMs. I would suggest that those of you who are not already appointed, apply for the ARRL Asst Tech. Coordinator (ATC) appointment. I'll be sending each of you applications soon. W7YS reported that one of the recipients of his OO advisory discrepancy reports actually wrote him a thank you note! FB Bill, K7KYW, Pima Co. DEC, W7FY, Yuma Co. DEC and N7EBT Verde Valley acting EC all sent in FB SET reports. Also, Walt, K7KYW, sent in FB 1989 EC annual report. Congrats to all who participated. NJ7E, our OOC, and your SM will be traveling to Douglas in Feb'y to visit FCC officials. John, NJ7E, recently received a commendation from FCC for outstanding work in locating a jammer in the Cave Creek area. The jammer, a ham, was fined \$750. Good work. ARCA sponsored Spring Hamfest is Mar. 31 at Scottsdale Community college hosted by Scottsdale ARC. Also Cochise ARC will have their annual Spring hamfest in Sierra Vista May 4-6. Send more reports guys and gals, CUL & Jm. Traffic: W7EP 322, W7OIF 102, K7RLL 66, N7ETP 64, W7LVB 52, K7POF 50, W7KXE 32.

LOS ANGELES: SM, Phineas J. Icenbice, Jr. W6BF—WA6JTM, Harry was elected Chairman of the Los Angeles Area Council of Amateur Radio Club for 1990. WA6WZN, Sandy was elected Vice Chairman and KF6NC, Ken was re-elected Sec/Treas. We have about 45 Area Clubs as members. The Council will promote the next HAMCON 92 and KF6NC, Ken Wahrenbrock was selected to be the Chairman. Your Club should contact Ken as soon as possible so that your club can participate in their choice activity. The first meeting will be held at the Marriott Hotel (LAX) Sat. (11) AM, Mar. 31 1990. This conventional may be an ARRL National Convention. Committee meetings will be held every three months. Participation on this Committee is a must for all clubs that want to learn and earn!!! If you are a club officer and don't vote to have your club participate you are missing a great opportunity.—N6MAD, Kathleen B. Carlson is the Traffic Mgr. for W6FNO/R. Kathleen's report for Dec. 89 is as follows: N6NYK-66, N8AHT-26, K8BCC-22, N6TFS-21, & K8BSPG-18.—The FCC issued public notices involving two ENFORCEMENT actions, one taken against Donald Lahto, WA7WOC of Carefree, Ariz. (\$750) and one taken against David B. Hodges, N3DTH, a \$1,200 forfeiture. Both were for Malicious Interference!—Many

phone calls have been received recently regarding telephone interference abatement. Two types of components have cured all of my problems with dozens of telephones. These inexpensive components are 10 cent Ceramic Capacitors and two dollar Ferrite Toroids. The capacitors, filter the Common Mode Coupling. The first place to install the capacitors and ferrites is at the Outside Junction Box To The Building. (The reason is that this keeps the RF signal from getting into the cable). Now each telephone can be treated with the same cure. Connect one .005ufd ceramic across each side of the line to ground. (.005 ufd +/- 100% capacity tol. & 1,000 v.) Next wind about six or ten turns of the telephone line (cable) thru the ferrite toroid. In a few cases two ferrite toroids must be used one on each side of the capacitors. A typical selection for the ferrite toroid is Mix #43, u = 850, ID = 3/4", Amidon and Palomar each sell these cores in small quantity for about two dollars. These same techniques work for other systems such as burglar alarms, door chimes, sprinklers, PA systems and many other similar items.

ORANGE: SM, Joe H. Brown, W6UBQ—ASM: Riv DEC, W6LKN, Bob (714-886-3823). SM: Org Co, Ralph WB6JBI (714-776-9272). ASM: SB Co, Ken WA6ZEF, ASM: Jerry, AD8A, Section News Editor. Good luck, OM. ACC reports. Frm Tri-County ARA, Support your elected officers. Come out to the meetings, PARTICIPATE, we can continue to be the best little club in the country. de Moody, W6BL, Pres. VP Craig N6SYK, SEC. Ron WB6FSX, Treas John WBASH. Morongo ARC Pres Brian N6VBM, Treas Bill K6SEI, (Sec NIL). Autometrics RC is now ARRL affiliated and will have the many available benefits. Good move. Frm the Cachella Valley ARC, Indo Hams. The City of Indo has a new antenna ordinance that requires a bid permit if height exceeds 12 ft. the max is 65 ft. Check with local officials, there is a grandfather clause. Victor Valley ARC congrats to WB6FCS for 1st place in Orange Section Sept VHF Contests. 1990 Officers, Pres, Jerry, K7YQ, 1st VP Jim, N5COT, 2nd VP Cliff, K6GPD, Sec Jim, W6OUJ, Treas Karl, WB8YLO. Bishop ARC, 1990 Officers, Steve W6ST, Pres, John, KE7CC VP, Jon N6WC, Sec Bill, W6DQR, Treas. Buena Park ARC, was there to help the coordinating council in food distribution to the needy, with W6YJK spearheading. WA6SHF, K6QWZ, K6KVC, K6BKH, W6BGL, N6TRA, WA6PLM Plus XYL, K6B5YK and Bob sez a rewarding morning helping our neighbors going through bad times. Fullerton RC rpts full license a great success. 5 Novices and 12 upgrades. Trx AA8DD & WB9YV, REHAB RADIO North Pole Communicators were at it again. 70 patients talked to Santa. Highlight this time was the seriously ill young boy who had not been eating, but after the QSO with Santa started taking food again. (There is a Santa Claus.) Trx K6OV, WB6GCI and WB6ECB de W6APCO, Riverside County ARA 1990 Officers Pres Mike, N6KZB, VP Steve K6ZFH, Treas Fred, W6TKV, Sec Bob, N6SHT, STM: Dan, W6FCO, Trs Dec 89 rpt, SCNV 31 sessions, QNT 262, QTC 264, PSNR W6BO, N6ADV, K6BHK, K6BND, BFL W6FCO. Traffic: W6GO 851, K6BHK 148, K6BND 118, K6ZCE 77, K6JT 77, K6AGND 72, W6CPB 65, AB8A 56, N6OKS 55, W6SX 37, N6ADV 27, K6XZ 37, K6GXB 16, K6BJO 13, N6HIW 8, W6BWK 4. SM Info. If you have words of wisdom you feel should be included in this limited space, please contact SM Joe, W6UBQ, 714-887-8394 or ASM Jerry, AD8A, at 714-351-8824. cu.

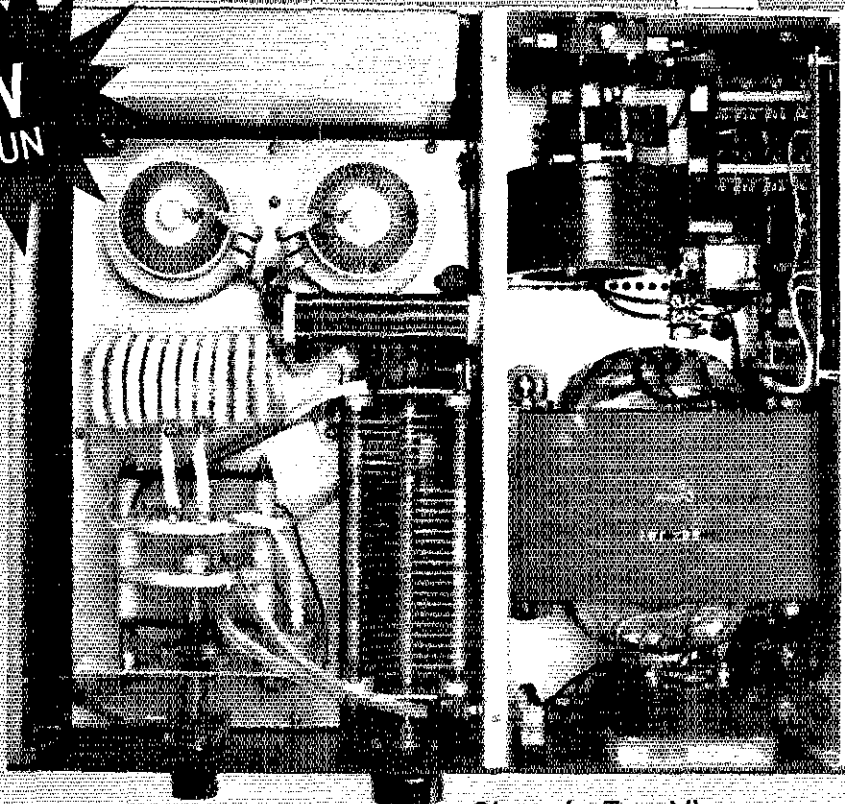
SAN DIEGO: SM, Arthur R. Smith, W6INI—SEC: WBINI. STM: N6GW. PIC: N6PKY. TC: N8UZE. The Southwestern Div Conv for 1990 will be held in San Diego Aug 24-26. If you are not a member of your local club you are missing out on a vital aspect of Amateur Radio. Central Dist ARES meets at Normal Heights United Methodist Church, 4650 Mansfield, each second Saturday. Bkfst 0800-0845, meeting 0900. Come to either or both. Everyone welcome. Late Nov and early Dec saw seemingly endless Santa Ana's resulting in 10 days of Red Flag Patrols. Fifty operators participated. If you are interested in ARES jackets, caps or sport shirts contact K6RLX (449-1282). An ARES 220 net meets each Tue at 1900 on 223.52 MHz, providing an opportunity for Novices to take part in ARES. WA6COE is NCS. Club officers for 1990: North Shores ARC Pres WB6AX, VP N6GZI, Sec K6A6FR, Treas N6RRT; Poway ARC Pres WB6ENP, VP K6CD, Sec K6APXD, Treas K6B6VA; ARC of El Cajon Pres WB6F, VP K6ARLX, Sec N6VGE, Treas W6ULU; Palomar ARC Pres W9FQN, VP K6JUM, Sec WB6CD, Treas WB6B. NCTN (Nov) 29 sessions, 68 msgs, 251 ck-ins. ARES CV (Nov) 4 sessions, 8 ck-ins. Traffic: (Nov) K6ZFH 548, K6BCK 73, N6RVO 46, N6GW 9, W6BILK 3.

SANTA BARBARA: SM, Thomas J. Geiger, W2KVA—We have put aside December's news to note with sadness the loss of one of amateur radio's tireless workers and great friends. On Saturday morning, January 6, John Griggs, W6KW, became a Silent Kay. John served in many capacities, made numerous contributions to the art and science of radio communications, and to the furtherance of amateur radio. We have space here to highlight only a few. John was first licensed in 1922, at the age of 15, and remained an active ham for the succeeding 68 years. His amateur radio avocation led him into engineering, and he designed transmitters for the XEMO and XERB broadcast stations in Mexico in his early twenties. In the late 1930's John designed the radio equipment used by Admiral Byrd on his 1940 Antarctic expedition. During World War II he served with the Navy as a radio field engineer in the Pacific. Over the course of his professional career with the Consolidated Vultee Aircraft Corp. LPL Engineering Corp. in Los Angeles, he designed avionics and communications equipment and public service communications systems. With the resumption of amateur radio activities following the war, John took an active part in ARRL leadership, being elected ARRL Southwestern Division Director in 1949. He served in that post until 1954, as Assistant Director (1955-1959 and 1961-1967), and again as Director from 1967 till 1978 when he was forced to retire because of his health. In 1972 John received a special "Wouff Hong" certificate commemorating his (then) fifty years as a licensed amateur, and honoring his devotion to the ideals of the service. After his retirement in 1978 John was accorded the rare tribute of being elected an Honorary Vice President of the ARRL. In 1984 he was presented with the Southwestern Division Meritorious Service Award "for great contributions and personal service for the perpetuation of ham radio." In addition to his many ARRL activities W6KW was an active member of the San Diego ARC and the San Diego Council of Amateur Radio Clubs, which he served as President and

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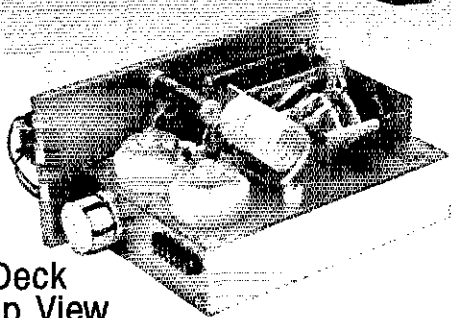
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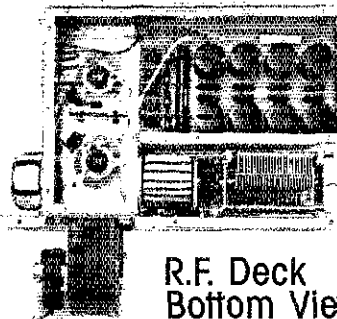


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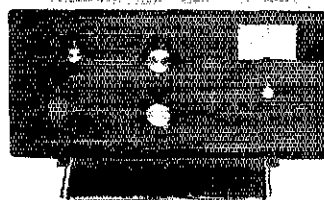
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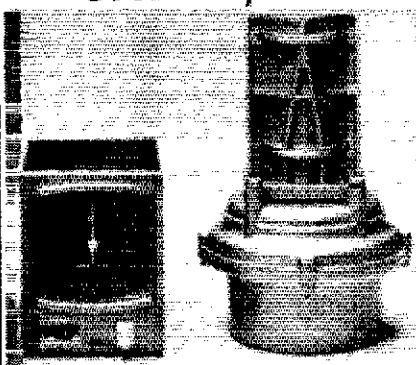


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MODEL	BANDS	MAX. LENGTH
GD-3	40-20-10M	47ft/20.2M
GD-5	40-30-20-15-10M	47ft/20.2M
GD-4	80-40-20-17-12-10M	137ft/41.5M
GD-8	80-40-30-20-17-15-12-10M	137ft/41.5M
GD-7	140-80-40-20-17-12-10M	255ft/77.7M
GD-9	140-80-40-30-20-17-15-12-10M	255ft/77.7M

Choose between 500W PEP or 2KW PEP version. Install as a horizontal dipole, an inverted-V or an L-shaped dipole. SWR is usually better than 1.5:1. No tuner needed. See tests and testimonials of our customers. The GARANT WINDOM ANTENNAS are no dummy load antennas. The windom antenna has been created by Loren G. Windom, WB8Z, in 1928. Our special GD-BALUN (500W or 2KW) matches the low impedance (50Ω) coax feedline to the high impedance windom type antenna. All GARANT WINDOM ANTENNAS come with a 3-YEAR LIMITED WARRANTY and a 10-DAY MONEY-BACK GUARANTEE. Who else has this much confidence in his products?

THE PROOF

CUSTOMER COMMENTS: Howard, W3HAM on his GD-7/2KW, "Service was fast. The antenna is first class. It does all it was advertised to do. Now I have one antenna, one feedline and all the HF amateur bands for the first time in 27 years. The XYL likes that too." William, WA4ZCE on his GD-8/500W, "Service was excellent. Shipping speed was excellent. I have a GD-8/500W in use. I use it 80 - 10 meters. It does excellent on each band. The SWR is just like you said it would be. Thank you very much." Gary, N9KDJ on his GD-4/500W, "It was delivered in 4 days. I put it up in just a few hours. The wire legs are at a 90° angle at the balun and the antenna is horizontal at 15° above ground. Used your exact measurements and the SWR curves, without a tuner, are even better than you advertised. All signal reports, state side and DX, have been great. Best wire antenna I have ever used." C.D.W., W4YJV on his GD-4/500W, "The only topless antenna I ever owned that permits both 80 and 40 meter operation without a tuner." Woody, N3CJA on his GD-6/500W, "It is great not to have to worry about SWR on 80,40,20,17,12 and 10 meters. I use it as a horizontal wire, up about 35 feet."



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Chairman, respectively. After his move to Los Osos in 1971 he became active in the Estero ARC. John also was a member of QCWA and a number of civic organizations. John's love of amateur radio and tireless work on its behalf was enthusiastically shared by his wife Roxanna, K6ELO. He is survived by Roxanna, sons Art, KA6UEW, and Bruce, and one grandson, John W. John Griggs, W6KW, was an exemplary individual and a beacon for all ham radio - he is sorely missed. In keeping with the spirit of John's life, the family requests that memorial donations be made to the ARRL Foundation in lieu of flowers. November testing successes-Satellite ARC (GLAARG) - To Extra: KB6DUG, To Tech: KC6ETD, KC6GIX. Examiners: WB6IUY, N6IR, N6UE, NM6W, W6PIM, W6QGB. Santa Barbara ARC (ARRL) - To Advanced: W6IQJ. To General: KC6ETR, N6WAO, N6UUV, N6NVN, KC6GBP. To Tech: KC6GAX, KB6NUO, Larry Nicholas, Bob Roberts, Irene Amable, Oscar Ocampo, Jim Britch (all unlicensed). Examiners: KB5AH, AA6OT, AA6MX, WD6ETK, K6XG, WA6VNO, KA7MGM, W6PIM. December testing successes - SMRA (ARRL) - To Extra: WA1FMM. To Advanced: N6WVM, K6UHU, WA6WKA, WA6WKB, N6VDI. To General: KB6PQE, KC6CRA. To Tech: WD6ARW, Mike Monaco, Ed Padgett, Ralph Richardson, Ralph Steele (call signs pending). Examiners: N6SR, W5ZV, WR2S, KA6KTU, AA7AA, WB6CNO, K6JTI, K6VK, WD6BAM. Non-VE assistants: KA6WZP, Laura Schroeder. Congratulations to all and thanks to those dedicated VEs and assistants. Congratulations also to former PIO, N6FOU, on upgrading to Advanced (previously unreported). 73 for now.

WEST GULF DIVISION

NORTH TEXAS: SM, Dan Dansby, W5URI-ASMS: W5GPO, K5MXQ, W5IWE, K6GSC, KF5BL, ACC: KA1CWM, STM: W5VMP. SEC: N6AJP. BM: W5QXK, TC: K5SXX, PIO: K5HGL, OOC: W5YKO. Welcome N3FKV to our Section. Dick is the author of an article in the ASR about getting on Satellite CHEAP. We need more articles like this for the low budget ham and zero fund youth. Now if someone will write about low priced HF Gear. Thanks to N5PIU and others, ATV is getting hot again. An ATV Rptr is proposed for the DFW area and Andy, W5V5 conducts a net on the Arl Rptr (147.14) each Wed 8:30 PM local. K6GSC tells me that the Four States ARC is planning a tailgate swapfest and maybe other activities. Details when available. 7290 kHz picnic to be at Bastrop SP. Check into net for details. Work on Arlington Hamfest is in full speed, plan to make it 8-10 June 90. Next Section News letter due out about 1 Mar 90. It will have list of all known clubs in section. If your club is not listed or you don't know, please let me or KA1CWM know. We need name of club, president, news editor, When and where you meet. BPL: K5UPN 0.638, 563, 5 = 1206; W5TOO 149, 287, 427, 9 = 872; KF5BL 25, 100, 105, 75 = 305; N5PGZ 106, 24, 32, 26 = 188; Other Traffic: W9OYL 287, N5KCL 204, WA5MWD 200, KB5BNU 124, N5LDD 122, KD5RC 96, N5NZH 91, KB5ADE 88, WB5CPY 73, AC6Z 41, KC6NG 39, K5ZSB 35, WA5EZT 27, W5VMP 11. Our sympathy to K5MXQ on the passing of his mother. Congratulations to KC6NG on being elected NM of the D-FW Tlc Net. 7290 kHz Tlc Net reports for Dec: 45 sessions 3484 QNI, 513 Messages NTS liaisons 2 per session-NM KB5DVF. TTN for Dec QNI 1050, QTC 316, 31 sessions, in 1874 minutes.

OKLAHOMA: SM, Joe Lynch, N6CL. Your SM was privileged to attend several Christmas banquets during December. My appreciation goes to all of the wonderful clubs who allowed me the opportunity to share their celebration of the holidays. The new president of Enid ARC is KF5SD. The new president of Edmond ARC is KA5WAV. The new president of Wheatstraw is K5GGL. Congratulations to N5OHL on upgrading to Advanced. We all thought you would never get past that General code test. This spring sees many new hams on the air and many upgrades from the fall classes. It is our responsibility to show our new brethren how to operate properly and how to be ladies and gentlemen of the airways. Your SM has heard of and personally observed too much less-than-honorable operating this past year. We owe it to the future of our hobby to be responsible and courteous to our fellow amateur. The Tulsa to Oklahoma repeater link continues to work well. Enid ARC has acquired equipment and will soon be on line with links that may eventually extend its portion of the coverage to the Panhandle. Silent Key: W5IIX reported by K5KXL. 73 for this month, de Joe, N6CL. Traffic: W5EQW 677, N5IKN 194, K5CXP 87, W5OUJ 78, W5VOR 84, K5GBN 35, W5AZO 31, W5OGC 28, PSNR: K5CXP 130, 2/30, 3/12, 5/12, 6/16, T/100.

SOUTH TEXAS: SM, Art Ross, W5KR- SEC, K5DG, STM, WD5GKH, PIO, W5SUZB, ACC, W5YDD, BM, W5WCY, TC, N5ZU, OOC, K5SBU, SGL, K5JKN, ASM all of above plus N5TC. San Benito ARC (BSC) Pres WA2VJL rpts busy Dec with Santa Claus Parade communication support. "Talk to Santa" event for the children in local hospital and a Special Event operation for "Santa's R&R" upon return to North Pole; WA2VJL, N5NYK, N5LNS, K5FTU, N5GNK, K5UUY, K5SBJ, WB9BXE took part. OBS WA2VJL rpts 7 bulletins, 1 special bulletin, 2 propagation facts given 27 readings on 7 nets. Heart of Texas Ham Operators' Group (HOT-HOG), Brady, VE Team traveled to Brownwood to conduct a test session for that club; 13 applicants took exams. Huntsville ARS bulletin rpts upgrades: N5OPL to General; KB5UJ, N5ODJ to Advanced; W5IKB to Extra. PIA KA5EEQ, Brenham ARC, rpts N5PRA (ex-KB5UJ) upgraded to Technician; N5GCU retired from Blinn College, now more time to Ham. DRN5 NM W5YDD rpts 998 msgs passed in 62 Dec sessions; STX represented 100% by W5KLV, W5CTZ, W5H2Q, K5SZV, N5NAV, KD5KG, N5ILI, W5YDD. PIA N5ZJ, Seguin, rpts CTTN NM N5NAV using "round robin" message in training procedures; N5HYR risked freezing himself during installation of heater for "frozen" repeater; 34 Hams and families attended pre-Christmas breakfast in Startzville. AARC-OVER, Austin ARC bulletin, reminds all hands that Texas Slow Speed Net (TSN) meets nightly at 8:00 PM on 3745 kHz; TSN NM N5KCL will be glad to hear you. CAND NM K5UPN rpts 1267 msgs passed in 31 Dec sessions; DRN5 represented 100%; STX stations were W5YDD, N5ILI, N5NAV, K5SZV, KD5KG, W5KLV, BARN, Beaumont ARC News, rpts W5KWA donated 444.7 MHz repeater to the club; club received grant of \$1000 from local civic club for purpose of completing Red Cross emergency station and to maintain emergency equipment; AC5K named Ham of the Year at Christmas party; KC6SE and WD5EXC were wed in Dec. The Bexar

(pronounced BARE) Wire, San Antonio ARC, welcomes new Novices KB5KYY, KB5KYZ, KB5KZA, KB5KZB, KB5KZC, KB5KZD, KB5KZE, KB5KZF, KB5KZG; new Generals N5OAL, KB5KIL, N5KLC, KA5HSM, N5KEI, KB5KFI; new Extras WD5JUV, KB5FUF, N5NQR, WB8CXN, W5VRC, K5SYD, KB5FCV; also 6 unlicensed earned Technician and 3 earned Novice. Brazos Valley ARC, elected new officers for 1990: N5KXU, Pres: VP, N5AFV; Recording Secy, N5OUT; Correspondence Secy, KB5CO; Treas K5G; Director, WB4LZG; rpts upgrades KB5KTD, KC4DRQ, KB5KQZ, KB5JLJ, KB5NXV, KB5KLZ, KB5ZBZ, KB5KSJ and 7 unlicensed to Technician; KB5ISL, N5LAV, KB5ION, KB5BXO, KA5OJ and 1 unlicensed to General; KB5JZI, KB5JIZ, KB5BCL, N5OZV, KB5JOG to Advanced; KB5HWW, N5OVX, N5JQK to Extra; WOW! They were busy! Brazosport ARC bulletin, Lake Jackson, rpts KB5KQU and KB5KQT upgraded to Technician. Traffic: N5NAV 599, WB5J 427, N5ILI 278, W5YDD 270, WD5GKH 253, W5CTZ 174, WA2VJL 118, N5ZJ 53, K5SZV 52, W5KR 26, W5KLV 20, N5KAO 12.

WEST TEXAS: SM, Milly Wise, W5OVH-Happy New Year to all since this is the first article of the year 1990. In Odessa, KB5EDF, Mike Walker was named Amateur of the Year for the Odessa Club. He was the driving force behind a monthly forum. W5JBE was named Amateur of the Year for always being there for the amateurs. Thanks, Potts, and our deepest sympathy goes to you after the loss of your wife, Mary. John Lumpkin, N5ETX, received the Honorable Duck Award. Eddie Owen, K5AL, was named Key Man of the Year. The upgrades in the Odessa area were N5KOA to General, N5LNN to General; KB5ISN to Advanced with new call K5IAL; N5IYX to Advanced with new call, K5IAM and N5KUC to Advanced. The following amateurs helped with the North Pole Net at the Northwest Texas Hospital. Cheering up unfortunate children who are in the hospital during Christmas: WA4NXL; KA5RSR; WB5PUM, WD5BWR; and KA5PTG, taken from the oscillator bulletin of Amarillo, TX. Here in El Paso, we are so very proud of our youngest ham, Rita Williamson, KB5KYN, Daughter of Owen, KA5UUR. She is just eight years old and studying hard for her Tech and General. The latest tally of ARS members in the West Texas Section is 398. This is a pretty good showing for the first two years. The West Texas Section is starting up or should I say started the Section Manager's net again. It will be held on the second Thursday of every month at 0100 Z on 3931 kHz and will be called by SM Milly Wise, W5OVH, or ASM Les Bannon, W5FE, when Milly cannot be there. Everyone is invited to check in. The order will be first the section appointees then other appointees. Then we will open for other input. The San Angelo ARC elected Larry Altman, KB5BCR, Pres., V-Pres. Roy, N5MHP, Sec/Treas, Nancy, N5MMQZ. 73, Milly Wise, W5OVH.

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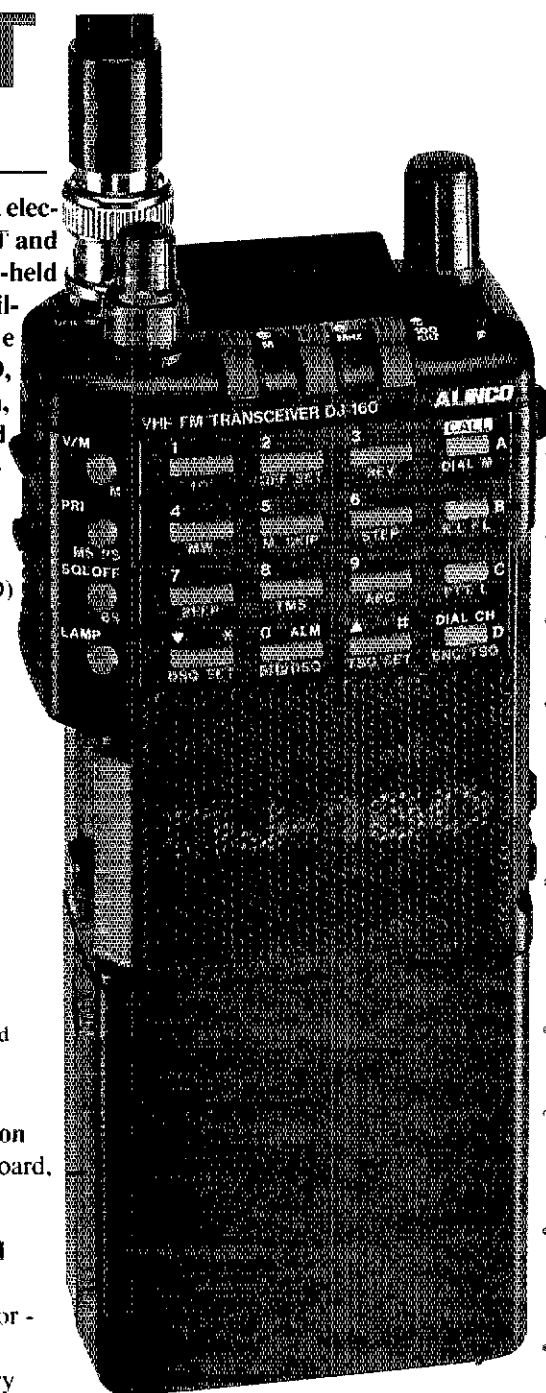


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3 STRIKES AGAINST INTERFERENCE

INTERFERENCE HANDBOOK by William R. Nelson, WA6FQG, Edited by Bill Orr, W6SAI. WA6FQG is a former RFI investigator for Southern California Edison Company. This 250-page book is written from an RFI sleuth's perspective and is a diary of his experiences in solving interference problems. His experiences run the gamut from the common (arcing thermostats) to the bizarre (loose metal sheathing in a temporary building next to a 250kV transmission line and a certain brand of 25-watt light bulb). Besides all sorts of power line interference causes and solutions this book covers electrostatic discharge (rain or snow static), grounds and grounding, vehicle noise suppression, RFI from nonlinear devices, how the power company locates RFI, how to RFI proof your transmitter, how some receivers suffer from self-inflicted RFI and solutions to RFI in various electronic devices. Radio Publications, Second Edition, 1988, \$12 plus postage and handling*.

TRANSMITTER HUNTING by Joseph D. Moell, KØOV and Thomas N. Curlee, WB6UZZ. You'll find out how direction finding (DFing) can be both fun and practical. Combine the techniques taught in this 323-page book with those used by search and rescue teams and you can learn how DFing can even save lives! Explore the challenge of hidden transmitter hunts (fox hunting) and locating causes of both accidental and malicious interference to Amateur Radio communications. Find out about the history of RDF, how to get started, directional antennas, doppler DF units, all about S-Meters, commercial and military direction finding systems, direction finding from fixed sites, VHF mobile hunting techniques, T-hunting from orbit, hunting below 50MHz, how to be the "Fox" and triangulation using two BASIC programs. Copyright 1987 by Tab Books. \$18 plus postage and handling*.

RADIO FREQUENCY INTERFERENCE What causes RFI? What are your responsibilities under FCC regulations to solve RFI problems? Are all RFI problems difficult, expensive and time consuming to cure? You'll find the answers to these commonly asked questions about RFI in this 82-page ARRL publication. You'll learn how to understand why RFI occurs and how to eliminate it. Chapters include: RFI: Problem or Opportunity, Survival in an RF-filled World, Interference from Transmitters, Interference from Electrical Devices and Power Lines, Cable Television: Friend or Foe? FCC's Interference Handbook, Additional Sources of Assistance and Information, and Interference Filters Test Report. Copyright 1989. \$5.00 plus postage and handling*.

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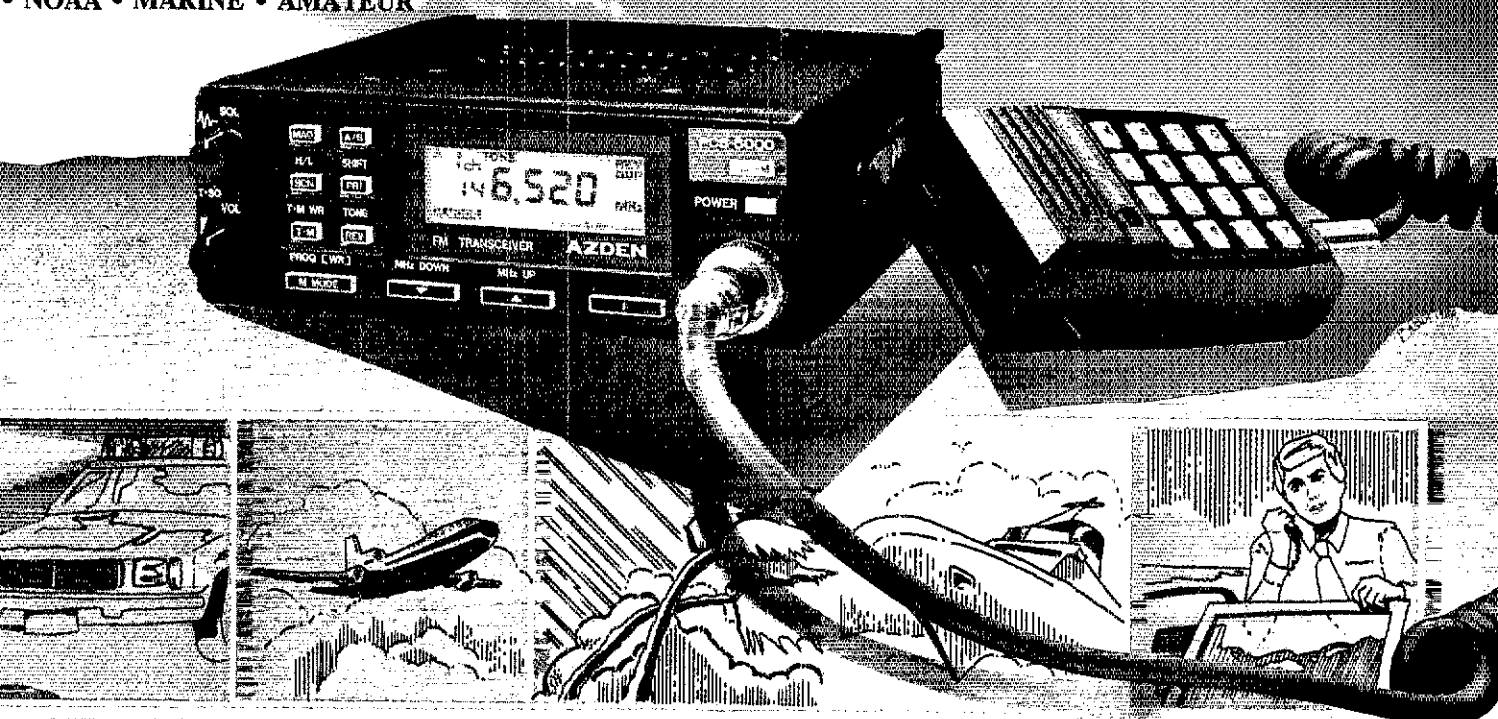
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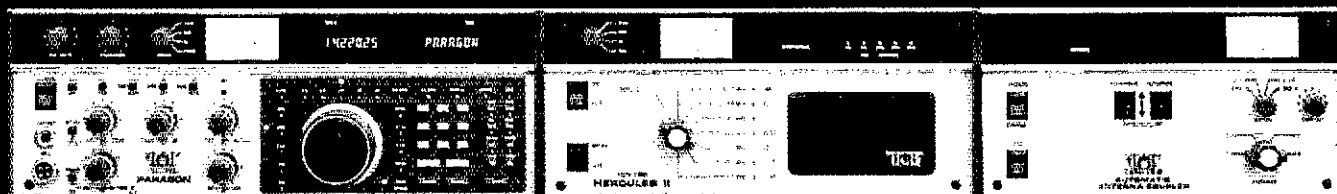
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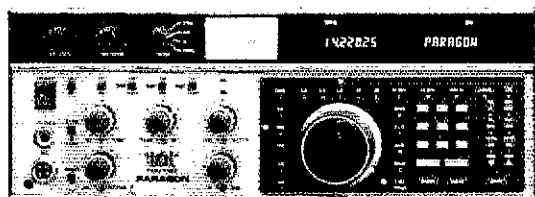
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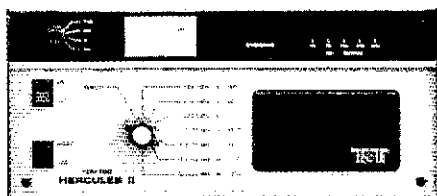
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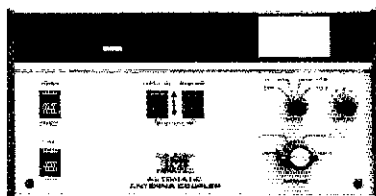
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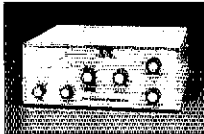
THE HERCULES II is a really classy solid state, all mode broadband amplifier that does not require any tuning. Remote band switching can be controlled by our Paragon or Omni V. Temperature controlled cooling system is whisper quiet on ssb, yet has adequate capacity to cool the internal heat sinks under key down conditions. Runs on 12-14 vdc for battery operation, mobile or base. (A heavy duty auto battery with a 10 amp charger makes a good, and inexpensive, base power supply.) Not shown is the Model 9420, 100 amp dc power supply that powers the Hercules II and the transceiver. A remote control system is available for mobile Hercules II installations. The Hercules II is fully metered and includes a 10 element LED peak power bar-graph display. Compact, good looking and a signal within one S-unit of the mighty TITAN.

THE MODEL 253, 2 KW AUTOMATIC ANTENNA COUPLER is the latest in our highly regarded line-up of tuners. Functions as an antenna management system with the front panel, four position, antenna switch. Positions 1 thru 3 are dedicated to coax fed antennas. Position 4 may be used for coax, single wire or balanced feeders through the built-in high power balun. Tuning is accomplished with a motor driven, roller inductor and fixed value capacitors selected with enclosed relays. The system is microprocessor controlled with one memory per antenna select position. Nine memories per antenna position are available when used with the Paragon or Omni V where band information is provided. The finishing touch for any station.

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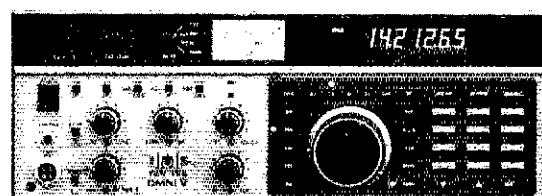
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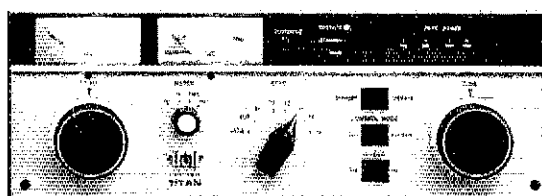
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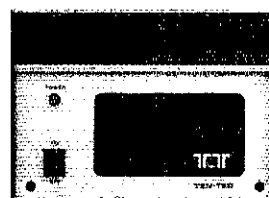
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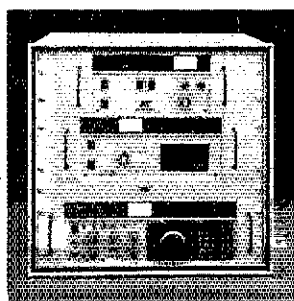


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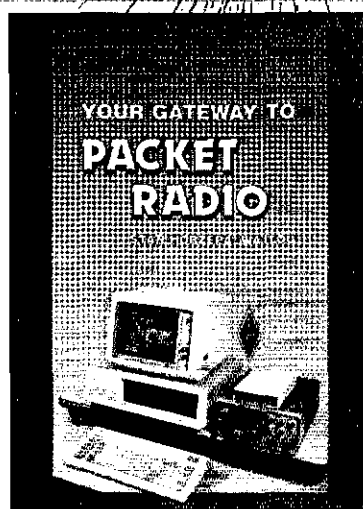
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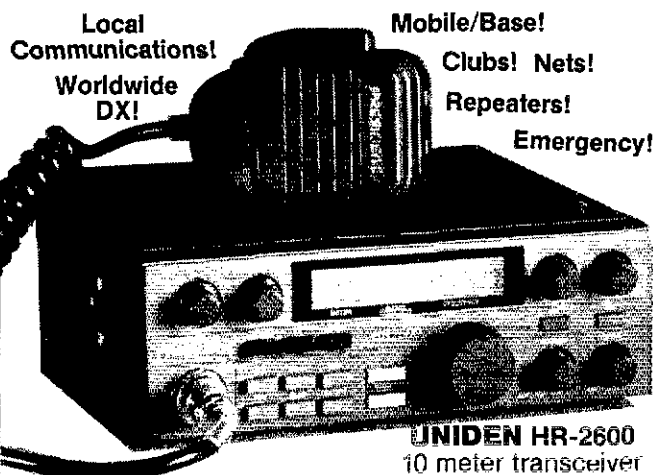
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In the two years since we first published **Your Gateway to Packet Radio**, interest in packet radio has exploded! To keep up with the expanding interest and evolving technology, the second edition contains 73 more pages—and nearly fifty percent of the original material has been revised. Newcomers will still find the basics on installation and operating procedures needed to get started.

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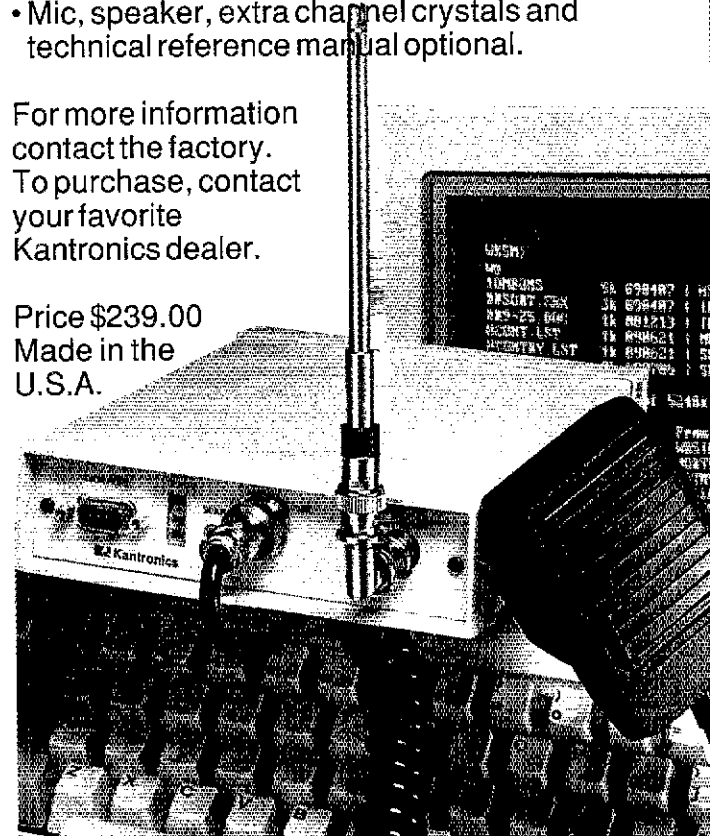
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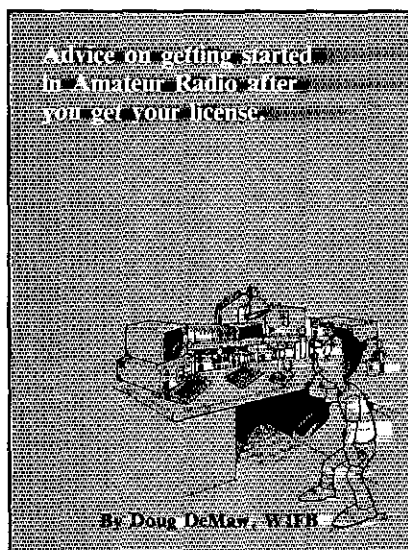


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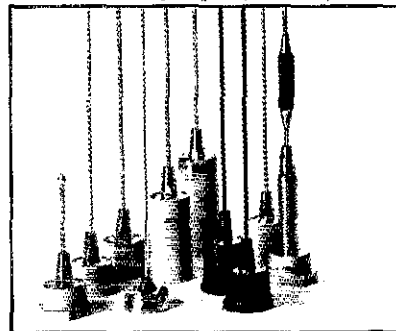
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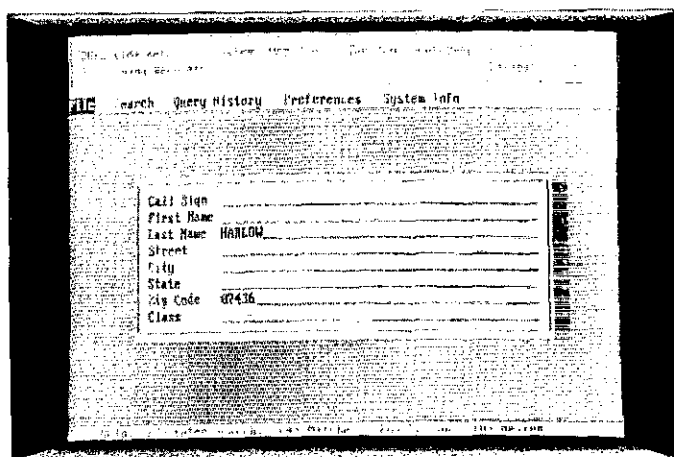
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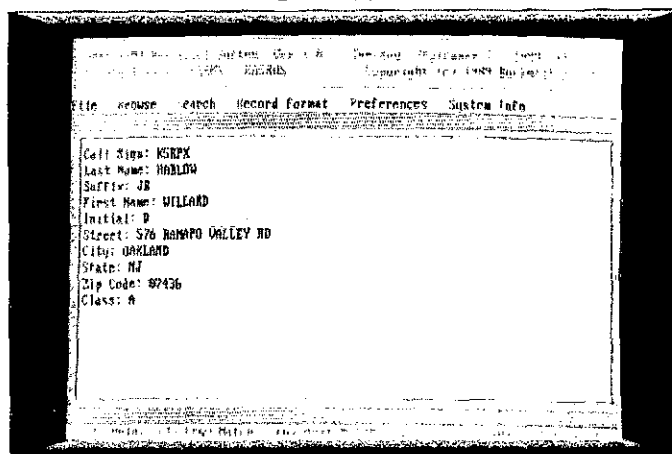
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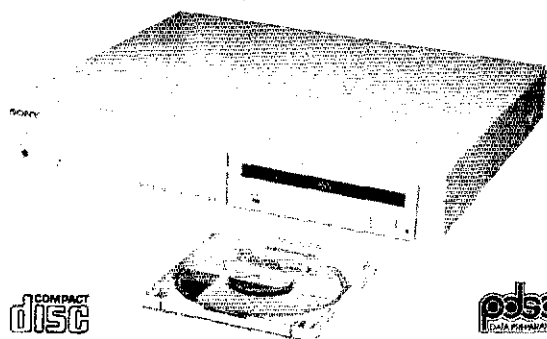
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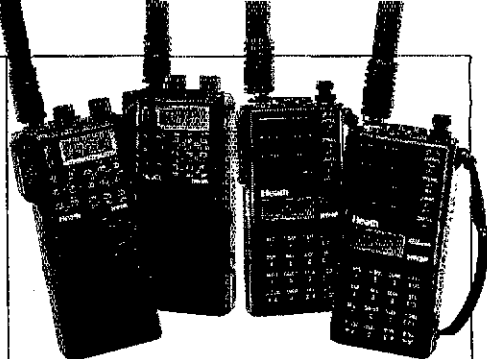
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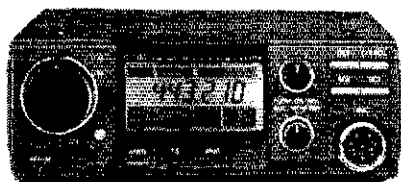
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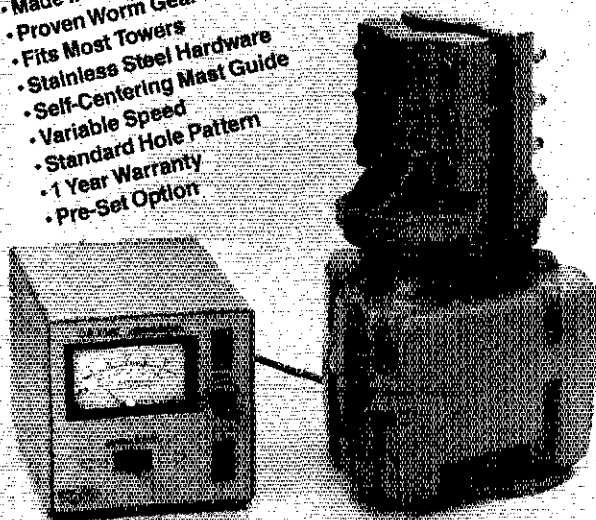
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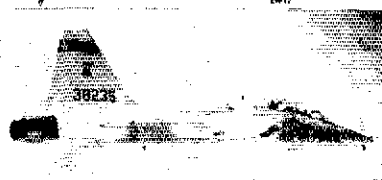
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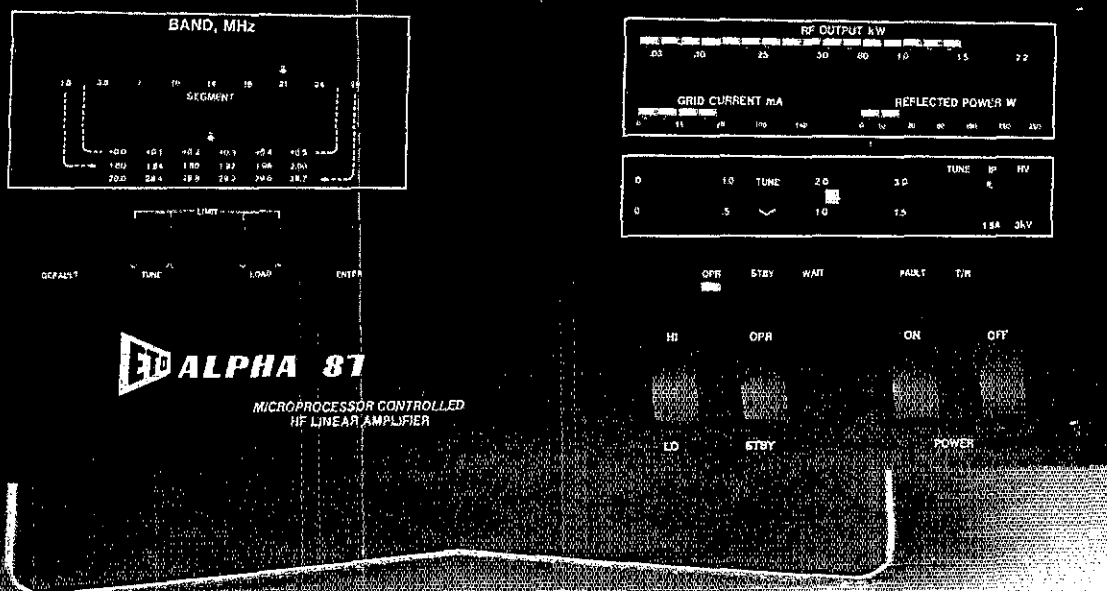
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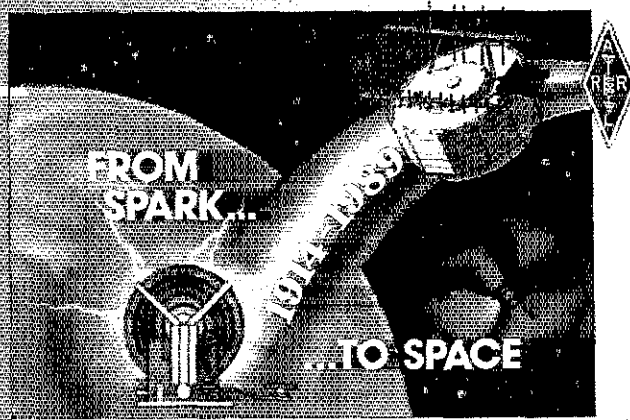
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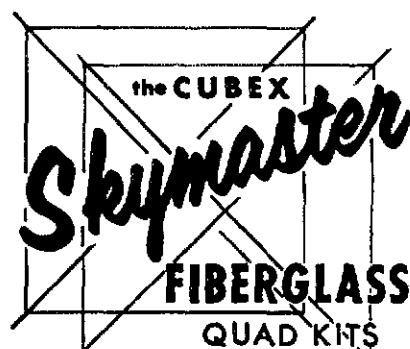
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DR-570T



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- **ULTRA-COMPACT BODY**
5 7/8" (W) x 2" (H) x 8 1/2" (D)

- **HIGH POWER**
45 watts on 2M and 35 watts on 70 cm.
Approximately 5 watts low power.

- **EXTENDED RECEIVER RANGE**
(130-169.995 MHz) on 2M, 144-147.995 MHz transmit. 440-449.995 MHz on 70 cm. (transmit and receive)
(Specifications guaranteed on amateur bands only. Modifiable for MARS/CAP permits required)

- **SIMULTANEOUS**
Receiving on both bands at the same time
Scanning; intermix scan modes on both bands at the same time

- **INDEPENDENT**
The volume, squelch and control dial are independently adjustable on both bands. You can store the following information on both bands at the same time. Priority function, choice of 37 encoding/decoding sub-tone frequencies, call channel, scan function (program, memory channel, VFO or unique open channel scan), memory skip, bell function, + or - repeater shift.

FULL FEATURES

- **FULL DUPLEX CROSS BAND OPERATION**
Transmit on one band while receiving on the other band - telephone style.

- **AUTOMATIC BAND EXCHANGE (A.B.X.)**
When in the ABX function is active, an incoming signal on the sub-band will activate an automatic exchange between the main band and the sub-band.

- **PRIORITY**
The VFO frequency is monitored for 5 seconds and then shifts for one second to the selected priority channel (In both bands at the same time).

- **DUAL SPLIT SHIFT OPERATION**
Operates odd offset operation

- **BELL FUNCTION**

- **REPEATER REVERSE FUNCTION**

- **CALL CHANNEL FUNCTION**

- **BEEP FUNCTION**

- **30 MEMORIES (10 FOR EACH BAND)**

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- **4 SCANNING MODES**
Program scan, memory scan, band scan and unique open channel scan (opposite to normal busy scan). Scan stops on a busy (or open channel) channel and then resumes approximately 5 seconds after stopping even if the signal is still present.

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The DR-570T can be used as a cross band repeater.

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- **MHZ FUNCTION FOR BOTH BANDS**
One MHz is increased or decreased per touch
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One touch selection with pressing of twin key
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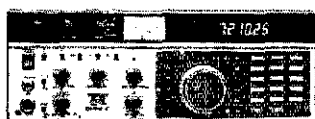
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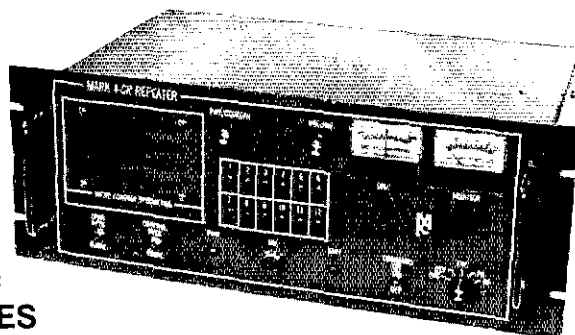


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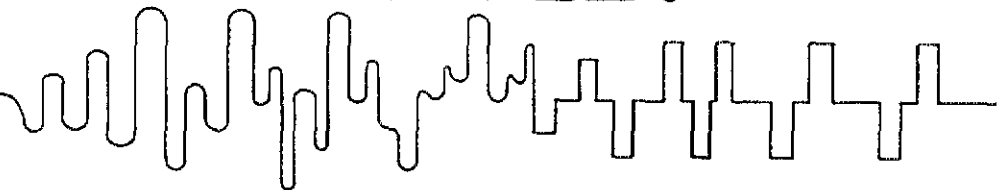
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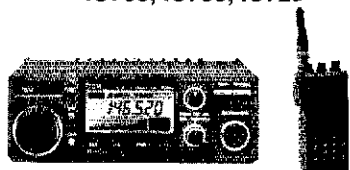
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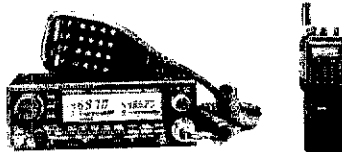


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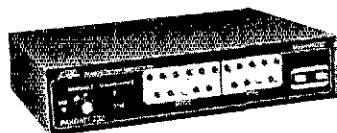


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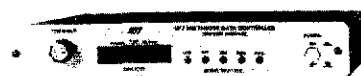
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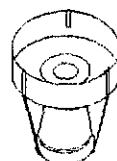
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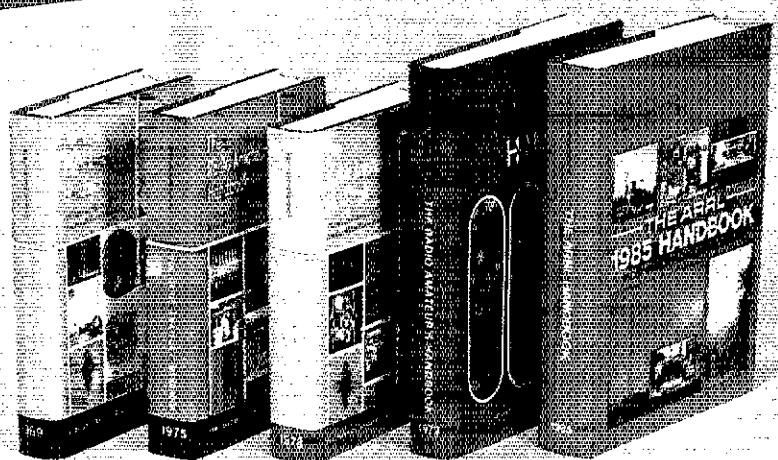


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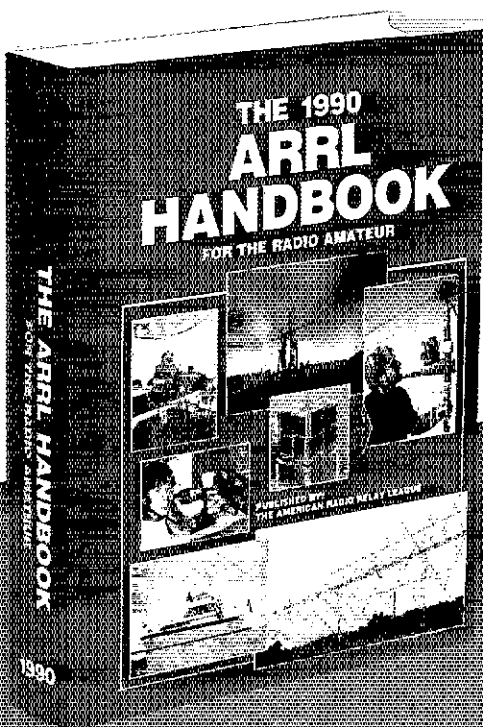
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INTRODUCING THE GREAT...



If you bought one of the Handbooks pictured above, you're not alone. These represent over 485,000 of the 5.8 million copies of the Handbook purchased since 1926. ARRL's premier publication is successful because it is updated every year. The new sixty-seventh edition is no exception. With over 1200 pages and over 2100 tables, figures and charts, the 1990 ARRL Handbook for the Radio Amateur is better than ever!

Every ham is interested in antennas, and we've added a host of new antenna projects including three high-performance Yagis for 144, 220 and 432 MHz designed by Steve Powlishen, K1FO. Dick Jansson, WD4FAB, has completely revised the space communications chapter, which includes his innovative helical array for AO-13 Mode L.

But that's not all. You'll find many other popular construction projects that can be built in a weekend, such as power supplies, keyers, measuring devices, QRP transmitters and VHF/UHF preamps. For the more ambitious builder, there are projects like a high-performance communications receiver, high-power HF and VHF amplifiers, a 1296-MHz transverter or digital audio memory keyer.

The Handbook has always been famous as a reference for component data. You will find an entire chapter devoted to everything from tube and transistor specifications to aluminum tubing sizes. Also featured is the most up-to-date information on digital techniques and operating practices.

At \$23, the Handbook remains an exceptional value for a hardcover technical publication. For shipping and handling in the US, please add \$3.50 (\$4.50 for UPS), elsewhere add \$5 for shipping by surface mail. Save on shipping charges by visiting your favorite ARRL dealer!

Here is a description of what is covered in the Handbook:

The first five introductory chapters cover basics of Amateur Radio, electrical fundamentals, radio design technique and language, solid state fundamentals and vacuum tube principles. Next are 12 chapters devoted primarily to these topics: power supplies, audio and video, digital basics, modulation and demodulation, RF transmitters, receivers, transceivers, repeaters, power amplifiers, transmission lines and antenna fundamentals. Another four chapters cover voice, digital, image and special modulation techniques. The RF spectrum, propagation and space communications are covered in two chapters. The construction and maintenance section offers 12 chapters of useful projects ranging from power supplies and antennas through digital equipment. You'll also find up-to-date component data that the Handbook is famous for. The final five chapters cover obtaining your license, station design and operation, interference, monitoring and direction finding. An abbreviations list and huge index make up balance of the book.

The American Radio Relay League, Inc., 225 Main St, Newington, CT 06111 USA

AEA's Amiga Video Terminal (AVT) Master SSTV and FAX System

Imagine sending and receiving high resolution color or black and white images and photos via radio transceiver OR telephone. And then imagine the ability to "erase" QRM and noise effects. With AEA's new AVT (Amiga Video Terminal) Master System, you get pixel perfect pictures. The AVT Master offers 55 SSTV (Slow-Scan TV) modes, many in up to 4,096 simultaneous colors with a resolution from 128 by 120 up to 640 by 400. Nine FAX modes in resolutions up to 1,024 pixels by 1,200 lines in 16 grey levels are also possible. The AVT offers every known SSTV commercial and experimental mode, as well as WEFAX, NEWSFAX and GEOS FAX (with optional board). This is a major breakthrough for SSTV and FAX enthusiasts!

Flexible Hardware. Five separate receiver inputs allow you to attach a two-meter, six-meter, HF and SWL rig plus a tape recorder...all at the same time! Plus there's an RJ-11 telephone jack. Simply plug in your phone line to the interface unit and transmit a full-color image in about 12 seconds. Both positive and negative transmitter keying, as well as individual tape recorder and transmitter audio outputs provide the ultimate connection. You don't ever need to touch the box...all controls, including system audio output levels and input selection are accomplished on-screen using the Amiga mouse.

High Performance. The AVT is already in use every day, passing picture-perfect images across the continental U.S. and even to Hawaii. Images sent with the AVT may be damaged as much as 50 percent by QRM and QRN, and still be recovered by the system so that it's almost impossible to tell there was ever any interference. Built-in image processing and signal conditioning ensures the best picture quality, picture after picture.

Compatibility. You can receive ANY SSTV or FAX signal...the AVT supports all modes, including the new European modes to the older color composites to black-and-white SSTV to 60/120/240 LPM FAX transmissions. Multiple aspect ratios provide the right picture when monitoring those unusual FAX stations, too. All

of these modes are available in full transceive. The images received by the system are compatible with every paint program, digitizer, frame grabber and scanner currently available for the Commodore Amiga, allowing unparalleled flexibility and artistic freedom.

Revolutionary. The AVT also offers new SSTV formats that easily outperform ALL pre-existing modes...integral data recovery, narrow bandwidth, full color, multi-image (3-D), multiple resolution and synchronous transmission.



AVT image before transmission.

Intuitive. Every command is presented in a logical, consistent series of menus and control panels. Sophisticated tools such as a detailed oscilloscope simulator aids tuning. The system even transmits an "Alignment Signal" to ensure a quick match in frequency between systems when operating SSB. When you have a question, a 140-page comprehensive manual will provide you with the answer. Should you need further assistance, AEA's staff of trained technical support personnel can be contacted at (206)775-7373.

Feature-Packed. Built-in capabilities include: Tuning oscilloscope. Mode-to-mode conversions. Interpolating zoom. Image inset. Brush "Clipart" (file artwork) cut and paste, including transparent background. Image tinting, brightness and contrast control. Thresholding. Black-and-white and color histograms. Text overlay using multiple fonts, boldface, italics and underlining in any combination or color. Automatic CW and synthesized speech ID after transmit. Extensive macro and script capability (with ARExx program). Custom color bar generation. Luma conversion and image averaging. Black-and-white and color negatives. Eight function damaged scan line "Repair Kit." Multi-



Image in process of being restored after heavy QRM transmission.

ple mode full-frame intelligent image cleanup with sensitivity control. Owner defined FAX demodulation curves. Image rotation and flipping. Paint capability. Extensive ARExx language support. Real-time software filtering for scope and receive operations. Up to 16 high-resolution image memories at one time. Grab screens to transmit from any digitizer or operating program in real-time. Transmit and receive sequences of images using multiple memories. One button automatic reception of most SSTV modes. Automatic start and run at any time...catch those midnight FAXes without being there (with ARExx program). Copy and exchange between image memories. On-screen DTMF pad. Image printing in both black-and-white and color on literally hundreds of different printers. You can even tell the system what to do remotely (with ARExx program), via packet and/or RTTY using standard TNC's such as AEA's high performance PK-232MBX multi-mode data controller.

Updates. Since the AVT is a software driven system, there aren't any costly ROM and hardware updates. Occasional updates will be provided on a disk. Simple, inexpensive and fast.

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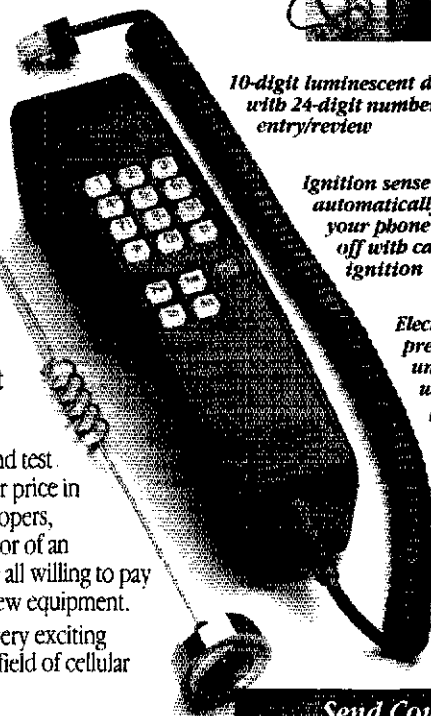
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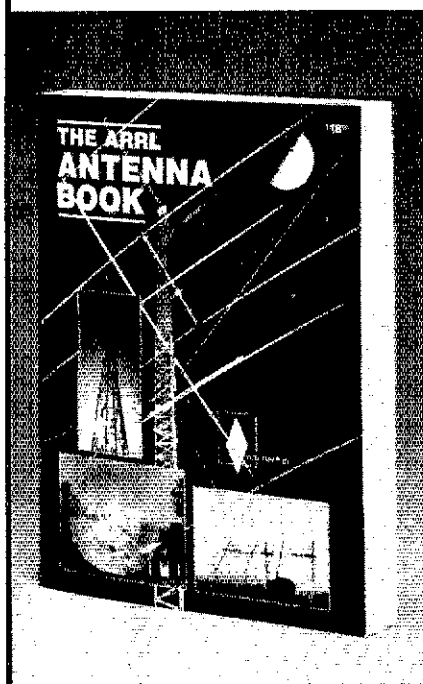
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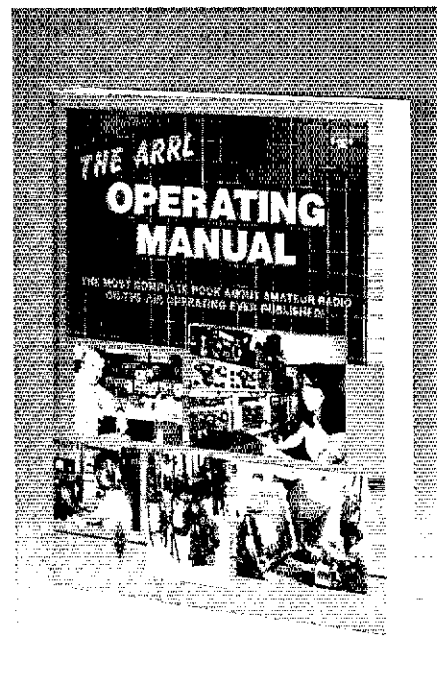


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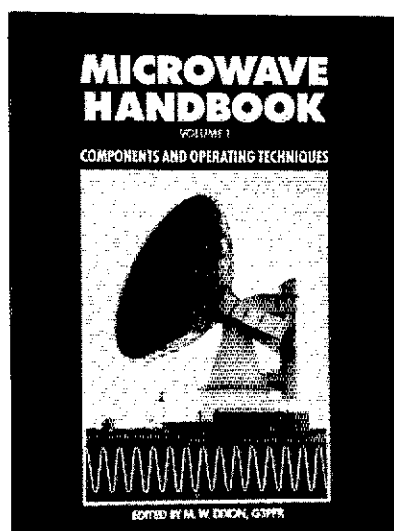
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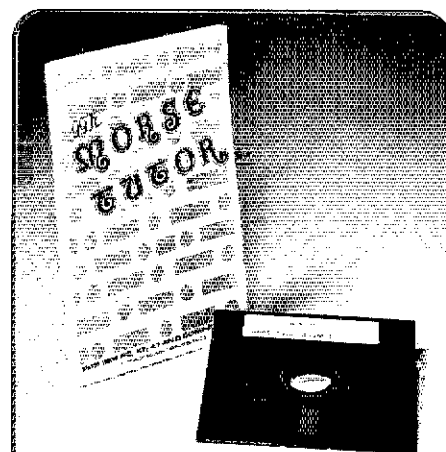
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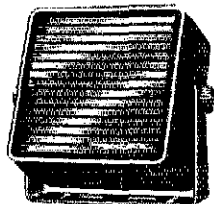
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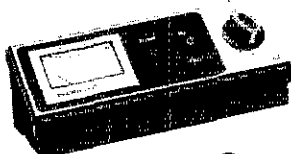
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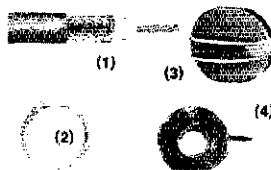
SWR/FS Meter



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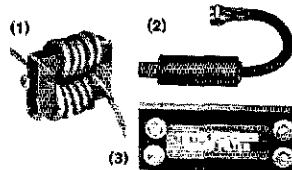
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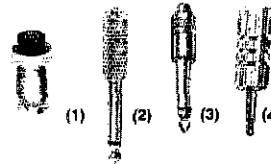
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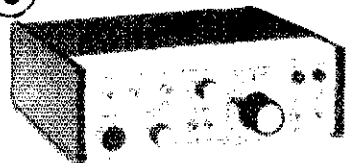
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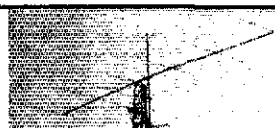
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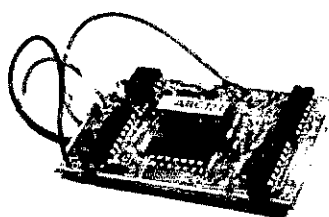
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PROFESSIONAL CW operators, retired or active, commercial, military, gov't, police, etc. invited to join Society Of Wireless Pioneers-W6WOW, 146 Coleen Street, Livermore, CA 94550.

HUNGARIAN-AMERICAN Hams meet at Dayton Hamvention April 26-29. Info: L. Radnay, W1PL, 66 Wheeler, Melrose, MA 02176, phone 617-865-6419.

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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 unit has 54 inch whip, 50 ft. coax and connector. 3x2x4 in. Use 12 VDC or 110 VAC with MFJ-1312, \$12.95.

VHF SWR/Wattmeter

MFJ-812B

\$29.95

Covers 2 Meters and 220 MHz. 30 or 300 Watt scales. Also reads relative field strength 1-170 MHz and SWR above 14 MHz. 4 1/2 x 2 1/4 x 3 in.

MFJ Coax Antenna Switches



\$34.95 MFJ-1701



\$21.95 MFJ-1702B



\$59.95 MFJ-1704

Select any of several antennas from your operating desk with these MFJ Coax Switches. They feature mounting holes and automatic grounding of unused terminals. They come with MFJ's one year unconditional guarantee. MFJ-1701, \$34.95. Six position antenna switch. SO-239 connectors. 50-75 ohm loads. 2 KW PEP, 1 KW CW. Black alum. cabinet. 10x3x1 1/2 inches. MFJ-1702B, \$21.95. 2 positions plus new Center Ground. 2.5 KW PEP, 1 KW CW. Insertion loss below .2 dB. 50 dB isolation at 450 MHz. 50 ohm. 3x2x2 in. MFJ-1704, \$59.95. 4 position cavity switch with lightning/surge protection device. Center ground. 2.5 KW PEP, 1 KW CW. Low SWR. Isolation better than 50 dB at 500 MHz. Negligible loss. 50 ohm. 6 1/4 x 4 1/4 x 1 1/4 in.

"Dry" Dummy Loads for HF/VHF/UHF



\$28.95 MFJ-260B



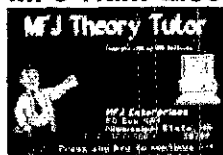
\$69.95 MFJ-262



\$109.95 MFJ-264

MFJ has a full line of dummy loads to suit your needs. Use a dummy load for tuning to reduce needless (and illegal) QRM and save your finals. MFJ-260B, \$28.95. VHF/HF. Air cooled, non-inductive 50 ohm resistor. SO-239 connector. Handles 300 Watts. Run full load for 30 seconds, derating curve to 5 minutes. SWR less than 1.3:1 to 30 MHz, 1.5:1 to 150 MHz. 2 1/2 x 2 1/2 x 7 in. MFJ-262, \$69.95. HF 1 KW. SWR less than 1.5:1 to 30 MHz. 3x3x13 in. MFJ-264, \$109.95. Versatile UHF/VHF/HF 1.5 KW load. Low SWR to 650 MHz, usable to 750 MHz. Run 100 watts for 10 minutes, 1500 watts for 10 seconds. SWR is 1.1:1 to 30 MHz, below 1.3:1 to 650 MHz. 3x3x7 inches.

MFJ Ham License Upgrade Theory Tutor



MFJ Theory Tutor practically guarantees you'll pass the theory part of any FCC ham license exam. Versatile MFJ software is the best computer tutor ever tailor-made for ham radio. You can study the entire FCC question pool, selected areas and take (or print) sample tests. Auto. saves each study session (ex. sample tests), gives you all FCC test graphics (ex. mono.), explanations of hard questions, pop-up calculator, weighted scoring analysis, color change option and more. Order MFJ-1610-Upgrade; MFJ-1611-Tech.; MFJ-1612-Gen.; MFJ-1613-Adv.; MFJ-1614-Ex. for IBM compatible. For Macintosh; MFJ-1630-N; MFJ-1631-T; MFJ-1632-G; MFJ-1633-A; MFJ-1634-E, \$29.95 per license class. MFJ-284 or MFJ-286

MFJ Speaker Mics

\$24.95

MFJ's compact Speaker/Mics let you carry your HT on your belt and never have to remove it to monitor calls or talk.

You get a wide range speaker and first-rate electret mic element for superb audio on both transmit and receive.

Earphone jack, handy lapel/pocket clip, PTT, lightweight retractable cord. Gray. One year unconditional guarantee.

MFJ-284 fits ICOM, Yaesu, Sanyo. MFJ-286 fits Kenwood.

MFJ-1278 Multi-Mode Data Controller

MFJ-1278

\$279.95

Use computer to transmit/receive in all 9 digital modes: Packet, AMTOR, ASCII, CW, RTTY, FAX, SSTV, Contest Memory Keyer and Navtex receive. Easy-Mail™ Personal Mailbox, Built-in printer port, 20 LED tuning indicator, AC power supply, Host/KISS, 32K RAM, Multi-gray level FAX/SSTV modem, CW key paddle jack and tons more. Options include 2400 baud modem (MFJ-2400, \$79.95) and software starter packs with computer cables, \$24.95 each, for IBM compatible, Commodore 64/128, Macintosh and VIC-20.

12/24 Hour LCD Clocks



\$19.95 MFJ-108B

\$9.95 MFJ-107B

Huge 5/8 inch bold LCD digits let you see the time from anywhere in your shack. Choose from the dual clock that has separate UTC/local time display or the single 24 hour ham clock.

Mounted in a brushed aluminum frame. Easy to set. The world's most popular ham clocks for accurate logs. MFJ-108B 4 1/2 x 1 x 2; MFJ-107B 2 1/4 x 1 x 2 in.

Cross-Needle SWR/Wattmeter

\$69.95 MFJ-8158

MFJ Cross-Needle SWR/Wattmeter has a new peak reading function! It shows you SWR, forward and reflected power in 2000/500 and 200/50 watt ranges. Covers 1.8-30 MHz.



Mechanical zero adjusts for movement. SO-239 connectors. Lamp uses 12 VDC or 110 VAC with MFJ-1312, \$12.95.

Deluxe Code Practice Oscillator



\$24.95 MFJ-557

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base so it stays put on your table. Portable because it runs on a 9-volt battery (not included) or an AC adapter (\$12.95) that plugs into a jack on the side.

Earphone jack for private practice. Tone and Volume controls for a wide range of sound. Speaker. Key has adjustable contacts and can be hooked to your transmitter. Sturdy. 8 1/2 x 2 1/4 x 3 3/4 in.

MFJ Multiple DC Outlet



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45G	10' section	\$140.00
45AG3 & 4	model 3 or 4 top section	\$142.00
55G	10' section	\$180.00
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BX-40	40' self supporting 18 sq. ft.	\$215.50
BX-48	48' self supporting 18 sq. ft.	\$274.50
BX-56	56' self supporting 18 sq. ft.	\$368.50
BX-64	64' self supporting 18 sq. ft.	\$474.50
HXB-40	40' self supporting 10 sq. ft.	\$249.50
HXB-48	48' self supporting 10 sq. ft.	\$336.50
HXB-56	56' self supporting 10 sq. ft.	\$432.00
HXB-64	64' self supporting 10 sq. ft.	\$513.00
HDBX-48	48' self supporting 18 sq. ft.	\$423.50
★ BUY WIRE SPECIAL ★		
3/16EHS	500' galvanized 7 strand	\$45.00
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AP-8	8 band 1/4 wave vertical	\$161.00
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A3S	3 element triband beam	\$295.00
A743	7 & 10 MHz add on kit for A3	\$88.00
A744	7 & 10 MHz add on kit for A4	\$88.00
D3W	10/12/17 mtr dipole	\$140.90
4218XL	18 element 2 mtr, 28' boom	\$144.00
R4	10, 12, 15, 20 meter vertical	\$211.90
R45K	17 meter add kit for R4	\$32.00
R5	10, 12, 15, 17-20 mtrs.	\$232.00
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AV4	40-10 mtr vertical	\$81.00
AV5	80-10 mtr vertical	\$124.00
ARX2B	2 mtr. "Ringo" Ranger	\$41.50
ARX450B	450 MHz. "Ringo" Ranger	\$41.50
A144-11	144 MHz, 11 ele. VHF	\$52.00
A147-11	11 element 146-148 MHz beam	\$52.00
A147-22	22 element "Power Packer"	\$148.00
A144-10T	10 element 2 mtr. "Oscar"	\$59.00
A144-20T	20 element 2 mtr. "Oscar"	\$86.00
215WB	15 element 2 mtr. "Boomer"	\$89.00
220B	17 element FM "Boomer"	\$109.00
220WB	144-148 MHz, 30 element	\$239.00
32-19	19 element 2 mtr. "Boomer"	\$124.00
424B	24 element "Boomer"	\$89.00
10-3CD	3 element 10 meter "Skywalker"	\$127.00
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58TV	80-10 mtr vertical	\$109.00
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ROTORS		
Alliance	U110	\$49.00
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(2-16 & 6-20)	4090 - per foot	\$0.35
1600	RG8U Mini 8 low loss foam per foot	\$0.22
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	88% tin copper braided shield - per foot	\$0.42
1176	RG213 Columbia - per foot	\$0.38

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PS12	Fully regulated, 10 amp constant 13 amp surge, electronic overload protection w/instant auto reset.	\$37.90
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PS25	Regulated 4.5-15VDC-25 Amp constant 27 amp surge, instant auto reset, dual meter for current & voltage.	\$89.90
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MAXON \$26.95


Model 495A - 49 MHz, FM 2-WAY RADIO hands free operation, voice activated transmit up to 1/2 mile. Batteries optional

Model 498... \$34.95
same features as 495A except uses "AA" nicad batteries and comes with battery charger


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5 Ch FM 2-way, with Earphone mic, oilers hands free voice activated or push-to-talk TX, VOX activated by Hi-Med-Low mic sensitivity switch, 5 1/2 x 2 1/4 x 1.


uniden Bearcat


BC200XLT
\$239.90
 200 Ch 12 band, weather & 800 MHz. Ch lockout, priority, auto search, delay, track tuning, programmable, built-in nicad rechargeable battery pack, AC/DC adapter & carry case.



BC70XLT
\$149.90
 20 Ch 10 band, direct Ch access, track tuning, programmable, ch lockout, battery low indicator, scan delay, memory backup, w/nicad battery pack and AC/DC adapter charger.






BC800XLT \$229.90
 40 Ch 12 band, 800MHz, instant weather, priority, auto search, scan delay, channel lockout, track tuning, auto search, direct Ch access, memory backup, AC/DC, 9 1/4 x 4 1/2 x 1 1/2 W.


BC145XL \$92.90
 16 Ch 10 band programmable, built-in delay, review, priority, memory backup, Ch lockout, direct Ch access, weather search, track tuning, AC/DC, external speaker & antenna jacks.


BC560XLT \$94.90
 16 Ch 10 band mobile, 2 digit LED, delay, priority, programmable, ch lockout, direct ch access, weather search, squelch, review, track tuning, w/mobile mounting bracket.

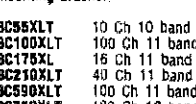

BC1110 \$119.90
 Preprogrammed for police in all 50 states PLUS scans all 40 CB ch's, scan & hold keys, super scanner, WX key for instant weather, mobile with all mounting hardware.


BC55XLT \$114.90
 100 Ch 11 band hand held.


BC175XL \$138.90
 16 Ch 11 band aircraft AC/DC.


BC210XLT \$159.90
 40 Ch 11 band aircraft & weather.


BC590XLT \$159.90
 100 Ch 11 band mobile weather.


BC760XLT \$259.90
 100 Ch 12 band w/800MHz mobile.

REGENCY SCANNERS

INF10	Preprogrammed for police & fire in all 50 states, large LCD display, Super Turbo Scan II, weather channel, scan, hold/scan key, mobile mounting bracket.	\$104.90
INF50	Preprogrammed for all 50 states for fire, police, & weather, Super Turbo Scan II, weather scan, scan & hold keys, delete key, track tuning, AC adapter, 5 1/4 x 7 x 1 1/2 H.	\$94.90

REGENCY

UC102 \$99.90
 Land mobile, Uni-Com is a 1 watt/2 ch capable, 1 ch provided, high performance two-way radio, lightweight, battery operated portable complete with flexible antenna, rugged plastic case and comes complete with battery and charger, 151.625MHz.



ASTATIC \$69.90

D104 Silver Eagle. Chrome plated base station amateur microphone, factory wired to be easily converted to electronic or relay operation. Adjustable gain for optimum modulation.

ETS D104 SE \$84.90

Same as above with end of transmission Roger Beep.

uniden

25 WATT 10 Meter Transceiver, all mode operation, backlit multi function LCD meter, frequency lock, auto squelch, NB, RF gain, PA, external speaker jack, 7 1/4 x 9 1/4 x 1 1/2 H.

HR2510 \$234.90

RANGER

10 meter transceiver, 25 watt, can be programmed to split receive, SSB, CW, AM, FM, programmable scanning, fully automatic noise blanker, 2 1/2 x 7 1/4 x 1 1/2.

AR3500 \$349.90

AR3500/100 \$419.90

EC BENTON County Miss. Needs Help!!! Would like to install 2 meter repeater with 220 line. Rural area is in mobile fringe of area repeaters. No 2 meter or 220 repeaters there or two adjoining Miss. counties or two Tenn. adjoining counties. Unable to do alone financially. Need line capabilities for local Skywarn activities via mobile operation. Could also use any weather related instruments. Any equipment donations will be appreciated and acknowledged. Contact Claud Hunsucker Jr., KB5FLC, Rt. 1, Box 209, Michigan City, MI 38647.

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ENGRAVING: Call sign/Name Badges by WBLQV, SASE for price sheet. Box 4133, Overland Park, KS 66204.

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QSLs QUALITY And Fast Service For 30 Years. Include call for free decal. Samples 50 cents. Ray, K7HLA, Box 331, Clearfield, UT 84015.

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QSL CARDS—We are filling re-orders. Send business size SASE with 45 cents postage for latest catalog. Mahro & Sons Print Shop, 2095 Prosperity Avenue, Maplewood, MN 55109-3621.

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QSL CARDS, rubber stamps, envelopes, ARRL member card. Send 45 cents postage or SASE for samples. Seventeen designs. Paragon Stamp, P.O. Box 544, Golata, CA 93118.

PIN-FEED continuous 90# white card stock for computer generated QSL's or MRC's. 3-1/2 x 5-1/2 finished size: \$500/10, \$3.50 shipping. QSLs, County Hunter Supplies, Mapbooks, MRCs, Logbooks. SASE brings info. Mobile Bureau Press, Box 6436-C, Florence, SC 29502.

FULL COLOR—3,000 \$325; 6,500 \$425; 12,500 \$800; 25,000 \$750. WABCSZ, 1-814-452-8375.

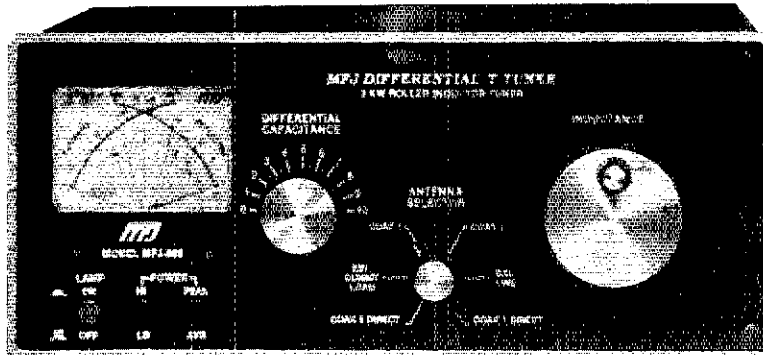
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MFJ 3 KW Roller Inductor Tuner

... lets you get your SWR down to *absolute* minimum for *maximum* power out -- something a tapped inductor tuner just can't do ...
... plus you get a **peak reading SWR/Wattmeter**, 6-position antenna switch, balun for balanced lines and 1.8-30 MHz coverage ... \$269.95

- **Easy-to-use 2-knob design**
- **Covers 1.8-30 MHz**
- **Peak and average Cross-needle meter**
- **Differential capacitor**
- **Roller inductor with 3-digits turns counter**
- **Directional coupler**
- **Current balun**
- **Handles 3 KW PEP**



MFJ-986

\$269⁹⁵

- **Made in U.S.A.**
- **1 year unconditional Guarantee**

MFJ's innovative new Differential-T™ Tuner uses a differential capacitor that makes tuning foolproof and easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only *one* setting.

The new MFJ-986 is a rugged no-compromise 3 KW PEP roller inductor antenna tuner that covers 1.8-30 MHz continuously, including 160 Meters, MARS and all the WARC bands. **The roller inductor lets you get your SWR down to the absolute minimum** -- something a tapped inductor tuner just can't do.

A 3-digits turns counter plus a spinner knob gives you precise inductance control -- so you can quickly return to your favorite frequency.

You get a lighted **peak** and average reading cross-needle meter that shows you SWR, forward and reflected power at a glance! A new directional coupler gives you even more accurate readings over a wider frequency range.

You get a 6-position antenna switch that lets you select two coax lines and/or random wires (direct or through tuner), balanced line and external dummy load.

A new **current** balun for balanced lines minimizes feedline radiation that causes field pattern distortion, TVI and RF in your shack. Ceramic feedthru insulators for balanced lines withstand high voltages and temperatures.

New Antenna Tuner Technology

MFJ brings you three innovations in antenna tuner technology: a new **Differential-T™** circuit simplifies tuning; a new **directional coupler** gives you more accurate SWR, forward and reflected power readings; and a new **current balun** reduces feedline radiation.

Differential-T Tuner™:

A New Twist on a Proven Technology

By replacing the two variable capacitors with a single **differential capacitor**, you get a wide range T-network tuner with only *two* controls -- the differential capacitor and a roller inductor.

That's how you get the new MFJ Differential-T Tuner™ that makes tuning easier than ever, gives you minimum SWR at only one setting and has a broadband

response that ends constant re-tuning. You'll spend your time QSOing instead of fooling with your tuner.

The compact 10 3/4 x 4 1/2 x 15 inch cabinet has plenty of room to mount the silver-plated roller inductor away from metal surfaces for highest Q -- you get high efficiency and more power into your antenna.

The wide spaced air gap differential transmitting capacitor lets you run a full 3 KW PEP -- no worries about arcing.

A New Directional Coupler: Accurate SWR and Power Reading

MFJ's Cross-Needle SWR/Wattmeter gives you more accurate SWR and power readings over a wider frequency range with no frequency sensitive adjustments.

That's because MFJ's new directional coupler gives you up to an order of magnitude higher directivity and coupling factor than conventional circuits ... *plus* it gives you a flat frequency response that requires *no* frequency compensation.

The cross-needle meter lets you read forward/reflected power in 2 ranges: 200/50 and 2000/500 watts. The meter lamp is front panel switched and uses 12 VDC or 110 VAC with MFJ-1312, \$12.95.

A switch lets you select peak or average power readings.

A New Current Balun: Reduces Feedline Radiation

Nearly all commercially built tuners use a "voltage" balun. A "voltage" balun forces the voltages to be equal on the two antenna halves. It minimizes unbalanced currents *only* if the antenna is perfectly balanced -- not the case with practical antennas.

The MFJ-986 uses a true **current balun** to force equal currents into the two antenna halves -- even if your antenna is not perfectly balanced -- so you get minimum unbalanced currents.

The **current** balun gives superior balance over the "voltage" balun.

Minimum unbalanced current reduces field pattern distortion -- which concentrates your power for a stronger signal -- *plus* it reduces TVI and RF in your shack caused by feedline radiation.

The MFJ-986 Differential-T Tuner™: Get *absolute* minimum SWR

Get the tuner that incorporates the latest innovations by the world's leader in antenna tuner technology.

See your dealer today for the new MFJ-986 Differential-T™ 3 KW Roller Inductor Tuner. You'll be glad you did!

Why Choose an MFJ Tuner?

Hard-earned Reputation: There's just no shortcut. *MFJ is a name you can trust* -- more hams trust MFJ tuners throughout the world than all other tuners combined.

Proven Reliability: *MFJ has made more tuners for more years than anyone else* -- with MFJ tuners you get a highly-developed product with proven reliability.

First Rate Performance: MFJ tuners have earned their reputation for being able to match just about anything -- *anywhere*.

One year unconditional guarantee: That means we will repair or replace your MFJ tuner (at our option) *no matter what* happens to it for a year.

Continuing Service: MFJ Customer Service Technicians are available to help you keep your MFJ tuner performing flawlessly -- no matter how long you have it -- just call 601-323-5869.

Your very best value: MFJ tuners give you the most for your money. Not only do you get a *proven* tuner at the lowest cost -- you also get a one year *unconditional* guarantee and *continuing* service. That's how MFJ became the world's leading tuner manufacturer -- by giving you your very best *value*.

Choose your MFJ tuner with confidence! You're getting proven performance and reliability from the most trusted name in antenna tuners. Don't settle for less. Get yours today!

MFJ

MFJ ENTERPRISES, INC.

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KENWOOD



TS-950

- Outstanding New HF with General Coverage Receiver
 - Digital Signal Processing (DSP)
 - Dual Frequency Receive Function
 - 100 Memories • 150 Watts
- CALL TODAY!**

YAESU



FT-1000

- Dual Receive with 2 Balance Controls
 - 200 Watts Output
 - Direct Digital Synthesis (DDS)
 - Direct Keyboard Frequency Entry
 - Contester's & DX'ers Dream Come True
- CALL TODAY!**

KENWOOD



TS-440

- Compact HF Transceiver with General Coverage Receiver
 - All Band, All Mode
 - Built-in Automatic Antenna Tuner
- CALL TODAY!**

YAESU



FT-470

- Dual Band Handheld
- Receive 130-180 MHz 430-450 MHz
- 2.3 Watts Output
- 42 Memories
- DTMF Autodialer



FT-411

- 2 Meter Handheld
- Receive 140-173 MHz
- 49 Memories
- Built-in CTCSS Encode/Decode
- 2 VFO's

MIRAGE/KLM

AMPLIFIERS

- High Gain, Low Noise GaAsFET Pre-Amps
- High VSWR Protection
- Over Power Shutdown • Made in USA
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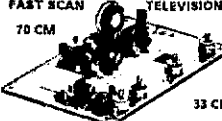
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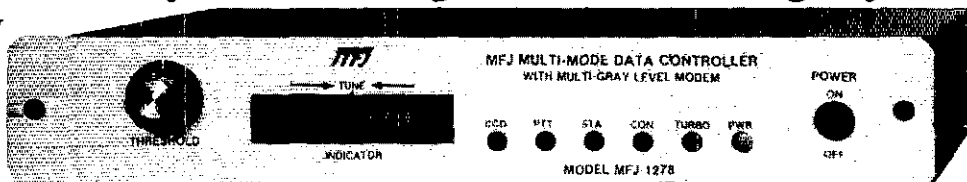
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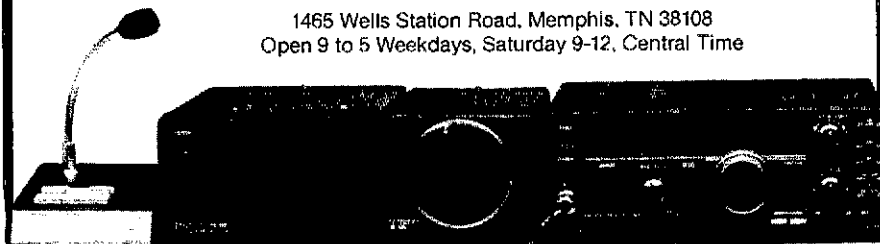
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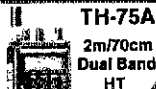
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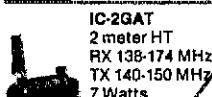
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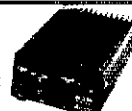
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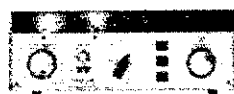
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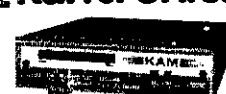
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April 27, 28, 29, 1990

Early Reservation Information

• General Chairman, Ed Hillman, N8ALN

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**Giant 3 day flea market • Exhibits
License exams • Free bus service
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Flea market tickets and grand banquet tickets are limited. Place your reservations early, please.

Flea Market Tickets

Maximum of 3 spaces per person (non-transferable). Tickets (valid all 3 days) will be sold IN ADVANCE ONLY. No spaces sold at gate. Vendors MUST order registration ticket when ordering flea market spaces.

Special Awards

Nominations are requested for "Radio Amateur of the Year," "Special Achievement" and "Technical Achievement" awards. Contact: Hamvention Awards Chairman, Box 964, Dayton, OH 45401.

License Exams

Service thru Extra exams scheduled Saturday and Sunday by appointment only. Send FCC form 610 (Aug. 1985 or later) - with requested elements shown at top of form, copy of present license and check for prevailing ARRL rates (payable to ARRL/VEC) to: Exam Registration, 8830 Windbluff Point, Dayton, OH 45458

1990 Deadlines

Award Nominations: March 15

License Exams: March 26

Advance Registration and banquet:

USA - April 4 Canada - March 31

Flea Market Space:

Spaces will be allocated by the Hamvention committee from all orders received prior to February 1. Express Mail NOT necessary! Notification of space assignment will be mailed by March 15, 1990. Checks will not be deposited until after the selection process is complete.

Information

General Information: (513) 433-7720

or, Box 2205, Dayton, OH 45401

Lodging Information: (513) 223-2612

(No Reservations By Phone)

Flea Market Information: (513) 845-3683

Lodging

Please write to Lodging, Dayton Hamvention, Chamber Plaza, 5th & Main Streets, Dayton, OH 45402 or refer to our 1989 Hamvention program for lodging information which includes a listing of hotel/motels located in the areas surrounding Dayton.

HAMVENTION is sponsored by the Dayton Amateur Radio Association Inc.

Advance Registration Form

Dayton Hamvention 1990

Reservation Deadline - USA-April 4, Canada-March 31

Flea Market Reservation Deadline: February 1

Enclose check or money order for amount indicated and send a self addressed stamped (#10) envelope.

Please Type or Print your Name and Address clearly.

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Flea Market	_____	\$25/1 space	
(Max. 3 spaces)		\$50/2 adjacent	
Admission ticket must		\$150/3 adjacent	\$ _____
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* \$12.00 at door		** \$24.00 at door, if available	

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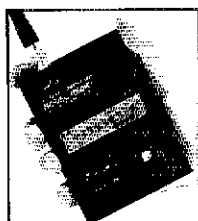
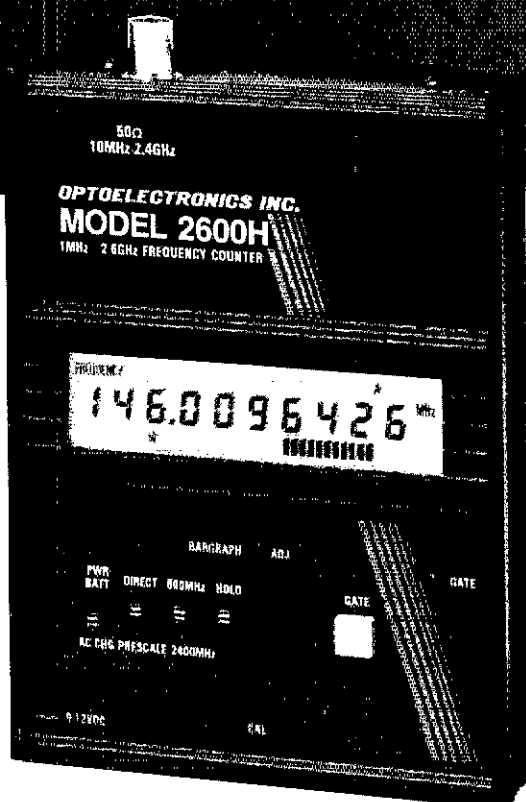
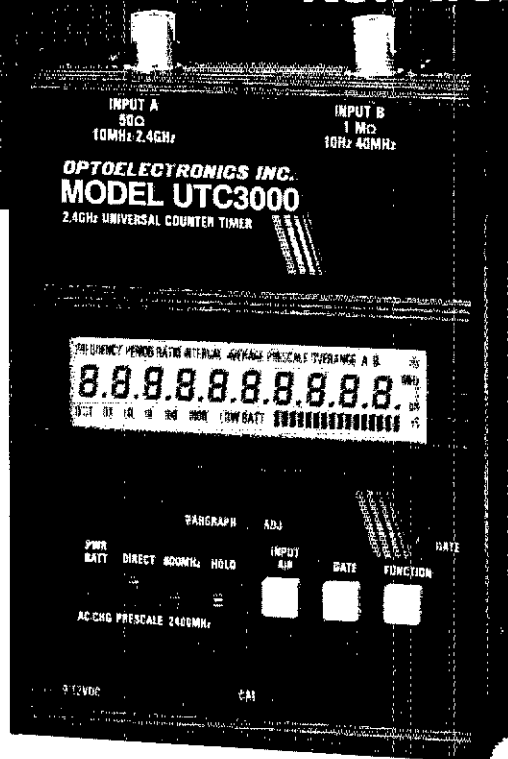
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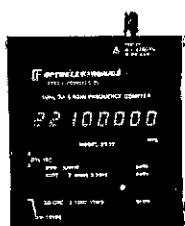
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12 AWG	.22"	.18"	24 AWG	.057"	.039"	30 AWG	.027"	.021"
14 AWG	.19"	.15"	26 AWG	.047"	.031"			
16 AWG	.13"	.10"						
18 AWG	.10"	.07"						
20 AWG	.07"	.05"						

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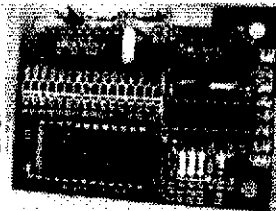
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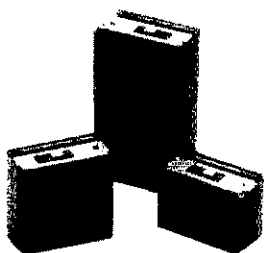
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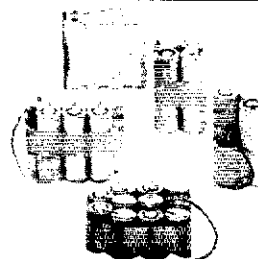
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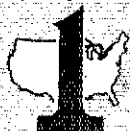
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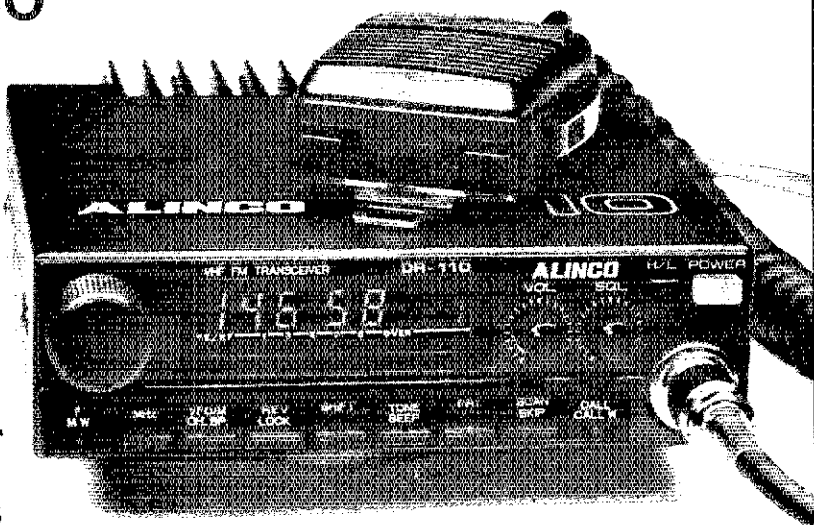
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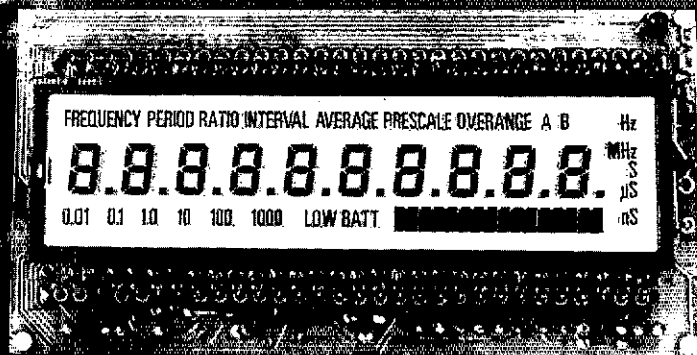
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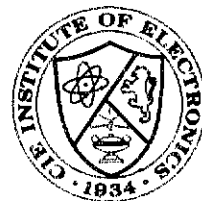
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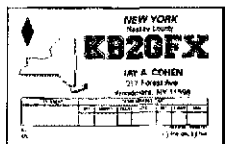
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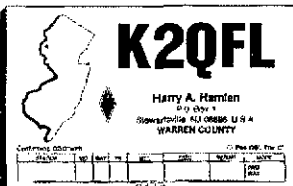
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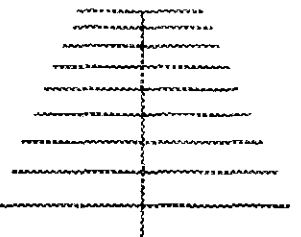
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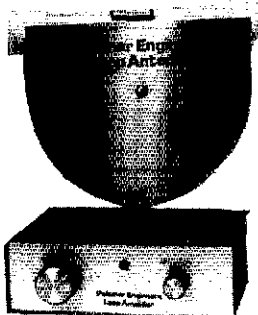


Can't hear the weak ones when conditions are bad? Receiver lacks sensitivity on 20, 15 or 10? Get the world famous Palomar pre-amplifier. Tunes from 160 to 6 meters. Gives 20 db extra gain and a low noise figure to bring out those weak signals. Reduces image and spurious responses too.

An RF sensing circuit bypasses the pre-amplifier during transmit. The bypass handles 350 watts.

Model P-410X (for 115-v AC) or Model P-412-X (for 12-v DC) \$149.95. Model P-408 (SWL receive only for 115-v AC) \$129.95. Add \$4 shipping/handling in U.S. & Canada. California residents add sales tax.

LOOP ANTENNA



Loops pick up far less noise than other antennas. And they can null out interference. Palomar brings you these features and more in a compact desktop package. The wideband amplifier with tuning control gives 20 db gain. Plug-in loops have exclusive tilt feature for deep nulls. Loops are available for 10-40 KHz, 40-150 KHz, 150-550 KHz, 550-1600 KHz and 1600-5000 KHz.

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Send for FREE catalog that shows our complete line of noise bridges, SWR meters, pre-amplifiers, loop antennas, VLF converters, audio filters, baluns, RTTY equipment, toroids and more.

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BOX 455, ESCONDIDO, CA 92025

Phone: (619) 747-3343

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Angela M. Beebe, KA1SER, Advertising Assistant
203-667-2494 is a direct line, and will be answered only by Advertising Department personnel.

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All Models Shipped
Factory Direct—
Freight Paid*

- Check these features:
- All steel construction
 - Hot dip galvanized after fabrication
 - Complete with base and rotor plate
 - Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG3758	37 ft	9 sq ft	\$CALL
HG5258	52 ft	9 sq ft	\$CALL
HG54HD	54 ft	16 sq ft	\$CALL
HG70HD	70 ft	16 sq ft	\$CALL

Masts—Thrust Bearings—
Other Accessories Available
—Call! Prices Shown Are
Your Total Delivered Price
In Continental U.S.A.!

ROHN Self Supporting Towers On SALE! FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save \$
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
H8X40	40 ft	10 sq ft	228	\$449
H8X48	48 ft	10 sq ft	303	\$589
H8X56	56 ft	10 sq ft	345	\$699
H8X64	64 ft	18 sq ft	281	\$569
H8X48	48 ft	18 sq ft	363	\$689

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.

ROHN Guyed Tower Packages

- World Famous Rohn Quality and Dependability
 - Rugged high wind survival provides safe installation
 - Multi purpose towers satisfy a wide range of needs
 - Complete packages include: guy hardware, turnbuckles, guy assemblies, concrete base, rotor plate and top section per manufacturers specs.
- Packages shown below are rated for 70 mph wind zone. 90 mph wind zone packages slightly higher. All tower packages shipped freight collect from our Plano, TX warehouse, in stock for prompt delivery.

Model	25G	Model 45G	Model 55G
50'	\$849	\$1229	\$1549
60'	939	1389	1939
70'	999	1719	2159
80'	1199	1869	2369
90'	1289	2039	2579
100'	1389	2199	2989
110'	1449	2459	3209
120'	1669	2619	3429

US TOWER CORPORATION

These rugged crankup towers and masts now available from Texas Towers! Check these features:

- ✓ All steel construction
- ✓ Hot dipped galvanized
- ✓ Totally self-supporting—No guys needed

Coax arms, Thrust bearings, Masts, Motor drives, Remote controls, Hinged bases, Rotor bases, & Raising fixtures also in stock.

CALL FOR SALE PRICES!

Model	Min.Ht.	Max.Ht.	Ant Load*	Sale price
MA40 mast	21'	40'	10 sq ft	\$629
MA550 mast	22'	60'	10 sq ft	\$99
TX438	22'	38'	18 sq ft	\$185
TX455	22'	55'	18 sq ft	\$279
TX472	22'	72'	18 sq ft	\$279
HDX555	22'	55'	30 sq ft	\$2079
HDX572	22'	72'	30 sq ft	\$3559

Note: US Towers Shipped Freight Collect From Visalia, CA Factory

*Note-towers rated at 60 mph to EIA specifications

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\$.39/ft \$379/1000 ft.
Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

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• RG8X—95% Bare Copper Shield • Low Loss • Non-contaminating Vinyl Jacket Foam Dielectric

9086

- Same Specs as Belden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

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1/2" Alum. w/poly Jacket. \$.79/ft.
1/2" LDF-50 Andrew Helix® \$1.99/ft.
3/4" LDF-50 Andrew Helix® \$4.99/ft.
select connectors below

Helix® is a Registered Trademark of the Andrew Corp.

Coaxial Cable Loss Characteristics (dB/100 ft)

Cable Type	Imped.	10MHz	30MHz	100MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	5.8
9086	50	.4	.64	1.7	3.1
1/2" Alum	50	.3	.5	1.2	2.2
1/4" Helix	50	.2	.4	.9	1.6
3/4" Helix	50	.1	.2	.5	.9

HELIX® CONNECTORS

Cable Type	UHF FML	UHF MALE N	FML N	MALE
1/2" Helix®	\$29	\$29	\$29	\$29
3/4" Helix®	\$55	\$55	\$55	\$55

Amphenol Silver PL259 \$1.50
UG218 N Male \$3.50
9086/9913 N Male Connector \$4.95

ANTENNA WIRE & ACCESSORIES

Stranded Copper 14ga. \$10/ft.
1/4 mile 18ga copper-clad steel wire \$30
Dog bone end insulator \$7.99 ea.

VAN GORDEN
1:1 Balun \$15 Center Insulator \$8
Dipole Kits D60 \$31.95/D40 \$28.95
Short Dipole Kits S80 \$35.95/S40 \$33.95
All-band Dipole w/ladder line \$29.95
GSRV all band antenna \$49.95

ALPHA DELTA

DX-A 160-80-40 Sloper \$49

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A3 3-el Tribander.
A4S 4-el Tribander Beam w/S.S. Hdwr.
A743 & A744, 30/40 mtr KIT for the A3 & A4.
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AP8 80-10 mtr Vertical.
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O40 40 mtr Dipole.
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A50-5 5-el 5 mtr Beam.
215 WB NEW 15-el 2 mtr Beam.
230 WB NEW 30-el 2 mtr Beam.
4218 XL 18-el 2 mtr Beam.
3219 19-el 2 mtr Beam.
4248 24-el 432 MHz Beam.
ARX2B 2 mtr Vertical.

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EXPLORER-14 SUPER-SPECIAL.
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V4S 440MHz Base Vertical.
TH5MK2S Broad Band 5-el Triband Beam.
TH7DXS 7-el Triband Beam.
TH3JRS 3-el Triband Beam.
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155BAS 5-el 15-mtr Beam.
105BAS 5-el 10-mtr Beam.
204BAS 4-el 20-mtr Beam.
64BS 4-el 6-mtr Beam.
12 AVQ 20-10 mtr vertical.
14 AVQ 40-10 mtr vertical.
18 AVT/WB 80-10mtr Vertical.
18HTS 80-10 mtr Hy-Tower Vertical.
23BS 3-el 2 mtr Beam.
25BS 5-el 2 mtr Beam.
28BS 8-el 2 mtr Beam.
214BS 14-el 2-mtr Beam.
28QD 80-40 mtr Trap Dipole.
58DQ 80-10 mtr Trap Dipole.
BN6S 80-10 mtr KW Balun W/Coax Seal.

HUSTLER

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4BTV 40-10 mtr Vert \$99 67-144 2-mtr Base \$129
66-144B 2-mtr Base \$89
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Standard 8 cord cables \$.25/ft.
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10 FT. STACKED SECTIONS
20G \$54.50 45G \$153.50
25G \$65.50 55G \$197.50

ALL ACCESSORIES IN STOCK—CALL

ROHN FOLDDOVER TOWERS

Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	
FK2558	58 ft.	13.3 sq. ft.	
FK2568	68 ft.	11.7 sq. ft.	
FK4544	44 ft.	34.8 sq. ft.	
FK4554	54 ft.	29.1 sq. ft.	
FK4564	64 ft.	28.4 sq. ft.	

25G Double Guy Kit \$299.
45G Double Guy Kit \$319.

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

TOWER/GUY HARDWARE

3/16 EHS Guywire (3900 lb rating) \$15/ft
1/4 EHS Guywire (6650 lb rating) \$18/ft
5/16 EHS Guywire (11,200 lb rating) \$29/ft
5/32 7 x 7 Aircraft Cable (12700 lb rating) \$15/ft
3/16 CCM Cable Clamp (13/16" or 5/32") \$4.15
1/4 CCM Cable Clamp (1/4" Cable) \$5.55
1/4 TH Thimble (fits all sizes) \$4.45
3/8EE (3/8" Eye & Jaw Turnbuckle) \$5.95
3/8EJ (3/8" Eye & Jaw Turnbuckle) \$7.95
1/2 9EE (1/2" x 9" Eye to Eye Turnbuckle) \$9.95
1/2 9EJ (1/2" x 9" Eye & Jaw Turnbuckle) \$10.95
1/2 x 12EE (1/2" x 12" Eye & Eye Turnbuckle) \$12.95
1/2 x 12EJ (1/2" x 12" Eye & Jaw Turnbuckle) \$13.95
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PHILLYSTRAN GUY CABLE

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Heavy Duty Steel Masts 2 in OD - Galvanized Finish

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12 in Wall	\$29	\$49	\$69	\$89
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Texas, Alaska & for information 1 (214) 422-7306



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- All Amateur Bands
- Dual Receive
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- 99 Memories • 100 W Output
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- Band Stacking Registers

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 - Receive on both Bands at Same Time
 - Extended Receiver Range
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- Compact, Lots of Features

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- 25 Watts Output on 2 Meters, 220 and 70 cm
- 10 Watts Output on 6 Meters and 1.2 GHz • 100 Memories

ICOM

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- Receive 30 kHz to 33 MHz
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- Full Kilowatt Output
- 160-15 Meters
- 3-500 Z Tube for Maximum Life
- Precise and Easy Tuning
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HIGHER POWER 2 METER H.T.



- Now 5 Watts Output
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- Same Accessories as TH-215

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COMPACT DUAL BAND FM HANDHELD (2M/70CM)



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- Dual VFO's for Each Band
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- Built-in CTCSS
- Built-in 10-Memory DTMF Autodialer

ICOM

IC-24AT

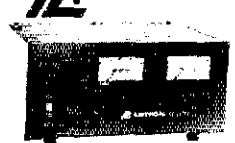
COMPACT DUAL BAND, FM



- 140-150 MHz; 440-450 MHz
- 5W Output
- Crossband Full Duplex
- 40 Double-Spaced Memories
- 4 DTMF Code Memories

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- VS20M ... \$124
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- VS35M ... \$174
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HR-2600 10 Meter Mobile

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- PAKMAIL™ Mailbox With Third Party Traffic
- Two Radio Ports

THE ORIGINAL MULTI-MODE TNC

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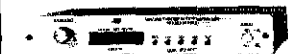
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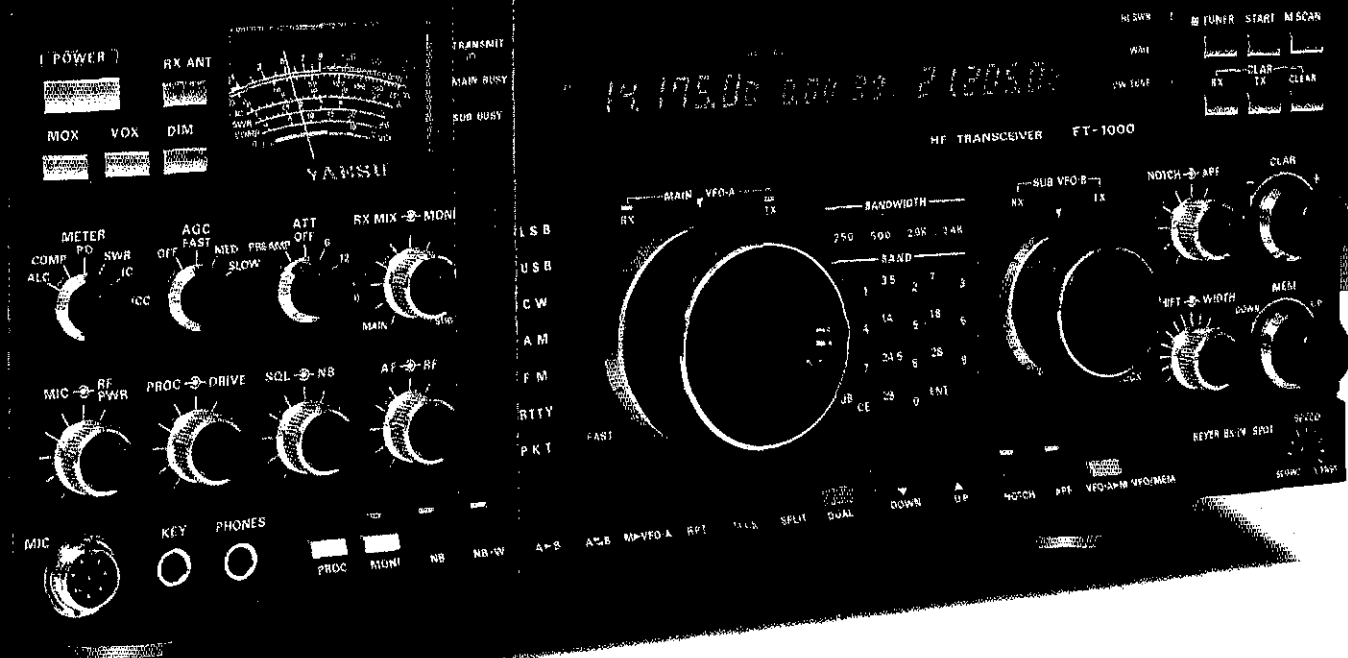
WANTED: QUALITY USED GEAR, CASH OR TRADE

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HUSTLER • HYGAIN



Performance.



Performance. Yours and your radio's. They go hand in hand. To be a truly world-class competitor, you've got to have a truly world-class rig. And it's here, now. The versatile new FT-1000 from Yaesu.

The FT-1000 will blow away your competition with a spectacular combination of power and operating flexibility with such features and options as:

- **Direct Digital Synthesis (DDS)**, two ten-bit DDS plus three eight-bit DDS for fast lock-up time and lower synthesizer noise than other traditional PLL systems.
- **High RF Power Output**, continuous adjustable output from 20 to a full 200 watts.
- **Dual Receive** utilizing two tuning knobs for easy spotting; with optional BPF-1 module allows cross-band dual receive.
- **Digital Voice Storage (DVS-2)** option provides

instant playback of 16-second receive memory, plus two 8-second "CQ Contest" messages on transmit.

- **Automatic Antenna Tuner** built-in with fast action and 39 memories for quick band changes.
- **QRM Rejection Systems**, including a variety of cascaded filter selections, width control, IF shift, IF notch filter, all-mode squelch, dual-mode noise blanker and a CW audio peaking filter.

Additional Features: 108dB dynamic range • front panel RX antenna selector • built-in electronic keyer module • stereo dual receive • flywheel effect on main and sub VFO tuning dials • twin frequency displays • CW spot.

A product of three years of intensive research and design. This HF rig will allow you to achieve a position of competitive dominance.

See the exciting new FT-1000 at your Yaesu dealer today. It's the best of the best.

YAESU

Performance without compromise.

DDS Direct Digital Synthesis

KENWOOD

The HT with More!

• Nine types of scan including new "seek scan" and priority alert. Also memory/channel lock-out

Simply press the channel number!

operation. When 12 volts applied, RF output is 5W! (Cable supplied)

used to check the frequency when CTCSS encode/decode is used.

DTMF monitor also included.

Bell hook, rubber flex antenna, PB-2 standard NiCd battery pack (for 2.5 W operation), wall charger, DC cable, dust caps.

The all new TH-225A brings you all the convenience of a mobile rig, with the portability of an HT. The TH-225A has all of the features as the TH-315A and TH-415A, along with these BONUS features!



TH-315A and TH-415A Features:

Receivers from 141-163 MHz. Includes the weather channels! Transmit from 144-148 MHz. Modifiable to cover 141-151 MHz (MARS or C-AP permit required).

battery pack (PB-2) provides 2.5 W output. Optional NiCd packs for extended operation or higher RF output available.

CTCSS decoder optional.

PB-1: 12 V 800 mAh NiCd pack for 5 W
PB-2: 8 V 500 mAh NiCd pack (2.5 W)
PB-3: 7.2 V 800 mAh NiCd pack (1.5 W)
PB-4: 7.2 V 1600 mAh NiCd pack (1.5 W)
BT-5: AA cell manganese/alkaline battery
BC-7: rapid charger for PB-1, 2, 3, or 4
BC-8: compact battery charger
SC-12: MC-30: speaker microphone
SC-12: 13: 274 soft cases
RA-9B: Simpyduk antenna
TSU-4: CTCSS encode/decode unit
VB-2530: 2m 25 W amplifier (1-4 W input)
TH-4: 5: leather cases
BH-5: swivel mount
MB-4: mobile bracket
PC-2V: extra DC cable
PC-30: cigarette lighter cord with filter

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

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