QST

February 1990 $3.00

evoted entirely to Amateur Radio



Hugo Puts Hams to the Test

02
43655 9

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

the 3KD Classic

the 2KD Standard



Now you have a choice of four high quality HF desk models providing the performance and reliability you have come to expect from a Henry Amplifier

3KD CLASSIC. . .new to the Henry line

1500 W PEP nominal output SSB and CW. 1000 Watts ICAS, RTTY, and FM, covering the 3.5 to 30.0* MHz frequency range. Nominal gain: 15 to 20 times input drive. Tube complement consists of one remarkable new Eimac 3CX-1200D7 ceramic triode. It uses a Pi-L plate circuit with a silver plated tank coil for maximum efficiency and attenuation of unwanted harmonics.

2KD STANDARD. . .new to the Henry line

Smaller than the 2KD Classic and with a slightly lower power output, but still the same rugged construction, the same superior components, the same dependability. The 2KD Standard is a 1200 W PEP nominal output SSB, CW, 750 W RTTY FM RF linear covering the 3.5 to 30.0* range. It uses a Pi-L plate circuit with a silver plated tank coil for maximum attenuation of unwanted harmonics. Its tube complement consists of one Eimac 3-500Z glass envelope triode in a grounded grid circuit.

3KD PREMIER

The same superb specs as the Classic, BUT with the addition of 160 meter operation and QSK break in keying. Both the Premier and the Classic desk models are no nonsense. . .no compromise amplifiers that will please the most discerning amateur for many years to come.

2KD CLASSIC

A proven desk top workhorse providing full legal power. Uses two Eimac 3-500Z glass envelope triodes plus a full complement of top quality components. And, as with all Henry amplifiers is backed by an enduring history of the most reliable equipment available for the amateur market.

*10 meters available on export models only

For additional information on these and the rest of the fine line of Henry amplifiers please call or write for our new information packet.

The Henry line of amplifiers also offers four very heavy duty HF floor consoles in addition to several UHF and VHF models. In all, we now offer 15 different amplifiers. . .more than any other manufacturer that we know of. One of them has to be just right for you.

In addition to our broad line of amateur and commercial FCC type accepted amplifiers we offer special RF power generators for industrial and scientific users. Call or write Ted Shannon for full information.

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KENWOOD

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!

Weight-less!

- Frequency coverage: TH-26AT: 136–173.995 MHz; TH-46: 438–449.995 MHz. (TH-26AT modifiable for MARS/CAP. Permits required.)
- ***NEW!*** Dual Tone Squelch System ***(DTSS)*** enables selective calling with 3-digit DTMF codes! The DTSS codes can be stored in channels 1–3.
- **21 memory channels.** Store everything you need, including CTCSS and DTSS codes. All ten channels can store RX and TX frequencies independently for odd split operations.
- **Frequency step selectable for quick QSY.** 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.
- **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.
- **Multi-function scanning.** Band and memory channels can be scanned, with time operated or carrier operated scan stop.
- **Auto-dialer function.** Four 15-digit DTMF codes can be stored for auto-patch use.

- **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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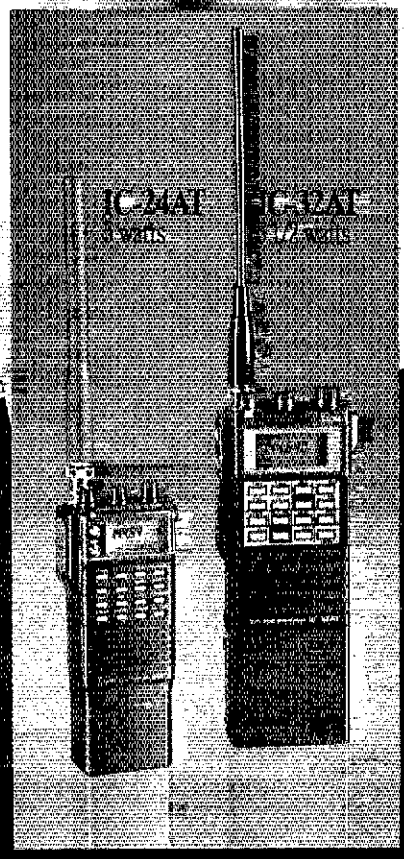
Complete service manuals are available for [illegible]
Specifications, features and prices subject to [illegible]

IC-24AT
IC-32AT

WE CHALLENGE YOU TO A DUAL.

ICOM'S DUAL BAND HANDHELDS



ICOM's IC-24AT and IC-32AT call you to action with the most feature packed, power packed dual band handhelds available. Whether you prefer the convenience of a mini-handheld or the grasp of a full-size handheld, ICOM has the dual-bander fit for you.

The IC-24AT mini-handheld and the IC-32AT give you full operation on the 2-meter and 440MHz amateur bands. Outstanding Performance!

POWER PACKED HANDHELDS. The IC-24AT provides up to 5 watts on 2- meters and 440MHz with a 12V battery while the IC-32AT is 5 1/2 watts on 2-meters and 5 watts on 440MHz.

PLENTY OF MEMORIES. Store any frequency, Tx offset and subaudible tone in any memory. Total flexibility to meet your needs.

PROGRAMMABLE SCANNING. Both units scan band and memories plus offer easy memory lockout and instant memory recall.

PRIORITY WATCH. Monitor the call channel, a memory channel or all memory channels every five seconds while operating!

ADDITIONAL FEATURES INCLUDE: Battery saver, all subaudible tones, multi-function LCD readout, dial selectability and DTMF pad for memory channel auto-patching. The compact light-weight IC-24AT also features a 24 hour clock with timer, and an autodialer. Access to multi-digit phone numbers at the touch of a button.

ACCESSORIES: The IC-24AT uses accessories from the "S" Series handhelds while the IC-32AT is compatible with all IC-2AT/02AT accessories. An optional UT-40 beeper silently monitors a busy channel for your calls. When the preprogrammed subaudible tone is received, the unit beeps and the LCD flashes.

The dual is over, ICOM's IC-24AT mini-dual bander and IC-32AT full-size dual bander give you maximum performance in the package best suited for your needs. Check you local ICOM dealer for the finest dual banders available today. The ICOM IC-24AT and IC-32AT.

ICOM

First in Communications.

ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004 **Customer Service Hotline (206) 454-7619** 3150 Premier Drive, Suite 126, Irving, TX 75063 · 1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349 ICOM CANADA A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada
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OUR COVER

When Hurricane Hugo plowed its path of destruction through the Caribbean and the Carolina coast, Amateur Radio operators established critical communications links. Read the "inside story" in Rick Palm's "Hugo the Horrible" on page 14. The jumbled pile of sailboats was photographed in Culebra, Puerto Rico, by Robert Howe, K1MZB. The inset shows Field Services Manager Palm being interviewed by a local CBS affiliate during the crisis. (*Inset photo by Joanne Palm, KA1SIP*)

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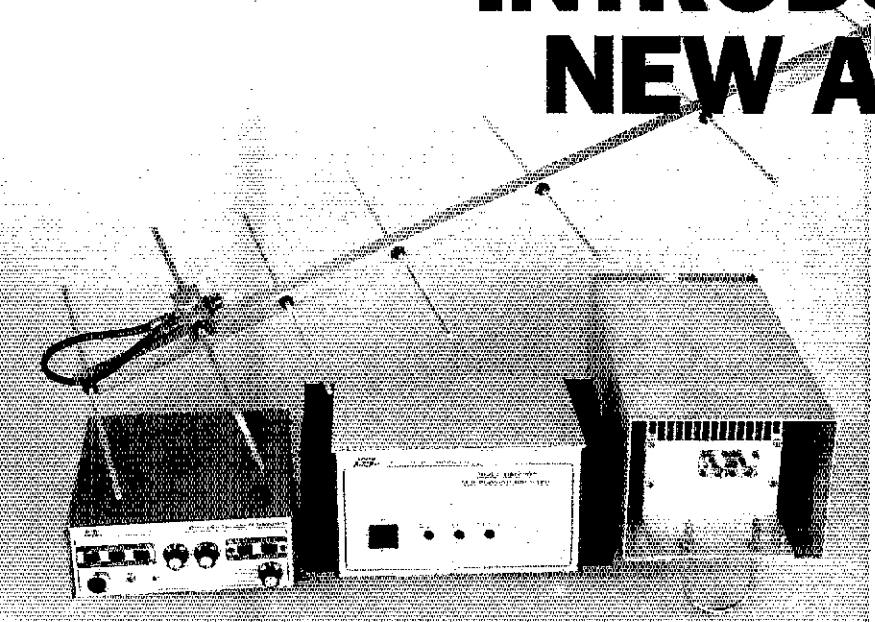
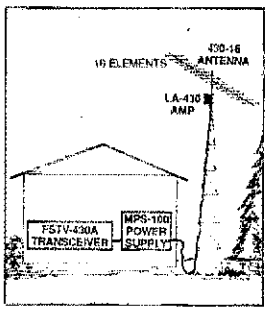
INTRODUCING AEA'S NEW ATV SYSTEM



Add a new dimension to your amateur radio communications with AEA's Amateur Television (ATV) system. If you hold at least a technician-class license, you can transmit and receive live or taped audio and video Fast-Scan TV (FSTV) information that rivals broadcast quality. Now you can share more than conversation over the air with this new mode of "personal communications."



It's Easy and Inexpensive. If you have a video camera or camcorder and a standard TV set, you may already own the most expensive components of an ATV system. AEA's ATV system includes a transceiver and antenna. Simply connect the camera, TV and the antenna to the transceiver, and you're on the air LIVE with one watt P.E.P.! Your TV set will monitor your transmitted and received pictures. If you want to broadcast with more power, AEA also offers a 50 watt mast-mounted linear amplifier with power supply.

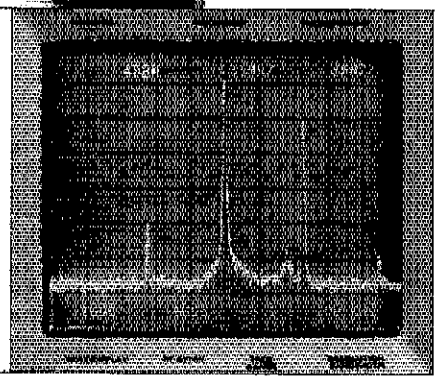


The FSTV-430A Transceiver features a low-noise UHF GaAsFET preamp with a typical noise figure of less than 1.5dB and a crystal-controlled or variable tuning down converter. Output is available on channel 3 or 4 for signal reception AND monitoring transmissions. Two frequencies can be selected from the front panel for transmission (one crystal is included). The AEA design is also optimized for superior video and audio quality without sync buzz even with weak signals. The FSTV-430A is the only transceiver you need to work ATV and it also allows you to use the same TV set to monitor your transmitted and received pictures.

The LA-430/50 Amplifier with Power Supply gives a boost to your ATV signal. It includes a 50W P.E.P. mast-mounted Linear Amplifier (**patent pending**) covering 420 to 450 MHz and a GaAsFET preamp which utilize the antenna feedline for DC power. The mast- mount eliminates the line loss between the amplifier/preamplifier and the antenna to improve both transmission and reception, and is the equivalent of a 100W amplifier in the shack with a 3dB line loss. The amplifier is housed in a weather-resistant alodized aluminum case. The MPS-100 power supply also provides a 13.6 volt output for the FSTV-430A.

What is the advantage of Vestigial Sideband (VSB)?

AEA's FSTV-430A Vestigial Sideband operation drastically reduces adjacent-channel interference. VSB requires much less bandwidth than existing double-sideband designs; it's the standard method of modulation required by the FCC for all U.S. broadcast TV stations. Similar in principle to SSB, VSB puts all of the audio energy and most of the video in ONE sideband instead of two. Using about half the spectrum space of competitive units, the FSTV-430A is the ONLY ATV unit that conserves spectrum space by using VSB. Even with AEA's LA-430/50 amplifier, one sideband is reduced more than 30dB. VSB presents an obvious advantage to the bandwidth-conscious ATV operator.



The 430-16 Antenna is a high-performance, computer-optimized yagi specifically designed for ATV operation. It features broadband frequency coverage from 420 to 440 MHZ. O-ring sealed connectors, 28 degree E plane and 32 degree H plane beam widths and 16 elements on a 10-foot boom.

See AEA's FSTV System at your local authorized AEA dealer. Put yourself in the ATV picture and join the fun!

Advanced Electronic Applications, Inc.
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AEA Brings You A Better Experience.

Straight A's!

On 10-15-20 Meters

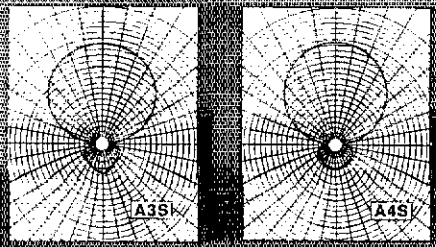
A3S

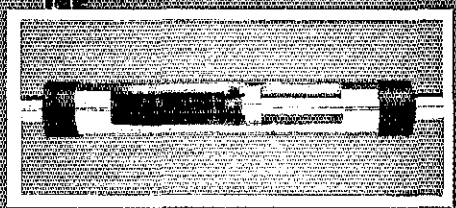
A4S

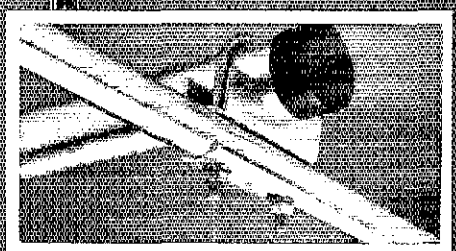
These tribander Yagis are designed with today's technology for great performance, high strength and survivability under extreme conditions. They are light in weight with clean profiles to reduce wind loading and stress on the mast, rotator and tower. The A3S and A4S have been designed for maximum gain 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
- Element 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 6061-T6 aluminum
- User friendly instructions for quick and easy assembly







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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.

DSP

Digital Signal Processing



Without DSP | With DSP

• **Digital Signal Processor.** DSP is a state-of-the-art technique that maximizes your transmitted RF energy. 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 Station monitor w/pan display • SW-2100 SWR/power meter • TL-922A Linear amplifier (not for QSK)



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

KENWOOD

TM-731A/631A

144/450 and 144/220 MHz FM Dual Banders

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

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

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"Dynamic Duals"



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THE AMERICAN RADIO RELAY LEAGUE, INC

The American Radio Relay League, Inc, is a noncommercial association of radio amateurs, organized for the promotion of interest in Amateur Radio communication and experimentation, for the establishment of networks to provide communications in the event of disasters or other emergencies, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

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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 . . ."

Automatic Control

There are two recurring concepts in Amateur Radio regulation: *station* and *operator*. A station is a collection of equipment, most especially transmitting equipment; the operator (FCC likes the term *control operator*) is the person responsible for it.

Most of the time, the operator is within an arm's length of the station and clearly is able to exercise control. Another concept that is generally well understood is that of *remote control*, where the operator's "arm" (as well as eyes and ears) is supplemented by a radio or wire link to the station. Through this link, the station can be effectively controlled from miles away.

When FM voice repeaters became popular in the late 1960s, there were no rules specifically intended to govern their operation. While amateurs had been relaying messages for decades and repeaters had seen limited service since the '30s, a station whose sole purpose was to retransmit the signals of other stations was a new regulatory wrinkle. In 1972, the FCC adopted special rules for repeaters, recognizing them as something different but *retaining the requirement that a control operator be on duty at all times the repeater was in operation*. This was quite a burden on sponsors of repeaters, and probably was honored as much in the breach as in the observance.

Two years later, the Commission decided it was ready to adopt, for repeaters only, a notion that had been introduced during the discussion of the new repeater rules: *automatic control*. The idea behind automatic control is that if rules compliance by a station can be ensured without an operator on duty, then the operator isn't needed. This is easier said than done, particularly when it comes to making sure that a nonham talking by autopatch stays within the law, so FCC retained (and still retains) the requirement that a control operator be on duty when third-party traffic is being handled via repeater.

Automatic control worked pretty well, and before long the FCC was prepared to extend its use to beacons, where message content is not an issue. But since the primary purposes of Amateur Radio involve two-way communication between amateurs, automatically controlled beacons were limited to *narrow segments* to minimize the possibility of interference to other stations.

A further extension of automatic control occurred in 1986, when the Commission authorized its use by stations transmitting digital communications above 50 MHz. Retransmission of third-party traffic is permitted as long as the traffic is introduced into the network by a station with a control operator on duty and as long as AX.25 (or compatible) packet protocol is used.

As discussed on this page 'way back in May 1986, the situation at HF is considerably more complex. A live operator can make sure a station doesn't cause potentially life-threatening interference to two-way communication; a "robot" station, at least at the present stage of development, lacks that discernment. Also, in our crowded HF bands there is no such thing as virgin spectrum; the introduction of *any* new form of operation is going to disaccommodate some prior users. So, it was necessary to proceed very cautiously into the realm of automatic control on HF.

For more than two years, under special temporary authority, a limited number of packet radio stations have operated by automatic control as an organized network on specific frequencies in the 80, 40, 30 and 20 meter bands. Some AMTOR operation has been authorized under similar provisions. A number of lessons have been learned, among them that an organized message-forwarding network on HF, operating under automatic control, provides an extremely useful capability that cannot now be duplicated any other way. But there is a down side, namely that if it's busy, such a network cannot share frequencies with users of other modes without causing irritation or worse.

What to do? At one extreme, we could eschew automatic control on HF—and deny ourselves its benefits. At the other, we could permit it without restriction—and test the limits of self-regulation, already sorely tried elsewhere on HF, by letting a modern equivalent of a range war determine where automatically controlled stations shall operate. (Robots being more patient than humans, this approach certainly would work to the disadvantage of traditional live, two-way amateur communication.)

Based on the recommendations of the ARRL Committee on Amateur Radio Digital Communication and the Membership Services Committee, the League's Executive Committee chose a middle course: to petition the FCC for rules permitting automatic control of RTTY and data communication in *narrow segments* of the HF bands. The petition is described in "Happenings" this month.

The particular segments proposed for automatic control conform, to the greatest extent possible, to the pattern of international usage that has evolved. Given that there is no virgin spectrum, there is bound to be some controversy surrounding the specific frequencies. Particularly on 40 and 20 meters, if we could be guided solely by US operating patterns the choice of segments probably would have been different; but propagation on these bands is global and we cannot responsibly adopt a parochial attitude.

It remains to be seen what action the FCC will take on the petition. Should rules be adopted essentially as proposed, some present operating patterns may have to be adjusted by no more than a few kilohertz. Any inconvenience that might result is to be regretted, but is a small price to pay for what can be gained from a reliable and efficient message-forwarding network.—*David Sumner, K1ZZ*

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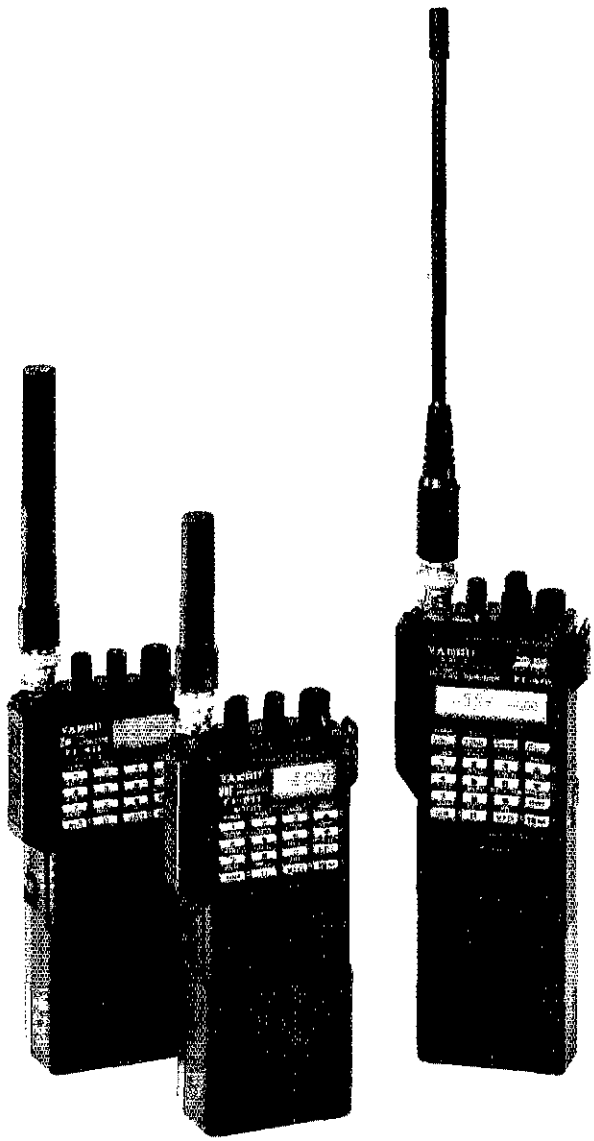

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Memory Channels	49	48	10
VFOs	2	1	1
Memory Channels Store Any Offset	49	10	10
Wide Receiver Frequency Range (MHz)—VHF	140-173	138-174	141-163
Wide Receiver Frequency Range (MHz)—UHF	430-450	440-450	438-450
Built-in CTCSS Encode/Decode	Included	Option	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

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Data and prices obtained from latest available manufacturers' brochures & printed material. October, 1989

*VHF Radios only.

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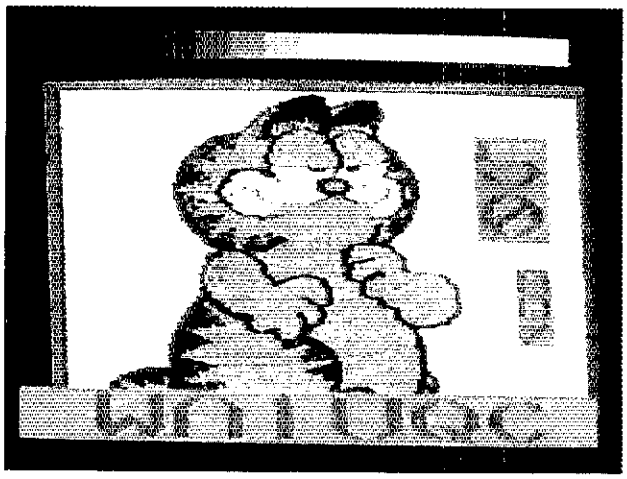
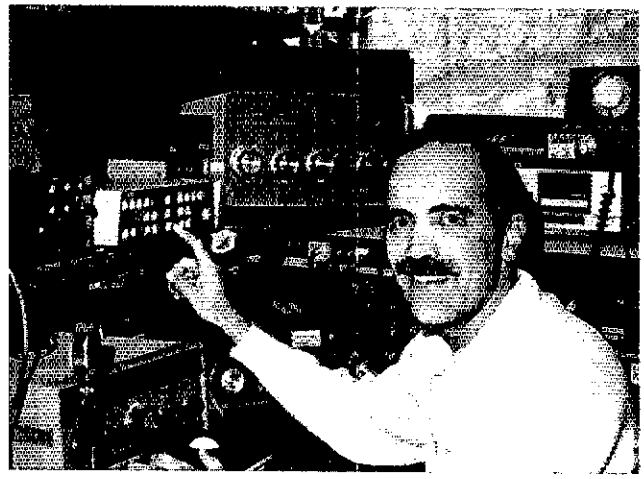
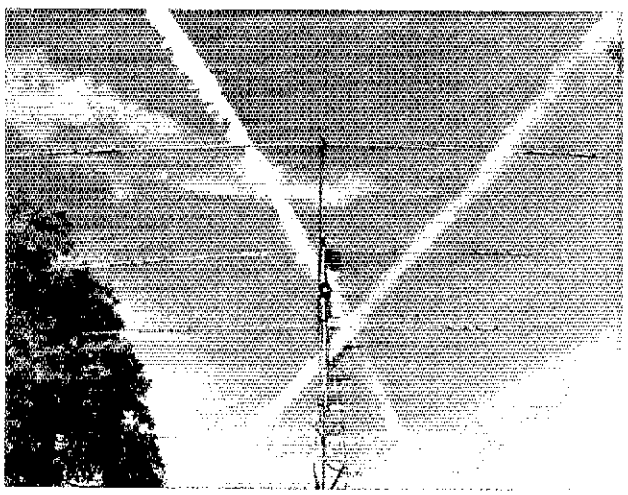
UP FRONT in QST

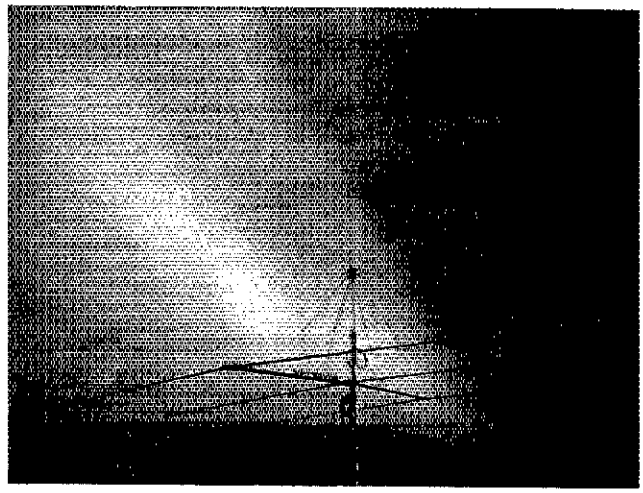






Picture-perfect 6-meter opening: On November 22, 1989, Dave Faucher, WA1UQC, and Paul Turner, G4IJE, may have completed the first UK-to-US SSTV contact on 6 meters. During their 50-minute QSO, several high-resolution screens were exchanged. The photographs show on-air screen shots as received, and depict the "closed-circuit" quality of the 6-meter path. Dave is shown manning the helm of his TS-600, which runs 300 W (with the help of an amplifier) to a 6-element Yagi; Paul was running 30 watts to a 5-element Yagi. The two hams managed additional QSOs over the next few days. *(WA1UQC, G4IJE photos)*





X marks the spot: These two photographs could easily qualify as "Modern Art Antenna Shots." The "X-beam" was sent to us by John Kaminski, W1NEN, of Greenville, Rhode Island, who immediately went running for his camera as soon as he spied the jet-engine contrails. The multicolored aurora shot came in via ARRL member John S. Ball, LAØEM, of Trollasen, Norway. John says the aurora, occurring about 9 PM local time November 17, 1989, produced plenty of E_s contacts. *(W1NEN, LAØEM photos)*



Our new look: In case you miss the four towers and more than a dozen Yagi antennas, a new sign now points the way to ARRL HQ. The sign is part of the finishing touches of the W1AW renovation. *(NTØZ photo)*



The guy you'd love to hate: Chuck Joseph, N5JED, of Mount Clemens, Michigan, didn't set out to belittle the rest of us DXers—it just happened that way! Chuck earned his wallpaper, including his DXCC certificate, while running 100 W to a 54-inch (that's no typo) *indoor* vertical antenna (the MFJ 1621). Chuck now has more than 120 countries confirmed with his humble setup, and hopes his success will encourage others with space and antenna restrictions to keep on operating. *(N5JED photo)*



There's more than one way to string a Hazer: Shown after a recent move from New York to Alexandria, Louisiana, John Keighley, K2PZ (in the pool) was caught running a cable through his new tower—the cool way. During last summer's job, temperatures hit 95 degrees, prompting John's innovative construction technique. Also shown are friends KD5YU (wearing the hat), and KB5CX. *(photo courtesy of KN2N)*



NYC Ham of the Year: Fifteen-year-old Nickol Santiago, KB2GGW, proudly displays her 1989 NYC Ham of the Year Award with Joe Fairclough, WB2JKJ, President of the radio club of Junior High School 22 following her graduation from "22" last June. Nickol is known for her participation in the school's Classroom Net, which meets on 21,395 kHz. *(photo courtesy of Anna Hernandez)*

League Lines

Two new DXCC countries: By unanimous vote (7-0), the ARRL Awards Committee has accepted the recommendations of the ARRL DX Advisory Committee to add Conway Reef (3D2) and Banaba (T33) to the ARRL DXCC Countries List by virtue of Point 2(b) of the Countries List criteria. Banaba was formerly known as Ocean Island. QSL cards may be submitted for these two countries on or after March 1, 1990. Cards submitted before that date will be returned with no action. See page 61 of this issue for more information.

After more than 35 years "behind the diamond," ***E. Laird Campbell, W1CUT, has retired from ARRL HQ.*** Over the years, Laird has worked in several departments at HQ and was Managing Editor of *QST* since the '60s. See this month's Happenings column for a profile of Laird.

Mark Wilson, AA2Z, was named Managing Editor of *QST* upon Laird's retirement. Mark is familiar to many readers as Assistant Managing Editor and through his work as an editor in HQ's Technical Department.

Brian Battles, WA1YUA, joins HQ as Copy Editor for *QST*.

The National Telecommunications and Information Administration (NTIA), which shares responsibility with the FCC for management of US radio spectrum, has begun a ***comprehensive policy review of the use and management of the radio frequency spectrum in the United States.*** With the release of a Notice of Inquiry (NOI), the NTIA has invited comment on a broad range of topics. The full text can be found in the December 8, 1989 *Federal Register*. The comment deadline is February 23, 1990, and the reply comment deadline is March 30, 1990. The "NTIA Paper" is available from the Regulatory Information Department of ARRL HQ for a large 9- × 12-inch SASE with three units of postage.

PRB-1 Seminar to be held at Miami Hamboree: On Friday, February 2, a Continuing Legal Education (CLE) Seminar will be conducted by the ARRL Legal Strategies Committee in conjunction with the Miami Hamboree. It will be held at the Airport Hilton Hotel in Miami, Florida, from 9:30 AM to 1:30 PM Eastern Standard Time. The seminar is entitled "Land-Use Regulation of Federally-Regulated Communications Facilities and the Doctrine of Federal Pre-emption." It will be moderated by ARRL Counsel Chris Imlay, N3AKD, and will feature other members of the League's Legal Strategies Committee.

Primarily intended for ARRL Volunteer Counsel, attorneys, and municipal officials, the seminar will analyze several areas of local, private, and governmental restrictions of wireless communications facilities and radio antenna systems, and the limits of municipal and state jurisdiction. The cost of the seminar is $50.00 to anyone requiring the course materials. This includes the cost of the course materials and state Bar notification where applicable. The seminar is free to those not requiring the course materials or CLE credit. Course registration is available at the seminar.

The Dayton Amateur Radio Association (DARA) is accepting applications for its 1990 scholarship program. Licensed amateurs graduating from high school in 1990 are eligible and there are no restrictions on license class or course of study. ***Five $1500 scholarships will be awarded.*** The deadline is May 15 and the scholarships will be awarded June 1. For further information and application forms, contact: DARA Scholarships, 317 Ernst Ave, Dayton, OH 45405.

The Educational Activities Branch at ARRL HQ continues to receive letters and phone calls from parents and teachers requesting information on ***using Amateur Radio in the classroom.*** They cite "The Bardstown Experiment" (See October 1989 *QST*, page 39) as their motivation. For information on how you can become involved in teaching Amateur Radio, contact ARRL HQ.

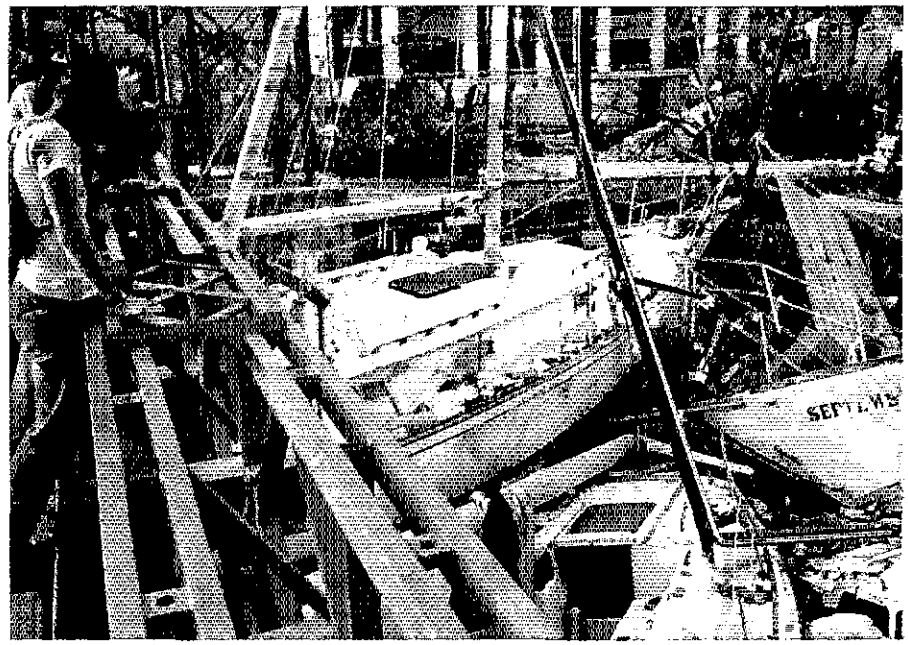
W1AW has begun using NAVTEX headings on AMTOR bulletins. This will allow so-equipped stations to copy only those bulletins which have not previously been copied.

ARRL has filed a ***Petition for Rule Making with the FCC*** seeking the adoption of rules to permit limited HF RTTY and data communications under automatic control. See It Seems to Us... and the Happenings column for more information.

Hugo The Horrible

Accounts of amateurs' heroism in danger's path.

By Rick Palm, K1CE
ARRL Field Services Manager



Hugo's wrath in Culebra, Puerto Rico. WA1PJS, NP4XM survey damage. *(photo K1MZB)*

Last September, Hurricane Hugo sighted down the gun barrel at the eastern Caribbean, Puerto Rico and South Carolina...then pulled the trigger. Death and almost incomprehensible destruction were the terrible results. Amateur Radio played a crucial role in mitigating the titanic effects of the storm's passage. Amateurs, individually and through organized nets, provided critical communication links for government and nongovernment relief agencies when normal channels had broken down. In many disaster areas, amateurs were first to establish contact with an outside world desperate to hear word, only seconds after winds had subsided enough to allow erection of antennas.

How did the amateur effort stack up against those of past disasters? In a nutshell, it was "new and improved." Actually, *much* improved. New techniques including packet radio and AMTOR were employed, proving especially useful in handling thousands of health and welfare messages on behalf of a concerned public.

Despite fatigue and enormous emotional pressures, operating standards were very high. The amateur community has every right to be proud of what was accomplished. It is difficult for the rest of us to imagine what having a radio link with the outside world must have meant to people whose homes and neighborhoods were suddenly turned into rubble.

ARRL Puerto Rico Section Manager Alberto Valldejuli, WP4CSG, said "Ham radio was vital to government and welfare agencies during this emergency. Thanks to ham radio, Civil Defense, Red Cross and National Guard had effective relief communications in all the affected areas."

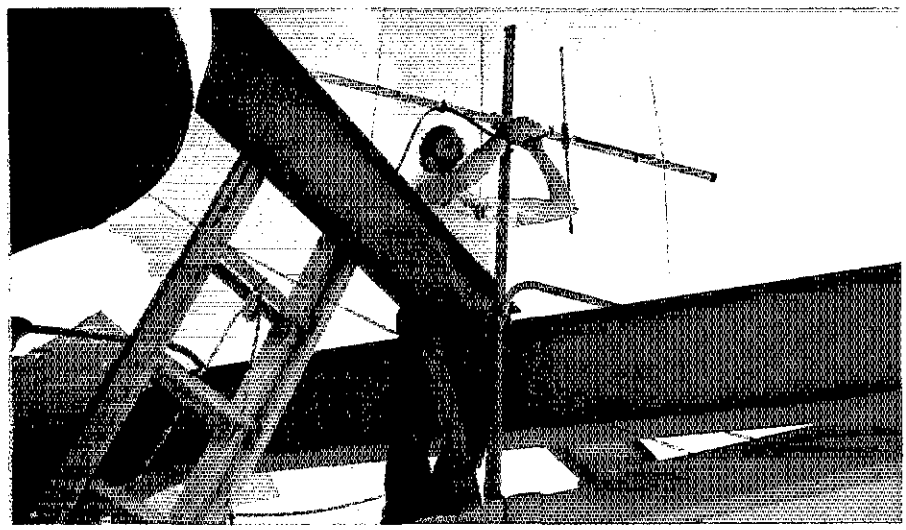
ARRL Roanoke Division Vice Director Jimmy Walker, WD4HLZ, said "Hugo was a challenge and Amateur Radio met that challenge." Walker managed many aspects of the South Carolina communications effort.

W1AW

Hugo prompted the Field Services Department, a staff unit of ARRL Headquarters, to implement an evolving emergency operations plan. Before Hugo struck, FSD staff members were in contact with served agencies. During the week that followed, they concentrated on maintaining solid contact with key League representatives in and near affected areas and handling requests for assistance. In Puerto Rico, this included filling a request for HF, VHF and power-generating equipment (Kenwood, ICOM and Pac-Comm jumped at the opportunity to donate the gear).

Another priority was getting reliable information from on-the-air monitoring and telephone communication with authorities. The information was processed and transmitted by bulletin over W1AW on the station's emergency schedule. Amateurs were thus advised on how to respond personally to the dynamic Hugo situation. Staff members also answered hundreds of phone calls from amateurs, served agency and government officials, and members of the domestic and international media.

Despite the heavy damage to the US Virgin Islands and Puerto Rico, a number of stations



WA1PJS installs a 2-meter Yagi on the "roof" of what was Culebra's hospital. Amateurs shared the site with Puerto Rico National Guardsmen. *(photo K1MZB)*



K1MZB operates packet in a Culebra hospital supply room under what remained of the roof. *(photo NP4XM)*

(especially in Puerto Rico) were on the air soon after the storm passed. Some were able to handle welfare inquiries for their immediate areas, although other traffic had priority. Not all the action was on 20 meters; for example, some excellent work was done on 10. On Monday afternoon, FSD staff operating W1AW found themselves shifting from the monitoring mode to active participation in a Spanish-speaking net of Puerto Rican stations on 28.450 MHz, where damage assessment reports were being collected. A representative of the Hartford-area community agency *La Casa de Puerto Rico* happened to be at the station translating reports when the net requested assistance from the mainland. With his help, W1AW operators assisted the net that day and subsequent days as well. Tuesday afternoon, staff reached Section Manager Valldejuli, who confirmed the official status of the net.

HQ was also in touch with Virgin Islands Section Manager Ron Hall, KP2N, by radio; his home on St Thomas was badly damaged, as were the homes of many other League volunteers and amateurs.

Prior to Hugo plowing into the US mainland September 21, FSD staff contacted affected Section Managers in the southeast, offering W1AW bulletin and other support.

ARRL International Assistance and Traffic Net

On Saturday, September 16, the League's International Assistance and Traffic Net (IATN) was activated on 14.303 MHz. For nine days, the net operated 15 hours per day. During the hours before the storm made landfall, a number of stations representing various governmental authorities in the Caribbean checked in. The net operated smoothly, concentrating on official traffic, damage reports, and traffic originating in the affected area while funneling disaster welfare inquiries elsewhere, including packet radio channels. The net provided access to the US National Traffic System (NTS) and point-to-point communications channels into diplomatic missions, government and nongovernment disaster relief agencies in Washington DC. ARRL National Emergency Response Committee (ANERCOM) Chairman Joel Kandel, KI4T, and member Geri Sweeney, N4GHI, directed much of the League's Hugo response through IATN.

Many islanders were on hand to offer assistance, including IATN regulars 9Y4IBN in Trinidad, J6LIH in St Lucia, J73BB in Dominica, J88AG in St Vincent, and VK6RQ in Australia.

As stations managed to get back on the air, they brought with them many outbound health-and-welfare reports and lists of names and phone numbers. Many stateside stations were standing by to make phone calls. Some had access to toll-free numbers; others made long-distance toll calls out of their desire to help people in distress.

IATN accepted no traffic from the US, freeing the net to assist stations in the affected areas. By using the *ARRL Net Directory*, net control stations advised US amateurs where to find local NTS nets and packet outlets to send traffic bound for disaster areas.

Hurricane Watch Net

As Hugo approached within 250 miles of land in the eastern Caribbean, the Hurricane Watch Net (HWN) activated to obtain local meteorological reports from amateurs in storm path areas for relay to the Miami-based National Hurricane Center. A secondary function was to provide genuine emergency and priority (logistical) traffic. The net also received damage reports from affected areas, relaying them to the National Hurricane Center (NHC).

One net control station (NCS), John Moore, NJ7E, said this time around, good net discipline prevailed with most amateurs listening to and following instructions. He credits W1AW advisories on proper operating procedures for the good discipline. There were many check-ins, including government stations, from all affected areas.

In one case near Puerto Rico, just prior to Hugo's attack, Moore advised a ship's sailors to get ashore. The sailors replied they would ride it out at anchor. Moore never heard from the vessel again.

During Hugo's assault on South Carolina, amateurs in Charleston, Hilton Head, Savannah, and on yachts fed local weather data to HWN. In one case, KF6JA reported from the *Snow Goose*, anchored in a Georgetown river, that her anemometer was pegged at 120 mi/h. In another, WB3EFS, in the town of Ladson, 15 miles inland from Charleston, checked in just prior to Hugo's eye passing overhead, then conducted a mobile survey during the eye and reported back afterward with assessments.

When NHC lost contact with the National Weather Service office at Charleston, it urgently requested HWN to contact the office to obtain an exact position of the eye. K9KJD, who was liaison to a local net, was able to get a precise radar fix from the office

Communications Procedures In Disasters

Clip and post at your operating position for reference during next year's hurricane season!

- Communications channels in support of damage assessment and disaster relief agencies must be established quickly; the availability of the channels must be made known to disaster area amateurs, and the rest of the amateur community.
- US amateurs must not be preoccupied with welfare inquiry traffic. Priority must be given to immediate disaster relief communications. Time should be allowed for outbound welfare messages to be sent first, each of which could potentially head off at least one, and perhaps many, inquiries. For amateurs to accept inquiry traffic from concerned families, friends and relatives stateside before there is any way to handle it raises false hopes and clogs the system.
- Control belongs in the affected area; they are in the best position to know the priorities. Amateurs outside the disaster area are there to support them, not the other way around.
- In providing information to the media, only authentic reports should be passed along, not unsubstantiated hearsay. See the League's guidelines for media contact in September 1988 *QST*, pp 58-59.

while the eye was over Charleston harbor.

NHC Director Bob Sheets asked that his thanks be passed along to all amateurs.

Virgin Islands

ARRL Virgin Islands Section Manager Ron Hall, KP2N, reported on ARES activity in one of the hardest hit areas:

Winds in excess of 210 mi/h swept through the Virgin Islands on September 17. St Croix was the worst hit with seven deaths and more than 90% of all houses damaged. ARES was activated on September 16, and members staffed the Emergency Operations Centers (EOCs) on all islands during the storm. Stations checked into the 146.81 repeater hourly for status reports.

After the winds died down, ARES members got on the air with whatever they could. NP2B's house lost 90% of its roof, yet he had traffic flowing within 24 hours. KV4JC's house lost part of its roof, but he managed to string out a wire and pass traffic. For the first week after the storm, 20 to 25 Virgin Island stations were our link to the mainland. VHF repeater links were reestablished through the efforts of W2IBJ and KP2O. WP2AGA set up a 2-meter packet digipeater to handle the large volume of messages coming in. A great job was performed by all Virgin Island hams.

Cliff Roberts, WB5VRC, traveled to St Croix as part of a jump team:

Upon my arrival on St Croix on Monday, September 25, I went to Public Safety Headquarters to set up my equipment. The damage wreaked by Hugo was more than I had imagined. Houses were just gone, with nothing left but the foundations and debris. Roofs were off many houses that were still standing, and power lines were draped across the roads. Employing two HF rigs, a 2-meter mobile rig and a computer, I sent and received traffic with operators in the states.

Because there was not a repeater left standing, we used 147.52 MHz simplex until we received a portable, battery-powered repeater from the states. When St Thomas repeaters were put back in service, we were able to communicate through them.

At Red Cross HQ, where Dayton Amateur Radio Association jump-team members W8IQJ and N8EEK were operating, we established a packet link so AMTOR dumps could be relayed locally and posted for the public to read. This system worked quite well, allowing us to handle a large volume of traffic in a short period of time.

I departed St Croix on October 5, arriving back in San Antonio the following day. The experience confirmed what Amateur Radio is all about: public service in emergency communications.

Puerto Rico

Bob Howe, K1MZB/V31MZ, played a multifaceted role at the behest of the International Amateur Radio Network. IARN was one of several 20-meter emergency assistance nets established during the crisis:

Stations on the US Virgin Islands were not taking incoming traffic because there was no way of locating addressees in most cases. But they were giving us outgoing traffic from island residents near their locations. As soon as we picked up the outgoing stuff, somebody on frequency would place a collect call to the stateside family or friend. I made perhaps three dozen such calls, not hesitating to wake someone up in the middle of the night. Without exception, everyone was grateful for good news about the lives of loved ones, some tearfully so, although many messages had news of severe property damage. Several appreciative people vowed to become amateurs.

The most critical Hugo traffic occurred late Tuesday and into the early hours of Wednesday, September 20, on 14.303 MHz. Bob, W9ARV, IATN NCS, checked in 4U1UN, the United Nations station in New York City, looking for stations on St Croix that could report the extent of civil disorder there. The Department of Defense wanted to know.

I went back to 14.275 and asked Klaus, KP2O, on St Thomas to move to 14.303 in case he knew something useful to 4U1UN. Mike, KP2V, at the Hess oil refinery on St Croix, and Pete, WA2AAX, on his boat at St Thomas, also showed up. What emerged from the three eventually became known to the whole world—that the island of St Croix was in a state of anarchy: Prisoners were on the loose, merchants were holding looters at bay with sawed-off shotguns, police were not reporting for duty, and local Guardsmen were allegedly participating in the looting. President Bush decided on Thursday to send regular Army troops and the FBI to St Croix. It is possible that the first and perhaps only information on which his decision was based came via Amateur Radio.

IARN solicited volunteers for "jump teams"—one- and two-man groups to go to affected islands. Bill, WØBIU, a retired dentist from St Louis, had already left for St Thomas. I decided to go and called Tom, WA1PJS, a retired Navy flier and emergency medical technician from Bath, Maine, who also had volunteered.



Emmie Patience, KA4LRM, served as net control of the South Carolina SSB Emergency Net during the Hugo crisis. *(W4DRF photo)*



Hugo marches on the South Carolina coast. The storm's eye passed directly over Charleston. *(NOAA 11 weather satellite image courtesy of WA9TFB)*

Once in San Juan, we saw Victor, KP4PQ, President of the ARRL Puerto Rico Amateur Radio League at his two-way commercial radio shop. As well as helping with our arrangements, Victor's office also was the drop-off point for several complete VHF stations that ARRL had sent for ARES use.

There still was no civilian communications with the island of Culebra, so we flew there on a National Guard C-7, September 29. Joining us was Tito, NP4XM, who had driven up from Villalba to help.

The destruction was incredible, leaving a nearly total lack of green vegetation on this semitropical isle. Trees and shrubs were stripped bare. The scene looked like a Maine winter.

We reported to a National Guard encampment where, to our surprise, there were two 2-meter rigs on a table below a sign reading "WP4GPE." The rigs and the call belonged to the Chief Warrant Officer who had been on Culebra since after the hurricane.

We set up our HF and VHF gear. Tito, a packet expert as well as top-rate CW operator, got the packet rig going and promptly connected with Sergio, KP4GY, in Fajardo, the nearest city on the main island. Fajardo was hit hard by Hugo, although not as hard as Culebra, and Sergio was on emergency power.

We had a decent signal into IARN on 14.275, but passed most of our traffic on the Puerto Rico Net (PRN), the section ARRL NTS net, and on 2-meter packet and voice. Over the next four days we moved a moder-

ate amount of health-and-welfare, Red Cross and local police traffic to the main island.

Our first health-and-welfare inquiry arrived on packet from KP4USN via KP4GY's BBS, a Red Cross DWI (Disaster Welfare Inquiry) concerning the yacht *Born Free*. Tom and Tito located the vessel, which had washed aground at El Vate. The next day I met the yacht's owners, Mr and Mrs Kwant of Toronto, who described their harrowing 14-hour, on-board ordeal. Happily, we sent a reply that the Kwants were safe and *Born Free* suffered no serious damage.

Another typical message was one via the 147.09 voice repeater from Vern, WD4EEB, at Red Cross, San Juan, inquiring about a local family. Tom and Tito found them after getting their address at the post office. A reply to stateside that the family was safe—but their house was demolished—was on its way the same day.

With limited telephone and electrical service restored by our second day on the island, things were beginning to return to normal. We returned to the states. It had been the most important thing I had done in 30 years as a radio amateur.



Mel Cole, WA1WTP, in touch with the Caribbean during Hugo's onslaught. Cole was one of hundreds of amateurs across the nation who provided direct assistance. *(photo courtesy of Beverly, MA* Times)

Help From the *USS Valdez*

US Navy Seaman JoJo Leto, NØFBC, tells the story of his Amateur Radio work upon entering San Juan post-Hugo:

As soon as Hugo passed, our job on the *USS Valdez* was to bring fresh water to San Juan and St Croix. Within a short time of pulling into the Puerto Rican Naval Base, we put the ship's Amateur Radio station on the air. Some 422 phone patches were made for the ship's crew and islanders to loved ones in the states. Don, KA1TER, and I operated for several days straight, relaying information to stateside stations and making sure that communication between the states and the Caribbean was intact, as Amateur Radio was the only link out of the islands at the time.

A local Civil Defense leader pleaded with us to solve his group's communications problem—they didn't have any. We installed equipment and antennas at the Civil Defense Building and the hospital. This facilitated communications among ambulances, the hospital and Civil Defense. By this time, the locals thought the world of me and were excited and happy to know that they were no longer isolated in Nugabo. Many a man, woman and child hugged me and shook my hand for bringing communications back to the hospital and their ambulances.

That night when I left Nugabo to go back to the ship, I really felt that Amateur Radio had made this all possible. I felt so good knowing such a simple thing as building antennas could help so many people so much.

Badge of Courage in South Carolina

As the eastern Caribbean and Puerto Rico lay wasted in its wake, Hugo took aim at the South Carolina coast. Section Emergency Coordinator Gerald Hensley, K8AFP, marshaled his defense forces, notifying county Emergency Coordinators (ECs) as early as Monday, September 18, of probable activation of nets in support of county EOCs and the Red Cross. On Wednesday, he notified the state Emergency Preparedness Division that he would coordinate all ARES activities from the EPD EOC in Columbia. By Thursday, a statewide ARES net was established on 3993.5 kHz to support South Carolina ECs at the various EOCs. A 2-meter net was also established in the Charleston area, monitored at the EPD EOC by Hensley.

At 11:30 PM Thursday night, Hugo invaded Charleston. Other repeaters went down, leaving one as the sole source of communication between the area and EPD EOC. On Friday, with many repeaters in the ravaged areas back up, Hensley collected reports of damage and county requirements for relay to EPD officials.

By Saturday, local amateurs were exhausted. Hensley asked neighboring Georgia and North Carolina Section Emergency Coordinators to send reinforcements. During the following days, Amateur Radio continued to provide communications among the disaster areas and the Columbia EPD EOC. ARES support was also provided to National Red Cross.

Hensley concluded, "The Amateur Radio operators were truly able to provide emergency communications during Hurricane Hugo. Their training and experience gained through the ARES organization enabled them to maintain efficient and effective primary communication during the critical 36 hours after Hugo."

When South Carolina Emergency Coordinators filed Hugo action reports, the rest of us learned that their ARES jacket patches turned out to be badges of courage:

Charleston County: By Wednesday, it was time for amateurs to make a difficult personal decision: to pack up their families and head for a safer area or to dig in, fortify, and put into effect their years of ARES training. Many chose the latter: Charleston amateurs, including members of the Charleston Amateur Radio Society and Trident Amateur Radio Club, began preparation

By 8:00 PM Thursday, a state of emergency was declared, and the Emergency Preparedness Division activated its Emergency Operations Center. Four local hams began a vigil that, for some, was to last 15 days.

The governor and mayors had ordered the evacuation of much of the coastal area. This made it necessary for many hams and their families to leave their stations and move inland. Most of those who did stay volunteered to man the amateur stations located in some of the shelters, the National Weather Service Building, a local hospital and the EOC. As nightfall approached, the NWS heralded the bad news: The eye of the storm would pass directly over Charleston.

As the winds increased to the point where normal commercial power was disrupted, repeaters began to fail. The Trident Amateur Radio Club's battery-powered repeater became the only repeater in the area with the capability of maintaining the vital communications link between coastal EOCs and the State EOC, located in Columbia, South Carolina, approximately 110 miles away. At 11:35 PM, winds reached 135 mi/h, tearing away the roofs of the National Weather Service Building and the EOC, and knocking out county emergency communications systems. As the roof of the EOC peeled away, it damaged the HF dipole antenna and left the 2-meter rig the last radio in service.

Vast quantities of water entered the EOC's Comm Center, requiring its evacuation of all but two amateurs to other parts of the EOC. These two stayed at their posts, continuing to inform other amateurs in the region of what was happening at the Charleston EOC. When the power shorted out and the water became three inches deep, the waterlogged operators had to leave; the last operator out the door wrapped the 2-meter rig in his rain coat and carried it with him.

It immediately became necessary to evacuate more than 150 people from the EOC to

a safer location. As if it had been preplanned, the eye of the storm began making its way over Charleston at that time. Everyone moved quickly to an adjacent building where Amateur Radio operation continued to provide the essential link with the others in the net.

At dawn Friday, the amount of damage to the area could be seen. The EOC was still standing, but the outer roof from the front section of the building was gone. Amateurs reestablished HF communications links.

By Saturday, many amateurs from outside the storm area realized we were in desperate need of manpower to operate radios at a variety of locations. They came from all surrounding states and some from as far away as New York and New Jersey. Had it not been for our brother and sister amateurs coming to our aid we would not have been able to handle the massive emergency traffic load for the various agencies in the days that followed.—*Bob Myers, KN4AS, formerly KB4AKQ*

Florence County: On Thursday, September 21, at about 7:00 PM, a net was established on the 146.850 Florence repeater. Contact was made with stations throughout the county with the intent of providing communication as needed. Contact was maintained with the Florence County EOC beginning at 9:00 PM. Various amateurs functioned in several capacities during the course of the evening. Messages were relayed to Red Cross shelters.

Power went out at 1:30 AM Friday, and at 3:30 AM the Police Department called amateurs when police UHF repeaters developed problems. Most cars were off the street due to high winds, downed power lines and trees. At 4 AM, KC4HOE responded to the site of a roof cave-in.

On Saturday, we established communications support for the Red Cross, handling many messages Saturday and Sunday. —*Joe Tyner, WB9RXM, Florence EC*

Clarendon County: No amount of preparation could have been adequate for the events of September 21, 1989. As Hugo advanced on the coast, Clarendon County residents expected the storm to weaken. This was not to be the case. Sunrise Friday, September 22, brought evidence of massive destruction.

We had an HF rig and 2-meter station on the air. At about 12:30 AM Friday, we lost everything. With no auxiliary power at the repeater site we switched to the WB4LET repeater for communications.—*Gene Wells, KK4MB, Clarendon EC*

Chesterfield County: Amateurs were dispatched to the Chesterfield County EOC, equipped with 2-meter and HF radios. In addition, operators were sent to the hospital in Cheraw. Amateurs operated there in a fully equipped communications bus. Additional operators were stationed at other points, including the local police station.

As the storm worsened, we handled many messages for the hospital and National Guard. Although electrical power was out by 2:00 AM Friday, amateur communications continued without interruption, despite the destruction of a 200-ft tower used to support 2-meter antennas. Chesterfield County operators served unselfishly, providing emergency communications as needed.—*John Pegues, KA4ABW, Zone 4 DEC and Tom Jones, KK4NY, Chesterfield EC*

Berkeley County: The Berkeley County EOC was opened at 8:00 AM, Thursday, September 21. Antennas had already been set up and tested the previous day to ensure satisfactory operation. Radio checks were made with several neighboring counties. The EOC amateurs maintained communications with other EOCs, the various shelters around the county, and the state emergency net on 3993.5 kHz.

Berkeley High School was designated by EOC as a hurricane shelter. The amateur there, who was also shelter manager, coordinated the needs of 250 shelter residents with EOC and EMS personnel. During the storm, the portion of the high school used for the shelter began to disintegrate, losing skylights and roof sections. Occupants fled to another part of the building by flashlight.

Join The Amateur Radio Emergency Service!

The next time a Hugo hits, can your community count on your Amateur Radio skills for assistance? Join the Amateur Radio Emergency Service. ARES is composed of volunteer amateurs who have registered their qualifications and equipment for duty in emergency communications situations. Every licensed amateur is eligible for membership. Emergency services in each ARRL section are headed by the Section Emergency Coordinator, appointed by the Section Manager. ARES members register with their local Emergency Coordinator, and receive official ARES ID cards. For an application form and more information, contact your local ARES leadership, or ARRL Headquarters.

Join today!

The following day, amateurs coordinated distribution of canned goods, baby items, water, clothing and the like among area shelters. County officials seemed quite pleased and surprised at what Amateur Radio could mean to them and thanked us for a job well done. We were there for four days.—*Ernest C. J. Mertins, Jr, K4AQB, DEC*

North Myrtle Beach: Operations began with the opening of designated shelters and the North Myrtle Beach EOC on Thursday. Hugo was 350 miles southeast of Savannah, Georgia. North Myrtle Beach High School and Middle School were designated shelters.

Four repeaters were used to provide communications among the EOCs, shelters, Red Cross and county civil organizations. Amateurs relayed shelter head counts.

At 8:30 PM, power and telephone service was lost. The high school operated on limited emergency power for lighting, but the middle school was in complete darkness. In both locations, the only link from Red Cross workers in the shelters to the EOC was Amateur Radio. The middle school was not closed because the darkness was not considered hazardous and the evacuees did not want to relocate to the high school. The Amateur Radio link between the North Myrtle Beach shelters and the North Myrtle Beach EOC provided excellent emergency service.

It is hoped that we have seen the last of the "Hugos" for a long time to come.—*Joe Jones, W3TMO, North Myrtle Beach EC*

Horry/Georgetown Counties: Operations started at 10:00 AM Thursday, September 21, with Horry County EOC activating ARES and RACES. Within one hour after primary shelters were opened, amateurs with 2-meter gear were on the scene and ready to go. In addition to primary shelters having operators, Myrtle Beach Police, North Myrtle Beach Police, Surfside Beach Police, Red Cross Headquarters, Grand Strand General Hospital, and Forestbrook Elementary School (a secondary shelter) were manned by at least one amateur operator.

Primary operation was on the 145.11 repeater until it went down around midnight Thursday; the net moved to the 147.285 repeater for the duration of the storm.

By Friday, nearly half of the phone system and all of the power grid had failed. Communications were needed among various police stations and the EOC.

On Sunday, the Red Cross Director said he needed communication between his headquarters and five feeding centers in Horry and Georgetown Counties. Amateurs in these five centers provided vital communications to Red Cross Headquarters Sunday and Monday. —*Scott Lawrence, AA4LY, Zone 8 DEC*

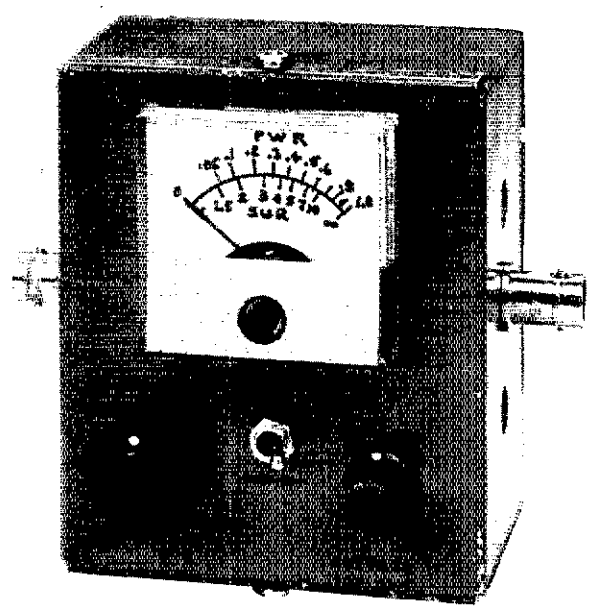
One Point of Light

One of President Bush's "Thousand Points Of Light," Amateur Radio volunteers, shone brightly through the darkest times of Hurricane Hugo. Amateur Radio was a beacon of help and hope for hundreds of thousands of victims and their families and friends around the world.

This fact was not lost on a US Congress ready to impose license fees on amateurs. In its November 21 report, the House-Senate Conference Committee said "The Conference Report strikes all of the fees for Amateur Radio licensees. The Conferees recognize that amateur licensees do not operate for profit and play an important public safety role in times of disaster or emergency."

A nice note to end a tough 1989 on!

A Simple and Accurate QRP Directional Wattmeter



Make a few small enhancements to the Bruene wattmeter and diode detector, and you have a directional wattmeter that's simple, portable, and accurate from 10 watts down to 5 milliwatts!

By Roy Lewallen, W7EL
5470 SW 152 Ave
Beaverton, OR 97007

A directional wattmeter is a really indispensable tool. Besides using such a meter to measure SWR, you can use one to tune a home-built rig, adjust a Transmatch, measure cable loss, and a host of other things. Because it's portable, a wattmeter is an important tool in the field: With it, you can make sure the rig still works, and spot any problems with the antenna system. If you're operating QRP in Field Day or some other event, a good wattmeter can help you keep your output at five watts as the battery voltage drops.

This wattmeter, designed primarily for portable use, gives accurate readings at power levels from 5 mW to 10 W. Achieving good low-power accuracy is a bit tricky; I developed a simple correction circuit to handle the job. During the editing of this article, I learned that the technique I developed for compensating the diodes in this wattmeter's detector circuit was first discussed by John Grebenkemper, KI6WX, in his January 1987 *QST* article.[1] I encourage reading (or rereading) this excellent article.

If carefully constructed, this wattmeter should function well from below 1 MHz at least into the mid-VHF range. One prototype tested in the ARRL Lab maintains better than ± 7% of full-scale accuracy, on all ranges, up to 432 MHz.

Circuit Description

A basic directional wattmeter has three major parts: directional coupler, detector, and meter circuits. Each block can be optimized for a particular application. Here's a description of each block.

[1]Notes appear on p 36.

Directional Coupler

Two types of directional couplers are commonly used by amateurs. The venerable Monimatch circuit is simple and useful for SWR measurement, but not readily adaptable as a wattmeter except over a narrow frequency range, because its sensitivity changes with frequency.[2] The Bruene circuit doesn't have this limitation, so is more suitable for our use. It's generally implemented with capacitive dividers for sensing voltage, but I chose to use transformers for this function.[3] This results in a simpler circuit that's adjustment-free. Sensitivity can be traded for insertion loss; the values chosen for this meter result in insignificant insertion loss.

Maintaining a near-50-Ω impedance on the line through the wattmeter eliminates several frequency-dependent effects. A microstripline structure is effective for this application, and is extremely simple to build, so I used that technique in this wattmeter.

Detector

Seemingly, the detector should be the easiest part of the wattmeter to design. Well, it happened again: The simplest part turned out to be the hardest. What's so hard about using a diode detector? If you don't want to know, skip ahead to the Construction section. For the truly adventurous (mathematically, that is), I've included the sidebar, "Ac v Dc: Why the Difference?"

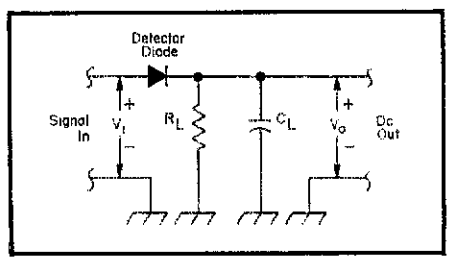


Fig 1—Simple diode detector.

Plain diode detectors, like the one shown in Fig 1, are simple and easy to use—*provided you don't require accurate results at low signal levels.* That's unfortunate, because good low-power accuracy is exactly what this wattmeter is intended to provide. Five milliwatts provides only 145 mV (peak) at the detector, so detector accuracy must be maintained down to this level. Some diodes, such as back diodes and zero-bias Schottky types, are specially designed for detecting very small signals. These, however, aren't as readily available as common silicon, germanium, and medium-barrier silicon Schottky diodes, so I investigated only the latter three types. Naturally, each has its deficiencies.

Common small-signal silicon diodes (eg, 1N914) drop too much forward voltage to be accurate at small signal levels when used with reasonable load-resistance values (up to 100 MΩ or so). Ordinary small-signal Schottky diodes are better, but still have an objectionable drop for use at low signal levels. The good old point-contact germanium diode (1N34 type) is the clear winner in this category. Applying 50 mV (dc) to a germanium diode detector produces about 45 mV at its output with a 1-MΩ load resistance. Increasing the load resistance to 10 MΩ brings the output to within 1 mV of the applied voltage.

So what's the problem? The problem is that *the results are different when you apply an ac signal to the detector!* This difference is clearly shown in Fig 2, which gives the measured output of a germanium-diode detector (like the one shown in Fig 1) with three different input signals of the same peak value. On the log-log scales, the vertical spacing be-

Ac v Dc: Why the Difference?

Why does a diode detector produce less output when detecting an ac signal than a dc signal if both signals have the same peak value? Why does a pulsed-dc signal produce a lower output than a steady one? Fortunately, we don't have to look any further than the ideal-diode equation to get the answers to these questions. This equation describes the characteristics of an ideal diode—a diode that is ideal in the sense that it can be described by some fundamental principles, not in that its conduction is perfect in one direction and zero in the other.

The ideal-diode equation is:

$$I_d = I_s \left(e^{V_d \frac{q}{kT}} - 1 \right) \qquad \text{(Eq 1)}$$

where

I_d = Diode forward current
I_s = Saturation current, about 10^{-14} A for silicon, 2×10^{-7} A for germanium at room temperature
V_d = Diode forward voltage
q = Electron charge, 1.60×10^{-19} coulomb
k = Boltzmann's constant, 1.38×10^{-23} J/K
T = Temperature, K

At room temperature, kT ÷ q is about 25 mV. Note that I_s is strongly related to temperature, doubling with approximately every 10-°C rise in temperature.

Because our discussion primarily concerns small signals, let's see how the ideal diode behaves with small voltages or currents applied. The small-signal I/V characteristics of an ideal germanium diode are shown in Fig A. This is simply a graphical representation of Eq 1 over a limited range. (The graph is also valid for silicon diodes if the current scale is reduced by a factor of about 20 million.) Note that the I/V curve doesn't bend at the origin; it's a straight line. This gives us our first clue about small-signal diode operation: a straight line on an I/V graph represents a constant resistance, so at very small signal levels the diode looks like a resistor, and hardly rectifies at all. (By very small signal levels I mean somewhat less than kT ÷ q [25 mV].) The resistance of the germanium diode is about 125 kΩ in this range (an ideal silicon diode is about 2.5 TΩ (2.5×10^{12} Ω!). At higher forward voltages, the current rapidly rises; at greater reverse voltages, the current increases, then levels out at a value of $-I_s$.

If we apply dc to the circuit of Fig 1, current will flow heavily at first, then taper off as C_L charges. Eventually, the current will simply be $V_o \div R_L$. Substituting $(V_i - V_o)$ for V_d in Eq 1 and rearranging produces an equation relating V_o and V_i:

$$V_o = V_i - \frac{kT}{q} \ln \left(\frac{V_o}{R_L I_s} + 1 \right) \qquad \text{(Eq 2)}$$

or V_d and V_o:

$$V_d = \frac{kT}{q} \ln \left(\frac{V_o}{R_L I_s} + 1 \right) \qquad \text{(Eq 3)}$$

To get a feel for the voltage drop to expect, look at Eq 3 with V_o = 100 mV, R_L = 1 MΩ, and $I_s = 2 \times 10^{-7}$ A. This results in a diode drop (V_d) of 10.1 mV. In contrast, a silicon diode ($I_s = 10^{-14}$ A) would drop 403 mV (503 mV in for 100 mV out) under the same conditions, but it would have 10.1-mV drop if R_L was made 20 million times larger. As the signal level increases, the drop increases—but not in proportion, so detector accuracy improves. Increasing the load resistance helps also; at 100 mV out and R_L = 10 MΩ, V_d = 1.2 mV.

Now let's see what happens with an ac or pulsed-dc signal. Looking at Figs 2 and B, we can see that when V_i is greater than V_o, the drop is the same as if the input signal were dc. However, for part of the cycle, V_i is less than V_o. During this time the diode is reverse biased and substantial current flows to the left in Fig 1. Generally, C_L is made large enough to make the ripple on V_o very small. We can then consider V_o to be a constant value after an initial charge period of many cycles of the input signal. For any signal,

$$V_o = I_{d(avg)} R_L \qquad \text{(Eq 4)}$$

where $I_{d(avg)}$ is the *average* current flowing through the diode over a cycle of the input signal.

The wattmeter's detector signal is a bipolar sine wave,

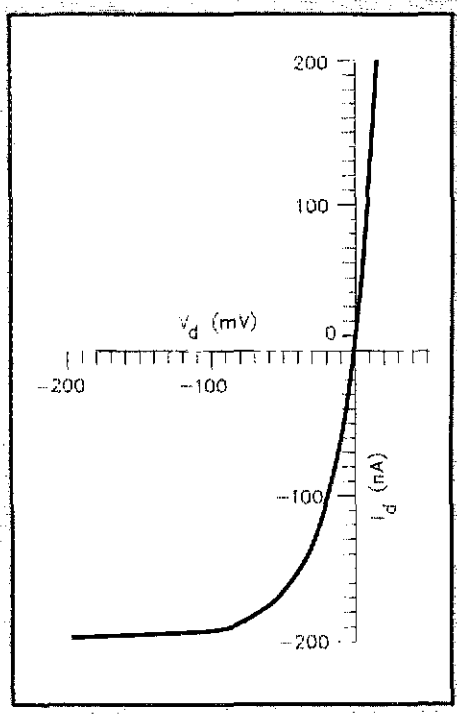


Fig A—Current-voltage characteristics of an ideal germanium diode.

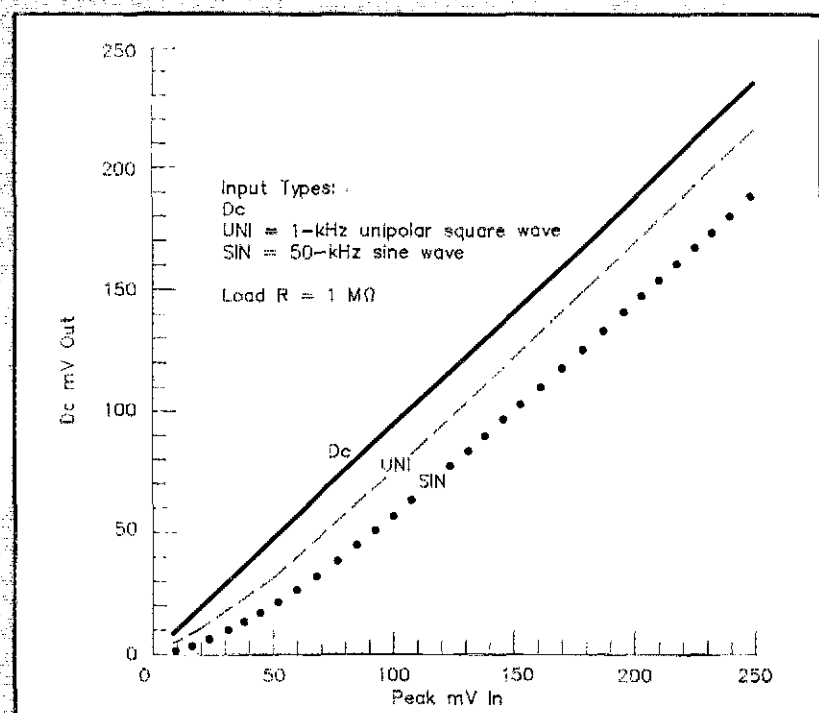


Fig B—The same data as that of Fig 2, plotted on linear axes.

but analysis of a unipolar square wave illustrates the principle and is much easier to attack mathematically (I'll discuss the sine-wave case shortly).

Consider a unipolar square wave with a positive value V_p for 50% of the cycle and 0 V for the other 50%. When the input signal is positive,

$$I_{d(h)} = I_s\left(e^{V_{d(h)}\frac{q}{kT}} - 1\right) \qquad \text{(Eq 5)}$$

where

$I_{d(h)}$ = diode current when the input signal is high.

$V_{d(h)} = V_p - V_o$ = forward voltage (diode drop) when the input signal is high.

This follows directly from Eq 1. When the input signal is zero, the diode is reverse biased. Again from Eq 1

$$I_{d(l)} = I_s\left(e^{V_{d(l)}\frac{q}{kT}} - 1\right) \qquad \text{(Eq 6)}$$

where

$I_{d(l)}$ = diode current when the input signal is low. $I_{d(l)}$ is negative.

$V_{d(l)} = -V_o$ = diode forward voltage when the input signal is low. $V_{d(l)}$ also is negative.

Because $I_{d(h)}$ and $I_{d(l)}$ each flow during 1/2 of the input cycle, average current is found by

$$I_{d(avg)} = 1/2\,(I_{d(h)} + I_{d(l)}) = \frac{V_o}{R_L} \qquad \text{(Eq 7)}$$

Combining Eqs 5, 6, and 7 and solving for $V_{d(h)}$:

$$V_{d(h)} = \frac{kT}{q}\ln\left[2\left(\frac{V_o}{I_sR_L} + 1\right) - e^{-V_o\frac{q}{kT}}\right] \qquad \text{(Eq 8)}$$

$V_{d(h)}$ represents the difference between the peak value (V_p) of the input signal, and the output voltage (V_o). An analysis of the argument of the logarithm shows that it's always greater than the dc case. In fact, when V_o gets much greater than kT ÷ q, $V_{d(h)} = V_{d(dc)} + (kT \div q)\ln(2)$, or about 18 mV at room temperature. This result is independent of R_L, so even if R_L is large to minimize dc drop, the added drop due to applying ac will stay the same (as long as $V_o >> kT \div q$). The added offset is clearly shown in Fig 8. Values calculated from Eqs 1 and 8 fall almost exactly on the graphs. A similar analysis for a bipolar square wave results in the same limiting value of 18 mV of excess drop.

Math is fun! But everyone's got a limit, and mine falls within the large gap between analyzing the detector with square-wave and sine-wave inputs. However, some generalizations can be made without having to do a rigorous sine-wave analysis. With a sine wave applied, one would expect diode forward current to flow for only a small part of the input cycle, resulting in a greater drop than with a square wave applied. The sine-wave case was studied with a mathematical computer model, and the results agreed very closely with the measurements presented in Figs 2 and 8.—*W7EL*

tween plots is proportional to the fractional (percentage) difference between the outputs. As you can see, a simple germanium detector is accurate for ac signals *only when the peak input signal level is above about 1 V.* A simple correction circuit is the secret to this wattmeter's accuracy. I'll explain it in a moment, but first I'll briefly explain why the detector output is less with an ac than with a dc input.

When the forward or reverse voltage across a diode gets very small (a few millivolts), the reverse and forward currents are approximately equal for a given applied voltage; that is, the diode acts like a resistor. (I measured a typical germanium diode's resistance as about 120 kΩ, a value very much smaller than that of silicon diodes.) If dc is applied to the detector, the detector circuit acts like a voltage divider, with the input voltage dividing between the diode resistance and the load resistance. When ac is applied, however, the current flow during the negative half-cycle removes a substantial part of the charge put on the load capacitor during the positive half-cycle, resulting in a lower detector-output voltage. The effect is waveshape and duty-cycle dependent, but isn't related to the frequency of the input signal.

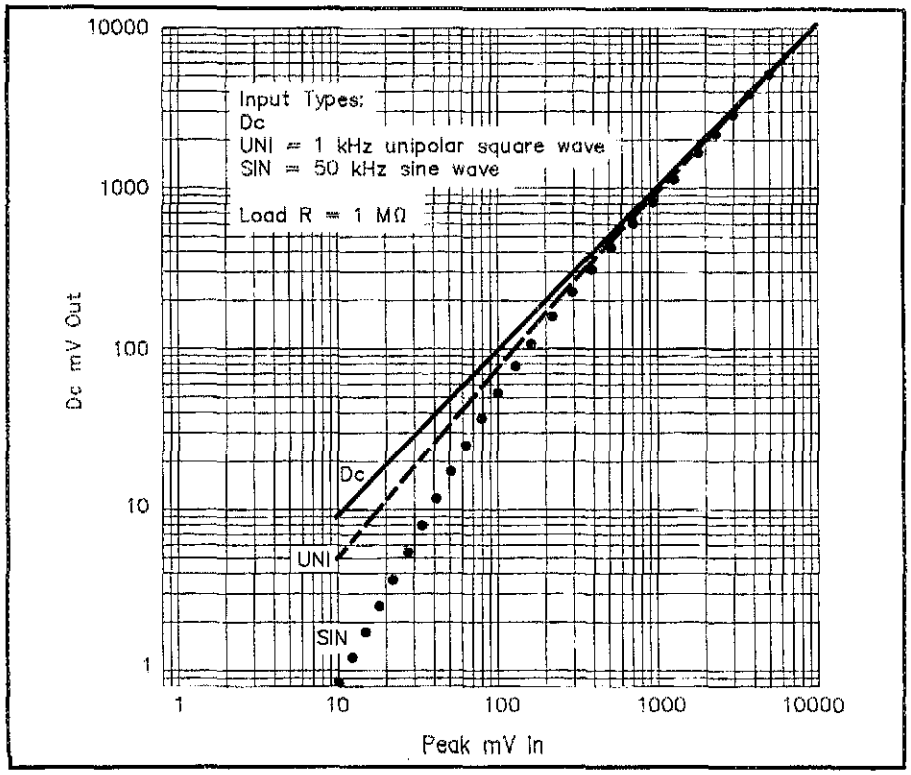


Fig 2—Dc output voltage of the detector of Fig 1 with three types of input signals.

Silicon diodes exhibit the same properties, but at different levels. Silicon-diode resistance at few-millivolt levels is about a million times larger than that of germanium diodes, but extremely large load resistances (10^{12} Ω or so) would have to be used to bring the forward drop to the germanium-diode level. The much smaller currents flowing through the much larger resistance result in the same net effect. The observed ac/dc difference is explained by the ideal-diode equation (see the sidebar). Dc and unipolar-square-wave measurements were compared to results predicted by the ideal-diode equation with extremely good agreement.

Common 1N34A germanium diodes purchased from Radio Shack® were found to be satisfactory for this detector.

The Meter Circuit

See Fig 3. An op amp is a logical choice to provide a high load impedance for the detector and a low-impedance output. Most op amps, however, have enough input-bias current to produce a significant voltage across a high-value detector-load resistor, ruining the measurement. Fortunately, operational amplifiers that have input-bias currents of only a few picoamperes—more than adequate for this application—are readily available. The CA3160 (and its externally compensated equivalent, the CA3130) has the desirable combination of extremely low input current,

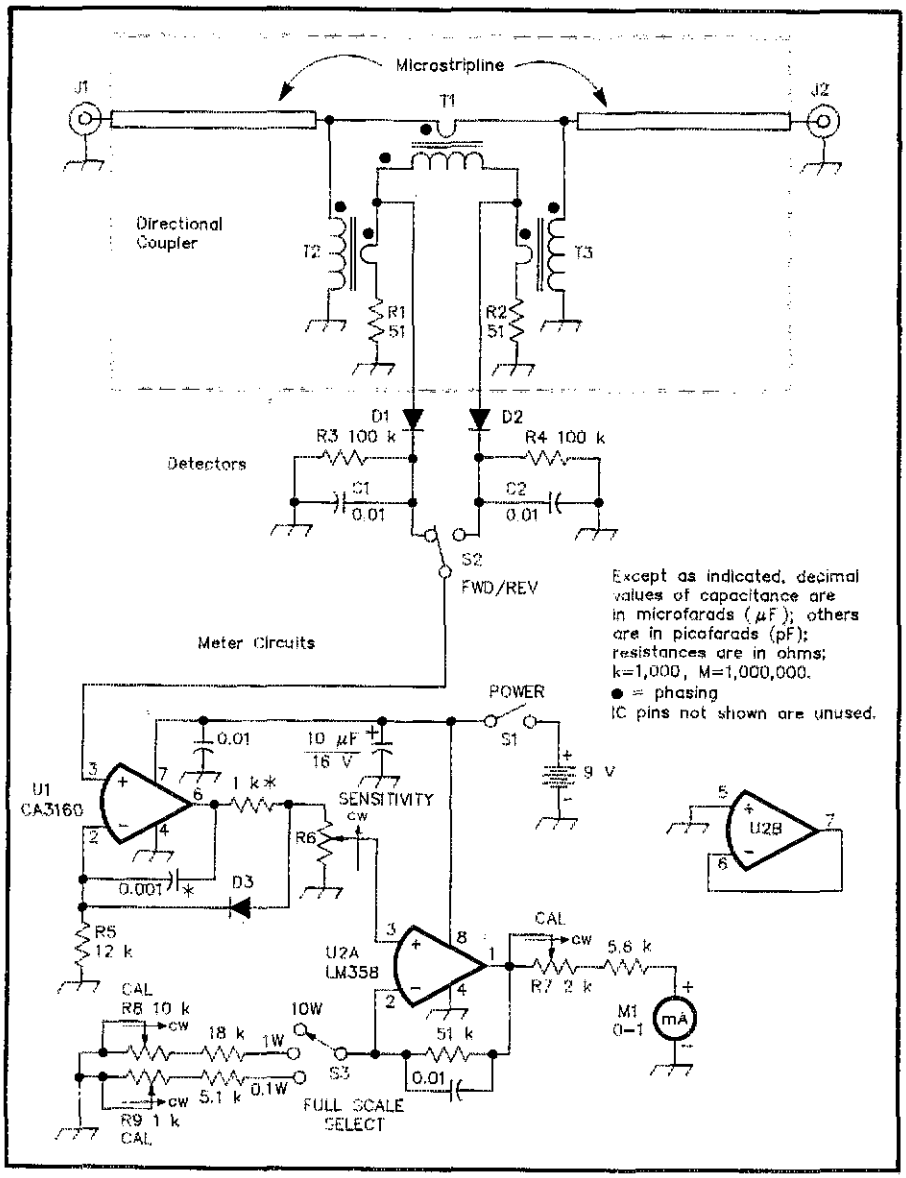


Fig 3—Schematic diagram of the QRP directional wattmeter. All fixed resistors are ¼-W, 5%-tolerance units. D1-D3 are common 1N34 germanium diodes; they should be matched (as discussed in the referent of Note 1) for best performance. T1-T3 are FT-37-72 ferrite cores with single-turn primaries (one pass through the core—see Fig 5). The primaries of T2 and T3 are comprised of the ungrounded leads of R1 and R2, respectively. Each transformer has a single secondary winding consisting of 10 evenly spaced turns of no. 28 enameled wire. Do not substitute a different core for the FT-37-72. R6 can be any value between 10 kΩ and 100 kΩ. The resistor and capacitor (associated with U1) marked with asterisks may be necessary to eliminate instability in the op amp, although my prototypes don't require them. See text.

input-and output-voltage range down to the negative supply rail and moderately low current consumption. To my knowledge, no other readily available op amp shares this set of features; if you know of one, you may substitute it for the CA3160 used at U1.

The second op-amp input is used by the diode-compensation circuit, so a second stage is required to permit variable gain. The only requirements for the second op amp are moderate current consumption and the ability to handle input and output signals down to the negative supply rail (ground). The LM358 contains two such op amps; one section (U2B) is unused in this application. You could substitute one section of an LM324, another CA3160, or any other op amp having the required characteristics.

The diode-compensation circuit (D3 and R5 in Fig 3) creates an offset that approximately compensates for the drop across the detector diode. If dc was applied to detector D2/R4/C2, and if compensation resistor R5 and detector load resistor R4 were equal, perfect compensation would result (assuming that D2 and D3 were identical). However, the circuit is actually compensating the detector *ac* drop with a *dc* drop, so more current must flow through compensation diode D3. This is accomplished by making R5 smaller than R3 and R4. Although the compensation isn't perfect, it's extremely good, and a remarkable improvement for only two added components. Without the compensation circuit, the wattmeter error was 30-50% for small signals (5-50 mW); with the compensation circuit, measured error is less than 7% over the same range. In addition, the compensation circuit tracks well with temperature; an important consideration for portable use.

In John Grebenkemper's circuit (see Note 1), an additional resistor and capacitor in the feedback network are used to ensure stability in the op amp. I saw no signs of instability in my prototype, but if you experience instability problems, adding these components (marked with asterisks in Fig 3) should help.

Construction

Meter Face

You'll need to make new scales for the meter or, at the very least, add markings to the existing scale. It's fairly easy to make the new scales readable and somewhat harder to make them look nice. If you decide to make new scales rather than add marks to the existing scale, you'll want to record the correct places to make the new marks before you obliterate the old scale. See this month's Hints and Kinks column for one method of relabeling a meter face.

Directional Coupler

This wattmeter works best if there's a constant 50-Ω impedance from the input to the output, but it's not highly critical. There are always impedance bumps at the transitions

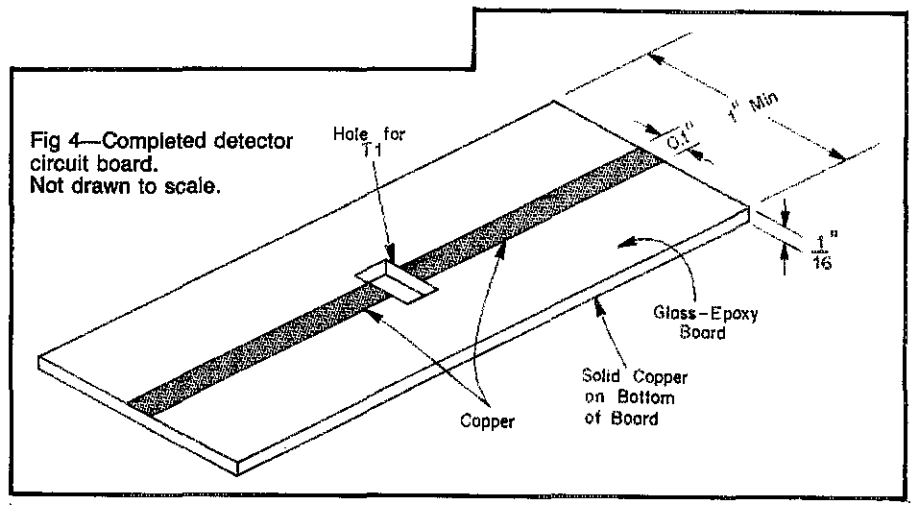
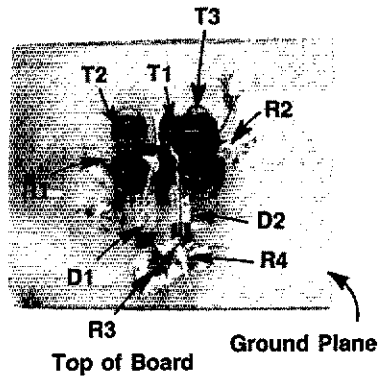


Fig 4—Completed detector circuit board. Not drawn to scale.



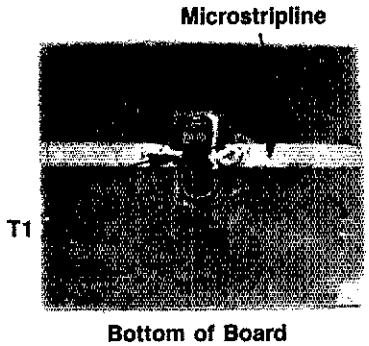


Fig 5—Close-up views of the completed directional coupler. T1's primary is a straight piece of insulated wire spanning the cut in the microstripline. T1's secondary winding is routed through the hole cut for T1. The top view shows the components comprising the directional coupler and detector. To achieve minimum lead lengths, R1-R4 are mounted vertically on the ground plane. Capacitors C1 and C2 are not shown, although they should be mounted directly across R3 and R4, respectively.

between the coax connectors and the microstripline, and a larger bump at the coupler transformer, but these bumps can be made insignificant at HF with a little effort. Only the microstripline and directional coupler are sensitive to layout, and you have considerable latitude with these components if you know the rules.

The microstripline will be the simplest circuit board you've ever made. If you've never made a PC board before, don't worry—you can't go wrong with this one. It consists simply of a single trace on one side of the board and a ground plane on the other. There are at least three ways to fabricate this board: You can stick adhesive copper tape to the non-foil side of a single-sided board, you can etch a double-sided board, or you can cut along the edges of the line with a knife and peel away the unwanted copper.

No matter which method you choose, start with a piece of 1/16-inch-thick, glass-epoxy PC board. The board's length should equal or exceed the distance between wattmeter input and output connectors, and the board should be at least one inch wide (wider is okay). The width of the microstrip, which should be about 0.1 inch, determines the impedance of the line. Impedance doesn't change much as line width changes, and the impedance isn't too critical for this application. So if you don't have a decimal ruler, just make the trace a bit thinner than 1/8 inch—it'll be close enough. After making the board, cut a hole in the center just large enough to accommodate transformer T1. The finished microstripline should look like that shown in Fig 4.

Mount the coupler components using *short* leads. A suggested layout is shown in Fig 5. Then assemble the rest of the wattmeter and mount the completed coupler between the input and output connectors. The connections from the connectors to the microstripline must be very short, particularly the ground connections. If possible, put a solder lug or lugs on the connector-mounting screws and solder the lugs directly to the bottom of the line as shown in Fig 6.

A template package containing a PC-board pattern integrating the wattmeter circuit and directional coupler, parts-placement diagram and other information is available from the ARRL Technical Department Secretary for a no. 10 SAE with return postage for 1 ounce.

Tips

A small center-off toggle switch, wired for **REV-OFF-FWD** operation, is a convenient way to combine S1 and S2. However, small toggle switches are amazing in their ability to turn themselves on at the slightest provocation—like being bumped around in a suitcase or backpack. So if you're going to use this wattmeter for portable operation, use some other kind of switch (a slide switch, for example) for, or in series with, S1.

I've seen quite a few articles implementing the Bruene directional-coupler circuit with a powdered-iron core (eg, T-68-2). The low winding impedance of such a transformer will ruin the accuracy of this circuit, so don't use powdered-iron cores for the transformers in this wattmeter.

Adjustments

All you'll need for adjustment is a high-impedance dc voltmeter. Connect the voltmeter between the wiper of the **SENSITIVITY** control (R6) and ground. Connect a temporary jumper between pins 7 and 3 of U1. Turn R6 fully counterclockwise. Set the **FULL SCALE SELECT** switch S3 to the 10-W position. Turn on **POWER** switch S1. Slowly turn R6 clockwise. As you do, the wattmeter and voltmeter readings should increase. If not, turn the wattmeter off and check your wiring.

Adjust R6 for a voltmeter reading of 6.49 V, then adjust R7 so the wattmeter reads full scale. Adjust R6 for a voltmeter reading of 2.05 V, then switch S3 to the 1-W position. Adjust R8 until the wattmeter indicates full scale. Adjust R6 for a voltmeter reading of 0.649 V, then switch S3 to the 0.1-W position. Adjust R9 for a full scale reading on the wattmeter. Turn the wattmeter off and *remove the temporary jumper between pins 3 and 7 of U1*. This completes the calibration.

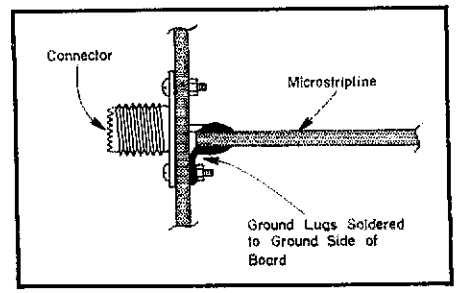


Fig 6—Using solder lugs to make a good connection to the ground side of the microstripline.

To obtain maximum reliability, measure R7, R8, and R9 and replace them with fixed resistors of the measured values; readjustment should never be necessary.

If you need to measure SWR at levels very close to 1:1, you may want to tweak the wattmeter to show a zero-reflected-power indication when connected to a reference dummy load. The resistors to adjust are R1 and R2. Theoretically, the correct value for these resistors is 49.5 Ω each. It's not necessary to readjust the wattmeter if you change the values of R1 and R2 slightly.

Use

To measure power, select the appropriate scale and turn S6 fully clockwise. The power flowing in the line is the forward reading minus the reverse reading. To measure SWR, switch S3 to the next more sensitive setting and switch S2 to **FWD**. Adjust R6 for a full-scale meter reading. Flip S2 to **REV** and read the SWR scale. To adjust a Transmatch, put the wattmeter between the transmitter and Transmatch and adjust the Transmatch for zero reflected power.

The directional wattmeter can do anything an SWR meter can do, and many things besides. Because you can measure power anywhere in a system, you can use the wattmeter to find cable and Transmatch losses, measure transmitter power, and lots of other things. You'll be surprised how often you reach for it!

Acknowledgments

Thanks to Dave Deford, KØED, for helping me reduce the mystery of ac versus dc response of a diode detector to the realm of physics, where it belongs.

While editing this article, *QST* Assistant Technical Editor Rus Healy, NJ2L, recognized the detector-diode-compensation method as the one presented by John Grebenkemper (see Note 1). John Grebenkemper subsequently reviewed the article and made several useful suggestions, many of which have been incorporated into this article. One important consequence of John's comments is that they motivated me to model the performance of the detector/compensation combination for sine-wave inputs, during which I discovered an undesirably high sensitivity to diode saturation current, which is closely related to temperature. This resulted
(continued on page 36)

Cheap and Easy Control-Signal Level Converters

Getting station equipment of varying vintages to work together can be a problem. Power MOSFETs can provide the key to easy station integration.

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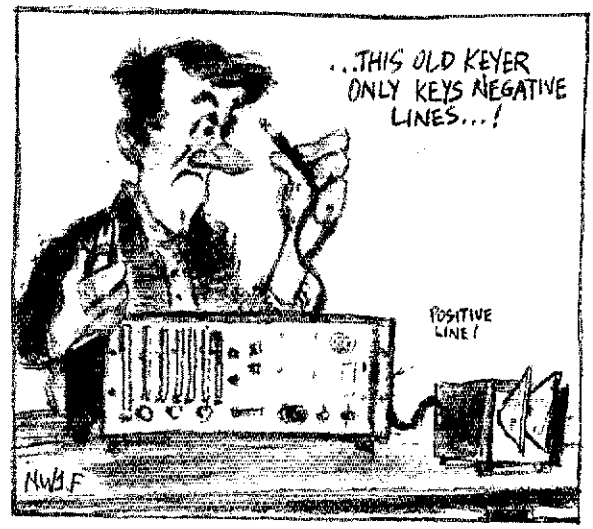


After salting money away for longer than you care to remember, the big day finally arrives. Your new, all-solid-state, all-band, all-mode, all-everything transceiver finally arrives in the shack! Of course, no time is wasted getting the new baby ready for the airwaves from its new home. First comes the CW keyer connection. Oops! The faithful old home-brew keyer only keys negative lines. Oh, well...put CW on hold for a while. Let's connect the linear amplifier. Hm-m-m... that −120-V dc relay line from the amp won't set well with the little NPN switching transistor in the new rig. So much for the pileups, for now anyway! And on it goes...

Until fairly recently, interfacing station equipment was a simple matter. Most control-signal switching was done with relays. Grid-block keying dictated negative CW key lines. Modern rigs provide unprecedented flexibility on the air, but have taken a lot of the flexibility out of station design with respect to interconnecting with accessories, especially older ones. Reliable high-speed operation of control signals implies using transistor switches, which are usually unipolar by design. Unfortunately, the signal levels to be switched in an existing station aren't always compatible with what the new rig's designer had in mind. External relays can put the gear on speaking terms, but their inherent noise, slow action and usual requirement of an additional power source make them an unattractive solution.

A modern approach to interface-signal switching is based on the use of MOSFETs. Advances in device technology have led to the development of the HEXFET™ power MOSFET. Capable of handling substantial voltages and currents, power MOSFETs have become common design items, so now they're inexpensive and readily available. DeMaw recently described a novel RF amplifier using power MOSFETs to great advantage and Hayward discussed HEXFET RF-amplifier stabilization and power output.[1,2] The unique properties of power MOSFETs make them practical devices for use in easy-to-build, self-contained signal-level and sense converters that can solve nearly any station control-signal connection problem you're likely to encounter.

Using MOSFETs as Switches

The transfer characteristic of power MOSFETs makes them well suited for switching applications. Fig 1 shows the transfer characteristic for a typical HEXFET. Power MOSFETs are generally designed as *enhancement-mode* devices: The current flow between the drain and source of the device increases as the gate-to-source voltage increases. When a voltage, such as a control signal, is connected between the drain and source of the device, the resulting current is a function of the gate-to-source voltage, V_{GS}. Power MOSFETs are fairly simple to drive, as their gate-input impedance is large enough to be safely considered as infinite under steady-state conditions. The only time that appreciable current flows into or out of the gate of a MOSFET is during the switching interval itself, when the MOSFET is changing from *on* to *off* or vice versa. Gate current flowing during the switching interval is a result of the small amount of current required to charge or discharge the gate capacitance of the device when the gate-source voltage changes.

When used as amplifiers, power MOSFETs are biased near the threshold voltage, V_T in Fig 1. "All the way on" and "all the way off" are the only two states of interest when a MOSFET is used as a switch. As shown in Fig 1, $V_{GS} = 0$ volts results in an open switch, with drain current (I_D) nearly zero. Application of V_{GS} greater than V_T—but less than the gate-source breakdown voltage specified for the device—causes the device to saturate, closing the switch. The relationship between I_D, drain-source voltage (V_{DS}) and gate-source (V_{GS}) for a typical device is shown in Fig 2. The saturation characteristic shows that if $V_{GS} > 6$ V, I_D becomes nearly a linear function of VDS. Saturated, the power MOSFET behaves like a low-value resistor. The saturation drain-source resistance, R_{DS}, can be as low as 0.06 Ω for high-current units, but is typically 1-3 Ω in common device types.

Power MOSFETs are available in N-channel and P-channel configurations, for the switching of positive and negative control signals, respectively. In N-channel devices, current flows from the drain to the source, under control of a positive V_{GS}, as in Fig 3A. P-channel types provide the mirror-image polarity, as in Fig 3B, with current flowing from the source to the drain, controlled by a negative V_{GS}.

All MOSFETs contain a diode structure between the drain and source, oriented to be reverse biased when the transistor is connected properly. Although the diode is an unavoidable result of the internal geometry of MOSFETs, it serves a very useful

[1]Notes appear on page 27.

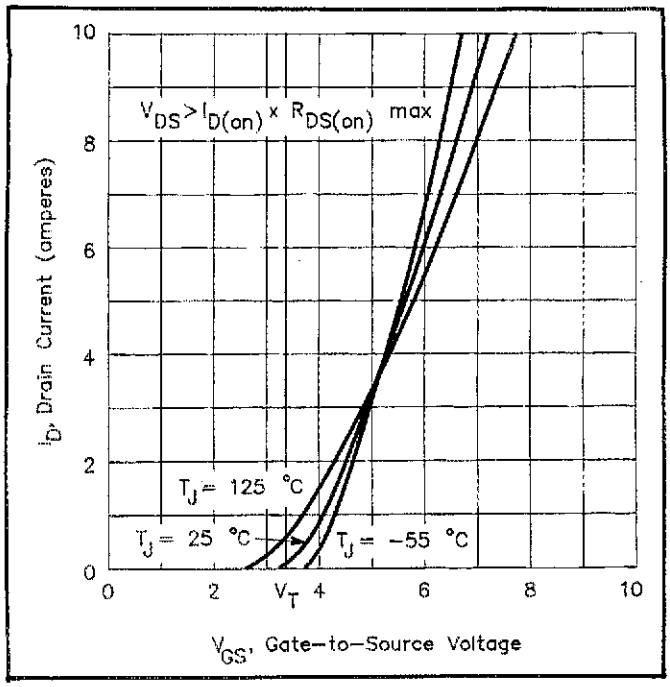


Fig 1—Typical power-MOSFET transfer-characteristic curves.

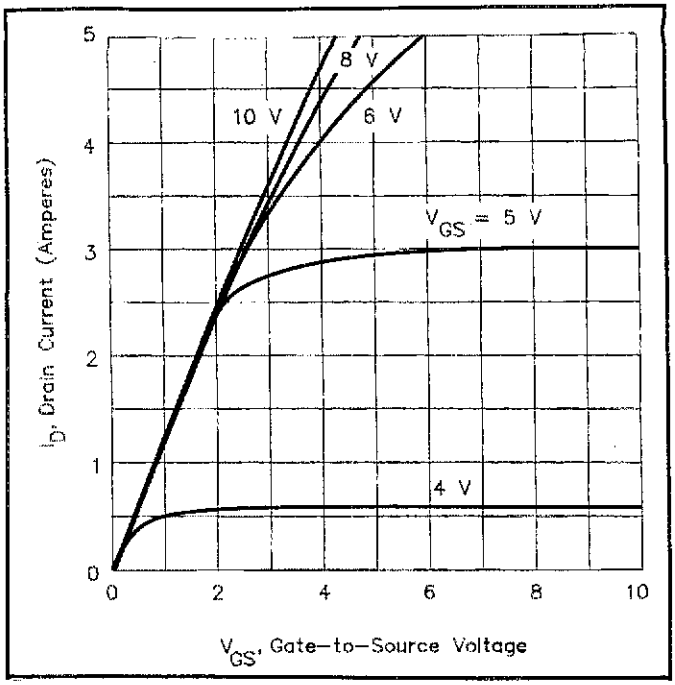


Fig 2—Typical power-MOSFET saturation-characteristic curves.

purpose in switching applications. Inductive loads produce large voltage spikes during turn off because of the rapid collapse of the inductor's magnetic fields. Such spikes can mean "lights out" for transistors without reverse-connected diodes for protection. Power MOSFETs have the protection diode built in, at no additional charge. In fact, many MOSFET data sheets provide detailed design specifications for the diode, to permit its use for critical circuit functions.

Designing Practical Level Converters

Nearly all station-control signals use a common ground as one side of the control line. Thus, one of four basic control-signal level-conversion scenarios that occur when equipment is interconnected:

1) A positive line must be actuated by a negative-only control switch.
2) A negative line must be actuated by a positive-only control switch.
3) A positive line must be actuated by a positive-only control switch.
4) A negative line must be actuated by a negative-only control switch.

Cases 3 and 4 may appear trivial, but they are important in situations where the control-switching device is incapable of handling the required open-circuit voltage or closed-circuit current.

Case 1 can be handled by the circuit of Fig 4A. This circuit is ideal for interfacing keyers designed for grid-block keying with positive CW key lines. In the off state, the control current through R2 is near zero, thus $V_{GS} = 0$ and Q1 is effectively turned off. Closing the negative-only control switch allows approximately 900 μA of control current to flow through R1; hence, $V_{GS} = 9$ V, turning Q1 on almost immediately. The value of R2 is a compromise between turn-off switching time and on-state power consumption. A circuit that eats batteries could prove a major handicap during pileups, indicating a large value is needed for R2. The gate capacitance of typical power MOSFETs is between 200 and 500 pF; thus, a large value for R2 would appreciably slow down the MOSFET's turn-off time because of the long RC time constant of the gate-current discharge path. Ideally, a level converter should be as invisible to the equipment as possible, and switch on and off very fast. A value of 10 kΩ for R2 provides a turn-off time of approximately 5 μs with 900 μA on-state battery drain.

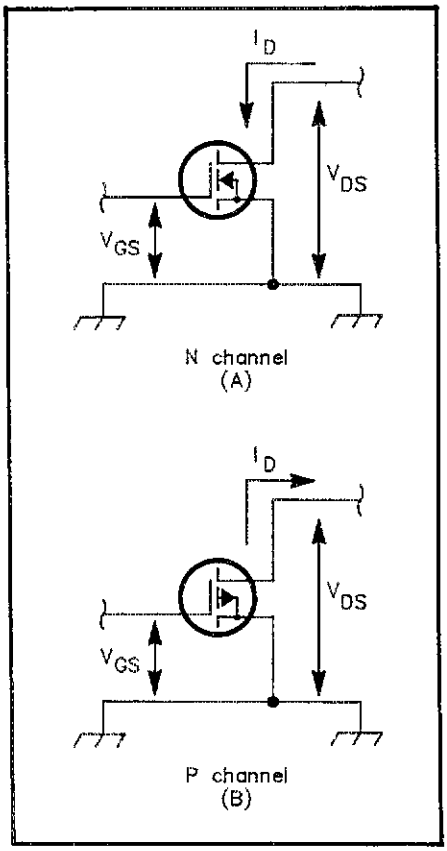


Fig 3—Polarity relationship of N-channel (A) and P-channel (B) MOSFET devices.

R1 is included to eliminate self-oscillation and switch ringing. The gate reactances of the device, in conjunction with the reactances of the external circuit wiring, occasionally form undesirable resonant circuits. Only a little capacitive coupling is required to the high-impedance MOSFET gate to generate some nasty parasitic effects! R1 effectively lowers the Q of the gate circuit's equivalent series inductance, but doesn't appreciably degrade the circuit's turn-on time. Zener diode D1 is included for protection of the control switch device in the unlikely event of MOSFET failure caused by a drain-to-gate short.[3]

A circuit suitable for Case 2 is shown in Fig 4B. This circuit is simply the mirror image of Fig 4A with respect to circuit polarity. Here, a P-channel device is used to actuate the negative line from a positive-only control switch.

Case 3 is handled by the addition of a CMOS inverter/buffer chip to the basic circuits of Fig 4, as in Fig 5A. The inverter function of the chip provides the logic reversal needed to drive the gate of the transistor high, activating the control line, when

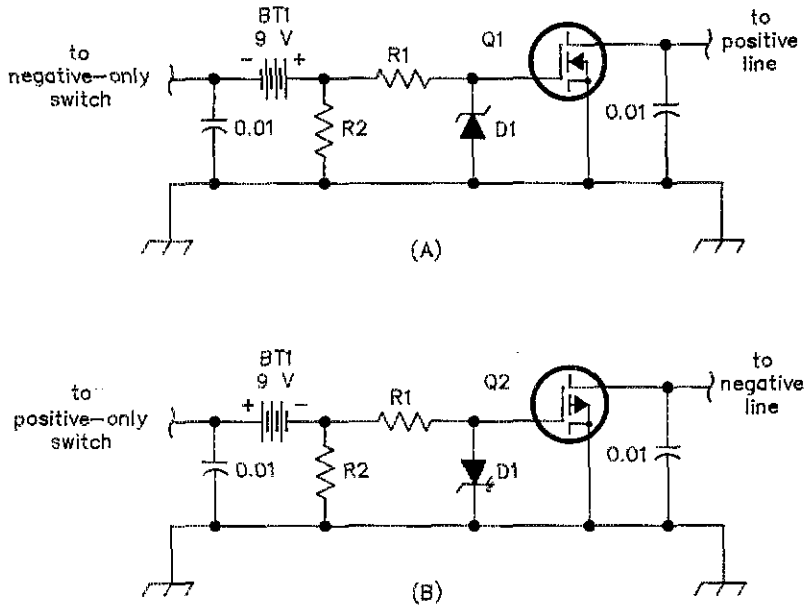


Fig 4—Level-shifter circuits for opposite input and output polarities. At A, from a negative-only switch to a positive line; B, from a positive-only switch to a negative line.
BT1—9-V transistor-radio battery.
D1—15-V, 1-W Zener diode (1N4744 or equiv).
Q1—IRF620.
Q2—IRF220 (see text).
R1—100 Ω, 10%, ¼ W.
R2—10 kΩ, 10%, ¼ W.

the control switch shorts the input control line to ground. The CD4049 is designed for driving a variety of loads, and is easily capable of driving the gate of the power MOSFET without external help. CMOS buffers provide a satisfactory output impedance (in both the high and low states) for driving the MOSFET gate, so that a 100-Ω stabilization resistor is not necessary in this circuit. As with any CMOS device, quiescent current is minimum when all unused inputs are tied to a logic level. CMOS device inputs left floating can allow the internal CMOS transistor pairs within the chip to draw supply current unnecessarily under steady-state conditions. With all inputs connected to a logic level, the CD4049 draws less than 5 μA of quiescent current. The circuit of Fig 5B is the polarity mirror of 5A, for actuation of negative lines via negative-only control switches.

Device Selection and Construction Hints

Almost any power MOSFET, HEXFET or TMOS™ transistor can be used in the level converters, as long as the voltage and current ratings of the transistor are sufficient to withstand the signal levels to be switched. Good devices to start with are IRF220 for Q2 and Q4, and IRF620 for Q1 and Q3. These transistors will withstand up to 200 V and switch up to 5 A. In addition, they're inexpensive and readily available from Digi-Key.® [4] The rest of the electronic and mechanical components (including the CD4049) are available from Radio Shack.®

A small piece of perfboard is an ideal base for the components, as shown in

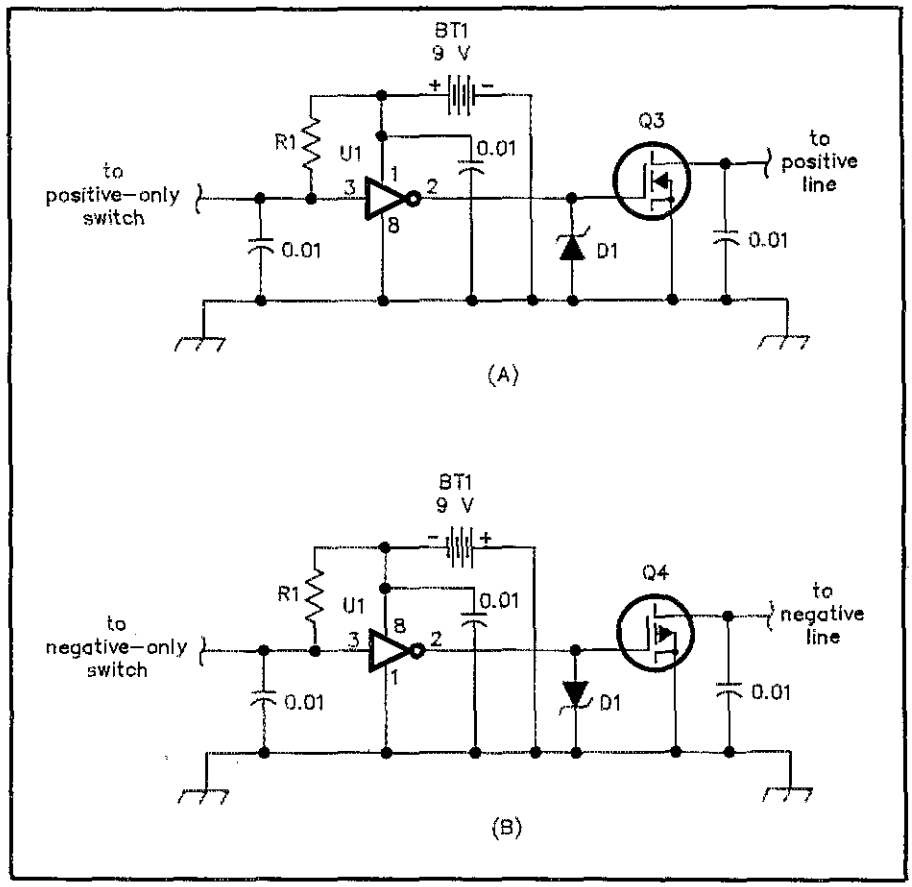


Fig 5—Circuits for same-polarity level shifters. At A, for positive-only switches and lines; B, for negative-only switches and lines.
BT1—9-V transistor-radio battery.
D1—15-V, 1-W Zener diode (1N4744 or equiv).
Q3—IRF620.
Q4—IRF220 (see text).
R1—10 kΩ, 10%, ¼ W.
U1—CD4049 CMOS inverting hex buffer, one section used (unused sections not shown; pins 5, 7, 9, 11 and 14 tied to ground).

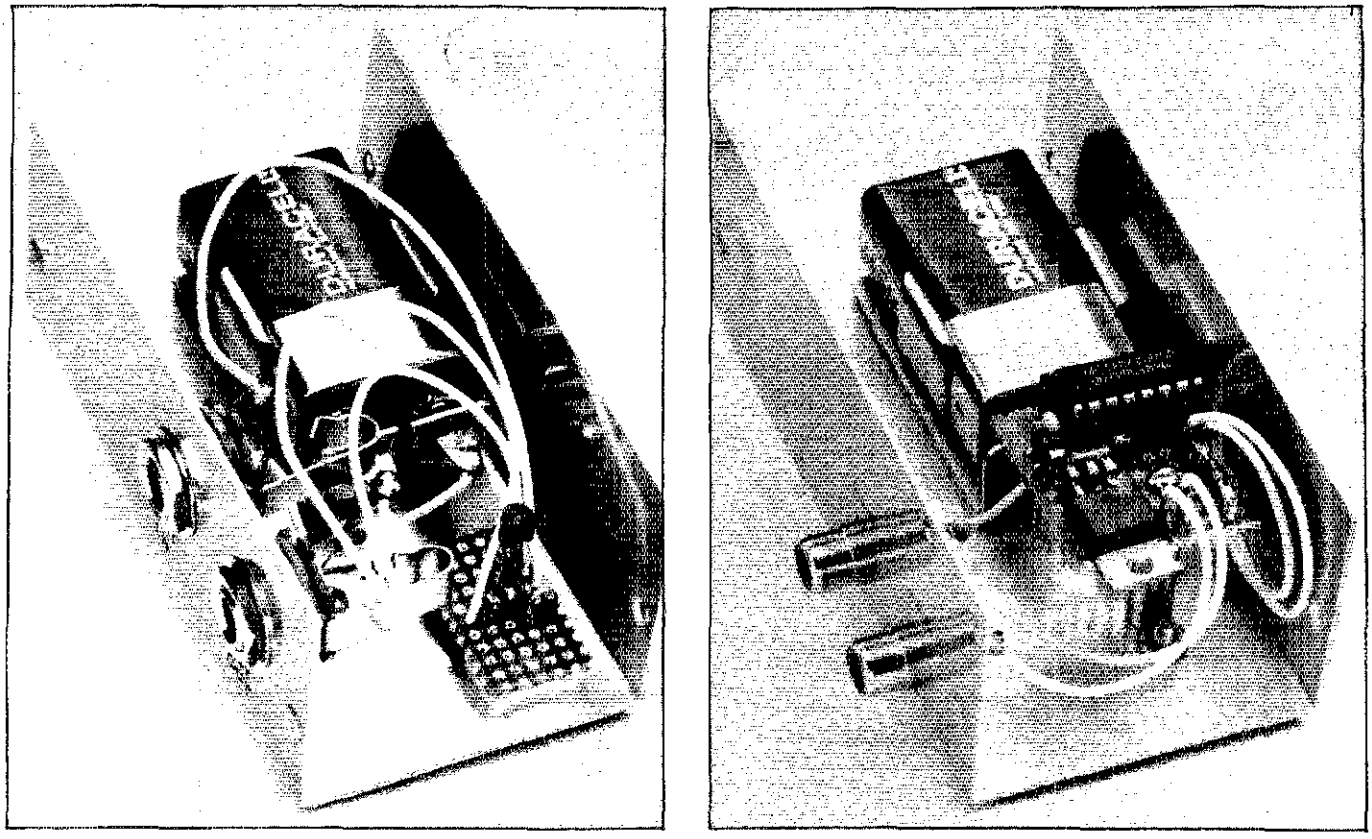


Fig 6—An inside view of a couple of control-signal level converters. With the exception of the transistors, most other components are available from your local Radio Shack store, electronics supply house, or local hamfest (see text).

Fig 6. To be most effective, the 0.01-μF RF bypass capacitors should be wired physically close to the input/output connectors themselves. Although the circuits presented work very reliably even under hostile RF conditions, the extra insurance against RF-induced glitching provided by the bypass capacitors is worth the effort. Wire-wrap or point-to-point connections are completely suitable, considering the simplicity of the circuits.

Use connectors compatible with the equipment to be interfaced. Shielded cables intended for connecting various audio components are readily available from consumer-electronic equipment stores and make for a neat and professional station layout. Most builders will probably want to miniaturize the level converters as much as possible to reduce station clutter. The packages shown in Fig 6 each measure 4 × 1-5/8 × 2-1/8 inches.

Final Comments

Typically, battery manufacturers specify the capacities of 9-V alkaline batteries at 500 to 550 mAh. Thus, at 900 μA key-down current, a level converter's 9-V battery should last at least 500 hours total key-down time. Under normal amateur operating conditions, frequent battery replacement will not be required. Circuits of this type have been powered by alkaline batteries at my station for 1½ years without replacement. To be on the safe side, change the battery once per year to ensure that nothing will go weak in the middle of a 20-meter CW pileup.

A strategically located control-signal level converter or two is usually all that's required to put new and old station equipment on speaking terms. A few hours at the workbench can yield the level converter required to connect the new all-solid-state, all-band, all-mode, all-everything transceiver to the rest of the station equipment as if they were made for each other.

Notes

[1]D. DeMaw, "Power-FET Switches as RF Amplifiers," *QST*, Apr 1989, pp 30-33.
[2]W. Hayward, "Stable HEXFET RF Power Amplifiers," Technical Correspondence, *QST*, Nov 1989, pp 38-40.
[3]R. Jaeger, "An Improved Circuit for Interconnecting the SB-200 Amplifier and Solid-State Transceivers," Hints and Kinks, *QST*, May 1989, pp 48-49.
[4]Digi-Key Corporation, PO Box 677, Thief River Falls, MN 56071-0677.

Jim Galm, WB8WTS, earned BSEE and MSEE degrees from Case Western Reserve University. He's currently a PhD candidate in electrical engineering at CWRU. Jim's primary research interests involve the improvement of manufacturing inspection techniques. Specifically, he is involved in the application of optimal filtering and estimation techniques to industrial metrology and inspection of machined parts. He is also working on the fusion and integration of multisensory data into the inspection process. His previous work has included atmospheric metrology, millimeter-wave propagation studies and HF antenna design.

Jim is a cofounder and chief executive officer of PGM Diversified Industries, Inc, a manufacturing company currently producing industrial sensors and automation systems. Jim has been on the air since 1975, and holds an Extra Class license. His main Amateur Radio interests are HF DXing and contesting, both from home and from the CWRU club station, W8EDU. He is a member of the ARRL, The Institute of Electrical and Electronics Engineers, and the Machine Vision Association of the Society of Manufacturing Engineers.

Strays

***QST* congratulates...**

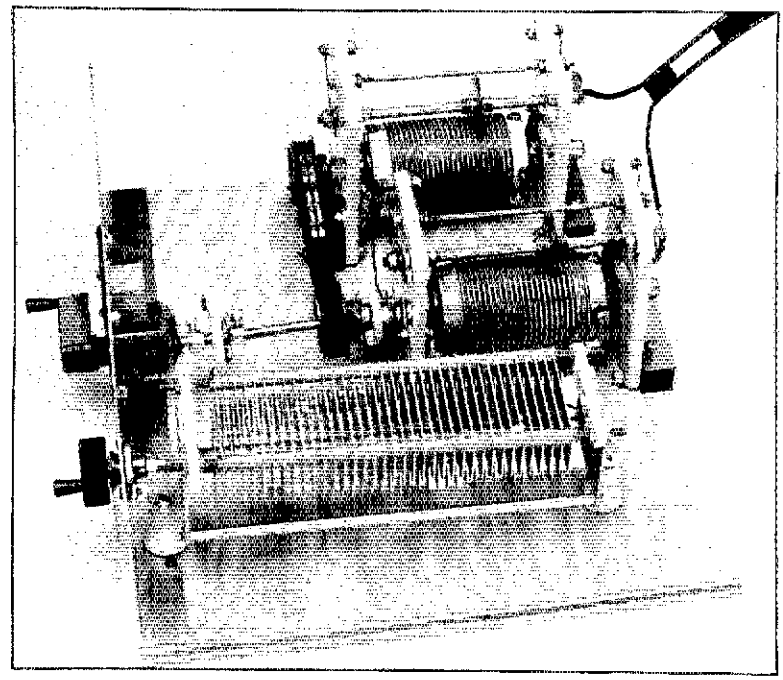
☐ The oldest Amateur Radio Club in Indiana, the Indianapolis Radio Club, which celebrated its 75th anniversary on December 8, 1989. The first meeting of the IRC was on October 28, 1914, and there have been regular meetings since that date. This active club conducts license classes, assists new amateurs in getting on the air, provides equipment to schools, publishes a newsletter and picks an amateur each year to receive an Amateur of the Year plaque.

I would like to get in touch with...

☐ anyone involved with manufacturing or testing Type 725A or 2J51 X-band magnetrons from 1943 to 1946. Charles W. Garthwaite, WØFZC, 9008 Ute Dr, Golden, CO 80403.

A *Balanced* Balanced Antenna Tuner

Are you using the right antenna tuner for the job? If you use a balanced, open-wire-fed antenna, the versatile balanced L network is *the* circuit for you!



By Richard L. Measures, AG6K
6455 La Cumbre Rd
Somis, CA 93066

Antenna tuners are like shovels. It takes more than one kind of shovel to perform a variety of jobs efficiently. For example, a snow shovel isn't suitable for digging holes in hard ground. A tiling spade could be used to shovel snow, but it wouldn't be very efficient. Similarly, no single antenna tuner circuit can do every antenna-matching job extremely well.

A balanced-load tuner should be designed—from the ground up—for the job that it is intended to perform. This article describes a circuit that does a superb job of feeding an open-wire transmission line (ladder line). It cannot be used for unbalanced loads such as a coaxial transmission line or for end-fed Marconi or Hertz antennas.

Now that we have nine Amateur Radio bands below 30 MHz, an open-wire line, center-fed-wire antenna system looks even more attractive than it did when such antennas first came into popular use in the 1930s. (In those days, we had only five bands below 30 MHz.) Taking advantage of this versatile antenna system requires a box that will interface the 50-Ω unbalanced output of today's transceivers to the highly variable impedance (Z) of the balanced feed points of multiband antennas.

Many makers of antenna tuners claim that their circuits can operate into an unbalanced load, or a balanced load, such as ladder line. Actually, most of the contemporary "matches everything, balanced or unbalanced" antenna-tuner circuits produce a semi-balanced output when used with a balanced load. Although the antenna will radiate in this situation, a semi-balanced output is like having a semi-balanced checking account: It is less than wonderful.

A look at the schematics for the contemporary "matches-everything" antenna-tuner circuits reveals that they are usually unbalanced, high-pass-filter-characteristic, T networks with balancing devices hooked to their unbalanced outputs. This is a compromise design which, not surprisingly, has compromise performance when used with a balanced load.

The imbalance in these "balanced" tuners can be easily confirmed with an RF voltmeter or RF ammeter(s). The actual current or voltage at each output terminal is progressively more imbalanced above about 7 MHz. At 28 MHz, it is not uncommon to have 50% more current or voltage in one of the legs than in the other leg.

Some may ask, "Why not use the same balanced tuner design that was in vogue in the 1930s?" As many old-timers know, the 1930s-era balanced tuner consisted of a resonant (or near-resonant), center-link-coupled tank circuit with movable taps on the secondary. For each band change, the taps had to be moved and reoptimized, the total inductance changed and the tuning capacitor retuned. Changing bands was labor-intensive! These tuners were seldom built in enclosures, because near-constant access to the taps and the inductor(s) was a necessity for changing frequency. It was a common practice to build these tuners on a breadboard for maximum accessibility.

In the 1950s, the E. F. Johnson Company marketed its Matchbox® series of balanced antenna tuners. These tuners used the same center-link-coupling arrangement as the earlier tuners, but they eliminated the movable-tap arrangement by using a double-differential capacitive voltage divider across the tank inductor. (A differential capacitor is the RF equivalent of a potentiometer dc-voltage divider.) This allowed the operator to increase and decrease the voltage fed to the antenna electrically, without changing taps. The Johnson circuit worked, but the Z-matching range was severely limited. Frequently, the SWR could not be reduced to a satisfactorily low level.

The balanced tuner described in this article has two front-panel adjustments, an optional high-Z/low-Z switch, and no adjustable taps. It uses the rarely seen, balanced version of the familiar, unbalanced L network. Changing bands is a piece of cake with this tuner, and the matching range can be made very wide by using enough L and C to handle the job.

The Trouble with Baluns

On paper, an unbalanced tuner, feeding a balun, connected to a ladder-line-fed antenna should work well. In practice, it does not work well. The reason for this lies in the balun.

As a rule of thumb, a balun should have about four times as many reactive ohms as there are resistive ohms in the load. This means that, for use with a 600-Ω balanced load, the balun should have a secondary-winding reactance of about 2.4 kΩ. For 80-meter operation, this works out to be more than 100 μH of balun inductance! To create this much inductance on an appropriate MF/HF-rated (μ = 40) ferrite core, an impractically large number of turns of wire would be required.

The use of a balun in high-impedance (particularly highly reactive) circuits inevitably creates two very sticky problems:

More turns mean more ampere-turns of magnetic flux in the balun's core, and high magnetic flux densities can cause ferrite cores to saturate. This distorts the RF waveform and creates harmonics that extend well into the UHF range. The remaining problem with using many turns of wire is that doing so increases the winding capacitance of the balun. The high capacitance of the winding creates unwanted reactance and/or balun imbalance. This is especially true with the commonly used 4:1 bifilar-wound balun, which does not have an evenly distributed winding capacitance like the trifilar-wound balun. When enough turns are placed on the 4:1 bifilar balun for satisfactory 80-meter operation, the inherent capacitive imbalance in the balun causes a progressively greater imbalance in the balun's output voltage as the operating frequency increases. This imbalance causes a differential RF current to flow through the ground wire on the tuner. The term *4:1 balun,* as it is applied to most commercial products, is a misnomer. These devices are much better suited for broadband, unbalanced-to-unbalanced 4:1 transformer service, such as that needed in the input circuit for a grid-driven, class-AB_1 amplifier with a grid-terminating resistance of 200 Ω.

There is a problem with a substantial current flowing in the ground wire on any tuner: Since *all* conductors, no matter how wide, have inductive reactance, the RF current that flows through the ground wire or strap can develop a large RF voltage on the tuner end of the ground wire.[1] With 1 kW on 21, 24 or 28 MHz, the RF voltage on the "matches-everything" tuner chassis can brilliantly light a neon lamp, make sparks with a graphite pencil and burn fingers!

The 1:1 trifilar-wound balun solves the capacitive-imbalance problem of the 4:1 balun. Unfortunately, it does *not* solve the problem of high capacitance in the windings themselves. And, more importantly, it does not solve the problem of core saturation resulting from the high magnetic-flux density created by the large number of turns required for any high-impedance balun.

The bottom line: High-impedance baluns are a very likely source of *grief*, no matter how carefully they are engineered and constructed.

All of these problems are easily avoided. The solution is simple: Don't put the balun in the highest-impedance part of the circuit. Instead, put the balun in the lowest-impedance part of the circuit (in most cases, the lowest-impedance part of the circuit is the 50-Ω coax input to the antenna tuner), and build a balanced L-network tuner for the balanced output of the low-impedance balun.

So, why have we been putting the balun in the wrong part of the circuit for all these years? Good question!

Calculating the Series and Shunt Reactances

The equations for calculating the total series reactance (X_{series}—in ±/Ω) and the shunt reactance (X_{shunt}—in ±/Ω) in a balanced L network are shown in Fig A. These ohmic values can be converted into values of capacitance and inductance for a specific frequency by using the two equations at the bottom of Fig A. Note that, for a balanced L network, the series reactance must be divided into two equal parts, and the shunt reactance must be completely isolated from ground.

The reactance equations give exact values only for nonreactive (purely resistive) loads. If the reactances of the L network are adjustable, a wide range of load reactances can be canceled by adjusting the L network to create an equal and opposite reactance. This is accomplished by applying a small amount of RF to the tuner and adjusting the L network for zero reflected power.

The shunt and series reactances that are found with the equations can be either inductive or capacitive, but they must always be opposites for resistive loads. If a high-pass-filter characteristic is desired, as is frequently the case on 160 meters (where strong local broadcast stations would otherwise cause receiver overload), the series reactance is capacitive and the shunt reactance is inductive.

If an L network is to be used on just one band, only one of the two reactances usually needs to be variable in order to obtain a low SWR over the entire band. A good use for this technique is with a half-wave antenna for the 160- or 80-meter bands. This antenna would otherwise have a low SWR at the middle of the band and a high SWR at the band edges (assuming that the antenna is tuned to resonate at midband). With a single-variable-component, L-network tuner, the SWR can be reduced to less than 1.1:1 at the band edges. (Of course, if both components are variable, the SWR need not exceed 1:1.)

If a band-pass filter characteristic is needed for a specific single-band operation, a high-pass L network can be coupled to a low-pass L network, and each network should be designed to contribute about half of the total resistance transformation. This way, only one of the two-stage L network's four reactances usually needs to be variable to allow coverage of the entire band with a low SWR. I use this circuit in a 160-meter tuner. It keeps the local broadcast stations from overloading my receiver, and it attenuates the second harmonic of my 160-meter signal to −63 dBc.

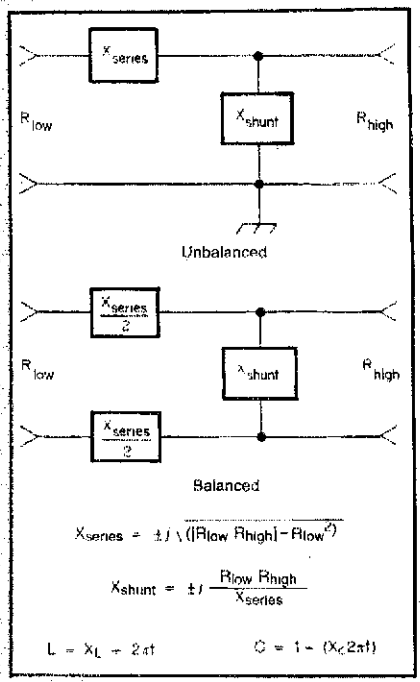


Fig A—Unbalanced and balanced L-network configurations, and equations for matching resistive loads using L networks.

An Inexpensive, High-Performance, Ugly, 50-Ω Balun

Building a no-grief 1.8- to 30-MHz 50-Ω balun is easy. No costly ferrite cores are needed, just a short length of 3- to 5-inch plastic pipe, about 30 feet of 50-Ω coax, and some nylon cable ties. Solid-dielectric coax is best for this application, because the center conductor of foam-dielectric coax has a tendency to migrate through the dielectric over a period of time if such cable is bent too sharply. This can result in dielectric breakdown.

The required length of the plastic pipe depends on the diameter and length of the coax used and the diameter of the pipe. For RG-213 coax, about one foot of 5-inch pipe is needed for a 1.8- to 30-MHz balun.[2,3] For 3.5- to 30-MHz coverage, about 18 to 20 feet of coax is needed. The number of turns is not critical, because the inductance depends more on the length of the coax than on the number of turns, which varies with the pipe diameter.

The coax is close-wound in a single layer

[1]Notes appear on p 32.

on the plastic pipe. The first and last turns of the coax are secured to the plastic pipe with nylon cable ties passed through small holes drilled in the plastic pipe. The coil winding must not be placed against a conductor. This simple-but-effective device is called a *choke balun*.[4]

Some people build choke baluns, without a plastic coil form, by scramble-winding the coax into a coil and taping it together. The problem with scramble winding is that the first and last turns of the coax may touch each other, which creates two complications: The distributed capacitance of the balun is increased, and the RF-lossy vinyl jacket of the coax is subjected to a high RF voltage. The single-layer-winding-on-a-plastic-coil-form construction method solves these problems by dividing the RF voltage and capacitance evenly across each turn of the balun.

A more compact, less ugly, 1:1, 50-Ω, trifilar-wound (with wire) ferrite-core balun could also be used, but there are some trade-offs. Ferrite cores are not as cheap as plastic pipe. Also, the air core of the coax balun can't saturate like the ferrite core and, unlike ferrite-core wire-wound baluns, single-layer coax baluns almost never have insulation-breakdown problems. Also, trifilar-wound baluns do not like to work into anything but perfectly balanced loads. With an unbalanced load, the coax balun—unlike the trifilar balun—does not generate a differential RF current on the outside of the coax that brings the RF to the input of the tuner. The choke balun is not fussy; it works as well into a less-than-perfectly balanced load as it does into a perfectly balanced load, and does so without the possibility of creating a differential RF current on the station ground that can fricassee the operator's fingers!

The Versatile L Network

The L network is *the* basic RF-impedance-transformation tool. It is also used to build high-pass, low-pass and band-pass filters. The unbalanced L network forms the basis for all of the antenna tuners that are currently being sold. All contemporary high-power MF/HF tube amplifiers use two or more L networks in series to match the high anode (plate) impedance of the amplifier tube to the low resistance of the coaxial output. Most amplifiers use two L networks in series, which is more commonly known as a pi (π) network. A few amplifiers use three L networks in series, which is called a π-L network. So-called no-tune/broadband amplifiers may use five or more fixed L networks in series for each band-switch position. More L networks means more harmonic suppression in the amplifier output. The complex-appearing Butterworth and Chebyshev filters are nothing more than a series of basic L networks.

When used for matching resistive loads, an L network consists of one capacitor and one inductor. When the L network is used for matching loads that contain both resistance and reactance ($R \pm jX = Z$), the reactance of the load may partially—or sometimes completely—replace one of the reactances in the L network. Thus, in rare cases, it is possible to build an L network with only one component, but only for a specific frequency and load impedance. In some situations, canceling the load reactance requires the use of a larger reactive component in the L network. In more extreme situations, the load may be so reactive that the L network must be made from two capacitors or two inductors!

There are four ways to connect the capacitor and the inductor in an L network. See Fig 1A. When inductance is used for the series reactance and capacitance is used for the shunt reactance, the L network acts as a low-pass filter as well as an impedance-matching device. When capacitance is used for the series reactance and inductance is used for the shunt reactance, the L network acts as a high-pass filter and an impedance-transformation device.

The resistance-matching range of the L network is remarkably wide. It can match 50 Ω to a 1-Ω or a 10-kΩ load with ease and good efficiency, provided that a reasonably high-Q inductor is used.

When the L network is used for stepping up the input impedance, the shunt reactance is placed across the load. For stepping down the input impedance, the shunt reactance is placed across the source (the input of the L network). Put another way, the shunt reactance is always connected across the highest-impedance side of the L network. This means that, for a 50-Ω input, wide-range tuner that will match loads of more than 50 Ω and less than 50 Ω, a step-up/step-down impedance switch must be provided so that the shunt reactance can be switched between the input and output sides of the tuner. The same result could be accomplished by reversing the input and output connections; the switch saves time.

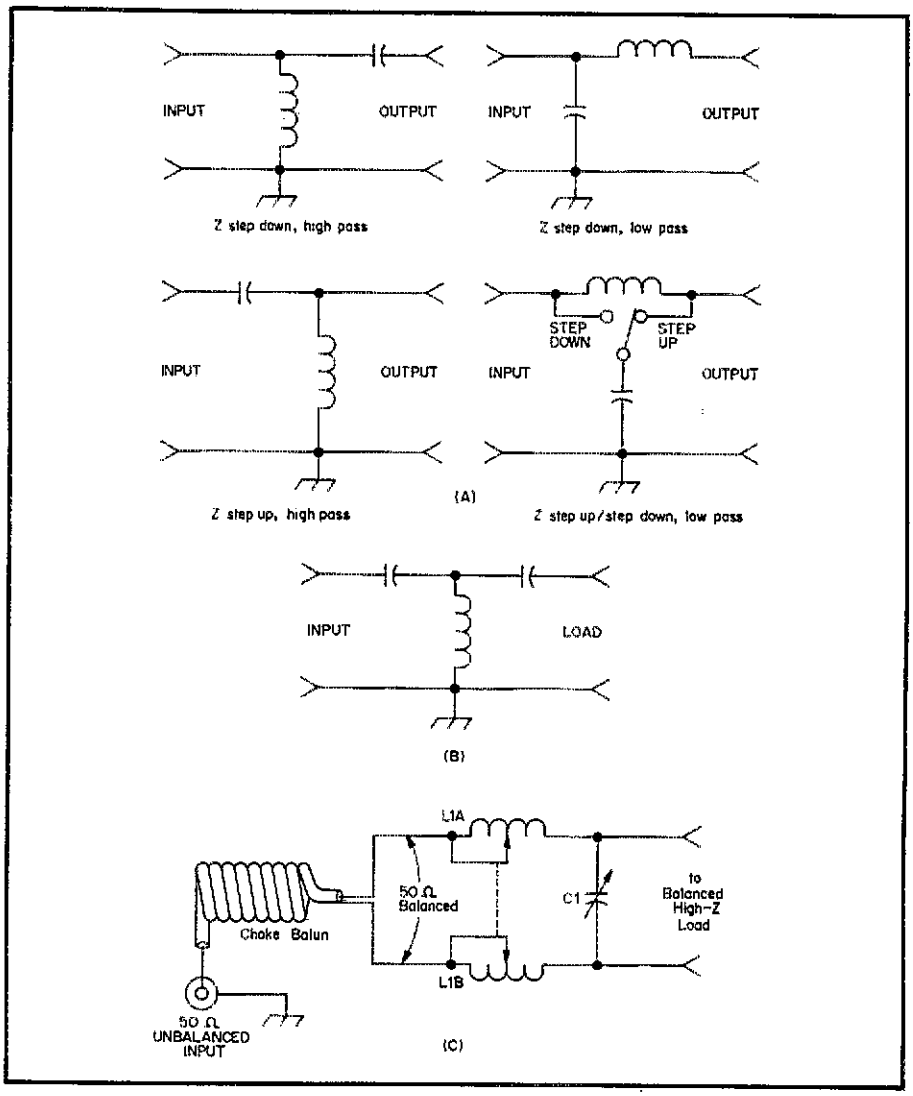


Fig 1—At A, the four basic L-network configurations. At B, the unbalanced-T network. At C, the balanced L network, fed by a choke balun made of coaxial cable wound on a plastic-pipe form.

The T network eliminates the need for the step-up/step-down switch. Ac circuit analysis shows that, for every R-X series circuit, there is an equivalent R-X parallel circuit. (Of course, this also works in reverse.)

See Fig 1B. An additional capacitor is placed in series with the load of a resistance-step-up L network that will not normally match a load resistance lower than the input resistance (usually 50 Ω). If the added series capacitor or inductor is adjusted so that it has a sufficiently high reactance, the resistive component of the series load's parallel-equivalent circuit will be above 50 Ω, and the step-up L network will be able to match the load.

For example, given: An impedance-step-up, series-L/shunt-C (low-pass-filter characteristic) L network that will only match load resistances that are greater than 50 Ω is connected to a 1-Ω load. Problem: Obtain a Z match.

One solution is to add a $+j10$-Ω (inductive) reactance in series with the 1-Ω load ($Z = 1 + j10$ Ω) This series R-X circuit is electrically equivalent to a circuit consisting of a 101-Ω resistor in parallel with an inductor whose reactance is $+j10.1$ Ω. Because a load resistance of 101 Ω is above 50 Ω, a match could be achieved if $-j10.1$ Ω is added to the L-network's shunt capacitor in order to cancel the parallel-equivalent circuit's $+j10.1$ Ω reactance. (Adding more capacitive reactance with a variable capacitor is easy: Simply adjust the capacitance to a lower value.)

The Balanced L Network

The L networks shown in Fig 1A and 1B will only work with an unbalanced input and an unbalanced load. A balanced L network must be used for a balanced load. The balanced L network is similar to an unbalanced L network; the difference is that the balanced L network's series reactance is divided into two equal parts, and both ends of the shunt reactance must be above ground. See Fig 1C. The balanced L network must be fed from a balanced source (such as the output of a choke balun, fed by an unbalanced transmitter).

Mechanical Considerations for Balanced L Networks

The tuning shafts of the variable inductors and the variable capacitor are hot with RF, and must be insulated from each other and from the outside world. Also, the insulated frame of the variable capacitor should be kept well away from any grounded surface. This requirement is much easier to meet if the balanced tuner is built in a wooden box, instead of in a metal box. The (RF-hot) frame of a single section variable capacitor should be elevated on standoff insulators. This helps to keep the circuit capacitively balanced.

If a split-stator variable capacitor is used, it won't be necessary to insulate its tuning shaft for high-voltage RF, or to keep the capacitor well away from ground. Use an insulated tuning knob with a well-recessed setscrew (instead of an all-metal tuning knob). This should keep you from being bitten by RF if the split-stator capacitor proves to be less-than-perfectly balanced.

The variable inductors must have equal inductances and be driven in synchronization by one tuning shaft. It is possible to end-couple the two variable inductors with an insulated coupling that can handle minor axial shaft misalignment, but this does not result in good electrical symmetry or optimum inductive decoupling between the two variable inductors unless a shaft extension is used. Good symmetry is probably a moot point for 80-meter operation, but it is a consideration on the higher-frequency bands. If you decide to use end-to-end coupling, use 1/4-inch polyethylene tubing for the coupler. It is a very tight fit over 1/4-inch shafts, and it can be held in place with 5/16-inch flat spring clamps. This tubing is available in stores that carry drip-irrigation materials, and is ideal for end-coupling RF components.

Another method of coupling the variable inductors is to use a 3/8-inch plastic timing belt and two plastic pulleys (like those used in xerographic copiers). This allows the variable inductors to be placed side by side, spaced at least two coil diameters apart (to avoid mutual coupling), resulting in better layout symmetry. A pulley-and-belt system can be used to drive the inductors. Pulleys (available with matching belts from Small Parts—see the section called "Parts"), come in two varieties: single flange and dual flange. Using these pulleys, the pulley/belt system operates like those used in many overhead-cam automobile engines: The belts have protruding rectangular blocks, positioned perpendicular to the belt axis, that are spaced to match corresponding notches on the pulleys. One single-flange and one dual-flange pulley should be used so that the belt cannot slip off, and so that the belt can be changed and adjusted without requiring dismounting of either one of the pulleys or one of the variable inductors from the chassis. Small flats can be ground into the variable inductor's tuning shafts so that the pulley's setscrews will stay put.

The ends of variable inductors that have a coil-end contact that is electrically connected to their tuning shafts should be connected to the lower-voltage (input) side of the balanced tuner. This minimizes the RF-voltage stress on the insulated parts that synchronize and drive the variable inductors. The roller contact must be shorted across the unused turns of the inductor to the low-voltage end of the variable inductor. This stops the Tesla-coil-transformer effect, which can cause spectacular RF arcing at some inductor settings. The wider-pitch ends of variable-pitch, variable inductors is placed at the higher-voltage (output) side of the tuner.

Sometimes it is more convenient to put a balanced L-network tuner in a remote location so that the ladder line does not need to be brought through the wall of the house. A simplified diagram of a remote-controlled, permanent-magnet reversible dc-motor-driven tuner is shown in Fig 2. This simplified diagram does not show the detailed wiring of the control cable and the remote indicator/control box/power supply.

Limitations

The balanced L network, as illustrated, is designed to work with balanced (or nearly balanced) loads that have a resistance greater than 50 Ω. The vast majority of open-wire-line-fed antennas fit into this category. Rarely, open-wire-fed antennas have resistances of less than 50 Ω. (This is the case with a half-wavelength dipole, less than ¼ λ above ground, fed with a transmission line that contains an even number of quarter wavelengths.) If a load resistance of less than 50 Ω is to be successfully matched, the variable capacitor must be switched to the input side of the variable inductors, or, as in a T network, a matched pair of appropriate reactances can be inserted in series with the load to obtain a match.

Because the impedance at the bottom of a ladder-line-fed multiband antenna can be almost anything imaginable, it is prudent to include a DPDT step-up/step-down impedance switch in the design of a balanced L-network antenna tuner, as mentioned earlier.

Selecting a Suitable Peak-Voltage Rating for the Capacitor

The peak RF voltage that appears across the capacitor varies widely depending on the feed-line impedance and the power level used. The voltage can be calculated if the impedance and power at the feed point are known. The formula for calculating this is $E = \sqrt{(P \times Z)}$. Because P is measured in RMS watts, the ac voltage (E) is in RMS volts, which can be converted to peak volts (e) by multiplying the result by $\sqrt{2}$. For example, if $Z = 600$ Ω and $P = 1500$ W, $e = \sqrt{(1500\text{ W} \times 600\ \Omega)} \times \sqrt{2} = 1341$ V peak.[5] Capacitors rated at least 1.5 kV should handle just about all matching requirements in this circuit.

When using a vacuum-variable capacitor, it is important to realize that the maximum-RF-voltage rating at 30 MHz is usually 60% of the rated dc/60-Hz peak-voltage rating. Thus, a 5-kV-dc/60-Hz rating is equivalent to a 3-kV-peak *RF* rating.[6] Used or new-surplus vacuum-variable capacitors should be tested before use, because they may have developed air leaks that render them useless.

Parts

In this circuit, as in any other antenna tuner, component-value selection is depen-

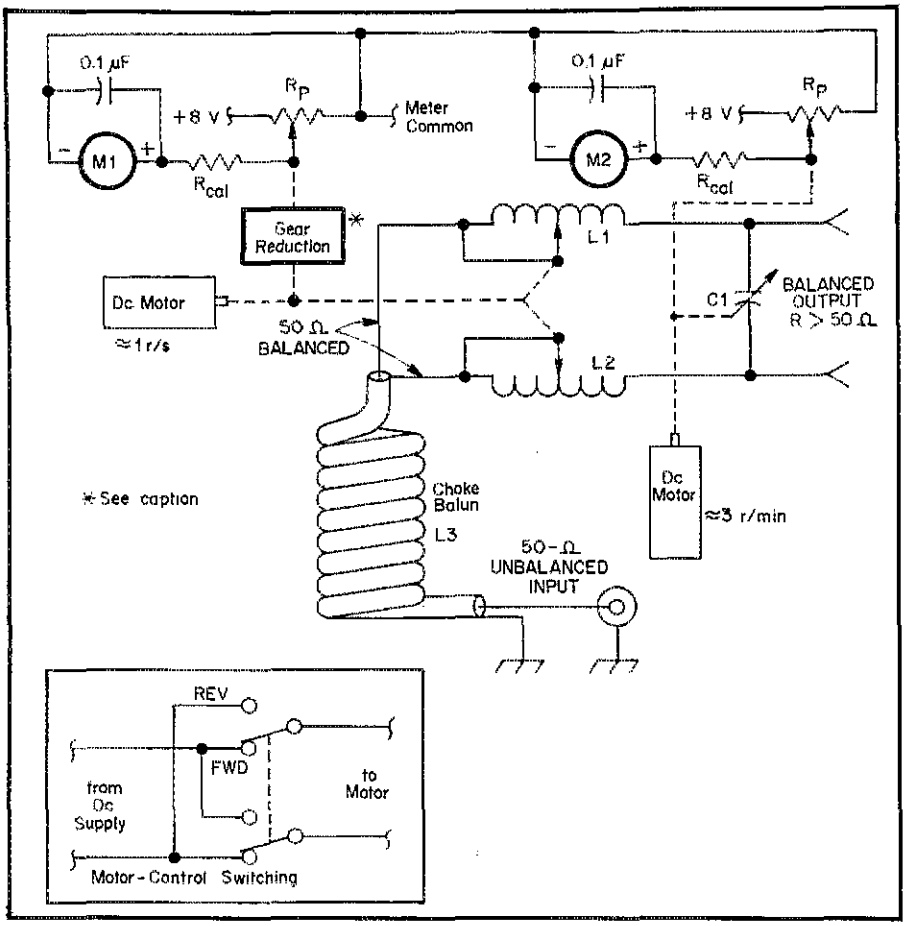


Fig 2—Schematic of a basic remote-control scheme for the balanced antenna tuner. A control cable with at least seven conductors is required for this arrangement; the meter-common and motor-common leads *must not* be connected together. Conductors are needed for: (1) approximately +8 V, regulated; (2) meter common; (3) motor common; (4) capacitor-drive motor; (5) inductor-drive motor; (6) capacitor-position-indicator meter; (7) inductor-position-indicator meter. Each motor is controlled by a DPDT momentary-contact toggle switch (see inset). If the tuner is to be used for loads of less than 50 Ω, a relay and additional control lines must be added to the circuit to switch the variable capacitor from the output to the input side of the L network.

Parts List

M1, M2—Position-indicator meters. 100 μA to 100 mA full scale, placed at operating position and fed through control cable to tuner.

R_p—Resolving potentiometer. 1- to 10-kΩ, single-turn linear-taper type. Some ordinary, 270° potentiometers work for this application if the internal stops are removed. A multiturn potentiometer can be used for the inductor-position-resolving potentiometer, eliminating the need for the gear-reduction scheme required to drive a single-turn resolving potentiometer from the variable-inductor drive motor.

R_{cal}—5- to 75-kΩ, ¼-W potentiometer. Adjust these for full-scale readings on M1 and M2 when the inductors and capacitor are set for maximum inductance and capacitance, respectively.

Motors—Permanent-magnet dc gear motors, one 3 r/min (for driving the capacitor), one 1 r/s (for driving the inductors).

dent on the load-impedance range over which the circuit is expected to provide a transformation from a 50-Ω unbalanced input. For matching a 600-Ω nonreactive load at 1.8 MHz in this circuit, the variable capacitor should be at least 488 pF. In general, the capacitor should have a peak rating of at least 1.5 kV, and the variable inductors should be wound with wire no smaller than no. 12 AWG for good efficiency.[7]

Maintenance note: Variable-inductor roller bars and other sliding-RF-contact surfaces should be routinely wiped clean with a lint-free cloth and then lubricated, about once a year. A suitable lubricant is GC Electronics Tunerlub, catalog no. 26-01. This material must be applied *thinly* (more is *not* better) with a lint-free cloth.

Miniature timing belts and pulleys are available from Small Parts, Inc, 6901 NE Third Ave, PO Box 381736, Miami, FL 33238-1736. To obtain a catalog, call 305-751-0856.

Acknowledgment

Kudos to Charlie Michaels, W7XC, who provided valuable input during the editing of this article. If you would like to discuss this or any of my articles with me, call me at 805-482-3034.

Notes

[1]For example, a 1-foot-wide × ≈7-foot-long silver strap connected to a 10-acre, salt-marsh ground looks like a ≈¼-λ *RF choke* at 28 MHz!

[2]Although PVC pipe works in this relatively low-voltage application, ABS pipe is better suited to this purpose, because ABS has much less RF loss than PVC.

[3]The specified size of plastic pipe is an approximate inside-diameter (ID) measurement. For example, schedule-80 pipe has an outer diameter (OD) about ½ inch larger than the specified pipe size.

[4]If the choke balun will be exposed to ultraviolet light, it is important to use black cable ties. Natural nylon (translucent) cable ties deteriorate quickly when exposed to sunlight.

[5]The PEP power measurement is an instantaneous, RMS measurement—not a peak-power measurement. The peak power of a sinusoidal wave is *twice* its RMS power. True peak-power measurements are seldom used in the Amateur Radio world, even though such measurements are necessary for calculating the peak-voltage ratings of components, such as the L network's capacitor.

[6]See R. Measures, "High-Voltage Breakdown Tester," *QEX*, Aug 1988, p 5, for a vacuum-variable-capacitor testing procedure.

[7]A source of variable capacitors and inductors is Cardwell Condenser Corp (Johnson Capacitor Division [capacitors], Multronics Division [inductors]), 80 E. Montauk Hwy, Lindenhurst, NY 11757, tel 516-957-7200. Call for a catalog. Cardwell manufactures the former E. F. Johnson line of 5-A (229 series) and 10-A (226 series) variable inductors. Their part number for an 18-μH, 5-A variable inductor is 229-202-1 @ $56.95 each. These inductors are suitable for matching nonreactive loads of up to 3 kΩ at 1.8 MHz, 6 kΩ at 3.5 MHz, and so on. The 28-μH version is part no. 229-203-1 @ $62.21 each. These inductors can be used to match nonreactive loads of up to 6 kΩ at 1.8 MHz, 12 kΩ at 3.5 MHz, etc. (Cardwell-Multronics part numbers for these inductors are the same as E. F. Johnson's). Cardwell takes Visa® and MasterCard® telephone orders. Cardwell's capacitor line includes 1.5-kV (type L) variables, such as their part no. 167-3-1, a 5.2- to 75-pF unit. Another source for variable inductors is Fair Radio Sales, Box 1105, Lima, OH 45802, tel 419-223-2196. They have carried used-surplus, 5-A, 14.35-μH units for $24, part no. 339/L44-MED. Fair Radio also carries variable capacitors and a ceramic HV RF switch that is capable of switching the variable capacitor on the balanced L network between the load side of the circuit and the input side of the circuit. The part number of this switch is 3Z9626, and the current price is $2.50.

Strays

I would like to get in touch with...

☐ any hams who are DJs, commercial broadcasters, or other professional on-the-air personalities. Bruce Brady, KA9SOX, 311 SW Maynard Rd, Cary, NC 27511.

☐ 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.

☐ anyone who has information about modifying a Motorola model MT-800 handheld transceiver to operate on any ham bands. Dave Mann, VP2EHF, The Valley, Anguilla Island, British West Indies.

Conducted By James W. Healy, NJ2L
Assistant Technical Editor

SHF Systems SHF 1240K 1296-MHz Transverter Kit

Reviewed by Zack Lau, KH6CP

Looking for an inexpensive way to get on 1296 MHz? The SHF 1240K kit sold by Down East Microwave may be just what you need—if you have some soldering experience and the basic tools that it takes to maintain your Amateur Radio station. In addition to the 1296-MHz weak-signal work for which this transverter is designed, it can be used for satellite operation on 1269 MHz by changing the crystal and adding enough amplification to get the 8- to 10-dBm signal up to a usable level. The SHF 1240K is designed to be used with a 2-meter IF.

The kit consists of two double-sided circuit boards, the parts to populate them, and construction information. Both boards have plated-through holes, although only the local-oscillator (LO) board is tin plated. The LO board takes 12.8 to 13.8 V dc and converts some of it to a frequency-stable ac signal between 540 and 580 MHz. The transverter board contains the basic circuits of any transverter: mixers, amplifiers, and band-pass filters. This board also has a doubler to get the LO signal up into the 1150-MHz range, and a splitter to feed the transmit and receive mixers. To use this kit as the heart of a simple transverter system, you will need SPDT coaxial switches or relays for 2 meters and 23 cm. Although *the kit doesn't come with one, a case is also* available for the transverter, in case you don't want to make your own.

Unlike other transverter kits, the tuned circuits in the SHF-1240 are pretuned! Using a proven design topology and accurate circuit-board etching, the need for adjustment controls (except LO-frequency trimming) has been eliminated. As a result, virtually no test equipment is needed to align this transverter, although it is a good idea to use a frequency counter to determine your exact IF-conversion frequency. The time-honored technique of using a beacon or big contest station as a frequency reference is cheaper, though, and often works just fine.

Construction

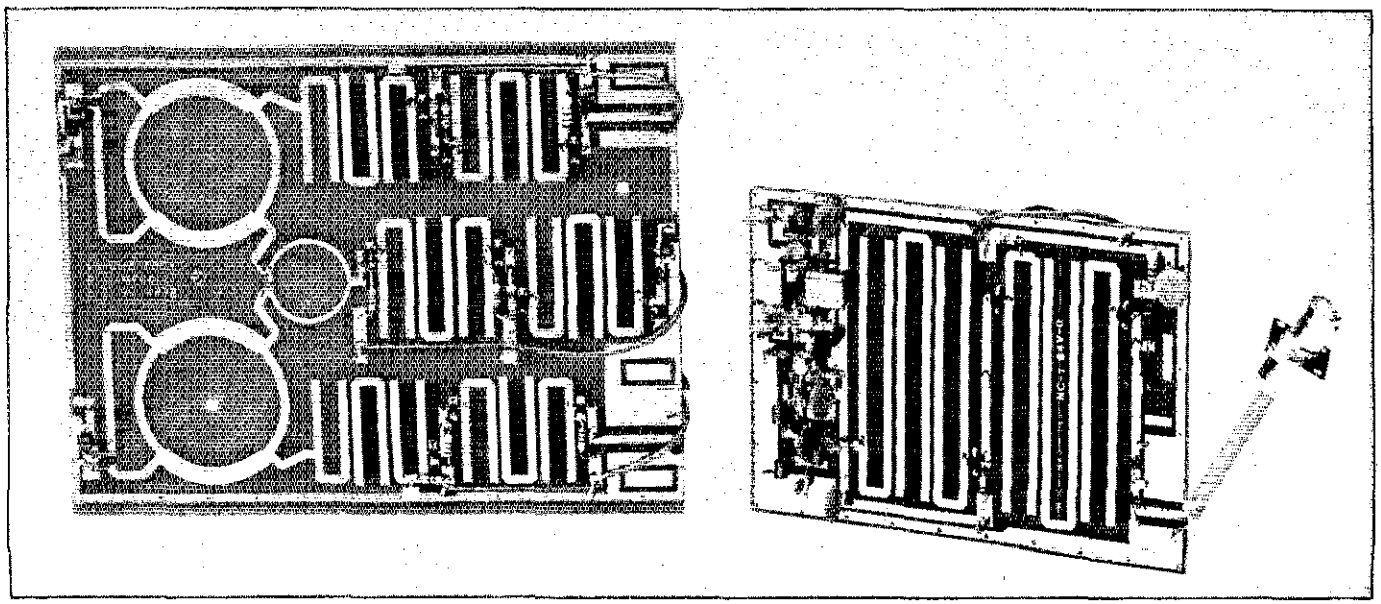
Despite the fact that I got one of the first kits available, both the LO board and the main transverter board took only about 3 hours each to assemble, a tribute to the good design of this kit. The problems that slowed me down, such as missing circuit-board holes, two capacitors of the wrong physical size (too small) and two parts left off the parts-placement diagram, have since been fixed by the manufacturer.

Omissions in the parts-placement diagram weren't a big problem in building the LO, because a larger-than-life picture of the finished board is included in the kit documentation. This is a great touch that I wish more kits had. There is no substitute for seeing exactly what the finished product should look like.

When I first completed the kit, there was a detectable oscillation in the receive preamplifier that kept me from being able to measure the noise figure (NF) with the ARRL Lab's HP 8970/346A measurement setup, even with a 2-meter band-pass filter in line. Moving a resistor retuned the oscillation so that some measurements could

SHF Systems SHF 1240K 1296-MHz Transverter

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Any 4-MHz segment between 1240 and 1300 MHz (with appropriate LO crystal).	As specified.
IF-drive level: 10 dBm.	As specified.
Receive-converter NF: Better than 4 dB.	5.0 dB.
Conversion gain: Not specified.	21.5 dB.
Power output: 8 to 10 dBm.	At 13.6 V, 10 dBm (saturated); 6 dBm at 1-dB compression point.
Power requirement: 12.8-13.8 V at 400 mA. 13.6 V optimum for supplied biasing components.	At 13.6 V and 10 dBm output, 440 mA.



be made. According to John Molnar, WA3ETD, of SHF systems, one of the 10 initial kits also exhibited this problem. Fortunately, his suggested cure of adding a 22-pF chip capacitor between the hairpin filter and ground worked fine, resulting in an oscillation-free, high-gain amplifier chain. This modification is included in current-production kits, although according to Bill Olson, W3HQT, of Down East Microwave, this problem is rare in all but the earliest kits.

The SHF-1240K isn't a kit for beginning builders, because soldering chip capacitors requires some skill and practice. I find that it helps to tin the capacitor terminations before soldering them into a circuit. The kit comes with no. 24 enameled wire for the coils; this is a good choice, because it's thick enough to allow easy removal of the insulation without damaging the wire. To wind the coils for this kit, you need to provide 1/16-inch and 7/64-inch drill bits to use as forms. When scraping the insulation off the coil wires, it helps to leave the coils on the drill-bit forms.

Once the transverter is assembled, the only adjustment required is setting a trimmer so that the oscillator starts reliably. The trimmer used in the review kit needs an unusual tuning tool. (I reshaped a drill shaft to make a suitable tool.) This isn't a problem in the current kits, though: A different style of tuning capacitor is now supplied with the kit.

If you hook up a stage improperly, as evidenced by abnormal current drain, troubleshooting can be easily done with a dc voltmeter. If the voltage at the output terminal of an MMIC is not between 3 and 5.5, it's not hooked up right.

Spurious Output

The spurious-signal content in the transverter's output depends on how the board is mounted. With the board unmounted, the LO spur is −37 dBc with no drive. With drive, the LO spur is −40 dBc. By tack soldering an IF attenuator to the back of the board, it is possible to *increase* the spurious content. The completed unit, without the cover on, has spurs close to the carrier that are approximately −36 dBc. The IF feedthrough is approximately 40 dB, although this can be reduced considerably by eliminating the attenuator and using a low-power source of 2-meter drive. The second harmonic of the mounted board's signal is −32 dBc.

Documentation

The seven-page-long SHF LO-board documentation is well done. The large photograph is helpful in building this kit, as mentioned earlier. A parts-placement drawing clearly indicates which parts go where. The SHF 1240K operation and main-board construction guide is less complete, and takes only five pages to cover construction and operation of a more complex circuit. No photograph of the main board is included to aid the builder, although you should learn enough from building the LO board to build this one without difficulty.

Using the SHF 1240K in your 1296-MHz Station

Of course, a 10-mW transverter kit that's as basic as this one requires additional equipment to make a functional 1296-MHz station. Assuming you already have a low-power 144-MHz IF rig, you'll need two coaxial relays or switches, an antenna, and perhaps a power amplifier and a preamplifier. Here's a rundown on what's out there. This is by no means a complete list; it's intended only to give you a start in the right direction.

Antennas

Recent editions of *The ARRL Handbook* and *The ARRL Antenna Book* describe 6- and 12-foot-boom loop Yagis designed by Chip Angle, N6CA. The *Antenna Book* also carries quagi antennas designed by Wayne Overbeck, N6NB, and 1296-MHz corner- and trough-reflector designs. Commercial loop-Yagi antennas for 1296 MHz and other bands are also available from Down East Microwave and other suppliers.

Higher Power

The easiest way to get more power at 1296 MHz is to add an MSA 1104 MMIC-amplifier stage. That should get the output up to 45 mW or so. For more power, a Mitsubishi M67715 hybrid power-amplifier module will boost an 8-mW signal to around 2.7 W. Those with design experience and test equipment could substitute a two-stage MRF581 amplifier to boost the board's 10-mW output to 0.6 W. I have also seen an MRF581-driven M57762 delivering more than 23 W, but it's an unpublished design for which I don't have any details.

Preamplifiers

The best 1296-MHz preamp design that I have built (and I've built several) is an ATF10135 circuit designed by Al Ward, WB5LUA, and covered in the *Proceedings of the 22nd Conference of the Central States VHF Society* (available from ARRL). This preamp's measured noise figure is 0.5 dB, and gain is 15.4 dB (measurements were made using the ARRL Lab's HP 8970/346A). An MGF-1402 preamp design also appears in Chapter 32 of *The 1990 ARRL Handbook*. Kits for 1296-MHz preamplifiers based on the W6PO design are available from Stephen Kostro, N2CEI, RD 1, Box 341A, Frenchtown, NJ 08825. Commercial preamplifiers for this band are sold by Down East Microwave and Microwave Components of Michigan, PO Box 1697, Taylor, MI 48180, tel 313-753-4581.

Conclusions

This kit, taking some of the recent advances in microwave technology, makes it possible for the careful amateur to build microwave gear with virtually no test equipment. This low-power, moderate-noise-figure transverter makes a nice little box for mountaintopping or repeater linking, where even a few milliwatts will go a hundred miles. And, SHF Systems makes transverter kits for 903, 2304 and 3456 MHz, as well as LO boards and LO parts kits. Assembled and tested versions are also available.

Price: SHF 1240K, including LO crystal, $139. Manufacturer: SHF Systems, PO Box 666, Nashua, NH 03061, tel 603-673-1573. SHF Systems kits, PC boards and assembled units are available exclusively through Down East Microwave, RR 1 Box 2310, Troy, ME 04987, tel 207-948-3741.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from Amateur Radio dealers. ARRL receives no remuneration for items presented in the Product Review or New Products columns.—*Ed.*]

The ARRL-purchased Product Review equipment listed below is for sale to the highest bidder. Prices quoted are minimum acceptable bids, and are discounted from the purchase prices.

ICOM IC-781 160- through 10-meter transceiver, s/n 1001 (see Product Review, January 1990 *QST*). Minimum bid: $3994.

Sealed bids must be submitted by mail and must be postmarked on or before February 27, 1990. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

In your bid, please clearly identify the item you wish to bid on, using the manufacturer's name, model number, or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by the successful bidder, FOB Newington. The successful bidder will be advised by mail. No other notifications will be made, and no information will be given by telephone to anyone regarding final price or identity of the successful bidder.

Please send bids to Purchasing Department, Product Bids, ARRL, 225 Main St, Newington, CT 06111.

Hints and Kinks

Conducted By David Newkirk, AK7M
Assistant Technical Editor

A NEW FACE FOR A RECALIBRATED METER

☐ *In "A Simple and Accurate QRP Directional Wattmeter,"* (pp 19-23 and 36, this issue), I described a QRP wattmeter that uses a standard 0-1 milliammeter modified with a custom, nonlinear scale calibrated directly in power and SWR according to the values shown in Table 1. Making new scales for a stock meter is one solution; adding markings to the existing meter scale is another. It's fairly easy to make the new scales readable, and somewhat harder to make them look nice. If you decide to make new scales rather than add marks to the existing scale, you'll want to record the correct places to make the new marks before you obliterate the old scale. One way to do this is as follows.

Refer to Fig 1. Attach the meter face to a large piece of paper. Trace around the face so you can exactly reposition it later. Find the meter pivot point by extending the tick marks at the scale's ends, and verify this point by extending a couple of other points on the scale. Then draw lines from the pivot point through the meter face to an area beyond the face, labeling them appropriately, as shown in Fig 1. Then you can remove, repaint and replace the meter face. The new scale and marks can be hand-drawn; press-on letters and numbers can be used; or the face may be made with a photographic process.

A caution: Anyone who sees my home-built equipment immediately realizes that, although I'm willing to spend a lot of time on functionality and performance, I don't devote much time to beauty! So you'll have to look elsewhere for advice on how to make a meter face good-looking. When finished, the meter face should resemble Fig 2.—*Roy Lewallen, W7EL, 5470 SW 152 Ave, Beaverton, OR 97007.*

Table 1
Meter-Recalibration Data for the QRP Wattmeter

Power	*Meter*	*SWR*	*Meter*
0.0	0.0	1	0.0
0.05	0.224	1.5	0.200
0.1	0.316	2	0.333
0.2	0.447	3	0.500
0.3	0.548	4	0.600
0.4	0.633	5	0.667
0.5	0.707	7	0.750
0.6	0.775	10	0.818
0.7	0.837	∞	1.0
0.8	0.894		
0.9	0.949		
1.0	1.0		

The *Meter* column expresses fractions of full-scale readings on the original meter scale. For example, the new SWR = 3 mark should be placed at the same place as the half-scale (0.5) mark on the original meter face.

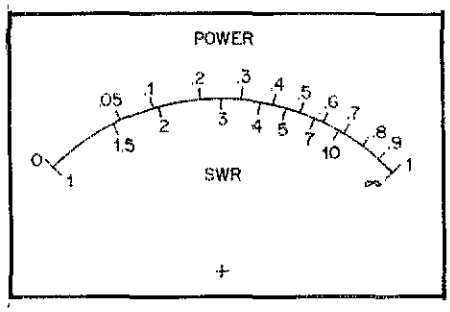


Fig 2—Example of a finished meter face. This scale is that of the meter used in "A Simple and Accurate QRP Directional Wattmeter" (pp 19-23, this issue).

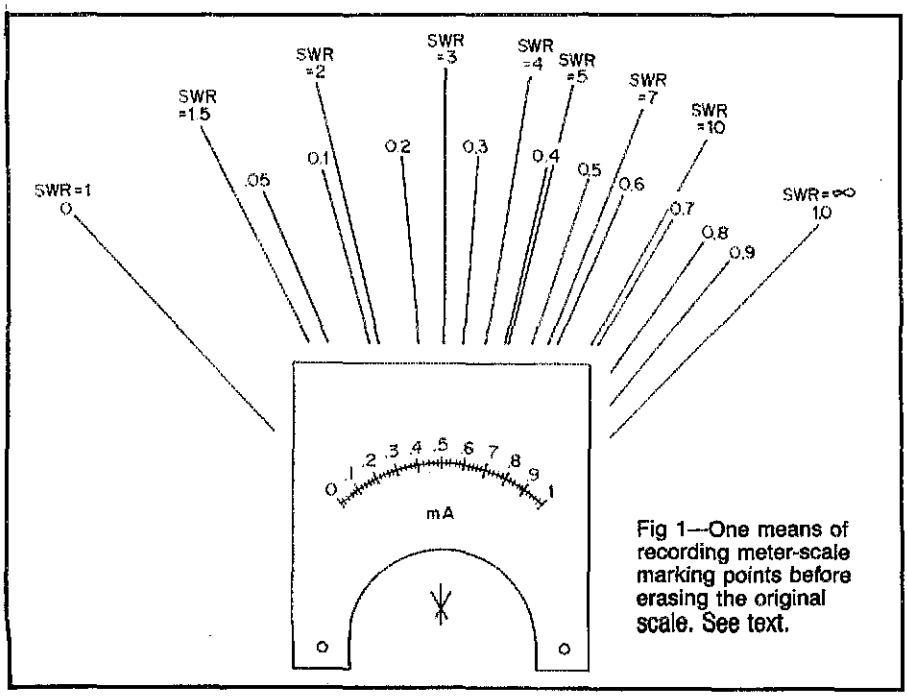


Fig 1—One means of recording meter-scale marking points before erasing the original scale. See text.

CONSTRUCTING LADDER (OPEN-WIRE) TRANSMISSION LINE

☐ Most commercial, open-wire transmission lines available for amateur use consist of spreaders and no. 18 copper wire. No. 18 is satisfactory for 1500 W at low to moderate SWRs, but it is inadequate for the very high SWR that can occur when a multiband antenna system is used at 1500 W. No. 14 solid-copper wire is better suited for this application. I've never seen commercially available, high-quality, no. 14, two-wire transmission line, however, so I made my own as described here.

Solid wire is better than stranded wire for constructing open-wire-transmission line because solid wire does not twist and short as easily as stranded wire. (Exception: Use finely stranded wire for the top few inches of the transmission line, near the feed point, where flexibility is important.) All-copper solid wire is best. (The springiness of copper-clad steel wire—Copperweld™ wire, for example—makes it not only very dangerous to eyes when it is handled and cut, but also makes it too unruly for use in transmission lines. Copper-clad steel wire also becomes prematurely brittle in normal use because of wind movement.)

No. 14, single-conductor, solid-copper, thermal wire ("TW"), used for wiring houses, is commonly available in 500-foot rolls where building materials are sold. This wire affords a good compromise between strength and stiffness. Its insulation can be removed by fastening one end of the wire to a stationary object and carefully pulling a sharp knife between the copper and the insulation of the stretched-out wire. (No. 14 TW can also be used for antenna wires if the feed-point insulator and transmission line are supported by means other than the antenna itself.)

Insulators

High-RF-quality, lightweight, long-lived, inexpensive and easy-to-fasten feed-line insulators can be made from acrylonitrile-butadiene-styrene (ABS) thermoplastic. If you can find it, 3/8-inch, round ABS rod stock or, as a second choice, 3/8-inch ABS square rod stock, works well. (Round stock affords less wind resistance.) These materials can be found at some of the larger plastic-supply houses. If you have a color choice, black is usually the most UV-resistant color.

If you can't find ABS rod stock, you can make your insulators from ABS plumbing

pipe, which is commonly available. For use as open-wire-line insulation, ABS pipe must first be heated and flattened into sheets. Cut the ABS pipe lengthwise into halves or thirds with a table saw. Make the lengths about the same as the width of a Teflon®-coated cookie sheet that will fit into your oven. Since ABS is a thermoplastic that melts at about 150 °C, set the oven temperature to about 180 °C (350 °F). Bake the ½ or ⅓ round sections of the pipe, concave side down, on the cookie sheet until they begin to soften. When the pipe sections are soft, open the oven and place a sheet of plywood, weighted with a brick, on top of the pipe sections. When the ABS is flat, set it aside to cool.

If you're using ABS rod, cut it into pieces of uniform length (3 to 6 inches). If you're using ABS pipe, use a table saw to cut the heat-flattened pipe into strips about 3/8 inch wide and 3 to 6 inches long.[1] Notch the ends of the insulators to a depth of about ¼ inch with a hacksaw or band saw that makes a cut *narrower* than the width of no. 14 wire.

How many insulators you need depends on the line's length and wire spacing. It's best to space the insulators at a distance equal to five to ten times their length. Six-inch-long insulators, for instance, are usually spaced 30 to 60 inches apart. Assuming 6-inch spacers spaced 60 inches apart, a 50-foot feed line requires nine insulators—assuming that the distance between each line end and its adjacent insulator is equal to the insulator-to-insulator spacing. Use no more insulators than are necessary to keep the feed line from twisting and shorting.

Fastening ABS Insulators to the Wire

Clamp both parallel wires, spaced appropriately, into a vise. Stretch the wires out straight and fasten their free ends to a stationary object. With the flame from a propane torch, heat one wire where you want a given insulator to be fastened. When the wire is hot enough to melt the ABS, press the wire into the insulator notch. The heated wire will melt its way to the bottom of the notch in the ABS. Hold the wire in this position for about 15 seconds to allow the thermoplastic to cool and reharden, trapping the wire. You can lessen the cooling time by pressing a damp rag to the insulator and wire. Repeat this operation until the line is completed. (Notes: This operation can be done with two hands, but it is much easier and faster with four hands. Don't overheat the wire; doing so may cause the thermoplastic to decompose and/or ignite.)

Lengthening the Feed Line's Service Life

The useful life of ladder line in windy areas can be extended by fastening a Dacron cord or braided-Dacron fishing-line tether (or tethers) to an insulator about halfway up the feed line. Pull the tether sideways to form an angle of about 45° and fasten it to a stationary object. The tether will keep the feed line from whipping around in the wind and avoid flexing that could eventually cause the wires to break. Two or three tethers, fastened to the same feed-line insulator and spread about 120° apart, work better than one.—*Richard L. Measures, AG6K, 6455 La Cumbre Rd, Somis, CA 93066*

[1]The line impedance, which can be calculated from the equation $Z_0 = 276 \log (2S \div d)$, where Z_0 is the characteristic impedance of the line, S is the center-to-center distance between the line conductors, and d is the conductor diameter (in the same units as S), is generally not critical in situations where the feed line is intentionally operated at a high SWR—that is, when its impedance considerably mismatches that of the antenna it feeds. This can occur when, for instance, an open-wire-fed doublet is operated on several bands. What counts is the feed line's ability to handle, with minimum loss, the high voltages and currents that can occur under high-SWR conditions. The main mechanical consideration is that the feed-line wires be far enough apart, and equipped with enough spacers, not to short-circuit with wind movement.

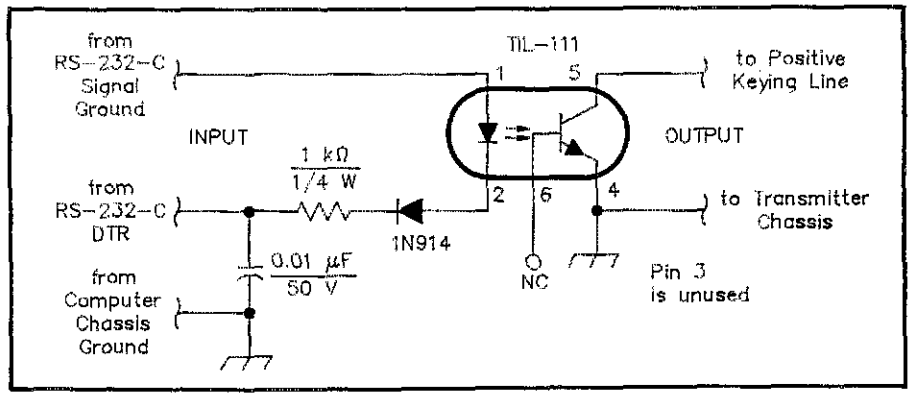


Fig 3—John Swancara's RS-232-C-to-keying-line interface consists of just four parts. You can build the circuit on a piece of scrap copper-clad circuit board. John obtained U1, a TIL-111 optocoupler, as part of Radio Shack's 276-139 optocoupler assortment.

CHEAP AND QUICK RS-232-C-TO-KEYING-LINE INTERFACE

☐ While experimenting with my Tandy® 1000 home computer and some ham code-generation programs, I learned that the computer's RS-232-C DTR line switched from +14 to −14 V when the programs executed the code. In about 1 hour, with a few Radio Shack® parts, I built the interface shown in Fig 3. It works great and easily keys my transceiver. I now send perfect CW!

When the Tandy 1000's +14/−14-V RS-232-C DTR signal switches to −14 V, the optocoupler's LED turns on the output transistor, pulling the circuit's **OUTPUT** line low. If you need a circuit that goes low on positive excursions of the **INPUT** line, just reverse the 1N914, and the connections to pins 1 and 2 of the optocoupler. If keying your rig involves switching a higher voltage than the optocoupler can handle, you can control a dc relay with the optocoupler and key the rig with the relay.[2]—*John Swancara, WA6LOD, 1002 E Mariposa Ave, El Segundo, CA 90245*

VCR BATTERIES FOR HAM GEAR

☐ VCR batteries can be a good source of 12-V power for emergency use. These usually come complete with case, shoulder or belt strap, wall charger, and—best of all—a standard lighter socket. I've used one of these with a Yaesu FT-208R hand-held for over a week at a time and still had power to spare.—*Dorth Falls, W4NTD, 1529 Granville Rd, Rock Hill, SC 29730*

[2]For an all-solid-state solution, see J. Galm, "Simple Control-Signal Level Converters," in this issue, pp 24-27.

A Simple and Accurate QRP Directional Wattmeter

(continued from page 23)

in lowering the values of R3, R4 and R5 to those shown in Fig 3 from the original design values, which were much higher. John's diode measurements showed a greater variation in I_{sat} than I had found, indicating the desirability of matching the diodes as described in his article. John also pointed out the possibility of op-amp offset causing the meter to read slightly upscale with no applied signal. The worst-case error is about 2% of full-scale deflection; less in most cases. If necessary, you can add an offset null consisting of a 100-kΩ potentiometer between pins 1 and 5 of U1, with its wiper grounded.

Notes

[1]J. Grebenkemper, "The Tandem Match—An Accurate Directional Wattmeter," QST, Jan 1987, pp 18-26. Also see "Tandem Match Corrections," Technical Correspondence, Jan 1988, p 49.

[2]This circuit was originally discussed in L. McCoy, "The Monimatch," *QST*, Oct 1956, and has been covered in many articles since.

[3]W. B. Bruene, "An Inside Picture of Directional Wattmeters," *QST*, Apr 1959.

Technical Correspondence

Conducted By Paul K. Pagel, N1FB
Associate Technical Editor

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

MICROWAVE AMPLIFIER UPDATE

☐ Shortly after my article was published, I was informed by Avantek that the major customers for the ATF-13135 desired to purchase these devices with the leads precut.[1] The use of automated assembly lines with "pick and place" machines created the need to buy the devices with precut leads (ie, 0.040 inch v 0.177 inch). The new device is called the ATF-13136. The ATF-13135 with the longer leads will still be available, but with possibly longer delivery times. The price of each device is the same.

Unfortunately, in some Amateur Radio applications, the shorter-lead parts cannot be mounted as described in the article. A different approach is needed. With the help of Down East Microwave, I built up two more 10-GHz LNAs using very small, tin-plated brass rivets (0.050-inch diameter).[2] The center-to-center spacing of the rivets is 0.160 inch. I had to be careful that the rivets did not touch the adjacent matching networks. The ATF-13136 was then centered between the rivets and the input and output matching networks. Noise-figure and gain performance of both the single- and dual-stage LNAs is comparable to the typical values shown in the original article.

On the prototype boards, I installed the rivets from the front of the board, and used a small hammer to flatten out the rivets on the back side. Then I soldered the rivets to the ground plane. You may be able to install the rivets from the back side. In any case, just make sure that the rivets do not touch the etched circuits.

As I mentioned in the article, the LNAs are capable of producing moderate power when properly biased. It is, however, not necessary to use the premium low-noise-figure devices in power applications. In the case of the 2304, 3456 or 5760-MHz LNAs, the ATF-10235 or the ATF-20135 can be used in lieu of the ATF-10135. These devices have a slightly higher noise figure, but comparable gain and power output. For the 10368-MHz LNA using the ATF-13136, the ATF-13336 or the ATF-13736 can be substituted. Significant cost savings can be realized when noise figure is not a major concern. Consult your local distributor for prices and delivery dates.—*Al Ward, WB5LUA, 2375 Forest Grove Estates Rd, Allen, TX 75002*

[1]A. Ward, "Simple Low-Noise Microwave Preamplifiers," *QST*, May 1989, pp 31-36 and 75.
[2]The rivets are available from Frontier Microwave, c/o Dave Mascaro, WA3JUF, RD1, Box 467, Ottsville, PA 18942.

G5RV COAX

☐ Richard Broomfield, K1ATV, wrote about selecting the right coax for use with the G5RV antenna.[3] He discusses use of RG-58 v RG-8 coax. Mr. Broomfield's major point is correct: The amplitude of the voltage impressed on the coaxial feed line is a matter for serious consideration. But 50-ohm line is *not* the correct feed line to use from the transmitter/antenna tuner to the ladder line. The feed line should have an impedance of 72 ohms.[4] Also, *do not* use a balun with the G5RV antenna. —*Joseph Noecker, N7HMV, 3912 SW Dolph Ct, Portland, OR 97219*

YAGINEC UPDATE

☐ Within one month after the appearance of my Technical Correspondence article, I received over 130 mail requests from 20 countries for the YAGINEC program.[5] Since then, I've made a number of additions to the program, including a polar graphics plotting capability and a Smith Chart plot v frequency. Particular antenna designs can now be saved to a disk file for future use, or for transferring the element data to the TAPER program, which has also been updated. An installation program is now included to allow users to customize the display foreground and background colors to individual taste. Help screens are now available to aid beginners.

For anyone interested in YAGINEC V 6.13, I'll be happy to ship them a copy for $5 to cover the cost of the disk, disk mailer and postage.—*Lew Gordon, K4VX, PO Box 105, Hannibal, MO 63401*

MORE ON TREE SUPPORTS

☐ I enjoyed Doug Brede's excellent article in the September issue.[6] I've a couple of additional comments on the subject.

For over 35 years, I've used a method of attaching an antenna to a tree that distributes the load on the tree's surface (see Fig 1). Cut some 1- to 2-foot long wooden strips from treated 1 × 2 or 2 × 4 lumber. A hole large enough to pass the supporting wire is drilled halfway down the length of the wooden strips and very close to one edge; the hole should be drilled through the narrow dimension. The wooden strips are threaded onto a piece of stiff *steel* wire, then spaced around the tree trunk with the holes and wire away from the trunk. To keep the assembly in position until the pull of the antenna stabilizes it, I use rubber cargo straps linked around the wooden strips. If the loop is generous and teardrop shaped, the tree can grow for many years without distress. I have observed no rot or damage to tree bark on oaks or pines.

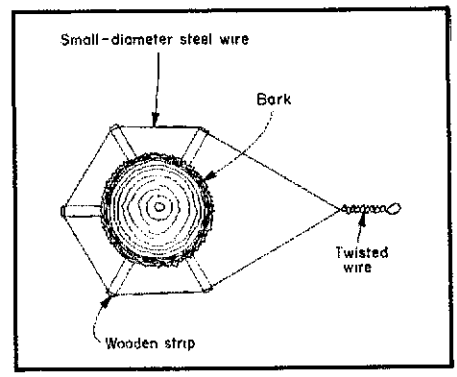


Fig 1—K8RQG's method of floating the load of an antenna on a supporting tree.

I use small diameter steel wire that rusts through in 12 to 15 years and falls off the tree. When the tree finally goes to tree heaven, some unsuspecting woodcutter won't be injured or wreck his chain saw when he runs into a buried eyebolt (as I have done). Eyebolts screwed into trees are sometimes forgotten, and after a few years, they're almost impossible to remove. With the method I've described, there is no penetration of the bark and no residual hardware.

A warning about using natural fiber rope (hemp or manila). The center of these ropes can stay wet or damp for a long time after being water-soaked. The center can rot and the strength of the rope can be severely compromised while the outside appears almost new. Don't climb with a natural fiber rope unless you know the rope's history. Polypropylene rope deteriorates quickly in the sun, loses strength and so is dangerous. Nylon and Dacron rope lose little strength because of wetness or mildew, and although Dacron loses some strength because of exposure to the sun, this loss is at a slow rate. Nylon rope is best to use, but if its stretch is intolerable, use Dacron. —*John O'Toole, K8RQG, 2251 E Euclid, Benton Harbor, MI 49022*

☐ Thanks to Doug Brede for his article in September *QST*. One additional suggestion may be in order. When using eyebolts, it's

[3]R. Broomfield, "The G5RV—Which Coax To Use," Technical Correspondence, *QST*, May 1989, p 51.
[4]L. Moxon, *HF Antennas for All Locations* (London: RSGB, 1982), pp 157-158.
[5]L. Gordon, "Using a Computer to Optimize a Commercially Made Yagi Antenna," Technical Correspondence, *QST*, Mar 1989, pp 44-46.
[6]D. Brede, "The Care and Feeding of an Amateur's Favorite Antenna Support—The Tree," *QST*, Sep 1989, pp 26-28.

always best to use forged eyes as opposed to the bent hook. There are two reasons for this. First, there is always the possibility that the rope could slip out of the eye when not under tension. Second, if the user has attached a high-tension device (such as a tower guy) to the bolt, the eye could open, causing a guy failure—with disastrous consequences!—*J. Craig Clark, Jr, NX1G, PO Box 83, Greenville, NH 03048*

☐ Thanks for the article, "The Care and Feeding of an Amateur's Favorite Antenna Support—the Tree." I've been using trees as my primary antenna support for about 24 years, but was typically more concerned about the antenna than the support! I made several changes to my support system as a result of the basic but useful information in that article.—*Alan Amos, KN1O, PO Box 362, Stow, MA 01775*

TUNABLE RECEIVER PRESELECTORS—WORTH THE TROUBLE?

☐ Many new rigs don't have a tunable preselector or tunable band-pass input filter. The purported advantage of a tunable preselector is that an improvement in receiver performance can be had over a receiver that uses fixed band-pass filters.

I own a Ten-Tec Argonaut 515 that has a tunable front end. The problem I've found when peaking the tunable front end of my transceiver on 10 and 15 meters is that the noise and power matches of the MOSFET front end do not coincide—as one would expect from a low-noise preamplifier. So, peaking the preselector on band noise is worthless. This may explain why a station doesn't hear well at times—the operator has peaked the tunable front end of his receiver on band noise, essentially ensuring poor receiver performance. (Accurately presetting the preselector control to known positions works to some extent, but personally, I always wonder if I couldn't have set it better!) To do a good job of adjusting the receiver for optimum noise performance, it's necessary to tune in a low-level signal.

Assuming you can adjust the preselector knob correctly, there's the problem of getting multiple filter sections to track properly. There are two ways of getting good stop-band attenuation. The first is to use a narrow filter bandwidth. This works because the attenuation is pretty much a function of bandwidth far from the center frequency. For instance, an extremely sharp 10-kHz-wide filter has about the same attenuation 100 kHz away as a 200-kHz filter has 2 MHz away, assuming identical filter topologies. Achieving such a narrow filter bandwidth is a real challenge. I've only been able to do this on 80 meters by accepting an insertion loss of 22 dB.

The second approach to getting good stop-band attenuation is to use a number of filter sections. Doubling the number of filter sections approximately doubles the attenuation. This approach requires devising some way to accurately tune multiple resonators, which may eliminate the practicality of building a narrow tunable filter that covers more than a single amateur band.

In terms of having a receiver that is functioning properly most of the time, most amateurs are far better off with fixed band-pass filters, although some old-timers will miss the knob tweaking.—*Zachary Lau, KH6CP, ARRL Lab Engineer*

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.

Feedback

☐ Please refer to "Auroral-E Propagation at 144 MHz," *QST*, Dec 1989, p 32. Use equation 4 in the sidebar, "Useful Definitions and Equations," as the correction for note 17, p 39, of April 1988 *QST*'s "Sporadic-E Propagation at VHF." The October 1989, p 38, and August 1989, p 41, Feedback items referring to this formula each have errors in them. We hope you're as glad as we are that the formula finally appeared correctly in print.

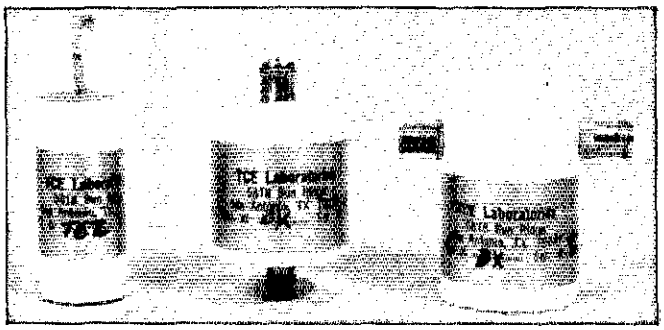
New Products

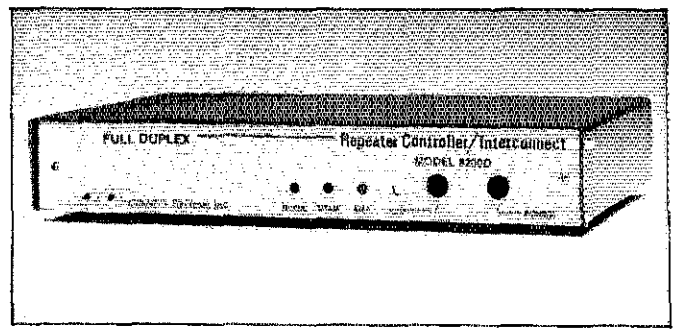
TCE LABORATORIES RFI FILTERS

☐ RFI filters in several styles are available from TCE Laboratories of San Antonio, Texas. Pictured are (l-r) TCE's wall-jack-telephone filter, and models CX and BX television filters. The BX and CX are similar; the BX is designed to operate in the presence of higher non-TV RF fields. The television filters are well suited to eliminating common-mode RFI caused by high-level RF outside the TV spectrum. TCE Labs provides an unconditional guarantee of satisfaction to buyers of their filters, and they offer filters for several types of telephones. Prices (including shipping and handling): BX, $22.95; CX, $17.95; wall-jack telephone filter, $15.95. Add $2.00 shipping and handling for the telephone filter if ordered without a TV filter; Texas residents include 8% sales tax. To order, or for more information, contact TCE Laboratories, 5818 Sun Ridge, San Antonio, TX 78247, tel 512-656-3635 or 800-545-5884.—*Rus Healy, NJ2L*

CSI REPEATER/DUPLEX-AUTOPATCH CONTROLLER

☐ Connect Systems, Inc (CSI), has introduced a full-duplex autopatch and repeater controller. The CSI model 8200D Private Patch V has four operating modes: (1) full-duplex autopatch controller; (2) semi-duplex autopatch controller; (3) semi-duplex private autopatch controller; (4) repeater controller with duplex autopatch. Private Patch V has a keyboard and built-in status display, a 90-memory telephone dialer, last-number redial, remote hook-flash, keyboard-programmable CW identification, toll-call protection, 1- to 6-character access and toll-protection-override codes, telephone-operated remote base, remote-controlled relay, user-selectable courtesy beep, and internally generated tone or pulse dialing. Options include a circuit to convert all of the 8200's modes to CTCSS operation with 32 selectable tones, and software that allows remote programming of access codes. For more information, contact CSI, 2064 Eastman Ave, Suite 113, Ventura, CA 93003, tel 805-842-7184.—*Rus Healy, NJ2L*





New Books

THE COMPLETE DX'ER

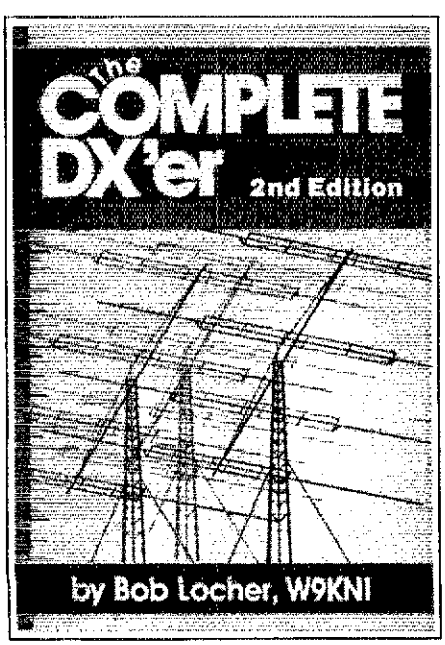
By Bob Locher, W9KNI. Published by Idiom Press, PO Box 583, Deerfield, IL 60015. Second edition, 1989. Softcover, 6 × 9 inches, 205 pages. Available from local dealers or direct from ARRL HQ for $12.00 (plus shipping and handling).

Reviewed by Ellen White, W1YL/4

If you think of yourself as a DXer, you're apt to ask, "Why should I read a newly revised book on how to work DX?" There are a lot of answers to that question, and there's a lot of fun in reading in this book to discover those answers! (If you're at the top position on the DXCC Honor Roll you'll still enjoy reading all those tips you learned over many years of playing the game.) Even if you're not interested in DX *per se*, you're bound to get a lot of pleasure out of this book. It applies common sense and thoughtfulness to the entire gamut of two-way shortwave radio.

I discussed the first edition of W9KNI's book in the How's DX? column in April 1984 *QST*. This second edition by that old DX pro covers a lot of meat and potatoes, from listening and transmitting, through equipment and "playing the game." The new edition successfully retains the approach and feel of the original volume and is enhanced by the addition of two important new chapters of special interest to SSB operators. Every significant aspect of DXing is covered in an engaging, realistic manner. Although it reads like a novel, you'll want to study *The Complete DX'er* as you would any good text.

There are three sections, roughly equating to skill levels. The first section teaches fundamental skills. The second is for those who have worked more than 200 countries; and the third is for the DXer who has bagged 300 countries and is waiting for the DXpeditions needed to make it to the Honor Roll—the goal of many dedicated DXers.



Chapter 1 furnishes a familiar scenario called "A Night on the Bands," gently and painlessly guiding the beginner through the early steps, literally "talking out" the significances of local time v UTC and the time/weather/calendar relationship in how hams operate worldwide. There are a lot of messages in this chapter alone, presented in a friendly informative manner.

Chapter 2, "Basic Listening," deals with the most important skill for successful DXing. Bob captures it well: "The art of listening is to let nothing get by you as you tune a band." Incorporated into that premise is knowing where to listen, when to listen, and what kind of equipment to listen with. A new chapter (12) caught my eye with the title "Morning Call." The truism well presented in this chapter is "*always* strive to copy all the weaker signals you tune across." Hand in hand with this is the necessity of keeping the AGC in the "fast" position so as not to "lock out" weak stations when an adjacent strong station begins transmitting. If you take heed, W9KNI's tips will help you learn a great deal about the specific DX station you're after, making it easier to snag him next time around. Application of the points in this chapter should help you avoid leaving for work with the dreaded defeated taste in your mouth (you know, that which comes from missing a DX opportunity while running out of time to operate!).

The practical aspects of sending and protecting a QSL card and its contents during the transit of international mail are discussed in detail. Chapter 14 offers a discussion of the pros/cons of stamps, reply coupons, and hard currency. Tricks include sending the DX station a pre-addressed label (rather than envelope) so the DX station can return the card as an airmail post card at a reduced rate, rather than the envelope rate. Included is QSL Manager information and DX QSL services.

Another new chapter, "Night Call," starts with a reminiscent hollow feeling—a phone call at 1:35 AM, which means one of two things: a relative or close friend has died, or there's a new one on! There is a rather thrilling description of a hunt for a phone QSO with 3Y2LA that is almost as exciting as reading Clancy's *The Hunt for Red October*!

The Complete DX'er tells it like it is: life in the pileups, the excitement of landing a new one, the agony of defeat, in a manner that both entertains and educates.

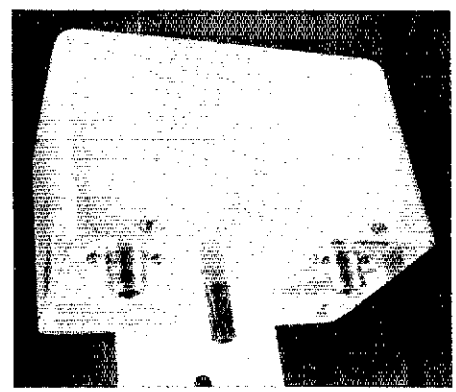
New Products

IMPROVED ONV SAFETY BELTS

☐ Addressing concerns raised in the December 1989 *QST* review of UPI Communication Systems' ONV Climbing Safety Belts, UPI has improved the belts by lengthening the safety ropes (lanyards) on these belts by 6 inches, and improving the rope splices by better securing them. UPI's ONV Safety Belts meet OSHA and ANSI requirements for climbing-safety equipment in their class. Prices remain $74.95 for the belt without the seat harness, and $89.95 for the seat-harness-equipped version. For more information, contact UPI Communication Systems, Box 886, Saddle Brook, NJ 07662, tel 201-368-3655.—*Rus Healy, NJ2L*

AMPIRE MAST-MOUNT VHF/UHF PREAMPLIFIERS

☐ Responding to VHF/UHF operators' need for low-noise mast-mounted preamplifiers with good immunity to strong out-of-amateur band signals, Ampire, Inc, designed models for the 144 and 420 to 450-MHz Amateur Radio bands. These preamps are available in three versions: Model 146 covers 144 to 148 MHz; 146OS operates over any 1.4-MHz segment of the 144- to 148-MHz band; and 440 covers any 2-MHz segment of the 420- to 450-MHz band. Each model contains post-amplifier helical filtering for good out-of-amateur-band signal-handling capability.



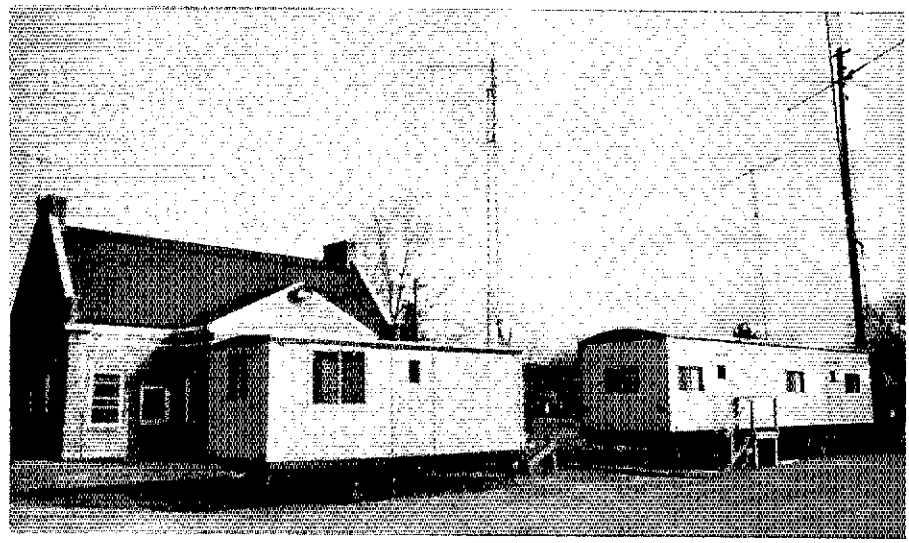
Each model can be ordered with provisions for powering the preamplifier via the feed line to the antenna. Up to 160 W of transmitter power can be applied to the 2-meter preamps (the 70-cm versions handle 100 W). RF-sensed switching is employed in each version. Power requirements are 13-20 V dc at 105 mA.

List prices range from $180 to $190. For more information, contact Ampire, Inc, 10240 Nathan Ln, Maple Grove, MN 55369, tel 612-425-7709.—*Rus Healy, NJ2L*

1989—A Second Look

From an eleventh-hour victory in Congress to natural disasters on both coasts of North America, the League's 75th anniversary year will be well remembered.

By Kirk Kleinschmidt, NTØZ
Editorial Supervisor, *QST*



The major renovation of the W1AW building forced the bulletin station to be housed in the trailer on the right for a large part of 1989. Dubbed W1AW/1, the setup allowed W1AW to remain on the air at reduced capacity during the construction phase of the renovation. *(KC1MP photo)*

One thing's for sure—1989 was not one of those years that come and go without making a fuss—Amateur Radio saw a lot of action on many fronts.

The year brought continuing efforts on several critical regulatory issues, including the reallocation of the lower part of 220-MHz, FCC's Part 97 rules rewrite, a codeless license proposal, initial preparations for WARC-92, and a victory for US hams as Congress dropped amateur licensing fees from tentatively approved legislation.

Amidst all of the political maneuvering, the League celebrated its 75th anniversary with the renovation and subsequent rededication of the landmark W1AW—complete with a VIP ceremony, new state-of-the-art transmitting equipment, and an improved antenna system that includes coverage of the 10-, 18-, and 24-MHz bands.

In the public service arena, hams had opportunities to test their emergency operating skills in 1989, as two disasters struck the US—Hurricane Hugo and the San Francisco earthquake. Amateurs provided critical communications in both cases, generating media attention and gaining recognition by government officials and citizens alike.

Congress Backs Away from License Fees

Thanks to a determined effort by volunteers and the League's Washington DC team, potentially restrictive fees for amateur licenses were headed off in Congress. Prior to the November 21 victory, the House and Senate each had adopted a version of the 1989 Omnibus Budget Reconciliation Bill (HR 3299) which contained $30 or $35 fees for every new, renewed or modified amateur license.

The fees were aimed at increasing revenue for the federal government, and would be levied on those radio services not "taxed" during the last revenue increase some four years ago.

Thousands of amateurs contacted their Senators and Congressmen from July through November, to express their concern over the proposed fees. In the end, the support of several key legislators, including Senator Carl Levin (D-MI) and Representative John Dingell (D-MI), was enough to persuade Congress to change its mind when it came to charging US hams, who serve in the nonprofit sector and are among President Bush's "Thousand Points of Light," for the privilege.

Dingell finished the Conference Report on this note:

"...But it is my view that if some licensees are exempted, then Amateur Radio operators should not be subject to the fees. Amateurs do not use the spectrum for profit, and they render important services to the public during natural disasters. Since the conferees have accepted some of the exemptions proposed by the Senate, we have decided to exempt the Amateur Service as well."

220-MHz Reallocation Still Being Fought

For those involved in the fight to reclaim 220-222 MHz for the Amateur Service, 1989 was an eventful, if frustrating, year.

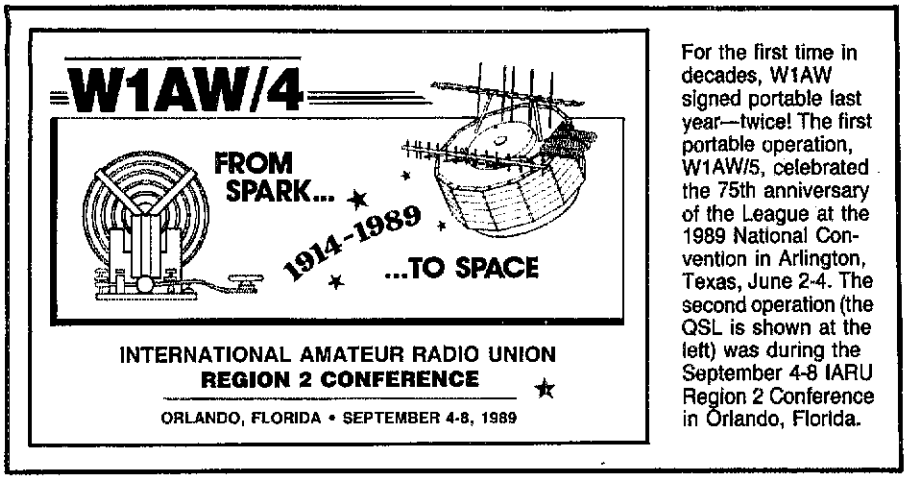
In testimony before the Government Information, Justice and Agriculture Subcommittee of the House Committee on Government Operations, League representatives in May objected to procedures used by the FCC in the reallocation process. But despite the support for amateurs generated by the proceedings, the FCC voted on June 15 to reaffirm its decision to reallocate the lower end of the 220-MHz band to commercial land mobile interests.

Seeing no further recourse, ARRL on September 28 filed a "Petition to Review Agency Order" with the United States Court of Appeals for the District of Columbia Circuit. The petition asks the Court to set aside the Commission's decision in Docket 87-14, and remand the matter to the FCC for redecision. The petition asserts that "the FCC's reallocation decision...was arbitrary, capricious, and an abuse of discretion and not in accordance with the law...."

Amateurs had a major ally in this case briefly, as the Justice Department, acting on behalf of the National Communications System, stated that the reallocation was contrary to national emergency preparedness goals. The Justice Department had filed suit against the FCC in the US Court of Appeals for the DC Circuit. Acting on a letter from the National Telecommunications and Information Administration, however, the Solicitor General withdrew the suit, and thus the case known as United States of America v FCC is closed.

Part 97 Rewrite

The rules that govern Amateur Radio in



For the first time in decades, W1AW signed portable last year—twice! The first portable operation, W1AW/5, celebrated the 75th anniversary of the League at the 1989 National Convention in Arlington, Texas, June 2-4. The second operation (the QSL is shown at the left) was during the September 4-8 IARU Region 2 Conference in Orlando, Florida.

the US underwent a major overhaul in 1989. On May 31, the FCC announced that it had completed its revision and reorganization of Part 97—reducing the total bulk of the document by roughly 40%. The new Part 97, which took effect September 1, is intended to simplify many redundant or obsolete passages.

It's interesting to note that in light of tremendous technological advances in the amateurs' state of the art, the section describing the basis and purpose of the amateur service remained unchanged—thus securing the value of our radio service to the public and to the government.

Part 15 Revision

The FCC, in General Docket 87-389, decided to relax its Part 15 standards for low-power RF devices not requiring a license, such as cordless phones and remote control units. The change was not viewed as favorable to amateurs.

The new rules provide these devices with greatly expanded frequency and modulation privileges, and they're now allowed virtually "everywhere," with the exception of a few restricted public safety and satellite downlink bands.

An ARRL motion for stay of the effective date of the Order was dismissed by the FCC on June 19. An emergency motion for stay was filed with the US Court of Appeals for the DC Circuit, and dismissed. The FCC has not yet acted on the League's petition for reconsideration. The new rules became effective June 23.

Codeless Amateur Licensed Proposed

After years of formal and informal debate among hams and in *QST*, it finally happened. On August 31, the ARRL submitted a petition to the FCC for a new "Communicator" class of Amateur Radio license which does not require a demonstration of proficiency in Morse code (RM-6995).

Under the proposal, the applicant would have to pass a written examination somewhat more comprehensive than the present Technician class test, including some questions about Morse code, but without a code speed or recognition requirement. Privileges would include all amateur frequencies and authorized modes above 220 MHz, with a maximum power output of 250 W.

The proposal was prompted by the outcome of a special ARRL study committee, convened in December of 1988. Foremost among the committee's resource materials were the results of a survey conducted by the League of the experiences of other countries with codeless licenses.

Although the idea does not yet enjoy universal acceptance among US hams, the ARRL feels a codeless license will benefit Amateur Radio now and in the future.

IARU Region 2 Conference Gears up for WARC-92

As a special gesture in recognition of the 75th anniversary of the ARRL, the IARU held its Region 2 Tenth General Assembly in Orlando on Labor Day weekend. These regional get-togethers of Amateur Radio organizations in the Americas are held every three years, to address key radio issues affecting them.

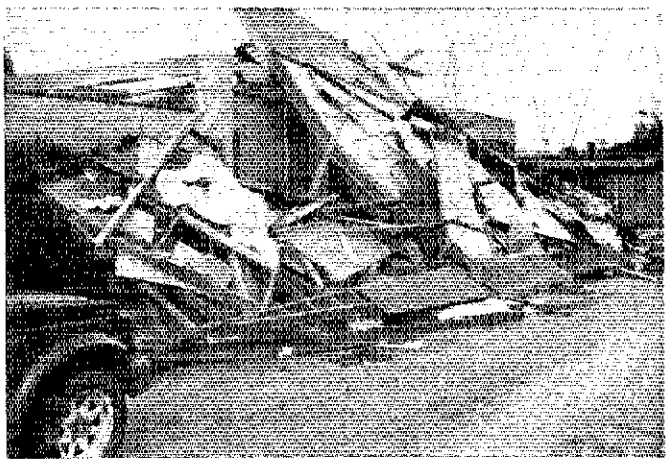
The key topic discussed at the Orlando assembly was the importance of preparing for the World Administrative Radio Conference, to be held in Spain in early 1992. There's a lot to be done in the time remaining. By early 1991, most of the technical support for positions to be taken at WARC-92 will have to be in place, yet the final agenda will not be known until mid-1990.

The frequency ranges subject to possible reallocation are: HF (3 to 30 MHz), 500-MHz to 3 GHz, and frequencies above 12.7 GHz.

WARC-79 was largely beneficial to Amateur Radio. We hope for similar results in 1992.

League's 75th Anniversary Ushers in a New W1AW

Hams around the country and the world celebrated the League's 75th anniversary



As Hurricane Hugo devastated much of the Caribbean and the Carolina coast, the September storm flattened thousands of houses and left millions of dollars in damage in its wake. Pictured above are the remains of a house near the waterfront in Culebra, Puerto Rico. *(K1MZB photo)*



October brought the rumblings of a second natural disaster as the San Francisco earthquake struck the Bay area, toppling houses, bridges and highways. The rubble shown above was photographed the day after the 7.0 Richter 'quake. *(KC6AAN photo)*

year, capped by the renovation and rededication of the Hiram Percy Maxim Memorial station, W1AW. W1AW is a symbol of Amateur Radio the world over, and in keeping with its stature, was given a world-class renovation—inside and out.

Rededication ceremonies were held at ARRL HQ on July 20. Rev. Michael F. Mullen (WB2GQW), 1987 recipient of the ARRL International Humanitarian award, gave the invocation. Some 300 people were in attendance as ARRL President Larry Price, W4RA, opened the new station.

The interior of W1AW was totally rebuilt, and the aging bulletin transmitters were replaced with state-of-the-art Harris Corp transceivers and amplifiers. Outside, more than a dozen monoband Yagi antennas were erected, replacing the existing, weather-worn antenna farm. 10-, 18- and 24-MHz Yagis were also added, allowing W1AW to transmit bulletins on the "WARC bands" for the first time.

W1AW, whose legacy dates to Hiram Percy Maxim and his fledgling ARRL, founded in Hartford, Connecticut, in 1914, has truly gone "From Spark to Space." Happy birthday, ARRL; and thanks, Mr Maxim....

Disasters...

Mother Nature finished 1989 with a one-two punch—Hurricane Hugo and the San Francisco earthquake—giving amateurs in the US and Caribbean a chance to really show their stuff. In both incidents, hams provided critical emergency communications for state and federal agencies as well as people in the stricken areas. High-speed packet networks handled much of the routine health-and-welfare traffic, freeing HF and VHF voice nets to concentrate on priority issues. Amateur Radio made a good showing for itself, followed by a wealth of favorable publicity.

Hurricane Hugo

On September 17, like a juggernaut, Hurricane Hugo slammed into the Leeward Islands and began its trek across the Caribbean toward Puerto Rico and, eventually, the Carolina coast.

Amateur Radio played a key role in minimizing the effects of the passing hurricane. In many areas, hams were the first to regain contact with the rest of the world, and handled thousands of priority and health-and-welfare messages following the storm.

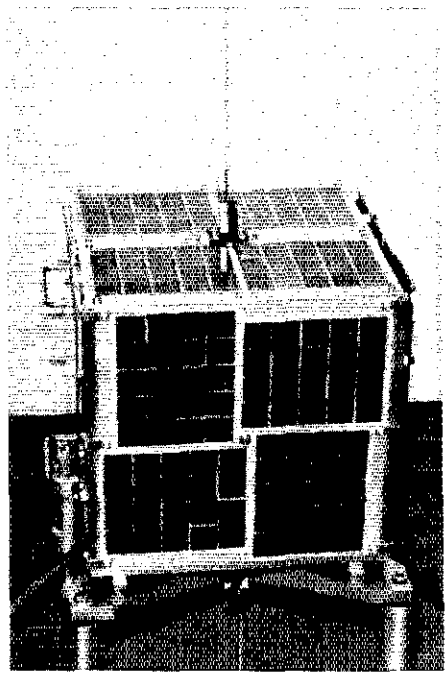
The San Francisco Earthquake

Amateurs provided communications to the earthquake-stricken San Francisco Bay area in the aftermath of the October disaster that caused widespread damage in northern California. The 7.0 Richter 'quake toppled highways, bridges and buildings, causing chaos in the region.

Local emergency nets on 144 and 220 MHz geared up for an onslaught of health-and-welfare traffic and provided on-site emergency communications. Because of the extensive packet network in the Bay area, the quake provided an excellent opportunity to demonstrate packet's emergency communications potential.

Technical Highlights for 1989

Advances in satellite technology were led by the design and construction of AMSAT's Microsats and the University of Surrey's UoSats, all of which are scheduled for launch on an Ariane rocket by the time you read this. Key engineering contributions came from Dick Jansson, WD4FAB, and student engineers from Weber State College in Utah.



This engineering model of an AMSAT Microsat, shows how physically small the new satellites really are. Scheduled to be launched by the time this issue appears in print, the seven Microsats will provide packet radio store-and-forward capability on nearly a worldwide basis. Engineering and development of the miniature satellites was a major ham radio achievement of 1989. *(photo courtesy of KO5I, N4HY)*

On the packet radio front, an article in May *QST* announced that ARRL is sponsoring a project to improve the efficiency of HF packet radio. The ARRL applied to the Federal Emergency Management Agency (FEMA) for a grant to reimburse experimenters for their out-of-pocket expenses relating to this project. FEMA awarded a two-year contract to ARRL in early October with funding of $10,000.

Colorado Springs was the site of the ARRL Computer Networking Conference and Digital Committee meeting. Steve Hall, WM6P, reported preliminary results of HF packet diversity tests. Glenn Elmore, N6GN, and Kevin Rowett, N6RCE, unveiled a 10-GHz digital microwave system capable of rates of more than 1 Mbit/s. The Digital Committee approved, in concept, Version 2.1 of the AX.25 link-layer packet radio protocol to include several improvements over Version 2.0. The final language of Version 2.1 is being completed by the Digital Committee.

Miscellaneous

In addition to the high-visibility activities and issues of 1989, there were many other noteworthy occurrences. We'd like to mention them all, but space allows us to highlight only a few.

Seventeen Meters

On the morning of January 30, the FCC announced the opening of the new 17-meter amateur band (18.068-18.168 MHz). The news was immediately announced via W1AW bulletin—and the word spread quickly. By 0100Z the band was packed with signals. Seventeen meters is the third and last of the new WARC-79 HF ham bands to be implemented.

ARRL Diamond Jubilee National Convention

Some 8,800 hams attended 1989's special ARRL Convention, held in Arlington, Texas, June 2-4. The keynote speaker was Father Gerry Kamibites, 5X5GK, who gave a rousing speech attesting to the value of Amateur Radio throughout his extraordinary life.

The Diamond Jubilee Convention hosted W1AW/5, to the tune of more than 3,000 contacts worldwide. It's not every day that HPM's call sign is heard with a portable designator—in fact, it reportedly was the first time that's happened since the '30s.

The Bardstown Experiment

The Bardstown Experiment sounds rather ominous, but it's really one of the brightest happenings reported in *QST* last year. The Experiment began in the spring of 1988 when David Greer, WE4K, lectured a group of Bardstown, Kentucky, junior high school students about ham radio. The Experiment ended (so to say) in early 1989 when the class' instructor, Chris Luvisi, KC4IDX, and all 63 of his students between the ages of 10 and 13 became Novice hams.

The article, featured in October *QST*, prompted nearly 200 hams to call or write HQ to request information or express interest in starting similar programs.

Sixty-three new, young Novices—that's an exciting accomplishment, and a promising note on which to look to the '90s and beyond.

Congratulations!

Why QRP?

Low-power operation is more popular than ever before. Why not join in the fun?

By Kenny A. Chaffin, WB0E
2942 South Wabash Circle
Denver, CO 80231

Why would anyone except a masochist want to operate with less than 5 W output? What possible attraction could there be? Perhaps it's for the same reason *anyone* would operate an amateur station in this age of global telephone systems and satellite TV.

Maybe it's for the challenge of doing something a little different. Maybe it's for the thrill. But I can tell you, there's nothing quite like having a QSO with a Japanese, Russian, or rare DX station while running less power than a kid's nightlight!

The QRP Q signal was created to mean "Shall I reduce power?" but has since been adopted by the enthusiasts of low-power operation as their banner. QRP has come to mean 5 W or less output for CW, or 10 W PEP output or less for SSB. Most amateur organizations and contests embrace these as the official QRP limits.

Many of the same amateur activities that take place in the rest of Amateur Radio's domain are alive and well within the QRP community. These activities include constructing home-brew equipment, operating QRP stations, experimenting, DX chasing, and contesting.

You Can Build It

The QRP arena is one of the few places where the average home-brewer still can make a decent showing. In this age of multistage, integrated circuit, super-sophisticated all-mode transceivers, QRP operation stands out as a home-brewer's dream. How many hams can hope to duplicate the operation of the latest HF transceiver on their workbench? Probably none. If, however, we change the rules by restricting the power output, it is certainly possible for nearly anyone with the ability to obtain a ham license to build a 5-W transmitter.

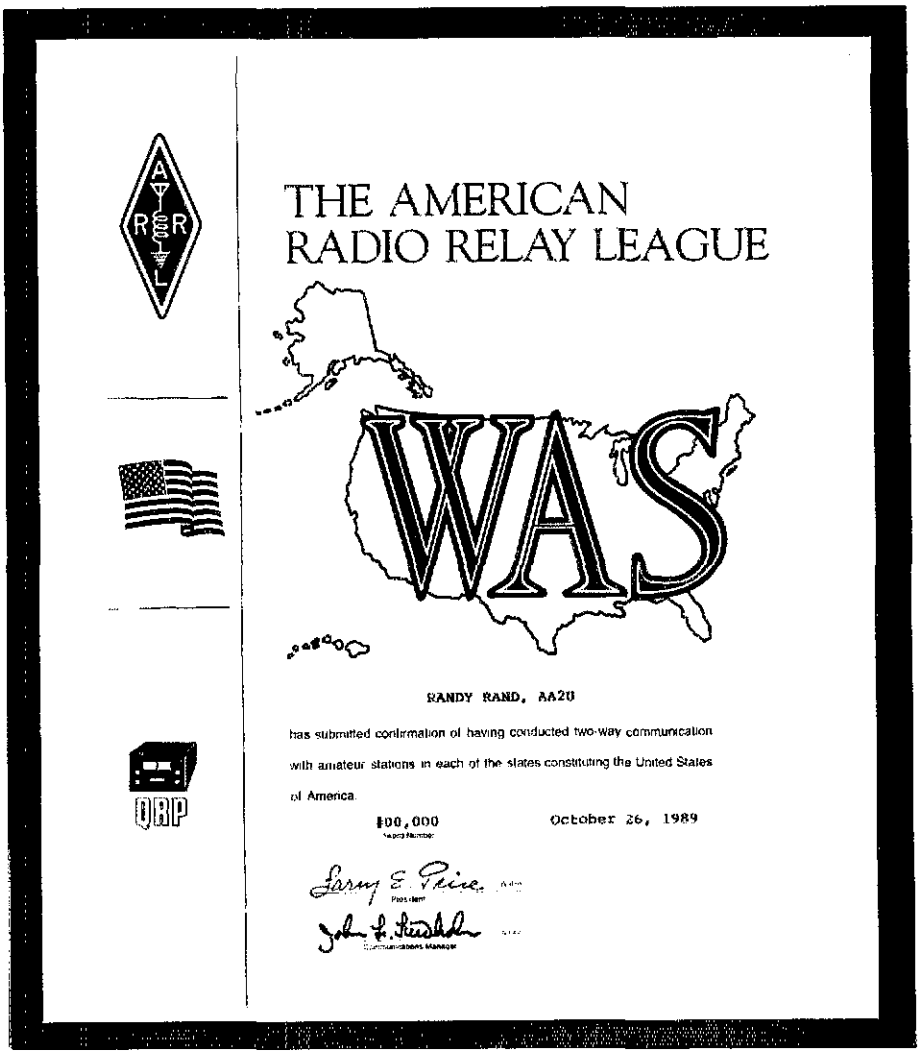
QRP transmitting equipment is simple and physically small. The same can't always be said for the receiver, however. A QRP receiver must do the same job as any other receiver, while usually in a smaller box. It is certainly possible to build an adequate QRP receiver by using minimal circuitry and integrated circuits—but it's not easy to duplicate a top-of-the-line commercial receiver in a matchbox.

If you are interested in home-brewing, but haven't actually done much, I would suggest the QRP transmitters as a good first project. QRP transmitters usually consist of a few transistors, and for HF work, the layout is not particularly critical. Probably the toughest part is finding or building the coils and chokes. Even the coils are not a big deal once you've wound a few. Schematics and kits are readily available. They make it easy to get started. After you've put together a kit or two, it'll be a piece of cake to move on to "bigger and better" projects.

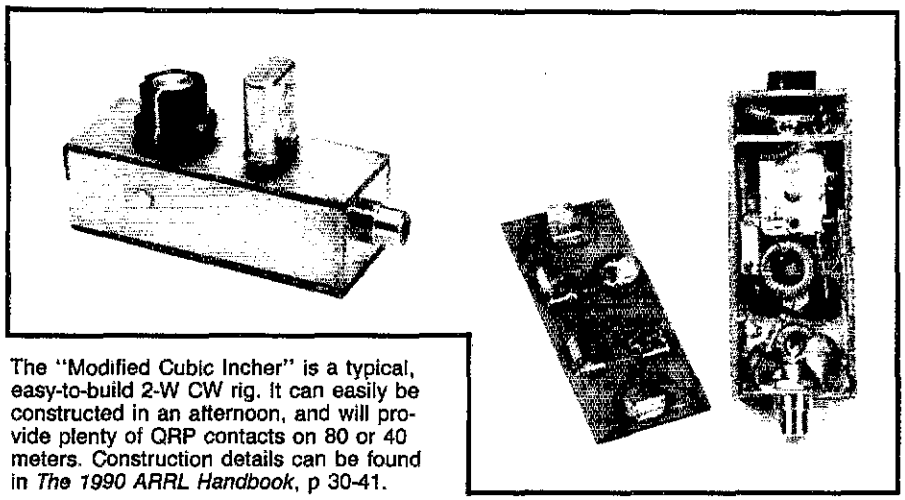
If you do start with a QRP transmitter, you can simplify the circuit even further by opting for crystal control. It may not be as restrictive as you think. A fair amount of QRP operation takes place on dedicated QRP frequencies—making it easy to pick the crystal you need (see Table 2). By adding a trimmer capacitor across the crystal you can "pull" the resonant frequency slightly to the lower side of the crystal frequency (This is, in effect, a simple VXO circuit.) The crystal can be pulled from about 3 kHz on 80 meters to 10 kHz on 15 meters, depending on the crystal type and other factors.

Antennas

Once you have a working transmitter, you'll need a suitable antenna. Which brings us to the question: What kind of antennas do QRP stations use? You may think that following the lead of low-power, simple transmitter and receivers, QRP antennas should be small and simple. This is definitely not the case. A QRP antenna system should be as efficient as possible. Many transmission lines



ARRL's popular Worked All States award has a QRP endorsement. If you're looking for an interesting stateside challenge, why not break out a flea-powered transmitter and give it a try? To make things easier, we no longer require "QRP" to be indicated on the cards submitted for the award.



The "Modified Cubic Incher" is a typical, easy-to-build 2-W CW rig. It can easily be constructed in an afternoon, and will provide plenty of QRP contacts on 80 or 40 meters. Construction details can be found in *The 1990 ARRL Handbook*, p 30-41.

attentuate the signal considerably before it reaches the antenna. If you have 5 W of RF output and a poor feed line, you could end up with only a couple of watts at the antenna! You should approach your QRP feed line as if it were being used for UHF or satellite work. You want to get as much power to the antenna as possible. Using a lossy feed line at kW power levels is tolerable; at QRP levels, however, the loss of every milliwatt becomes more critical.

The antenna itself is also important. For best results you need the best antenna you can put up—it's as simple as that—a high-gain Yagi if possible, up high and clear. It's just as though you were chasing the farthest DX. My antenna is a vertical, which is probably one of the worst choices. But it's the best I can do considering aesthetics, ordinances, and neighborly relations. Even with my vertical I've worked Japan and many Soviet stations using only 5 W output.

Books and Clubs

A couple of reference books you may want to pick up are, *The Joy of QRP* by Adrian Weiss, WØRSP, and *QRP Notebook* by Doug DeMaw, W1FB. The former is more operations oriented and the latter is almost entirely construction projects. There is also a monthly column on QRP written by Michael Bryce, WB8VGE, that runs in *73*. Another monthly QRP column appears in *World Radio*.

Occasional QRP articles, such as this one, appear in various Amateur Radio magazines. Several QRP clubs are available for those interested (see Table 1). QRP Amateur Radio Club International is one of the biggest, and publishes *QRP Quarterly*. For information about QRP ARCI and a sample copy of *QRP Quarterly*, write to Joe Sullivan, WA1WLU, 267 Sutton Street, North Andover, MA 01845. The Michigan QRP Club encourages low-power operation with its newsletter, *The Five Watter*. And if you're interested in British-style QRPing, you can join the G-QRP club [G-land QRPing is strongly associated with home-brewing QRP gear.]

Operating Skills Required

If you want to hone your operating skills, QRP is for you. With only a few watts of signal to work with, it becomes mandatory to perfect your operating technique if you are

Confessions of an Inveterate Milliwatter

People like to overcome challenges; it's part of our nature. I lack the physical skills to be a mountain climber, so I have instead chosen to challenge the fickle layers of the ionosphere with a transmitter that runs milliwatts. It's my way of riding the knife-edge of what can be done.

Like many hams, I started chasing DX with 100 watts. I was content with this until a friend loaned me an HW-7. The meager 5 W didn't work very well with an indoor apartment antenna, but it gave me quite a thrill to work a few common European countries.

I finally managed to move to the country, where I had enough acreage to grow a better antenna crop. I also built a crystal-controlled transmitter that used a 74S00 logic chip as the oscillator and final amplifier, producing 250 milliwatts. A few local states were quickly put in the log. I smiled every time I told the station I was working that my final was a NAND gate!

A few hundred miles seemed to be the limit until the 1984 CW Sweepstakes weekend. I had never paid much attention to contests, so I was not prepared for the bedlam I found when I turned on my radios that Saturday afternoon. A loud W4 was calling CQ on 40 meters, and with no expectation of actually being heard, I sent my call sign—once. What's this? He's working me! Uh, let's see, I first got my ticket in, uh, '64—that will do. By the time the contest was over, I had worked 24 states with 250 milliwatts. Those big-gun contesters sure have good ears! Three years later, I had them all. My hand was literally shaking as I waiting for the band to improve enough to work a KL7 in the CQ WW contest.

Last year, my milliwatt quest continuing, I modified an HW-8 to run 10 milliwatts output. I had quite an adventure during the '88 CW Sweepstakes, netting 56 QSOs with 31 ARRL sections. The 18-hour operation boiled down to 347,200 points per watt!

The 1989 CW SS gave me state number twenty-nine. A couple of DX contests later, eight DXCC countries were in the log. All contacts were made via an 80-meter dipole fed with open-wire ladder line.



ARRL Lab Engineer Ed Hare, KA1CV, shows off his modified Heath HW-8 QRP transceiver. Ed's micro-power rig puts out slightly less than 10 milliwatts on 80 through 15 meters.

It's a high-tech effort. I use a computer to predict expected signal levels to those elusive western states. By all indications, WAS with 10 milliwatts can be done! If any operators west of the Mississippi want to test their station's weak-signal capabilities, I would appreciate a sked!—*Ed Hare, KA1CV, ARRL Lab Engineer.*

Table 1

QRP Clubs

QRP Amateur Radio Club International c/o Bill Harding, K4AHK 10923 Carters Oak Way Burke, VA 22015	Membership—$10 Newsletter—*QRP Quarterly*
Michigan QRP Club c/o Membership Chairperson 5346 W Frances Rd Clio, MI 48420	Membership—$7 Newsletter—*The Five Watter*
G-QRP c/o George Dobbs, G3RJV 498 Manchester Road Roachdale Lance, England OL11 3HE	Membership—$12 US Newsletter—*Sprat*

Table 2

Internationally Recognized QRP Frequencies (kHz)

CW	*SSB*	*Novice*
1810		
3560	3985	3710
7040 (7030)	7285	7110
10106		
14060	14285	
21060	21385	
24900	24950	
28060	28885	28110
50060	50885	

going to work through that DX pileup. QRP is the radio equivalent of brain over brawn.

But isn't a 1-W signal lost in the shuffle of more powerful stations? It's not as lost as you may think. A 1-W signal is only a little more than three S-units weaker than a 100-W signal. So, if your 100-W signal is S-9, your 1-W signal will be about S-6. And that's plenty of signal!

For QRP operation, you must be able to find DX stations, be aware of when and for how long bands will be open and have a crisp and clear setup on both CW and SSB. You must be able to quickly assimilate a DX operator's technique.

One of the primary skills QRP operation strengthens is patience. With QRP power levels you have to wait for the right moment and make your move. This means you must be alert and listening rather than transmitting. You have to be familiar with the bands, operating procedures of DX stations and other QRP operators. All this takes a bit of patience, practice and listening.

How Do I Do It?

Okay, let's say you just want to operate QRP without building any special equipment. That's easy, just turn the power down on your 100-W transceiver. This requires a power meter or some other method of determining your output power. This adjustment is dependent on your rig, and may be as simple as reducing the RF output control or as complicated as retuning the transmitter for reduced output.

Here's a neat experiment that will introduce you to the realm of QRP operation in a gradual fashion: cut your maximum output in half and operate at that power level for a week or so, then cut it in half again. Continue cutting power until you're down to 5 W. I'm sure you'll be surprised, as I was, at how well you can communicate with reduced power. In many cases, the operator on the other end can't tell the difference. My Heath HW-5400 puts out about 100 W maximum, and now that I work QRP almost exclusively, I really have to have a special reason to crank it up to full power.

Commercial QRP Equipment

If for some reason you can't operate your rig at reduced output, there is commercial QRP equipment available. Heathkit has offered three different QRP transceivers. All operate CW exclusively and cover only that portion of the HF bands. The first was the HW-7. It put out a few watts and had a relatively unstable receiver. The redesigned and improved version turned into the HW-8; there are plenty of these still in use.

The QRP community really took the HW-8 to heart and there are modifications galore available to spruce it up. Most of these have been collected in the *Hotwater Handbook*, available from Michael Bryce (he writes the QRP column for *73*). This handbook has been recently revised and reprinted, and includes mods for both the HW-8 and the latest-generation HW-9.

The culmination of Heath's QRP line is the HW-9. It features a vastly improved receiver and a bit healthier power output—slightly more than 5 W on some bands. The HW-9 also covers the newer WARC HF bands and is the only QRP rig currently on the market. You'll have to find the others at swap meets or through the classifieds. Expect to pay up to $70 for an HW-7, $60-$100 for an HW-8, and $100-$200 for a used HW-9.

The cream of the crop among QRP rigs is Ten-Tec's Argonaut series. The latest version (still long out of production) is the Argonaut 515. It's worth its weight in gold. The previously released 509 is almost as good and the 509's predecessor, the 505, is still hanging in there. These rigs operate both CW and SSB and are usually available at swap fests, through want ads, and from individuals. A 505 goes for $100-$175, a 509 for $125-$200 and a 515 for $200-$300 or more, depending on the market. Most of these rigs are generally available, it's just a matter of whether you can afford, and find, a 515 or an HW-8.

A Few More Advantages

There are a couple of other advantages of QRP operations that aren't so obvious. Because you are operating with a minimal power output, your transmitter will probably last "forever." Your electric bill will be less—especially if you stop using your 2-kW space heater. The other nonobvious advantage is that you won't overload the front end of your neighbor's television. It's a pretty rare occasion when operating with 5 W causes interference.

Contests and Awards

The bonus multipliers and points for QRP contest operation have gotten many hams hooked on QRP. Operating "QRP battery power" for Field Day gives a multiplier of five. You only have to make one contact for every five QRO QSOs.

QRP operation is becoming quite popular for many major contests. The following contests have QRP categories: November Sweepstakes, June and September VHF QSO Parties, January VHF Sweepstakes, and the ARRL International DX Contest, among others.

As far as awards, QRP ARCI offers a thousand-miles-per-watt award, available to anyone presenting evidence of a qualifying QSO. QRP ARCI also offers special QRP awards for WAS, WAC and DXCC. The other QRP clubs also offer versions of these, and other, QRP operating achievement awards.

What's Left

What do you do once you've completed QRP DXCC? How about milliwatting? Milliwatting is operating at less than 1-W output. Once you've perfected your QRP skills and equipment, this is the next challenge. Admittedly, there are few who strive for these ranks, but when it all works—WOW! I've recently seen a circuit for a half-watt crystal-controlled transmitter using a single 2N2222 transistor. I haven't tried it yet, but when I do, I can't wait to hear what the operator on the other end says when I tell him. Of course, at milliwatt levels your antenna and feed line become doubly critical. It seems strange to see a 1-inch-square, single-transistor transmitter connected to ¾-inch hardline! But it's great fun.

So why not give QRP or milliwatt operation a try? You just might get hooked. See you on 7040 kHz—a popular QRP hangout.

Amateur Radio is Back on the Shuttle!

Youngsters across the country will be able to converse with astronauts via Amateur Radio as *Columbia* and *Atlantis* take to the skies.

By Rosalie White, WA1STO
Educational Coordinator

Not one, but two US space shuttle missions scheduled for Spring 1990 proclaim a banner year for Amateur Radio. These launches, carrying SAREX (Shuttle Amateur Radio EXperiment), give you opportunities to excite your area school kids about technology and Amateur Radio, *and* offer you a rare operating thrill.

Recent issues of *QST* have reported that the National Aeronautics and Space Administration (NASA) approved shuttle Amateur Radio operations for astronauts Ron Parise, WA4SIR, and Ken Cameron, KB5AWP. At this writing, Ron's mission, STS-35, is expected to fly on April 26, 1990, and continue for 10 days. Ken's trip, STS-37, will last five days after being launched on June 4, 1990. Ron, a payload specialist, will operate the SAREX hardware on the space shuttle *Columbia* using packet and voice operations. Ken, a pilot, hopes to add amateur television to his operating schedule aboard the space shuttle *Atlantis*.

NASA gave its authorization for SAREX operations for the following reasons:

- To encourage our youth to become excited about science and technology, and
- To familiarize large numbers of the general public with manned space flight.

NASA's intent in making astronauts available for SAREX operations is to involve the largest possible numbers of people, particularly youngsters, in Amateur Radio and the US space program. With your help, our astronauts will speak over the ham airwaves directly with large groups of students, showing teachers, parents and communities how Amateur Radio energizes youngsters about science, technology, and learning.

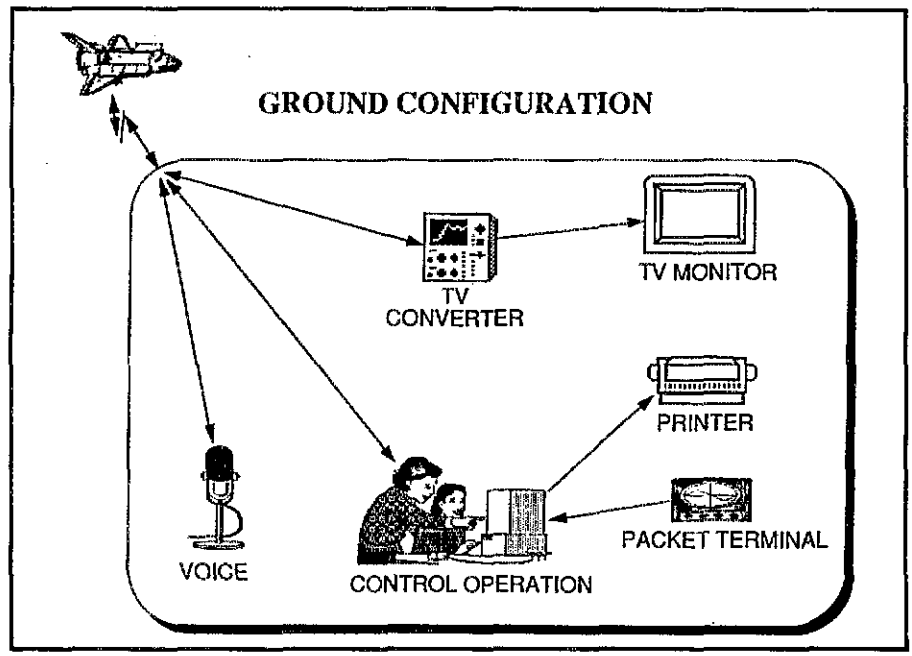
You can easily become a part of this activity in your local schools, as the astronauts will operate the SAREX equipment on the 2-meter band. You'll be able to send and receive messages via packet for periods of about 12 hours daily. The astronauts' work schedules will determine your chances for a voice or television message, but Ron and Ken may have an hour or more each day for these modes.

The Johnson Space Center's Amateur Radio Club station, W5RRR, in Houston, Texas, will retransmit astronauts' signals to WA3NAN, at Goddard Space Flight Center, in Washington, DC, and to W6VIO, at the Jet Propulsion Lab in Pasadena, California. These stations, plus W1AW and several VHF and UHF repeater groups, will retransmit the signals on most amateur bands so that you and the students can copy the communications. You'll hear NASA Mission Commentary, frequent bulletins to advise listeners of astronaut-planned transmissions, and all amateur two-way voice and amateur television transmissions with the shuttles. Using a simple hand-held transceiver, you can open the world of science to hundreds of youngsters. Students themselves can take part in the shuttle flight via a packet message, and some will even be able to talk directly to the astronauts in orbit!

ARRL and AMSAT are cosponsoring these exciting missions, with AMSAT heading up technical operations. Hundreds of Amateur Radio operators have already been working behind the scenes for months. Johnson Space Center Amateur Radio Club members have spent hours on necessary paperwork (compared to your IRS 1040, just imagine what shuttle paperwork entails), and modifying and testing the hardware used in previous SAREX work. Motorola Amateur Radio Club members in Schaumburg, Illinois, built a special antenna. Heathkit contributed two packet TNCs. The ARRL Foundation provided $8,000 for hardware. Roy Neal, K6DUE, is asking manufacturers and suppliers in the Amateur Radio industry to contribute equipment and money for other items.

The ARRL takes the lead with information and educational support. ARRL Educational Activities Branch (EAB) and NASA HQ will create lesson plans for teachers. All you need to provide is a 2-meter rig or a packet radio setup. If you're a teacher or instructor, contact ARRL EAB to get everything you'll need and regular news updates. If you're a parent or grandparent, contact ARRL EAB and a local school. EAB will send you materials, including ways to convince teachers and school administrators that Amateur Radio is an important discipline the school should take advantage of on a full-time basis.

This is a tremendous opportunity for you to showcase SAREX 1990 and Amateur Radio to kids of all ages in a big way. Plan on being a part of it; contact ARRL EAB now and give your best to our exciting hobby and to our hope for tomorrow: America's youth. QST



A block diagram of the planned modes for SAREX 1990. Packet radio and FM voice modes are primary, although FSTV operation is a possibility for the STS-37 mission. *(Drawing courtesy Johnson Space Center ARC.)*

Valentine's Day DX

By James G. Massey, KF4MA
105 Allen Avenue, JPV
Winter Haven, FL 33880

I recently received my DXCC Award. While many hams have long since surpassed 100 countries and even gone on to the Honor Roll, for me DXCC has been a 10-year, part-time quest sandwiched between moves, career changes, a five-year-old son and other hobbies.

In fact, I probably never would have made it, except for the recurring memory of my first DX contact.

When I received my General and Advanced licenses in 1975, I didn't rush to work HF. Instead, I got married, moved into a third-floor apartment in the Philadelphia area, finished graduate school and stuck to 2 meters.

In 1979 I was offered my first professional job, and my wife and I packed our few things and moved to Florida.

Newly "rich," I decided to take the big plunge and buy an HF rig. I ordered it on New Year's Eve, and it came a week later. But since we had moved into a first floor apartment (how could a ham ever do that to himself?), I put off trying to figure out how to put up an apartment antenna, and simply bought mobile antennas for the car.

For some reason, it never occurred to me that I would need an SWR meter to tune the antennas, until I found that only the 40-meter antenna put out a signal that anyone could hear.

I spent a month just talking to people on 40, which (after years of 2 meter FM) seemed like *real long distance*. I would sit in the car in the parking lot at home or at work, talking to anyone.

Cranking Out Contacts

Our only car was a subcompact Toyota. I had to start the engine each time I wanted to transmit, since the battery didn't have enough power. I then would shut the car off to listen, the engine noise overpowering everything I was trying to receive.

Finally, I got the other mobile antennas tuned. According to the log, my first non-40-meter QSO was on February 12. It was no further away than the 40-meter contacts had been—just up and down the East Coast.

Valentine's Day, 1980. Any other husband would stay home with his wife of less than four years, basking in the romance of the Florida evening. But where am I? Out in the apartment parking lot, tuning around 20 meters.

It's 7:13 PM. I stumble upon KB5AC on 14,260 kHz, asking for "check-ins," and people are answering him. Well, I've worked 2-meter nets for years; they just ask you to check in, and then you see who else is there. I call KB5AC, and he acknowledges me.

So how long do I wait? (Don't forget, Jim, this is Valentine's Day, and your wife is inside).

Suddenly, people are talking to a station who signs FB8ZO. F, I thought, isn't that France? Slowly it begins to dawn on me that I'm near the end of a long list of people who want to talk to France. How lucky can I get? I'm going to work DX!



I run in to check my new *Callbook*, just to make sure. (I don't remember if I said anything to my wife—maybe she wasn't talking to me by this time).

"FB8Z: Amsterdam and St. Paul Islands." Must be near France, I thought; let me look it up on the map.

No, not near France...*Indian Ocean?!* Oh, no, he'll never hear me, not with a mobile rig hooked to a weak battery and a whip antenna. And it's Valentine's Day. I'm not supposed to be sitting out alone in a car when my wife is at home inside, and it's going to take forever to get to me, and they're all going to wonder where I went if I don't answer when they call me....

At 8:13 PM, I'm still sitting out in the car. Suddenly they're calling for me: "WB3AJU, your call, please."

"Uh, oh,"—start the car, dummy, he'll never hear you on the battery (crank, crank, crank, crank, VROOOMMM!!!!)

"FB8ZO, this is Whiskey Bravo Three"—don't say Alligator Jungle Unlimited—"Aaal-faaa, Jouuu-lee-ette, You-knee-form."

Better say it one more time—"Whiskeeee Brah-voh thureee, Aaal-faaa, Jouuu-lee-ette, You-knee-form.

"You are faaaiiive by faaaiiive, fifffteeee faaaiiive in Floooreeedaaahhh.

"How copy?"

A half second of silence—I know he didn't hear me. Turn off the car, you can't hear over the engine!

"Roger, Roger, Whiskey Bravo Three Alfa Juliett Uniform, thank you for the five by five, you are five by two, fifty two, roger?"

"Uh"—start the car! (Crank, crank, crank, VROOOOMMMM!) "QSL the five by two"—what do I say now? I hear, "good contact." That's it? That's all? That's—*I did it*!

Reporting In

"Ellen, Ellen, I talked to them, the Amsterdam and St Paul Islands! Look, on the map, it's on the other side of the world, and I talked to them, right out of the car! It's my first DX—I mean foreign country!"

(She must have been giving me a "This is Valentine's Day, in case you've forgotten" look, but I never noticed.)

I run back outside, and in twenty minutes I snare a YU and a VE3, who tells me I'm out of the band (out of the band? Oops, what am I doing down there, oh please don't anyone else hear me).

I don't remember the rest of the night, though my log says that I worked a W2 and a WP2, and I was on until after 10 PM, which means I sat in the car a long time. And my wife spent Valentine's Day alone.

We're still married, and Ellen is KA4NSY. Sometime later I set up an

antenna so that I could stay in the living room of our apartment instead of having to use the car, and finally, when we made the first big move to a house, got a tri-band beam.

But I still use that original rig, combining DXing, ragchewing and public service net control work. A couple of times, especially when my job forced a move, when it seemed I was always too busy to use the radio, when the shack became the baby's bedroom ("no 10 meters today, Jim, it's his nap time"), or when the bills outran the money, I thought of selling it all and quitting.

But every time I get a new country, or break through a pile-up with my 100 watts and 20-foot-high antenna, or help someone pass traffic, I get a little taste of that Valentine's Day of 10 years ago, and I know that I'm hooked to stay.

On the other hand, I haven't worked any Valentine's Day DX from out in the car since.... QST

New Books

SPACE ALMANAC

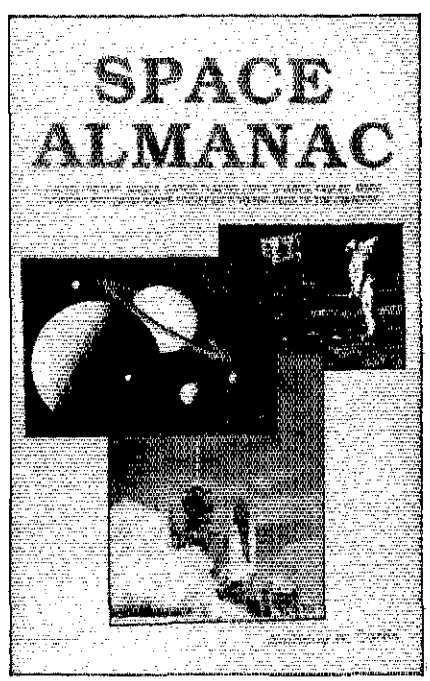
By Anthony R. Curtis, K3RXK. Published by ARCSOFT PUBLISHERS, PO Box 132, Woodsburo, MD 21798. First edition, second printing, 1990. Softcover, 8 × 5-½ inches, 960 pages. Available from ARRL for $20 plus postage and handling.

Reviewed by John Nelson, W1GNC

From AMSAT to Zond probes: If it was in space, is in space or is going into space you can find out about it in this one thick volume. This almanac is not just a list of facts; I was able to turn to any page at random and find some interesting new tidbit about space exploration: like "Kentucky" the space chick, part of a Purdue University egg-hatching experiment aboard the shuttle *Discovery*. There are seven detailed sections—astronauts, space stations, shuttles, rockets, satellites, solar system, deep space and a comprehensive calendar of space history and list of future space plans from around the world.

Twenty-nine pages are devoted specifically to Amateur Radio satellites. What is most interesting is the list of future launches, including the possible ham shack aboard the US space station *Freedom*. You'll find additional information about ESA's *Ariane* launch vehicles used to put the current OSCARs and Microsats into orbit. One minor flaw in the book is that it is copyrighted 1990, but the information on the Microsat launch date is based on information about six-months old. If you're into WEFAX, there are descriptions of the first weather satellite, *Tiros I*, launched in 1960, and those currently in operation. Also in the "Satellite" section are descriptions of many interesting communications satellites. An interesting bit of trivia: There were satellites from 21 countries in orbit on December 31, 1988. In all, 19,759 objects had been put into space (7,119 were still there) as of that date.

The biographies and information on Astronauts and Cosmonauts and their training gets the book off to the right start. What are some of our famous space heroes doing today? Find out!



Of course, there is coverage of SAREX—the Shuttle Amateur Radio Experiment in the "Space Shuttle" section. Besides descriptions of W5LFL and WØORE's operations from space, you can learn about the planned operation of Dr Ronald A. Parise, WA4SIR. There's a handy list of NASA Acronyms and Glossary also in this section. Descriptions of the experiments performed on the shuttles makes for interesting reading.

What did we learn from *Skylab*? What is the mission of the *Freedom* space station? How and when will it be built? What countries besides the US are involved? These questions are answered in the "Space Station" section of the book. You can also learn all about the USSR MIR space station, including background on the UIMIR operation from space. Find out about plans for a Russian space colony.

A major topic today among hams is sunspots, and the "Solar System" section tells what has gone on and what is going on the sun's surface. Interestingly, the current solar activity may help remove some of the "space junk" from orbit. There are space probes scheduled for the 1990s with a number of different missions which are described. You can also find out what we've learned from past space probes. The "Deep Space" section is even more fascinating: Supernovas, pulsars, neutrinos, an Einstein ring, black holes and more are covered. The section on "Rockets" not only covers launch vehicles, but spaceports as well.

With any reference book a detailed index is important. The *Space Almanac* devotes 33 pages to the index. There is a brief summary table of contents at the beginning, with more detailed contents given at the beginning of each section. I recommend this book because it makes fascinating reading and is a valuable resource. By the way, more than 20 years ago there were ten Zond probes launched by the Soviet Union: eight to the moon, one to Venus and two to Mars. Now you know. QST

Hams Organize Communications for Winter Special Olympics

How do you put together a network that will keep track of 1100 international athletes and 9000 volunteers over a mountainous 1000-mile area?

By Mike Hugo, KA6OIJ
1313 Autumn Ave
Ridgecrest, CA 93555

Communications preparation began 18 months before the Reno/Tahoe International Winter Special Olympic Games (IWSOG) commenced in early April 1989. A committee was formed, and the project of providing communications support for the games was under way. The games were the largest event ever held in the Reno/Lake Tahoe area and the largest Special Olympics in the history of the organization. The 1989 International Winter Special Olympics was to have more athletes participating than the 1960 International Winter Olympic Games in Squaw Valley. Because this would be a world-class event, the planning had to be complete. The entire world would be watching.

Design and Construction

The design and construction of a communication system required careful planning and many hours of work. The games were to be held at four locations (in two states) that covered more than 1000 square miles of mountainous terrain. No existing systems provided the required coverage. Peavine, north of Reno, at 8600 feet and Mt Rose, between Reno and Tahoe, at 10,200 feet, were chosen for the main equipment sites because they would provide excellent coverage.

The Peavine site was built in late May 1988 and possessed a remote base with outputs on 443 and 144 MHz. The Mt Rose site had 146- and 220-MHz repeaters. Both sites were hooked to backup power in the event of a commercial power failure during the games. Once winter set in, the only access to the sites would be via Snow-Cat or helicopter. The radios were put through their paces before the games, and arrangements were made to get to the sites if a problem should arise.

Recruiting Volunteers

It was apparent early on that there would be no such thing as "too many hams." The more hams, the more complete the communications would be. Personal visits were made to local ham radio organizations within a hundred miles of Reno to recruit volunteers. Mailings were sent to clubs that were farther away.

Each ham volunteer was sent an information packet containing general information about the games and specific communication information. The packet also included two forms that asked for information on equipment and the volunteer's availability. The forms were returned to Jim Newell, WA7UJB, who tracked the ham volunteers. Jim took the information and entered it into specially developed software that matched the volunteers to the various positions. Information also was forwarded to the IWSOG committee who entered it into its computer, along with the other 9000 nonham volunteers. The IWSOG staff then assigned credentials for access to restricted areas.

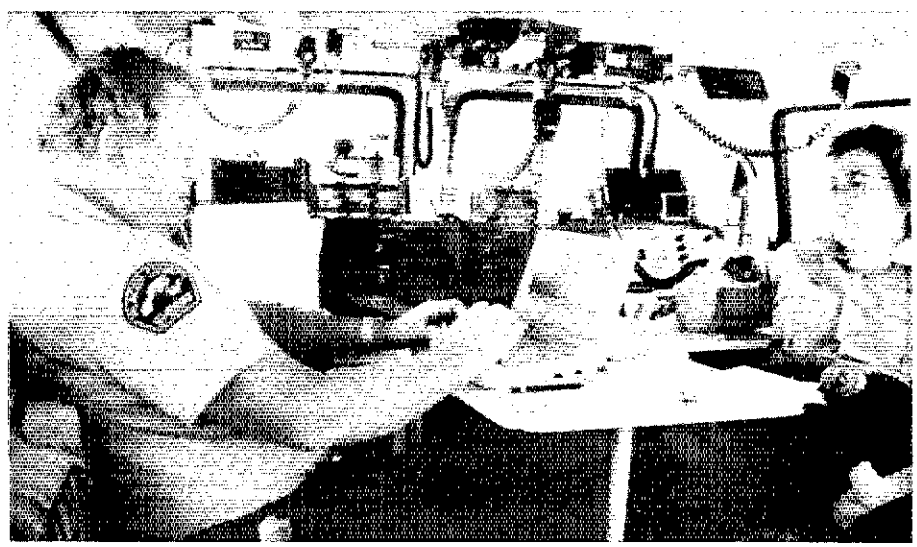
Weeks before the games, a net was set up on the Mt Rose repeater to inform hams in northern Nevada and California of the games. Because of the extensive coverage of the Mt Rose machine, almost every ham who volunteered could check into the informal net and ask questions.

All Preparation in Place

Before any skaters stepped on the ice or any skiers took to the slopes, the communication staff had logged 2500 volunteer hours. Although this seems like a lot, it is important to note that the communication committee was only one of 51 committees, and it provided communications for the other 50.

Each committee's communication needs was assessed. The information was used to set up a net structure and develop a handbook that was sent to the 150 ham volunteers. The handbook addressed topics such as crisis protocol, surviving in the mountains, net structure and frequencies.

There were three types of nets. The global logistic net, consisting of four stations, linked all the locations. Emergency traffic also could be passed on this net by

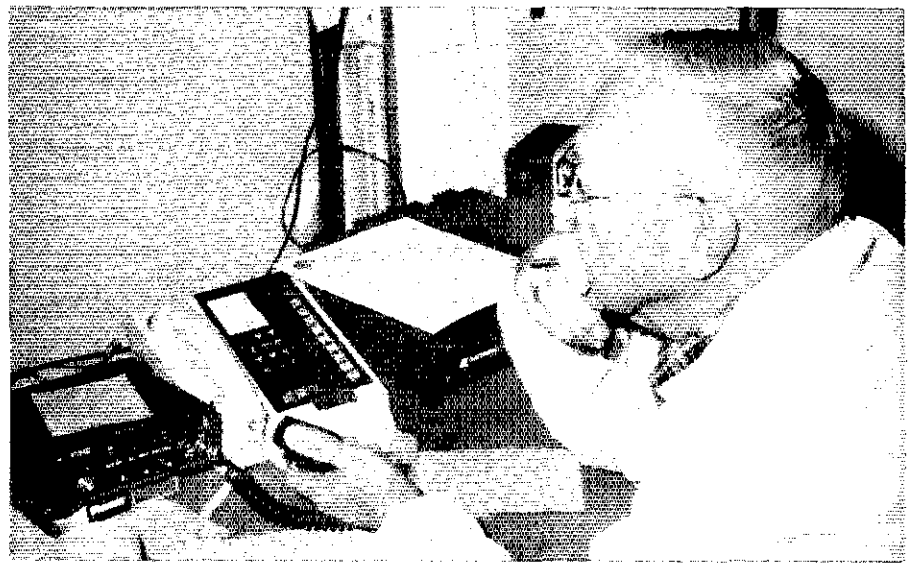


(l-r) Bob Dobbins, K6KKF, and MaryAnn Simmons, KI6TE, serve as net control operators in the communication van at Squaw Valley. *(photos by author)*

hams who found themselves between main event locations. Each location had a medical net that handled traffic and tracked medical personnel. Because of the sensitive nature of medical communications, all operators on this net used headphones to keep spectators from overhearing the transmissions. Repeater outputs were used most of the time, except when a medical team left a building. Also, each location had a logistic net that handled all nonmedical traffic.

Because of the large numbers of hams involved, all nets used logistical names except as required by law. This made personnel changes easy, as the net control only had to keep track of positions and not individual operators.

Neil Dresbach, WA7KCD, Walt Bartlett, WA1WSX, Ken Stuber, N4KS, Larry Oakley, W7AAA, and Don Freeman, KC7LX, volunteered to be the managers (decision makers) at each location. They scheduled the hams, with the assistance of the computer, and worked out problems as they arose.



Bruce Pfeiffer, N7CPP, acts as net control for the Reno-Sparks medical net.

April Fools' Day

April Fools' Day brought its first surprise early in the day when the ice rink failed to freeze, closing the Lawlor Event Center. The main communication room (tactical name Reno Comm) had all nets active. Mount Rose linked the communication centers. Without Lawlor, the net consisted of three stations—Reno Comm, Squaw Valley and Royal Gorge. Reno Comm's logistical net linked the volunteer check-in center, Olympic town, information centers and other stations as needed to the main IWSOG nerve center. On a 220-MHz repeater, a medical net kept tabs on the roving medical teams and linked those teams to first-aid stations and doctors. The net control provided access to medical records and to the landline. The phone system was operated by Telephone Pioneers of America.

Most of the week, at least ten nets, including a packet radio net, were active simultaneously. Each location had a packet station connected to KI3V, a DX packet cluster node that served as an IWSOG staff-spotting network. Since the IWSOG staff did not wish to carry commercial radios or beepers, each staffer was requested to check into an information booth when they arrived at an event location. The information was entered into the Packet Cluster where the information could be looked up as needed. Public address announcements or other locating means could then be used to find the individual. The Packet Cluster also proved useful in tracking the bus transportation.

The second incident of April Fools' day occurred when a protective circuit at the 8000-foot level on Mt Rose tripped because of high winds and power-line slapping. The emergency power at the repeater site did kick in, but cut out after 15 minutes. The local power company was called and already had a crew on snowshoes trekking up the mountain. In just over three hours, the crew had reset the breaker and contingency plans for the next day were canceled.

Opening Ceremony

Olympic champion Bruce Jenner officiated the opening ceremonies at Squaw Valley in a wet snow storm. All three nets at Squaw were in operation—an over-the-hill net to Reno Comm, a logistical net and a medical net. The Olympic torch arrived from Los Angeles, and the athletes took the Special Olympic oath: "Let me win, but if I can not win, let me be brave in the attempt."

Long Hours

The week went surprisingly well. Every night, entertainment was held for the Special Olympians and the public. There were no requests from other committees to cover the evening events. The medical teams, nevertheless, needed communications, so each day a call went out for help. The hams who worked all day and then volunteered for the special events could expect to put in 16-hour days. Some of the hams thrived on long days and volunteered every night.

Special-Event Station

Separate from the regular operations was a special-event station. A sign reading, "Send a Message Home via Amateur Radio," greeted each visitor at the entrance to the Wild West Olympic Town. Amateur Radio station W7 International Special Olympics (W7ISO) experienced a few pileups and worked 350 stations, as hams tried to pick up a commemorative QSL card. Rich Warren, N7RH, chairman of

Special Olympics

Special Olympics
1989 International Winter Games
Reno/Tahoe

Special Olympics is the world's largest program of year-round sports training and competition for mentally handicapped children and adults. It reaches more than a million athletes, ages eight and up, and holds international games every two years, alternating between summer and winter games. The purpose is to give athletes the opportunity to develop physical fitness, demonstrate courage, experience joy and participate in sharing gifts, skill and friendship with families, other Special Olympians and the community. The International Games are the final competition resulting from over 15,000 local games, meets and tournaments held both summer and winter each year in communities worldwide. Over 600,000 volunteers provide manpower for Special Olympics throughout the world.

For more information about Special Olympics worldwide, write to Special Olympics International, 1350 New York Ave NW, Suite 500, Washington, DC 20005.



Codirectors of the 1989 International Winter Special Olympic Games Mike Buttler (r), WA7RPS, and Tim Melarkey, WA7MOF, embrace after the closing ceremonies.

Wide Area Data Group and his XYL Donna, N7EQV, oversaw operations. The station consisted of an ICOM IC-735 HF transceiver into a vertical antenna situated on top of the convention center.

The Week Ends

The week went by quickly. Most of the hams probably did not have a firm grasp of how large the event really was until they got involved. It is difficult to describe what was felt by the volunteers. Volunteer Bill Finley, N7JTJ, explained, "I had no idea how important volunteers were until I watched the beginner [downhill ski] course at Squaw Valley. The support that those volunteers gave was incredible. The athletes would come up to me and want to show me their medal or say hi. I will be back for more of this heart-warming experience. Thanks..."

Bill's words are typical of many volunteers—not just hams. The event was supposed to be fun, and it was. Problems arose, but the good far outweighed the bad. The Truckee Meadows Amateur Radio Association (TMARA), the organizing club, could not have put on the event without help from both the Amateur Radio community and private enterprise. Both repeater sites performed spectacularly. Coverage of all areas was flawless. Mt Rose not only covered the event locations, but also major portions of California and Nevada. The huge coverage of the Mt Rose machines will be an asset to the area for years to come.

Many companies and organizations contributed to the Amateur Radio effort, including: Larsen Electronics, ICOM America, Ham Radio Outlet of Burlingame, Scala Antennas, Bally Engineered Structures, the University of Nevada Reno Electrical Engineering Department, and the Nevada Division of Forestry.

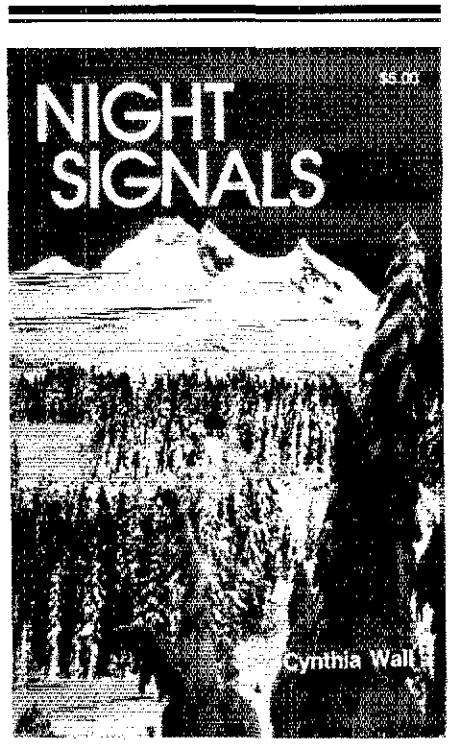
The amateurs who donated time are to be commended. It was the individual amateur who gave communications skills to a team effort that made the Amateur Radio effort a success. They displayed professionalism and real teamwork.

After the crowd was gone and the fireworks' smoke had dissipated, only three stations remained on the medical net. Tim Melarkey, WA7MOF, and Mike Buttler, WA7RPS, the codirectors of communications, embraced—"We did it! We did it!," they cried, thus ending an extremely successful, all-out amateur communications coordination project.

New Books

NIGHT SIGNALS

By Cynthia Wall, KA7ITT. Published by the American Radio Relay League, Inc, 225 Main Street, Newington, CT 06111. First edition, 1989. Fiction, softcover, 168 pages, $5.00.



Imagine yourself racing against time to find an injured fellow ham lost deep in a snow-covered wilderness. You have only his weak and intermittent 2-meter transmissions to help guide you to him, and to make matters worse, his injuries have made him incoherent and unable to precisely name his location. A new snow storm is rapidly approaching your search area...his life hangs in the balance...

Kim Stafford, KA7SJP, heroine of the newest Amateur Radio adventure from the publishers of the Tommy Rockford novels, faces just such a race against time as she helps search and rescue personnel locate her newest Amateur Radio friend, Marc Lawrence. Kim, a bright and lively high school senior and Marc, a college student are center stage in this fast-moving and enjoyable action-adventure novel. Wall's exciting and descriptive writing enables the reader to experience the fast-thinking efforts of Kim, Marc, and the rescuers as fully credible and highly engaging. Any ham who has participated in an emergency communications situation will feel the tension and excitement of this first Kim Stafford adventure as totally believable.

Several beautiful Oregon and Pacific Northwest settings provide the backdrops for the action. Via Amateur Radio, a network of hams participate to provide the critical links with emergency agencies, police and media. Through Kim and Marc we feel the joy (and occasional pain) of the chance contact that leads to a full-fledged and hazardous adventure. Admirers of Nancy Drew, the Hardy Boys and other books for young adults will enjoy the resourcefulness of these two intrepid hams, who clearly show that Amateur Radio can save the day and help you meet a nice companion!

Night Signals is available from ARRL and will make an excellent gift for any young person interested in Amateur Radio. Order one for yourself, put the coffee on, bundle up in the easy chair and get set for a thoroughly enjoyable mid-winter read. —*Mary E. Schetgen, N7IAL*

VHF/UHF Advisory Committee 13-cm Band Plan Proposal

By Thomas J. Kirby, W1EJ
Chairman, VUAC

The VUAC has carefully studied the 13-cm bandplan proposal published in April 1988 *QST*. The comments resulting from that proposal and the letters received from 1985 through 1987 were the basis for VUAC discussion. The VUAC has evolved this proposal to achieve the goals of several amateur technical communities and to satisfy constraints arising from electromagnetic compatibility considerations. The overriding goal is to minimize interference between amateur users at 13-cm. An AMSAT review finds that ISM-segment microwave ovens tend to be centered near 2430 MHz. AMSAT intends to build a satellite for wideband high-rate digital transmissions, thus, the VUAC suggests the high-rate digital satellite subbands. Enthusiasm for amateur TV is growing rapidly. The VUAC adds TV spectrum to the plan to support this interest. Military radiolocation might be found anywhere in this band. It cannot be planned around, but must be managed as encountered.

In consideration of the 9-cm satellite allocation, an 8-MHz satellite band is provided at 2430 MHz. The VUAC has attempted to structure the spectrum architecture to locate the less-interference-susceptible communities closer to the high-rate digital channels. Rates to 10 megabauds can be supported within the 5-MHz digital channels.

The VUAC suggested the weak-signal calling frequency be at 2304.2 MHz in its original review. We received many objections to that provision. The VUAC presently recommends 2304.1 MHz for that calling frequency. A study underway to examine the calling frequency question is scheduled for completion in 1992. The FM simplex calling frequency is recommended to be 2305.2 MHz.

The VUAC seeks further member input on this proposal; send to the chairman via HQ. It is the function of the Board's Membership Services Committee to reconcile any differences proposed by the repeater, satellite and digital communities.

Table 1 VUAC Proposed 13-cm Band Plan

Frequency (MHz)	*Activity*
2300-2310 MHz	
2300.0-2303.0	High-rate digital
2303.0-2303.8	Low-rate digital
2303.8-2303.9	All adjacent users
2303.9-2304.1	EME & CW
2304.1-2304.2	EME, CW & SSB
2304.2-2304.3	All narrow band modes
2304.3-2304.4	Unattended beacons
2304.4-2304.5	NB voice modes
2304.5-2304.7	Linear translator in
2304.7-2304.9	Linear translator out
2304.9-2305.0	Experimental beacons
2305.0-2306.0	FM simplex
2306.0-2309.0	FM repeaters
2309.0-2310.0	Control & aux links
2390-2450 MHz	
2390.0-2396.0	Amateur TV
2396.0-2399.0	High-rate digital
2399.0-2399.5	Low-rate digital
2399.5-2400.0	Control & aux links
2400.0-2403.0	Amateur satellite
2403.0-2408.0	Amateur satellite & high-rate digital
2408.0-2410.0	Amateur satellite
2410.0-2413.0	FM repeaters
2413.0-2418.0	High-rate digital
2418.0-2430.0	Amateur TV
2430.0-2433.0	Amateur satellite
2433.0-2438.0	Amateur satellite & high-rate digital
2438.0-2450.0	Experimental WB TV & spread spectrum

New Products

LTA HF AND VHF YAGI ANTENNAS

☐ LTA Industries has introduced a line of monoband Yagi antennas based on their successful 28-MHz monobanders. The new antennas cover the 7, 14, 18, 21, 24 and 50-MHz bands, as summarized in the table.

Shipping costs are not included in the tabulated prices. All antennas shown except the LT420HD and LT520HD are shipped via UPS; the '420HD and '520HD are shipped by truck, freight collect.

LTA also manufactures a line of 28-MHz antennas. Stainless steel hardware kits are optional. These antennas were designed using computer antenna-modeling software, and are optimized not for gain, but for pattern cleanliness. LTA's antennas use gamma or beta matches, depending on the model.

For more information, contact LTA Industries, 281 Dartmouth Dr, Canfield, OH 44406, tel 216-533-0087.—*Rus Healy, NJ2L*

LTA Industries Yagi Antennas

Antenna	*Band (MHz)*	*Number of Elements*	*Boom length (ft)*	*Price*
LT340	7	3	40	*
LT420	14	4	26	$360
LT420L	14	4	34.5	$445
LT420HD	14	4	40	$619
LT520	14	5	34.5	$459
LT520HD	14	5	40	$659
LT417	18	4	26	$345
LT517	18	5	34.5	$449
LT415	21	4	17	$195
LT415L	21	4	26	$254
LT515	21	5	26	$269
LT412	24	4	17	$185
LT512	24	5	26	$259
LT806	50	8	37	$259

*Built to order. Contact factory for price.

The ARRL and QST in no way warrant products described under the New Products banner.

Strays

AMATEURS WANTED FOR STUDY

The Oklahoma Research Center for Continuing Professional and Higher Education is studying how amateurs prepared for their license examinations. Participants will be asked to complete a questionnaire, and the Center would also like to review amateurs' published and unpublished biographies. Contact Terence Redding, WB5LMJ, University of Oklahoma Research Center, OCCE/202 McCarter Hall, Norman, OK 73037.

QST congratulates...

☐ J. D. Alexander, W5VMY and Frank Savat, Sr, WA5YOI, both of Shreveport, Louisiana, who were presented with the National Weather Association (NWA) Non-Membership Public Service Award at the NWA National Convention in Norman, Oklahoma. Alexander and Savat serve as Area Coordinators of the Volunteer AR-LA-OK-TX Severe Storm Spotter Corps.

Happenings

Conducted By John C. Hennessee, KJ4KB
Regulatory Information Editor

FCC Proposes Service Rules for Land Mobile Operation on 220-222 MHz; ARRL Court Battle Continues

In a Notice of Proposed Rule Making numbered PR Docket 89-552, the FCC is proposing to establish service rules for use of 220-222 MHz by private land mobile licensees. The proposed amendment to Part 90 will establish the necessary framework for the Commission to begin licensing land mobile operators. Most amateurs are familiar with the FCC Order in Docket 87-14, issued on September 6, 1988, reallocating the amateur 220-222 MHz band to the private and governmental land mobile service. The FCC stated that its main goal in the reallocation was to "provide unused spectrum for the development of spectrally efficient narrowband technologies."

The Commission is asking for comments in three areas. The first is that 220-222 MHz be divided into 200 5-kHz channel pairs. Second, the FCC has proposed making most frequencies in the 220-222 MHz band available to any person or entity eligible under Subparts B-E of Part 90.

Third, the FCC has proposed that some of the channels be designated as "noncommercial" for use by licensees to meet their internal communication needs. The Commission will bar commercial operations from these channels for five years. At the end of that period, private carriers would be free to apply for unoccupied frequencies. The FCC has proposed channels for nationwide use (such as the system envisioned by United Parcel Service) and others exclusively for local use. To receive license approval, national users would have to show financial responsibility. They would then get ten-year licenses. Controversy also centers on the FCC's assumption that there would be no loading requirements because they expect the marketplace to assure that the spectrum is used efficiently. Commissioner James Quello expressed concern that the lack of loading requirements could result in inefficient use of spectrum.

The ARRL has argued that there is no need for additional land mobile spectrum and that amateur considerations were not adequately addressed. Amateurs had a major ally in this case briefly, as the Justice Department, acting on behalf of the National Communications System, stated that the reallocation was contrary to national emergency preparedness goals. The Justice Department had filed suit against the FCC in the US Court of Appeals for the DC Circuit. Acting on a letter from the National Telecommunications and Information Administration, however, the Solicitor General has withdrawn the suit, and thus, the case known as United States of America v FCC is closed. The ARRL court case continues.

FCC SEEKS INPUT/ASSISTANCE IN RESOLUTION OF AMATEUR DISPUTE; ARRL RESPONDS

On October 11, FCC Special Services Division Chief Robert H. McNamara wrote to several amateurs seeking information and comments on phone patches, information bulletins, and over-the-air telegraphy practice. The letter requested information and insight that could help bring a resolution to "the unfortunate continuing over-the-air dispute that takes place on the amateur 20-meter band...which is jeopardizing international goodwill—a fundamental principle of the rules for the amateur service in the United States..." One recipient of McNamara's letter was W1AW Trustee John Lindholm, W1XX.

ARRL's response was submitted on November 15 by Counsel Chris Imlay, N3AKD, on behalf of Lindholm and the ARRL. It begins with pertinent background information:

"Your letter correctly characterizes as unfortunate the over-the-air disputes that have arisen about certain operating practices that have come to be regarded as controversial. However, the League knows of no particular reason to include 'telegraphy practice' in the category of controversial operating practices. As will be discussed, the code practice transmissions from station W1AW continue to be widely used and appreciated.

"...communications on behalf of third parties has been a part of Amateur Radio from its earliest beginnings in the United States. The very basis for the formation of the League in 1914 was to organize amateurs to relay messages on one another's behalf in order to overcome the limited range of the amateur stations of the day.

"It was not until the 1930's that international limitations were placed on amateur traffic, at the insistence of European governments whose telecommunications monopoly was a source of considerable revenue. It was not until 1972 that the FCC specifically prohibited 'business communications.' The imposition of these restrictions was itself quite controversial because it put amateurs, for the first time, in the position of having to evaluate the content of the messages they were relaying.

"Other background essential to an understanding of the issues raised concerns the concept of interference within the Amateur Radio Service and the extent to which operators are obliged to avoid interfering with one another. Willful and malicious interference is a violation of the rules, but interference that is merely a by-product of normal operating is not. In the crowded HF amateur bands, avoiding causing unnecessary interference to others is important to efficient operation; but a tolerance for interference and a willingness to cope with it as a fact of life is equally important."

With this as background, the League addressed McNamara's questions:

FCC: Is there a channel plan for the analog emission segment of each amateur service HF band?

ARRL: There is no channel plan, nor should there be, except in the very limited case where the operation of unattended stations may be authorized by an administration for good cause shown. The degree to which amateur stations can share the same or adjacent frequencies is dynamic: often, interference can be reduced to an acceptable level by a slight adjustment in operating frequency. This would not be possible in a channelized scheme.

FCC: What portion of the analog segment of each amateur band is used by FCC-licensed amateurs for domestic and international third-party telephony communications? What is the general nature of these communications? How many phone patches are transmitted per day by band? What effect does the transmissions of such communications have on the Amateur Service? Why aren't other communication services used for such communications?

ARRL: Domestic third-party telephony communications are a small part of the communications being conducted at any given time. Their effect on other amateur communications is minimal except in the very limited instances where disputes arise as to the "right" of one station or group of stations to use a particular frequency. The League regrets that these disputes arise since no amateur has a mutually exclusive right to operate on a particular frequency. Such disputes could often be avoided if the operators involved were more flexible in their choice of operating frequency.

There is a greater temptation to use Amateur Radio inappropriately for inter-

national than for domestic third-party communications, but abuses can be addressed adequately through enforcement of existing regulations.

FCC: What portion of the analog segment of each amateur band are FCC-licensed amateurs using for information bulletin telephony communications? How many amateurs listen to these transmissions? How many bulletins are transmitted per day? What effect do these transmissions have on the amateur service? Why aren't amateur digital systems used exclusively for such communications?

ARRL: Station W1AW has transmitted brief information bulletins using telephony emissions for decades. It has been common practice for other amateur stations to conduct similar operations, usually on a localized basis, and usually as a part of a scheduled net or on some other limited, scheduled basis. Such bulletins are very important to the dissemination of timely and accurate information to radio amateurs. In recent years there has been a trend toward amateurs receiving these bulletins via digital modes: however, not all amateurs have access to digital modes, and the telephony bulletins still serve a useful purpose.

FCC: What portion of the analog segment of each amateur band are FCC-licensed amateurs using for telegraphy practice communications? In view of the availability of recorded telegraphy training material, why are amateur service frequencies still used for this purpose?

ARRL: W1AW transmits Morse code practice in four one-hour segments on weekdays, and three one-hour segments on weekends. While higher speeds are used in Code Proficiency Qualifying Runs, the W1AW transmissions concentrate on the speeds required to pass the examination elements for FCC amateur licenses. Amateurs value this service highly, and it's well accepted in the Amateur Radio community.

Audio cassette tapes and computer programs are useful tools but audio tapes can be memorized after they are used a few times, giving the user a false sense of accomplishment; computer programs require expensive equipment. Neither method provides experience in copying Morse code under actual on-the-air operating conditions.

FCC: Suggest a statement of practices that you believe should be followed by amateur stations transmitting third-party communications, information bulletins, and telegraphy practice.

ARRL: At the urging of the FCC staff, the League in the mid-1970s developed the eleven-point "Phone Patch and Autopatch Guidelines" that appears in the *FCC Rule Book* (8th ed) on pp 13-15 to 13-17. These guidelines have withstood the test of time, and are generally accepted as a useful supplement to the Commission's Rules.

The League believes that the definition of the term "information bulletin" contained in the Commission's Rules should be strictly applied and enforced. Operators of amateur stations who cannot or do not wish to conform to these strict limitations may more appropriately seek licenses in the Broadcasting Service.

Finally, concerning telegraphy practice, the only guidelines needed are to ensure that the purpose of the transmissions is to provide telegraphy practice and not to engage in one-way transmissions that otherwise would be illegal:

- The text should not be generated randomly, since such practice material is readily available via other media.
- The text should be taken from a published, readily available source to facilitate checking accuracy of copy.
- The text should relate in some way to Amateur Radio.
- The text should not be sent repeatedly.

Based on the response from ARRL and others, the FCC will consider its next steps in this ongoing HF "dispute." McNamara says that possible alternatives range from a ban on all third-party traffic on amateur frequencies to rules that would designate certain frequencies where only third-party communications could be conducted.

ARRL FILES PROPOSAL FOR AUTOMATIC HF OPERATION OF RTTY AND DATA TRANSMISSIONS

On December 12, ARRL Counsel Chris Imlay, N3AKD filed a petition for rule making with FCC seeking the adoption of rules to permit limited HF RTTY and data communication under automatic control.

The 24-page petition draws on the experience gained during the past 2½ years under the Special Temporary Authority (STA) granted to the League in mid-1987 permitting a limited number of packet radio stations (known as SKIPNET) to operate under automatic control on specific HF frequencies forming an organized "long haul" message forwarding network. The League's conclusion based on this experience is that the desirability of automatic operation on the HF bands has been firmly established and, in fact, it is now an integral part of the normal amateur radio activity in all ITU Regions.

The League's proposal seeks inclusion of automatically controlled AMTOR and Baudot as well as data modes. In the petition, ARRL says "The feasibility of automatically controlled operation on AMTOR has been demonstrated by US amateurs operating under special temporary authority...AMTOR is more robust than is packet radio and is used to bridge difficult radio paths...Thus, its operations under automatic control is not only feasible but necessary for the development and efficient operation of amateur networks...manually controlled Baudot RTTY 'mailboxes' (or MSOs) have been active in the Amateur Radio Service since the early 1980s...the software controlling the mailboxes has provisions which allow the interrogating station to ask for repeats. Manual control of these mailboxes...is an unnecessary burden on the mailbox system operators...The technology and operational experience using each of these modes has matured to the point that this is now possible...the benefits of automatic operation are shared by amateur operators worldwide and are instantly available to provide public service during disasters."

The petition seeks designation of the following band segments as being available (not exclusively) for automatic control of RTTY and data transmissions:

- 3.605 to 3.615 MHz
- 7.035 to 7.045 MHz,
- 10.140 to 10.150 MHz
- 14.090 to 14.100 MHz
- 18.100 to 18.110 MHz
- 21.090 to 21.100 MHz
- 24.920 to 24.930 MHz
- 28.100 to 28.120 MHz.

In a separate letter to SKIPNET members, ARRL Executive Vice President Dave Sumner, K1ZZ, explained why these particular frequencies are suggested in ARRL's petition. He said that the ranges chosen in most bands are probably self-evident except for those in the 20- and 40-meter bands.

"The specific frequencies used by SKIPNET stations have shown that it's possible to shoehorn in with other US users. But, we have received complaints from societies in other countries about HF packet frequencies, particularly in the 20- and 40-meter bands.

"On 20 meters, nearly every other country operates phone in the 14.100-14.150 MHz range, and packet operations in the lower part of that range have been a continual cause of concern to them. This has been the case in all ITU/IARU Regions including Region II—the Americas. The fact that some of their own packet operators use frequencies above 14.100 has not convinced the societies in other countries that this is a good place for packet. The worldwide consensus (with some reluctance on our part) is that packet should operate below 14.100. Of course, that puts pressure on the Baudot RTTYers and AMTOR RTTYers just below them in frequency and ultimately on the CW operations.

"On 40 meters, most countries have a narrower band—only 7.0-7.1 MHz—into which they must squeeze CW, RTTY, packet, phone and image communications. Around 7.040, or even as low as 7.030, is where their phone band starts. So, you can understand why there might be contention over packet and RTTY around 7.090.

"The frequency segments for each band were chosen after careful review of domestic and international implications. While we knew to begin with that there was no such

thing as a 'perfect fit,' we had to try for a *'best fit' solution*. Please bear in mind that we now have a viable packet network that is worldwide in scope. As such, we need to use frequencies that are compatible with the rest of the world. Even with the frequency segments chosen, there may still be the need for future adjustments, both by us and in other countries to finally arrive at common segments for automatic operation.

"We anticipate that individuals may wish to suggest some changes in the frequency segments proposed by the League. We believe such inputs to be helpful in cases where commenters take the time to consider the domestic and international implications of their proposals."

At press time, the FCC has not yet assigned a rule making (RM) number.

QST MANAGING EDITOR LAIRD CAMPBELL, W1CUT, RETIRES

November 1, 1989, marked the end of an era at ARRL HQ, as Laird Campbell, W1CUT, retired after more than 35 years of service to Amateur Radio. Few persons have contributed as much to the League or in as many different ways as has Laird. After joining the staff in 1954 as a Contest Assistant, he moved to the Technical Department where he served for nine years as a Technical Assistant. While there, he experimented with solid-state design and, we believe, made the first amateur contacts using transistor transmitters on 20, 40 and 160 meters in 1955.



After moving to the Production Department in 1964, he was named Assistant Managing Editor of *QST* a year later and Managing Editor shortly thereafter. In 1972, Laird became Advertising Manager and served in that position until being named Assistant General Manager for Business Operations by Dick Baldwin, W1RU, in 1976. Laird returned to the helm of the Production Department—while also serving as Senior Staff Assistant for personnel matters. For 11 weeks during WARC-79, Laird was Acting General Manager of HQ. He has always been especially interested in the history of ARRL and Amateur Radio and was the *ad hoc* curator of the League's Museum of Amateur Radio. Many of the artifacts in the museum can be attributed to his careful stewardship.

Laird was first licensed in 1951 as WN5TQD, which later became W5TQD. After coming to Connecticut, he obtained the call sign W1CUT. He served in the US Naval Reserve from 1948 until 1982. Laird, who hails from Pampa, Texas, and now resides in Unionville, Connecticut, is known for his "sharp" sense of humor. Laird has made a lasting impression on his coworkers, and is one who we will never forget.

PLAQUE PRESENTED HONORING 1921 TRANSATLANTIC TEST SITE

In a joint venture, the ARRL and the Radio Society of Great Britain (RSGB) have arranged for a bronze plaque to be placed at the site of Paul Godley's successful receiving station used in the famous 1921 Transatlantic Tests. In a letter read at the December 11 dedication, ARRL Executive Vice President Dave Sumner, K1ZZ, noted that it was at that site in Ardrossan, Scotland, where the first Amateur Radio signals were heard from across the Atlantic and the intercontinental dimension of our beloved avocation was born. Ian Elliot, W7JMX, of Bozeman, Montana, conceived the idea for the plaque, and his generosity made it possible.

FCC FIELD OFFICE ADDRESS CHANGES

The FCC's San Francisco Regional Office has moved. The new address is: FCC Regional Office, 211 Main St, Room 537, San Francisco, CA 94105; tel 415-744-2722. As reported in the December Happenings column, the FCC's San Francisco Field Office has new phone numbers, but the office remains on Battery Street in San Francisco.

The FCC's Chicago Field Office reports it has new phone numbers, 312-353-0195 and 708-298-5171. The address is FCC Chicago Field Office, Park Ridge Office Center, Room 306, 1550 Northwest Highway, Park Ridge, IL 60068.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Illinois, Indiana, Maine, Northern Florida, Oregon, Santa Clara Valley, Vermont and Wisconsin sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. The list of incumbents is on page eight of this issue.

A valid petition must contain the signatures of five or more Full ARRL Members residing in the section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures *on that petition*. It is advisable to have a few more than five signatures on each petition.

Petition forms (FSD-129) are available on request from ARRL Headquarters but are not required. The following is suggested:

(Place and date)

Field Services Manager,
ARRL 225 Main Street,
Newington, CT 06111

We, the undersigned Full Members of the...ARRL Section of the...Division, hereby nominate...as candidate for Section Manager for this Section for the next two-year term of office.

(Signature...Call...City...ZIP).

Any candidate for the office of Section Manager must be a resident of the section, a licensed amateur of Technician class or higher, and a Full Member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination.

Petitions must be received at ARRL Headquarters on or before 4 PM Eastern Standard Time, March 9, 1990. Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before April 1, 1990. Returns will be counted May 22, 1990. SMs elected as a result of the above procedure will take office July 1, 1990.

If only one valid petition is received for a section, that nominee shall be declared elected without opposition for a two-year term beginning July 1, 1990. If no petitions are received for a section by the specified closing date, such section will be resolicited in July 1990 *QST*. An SM elected through the resolicitation will serve a term of 18 months. The Field Services Manager will fill vacancies in any SM office between elections.

You are urged to take the initiative and file a nomination petition immediately—*Richard K. Palm, K1CE, Field Services Manager*

REPEAT NOMINATING SOLICITATION

Because no petitions were received for the Alaska and Delaware Sections by the petition deadline of September 8, 1989, as a result of Notices in July and August *QST*, nominating petitions are hereby resolicited. See the above notice for details on how to nominate.

Correspondence

Conducted By John Hennessee, KJ4KB
Regulatory Information Editor

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.

THE LOST ART OF RADIO

☐ Just about my entire career has been devoted to the generation of radio frequency energy. As a broadcast engineer and active radio amateur, I can think of little else I'd rather do. And yet, I have discovered that most of the people who do what I do are at least a generation older than I am. Although amateur literature has done a commendable job in recent years of addressing the lack of growth in Amateur Radio, the problem ranges far beyond the realm of Amateur Radio into the very heart of science and industry. Good RF engineers are almost impossible to find, and industries are considering where the next crop of technicians and engineers will come from.

Why has this discipline of radio, which at one time was the very heart and essence of electronic technology, come to the point where most people consider it an arcane science?

To answer this question, I have been forced to consider what it was that first attracted me to radio during my formative years: I liked radio because it was aesthetically appealing. I was not nearly as impressed by the capabilities of radio as I was by the very nature of radio. Radio is great, not because of what it does, but because of what it is.

Nobody buys an original Da Vinci painting to cover a hole in the wall. There are more expedient ways to achieve that goal. By the same token, there are other means of communication that are more efficient than bouncing signals off the ionosphere, but the very fact that we can bounce signals off the ionosphere makes it worth the effort. Although communication is usually closely associated with what we do as RF people, most of us dyed-in-the-wool radiophiles would find our trade equally as fascinating even in the absence of communication. Maxwell's equations appeal to the body, soul, and spirit. Sine waves are veritable works of art. Antenna radiation patterns are beautiful.

It is incumbent upon us radio initiates to convey the mystique and aesthetic aspects of our hobby to the newcomer. To fail to do that is to doom our hobby as well as the radio profession as a whole to the status of a lost art.—*Eric P. Nichols, KL7AJ, North Pole, Alaska*

GOOD SHOW, *QST*

☐ I really enjoyed reading the four-part series "Tune in to Glasnost," which appeared in recent issues of *QST*. It gave me a new insight on ham radio in the USSR.

I would be interested in reading articles on how ham radio will be affected in the rest of the Eastern European countries, with the current dramatic changes taking place. I also wonder how they will affect commercial broadcasting from these countries. I started out as a shortwave listener in the '50s and it sure is exciting to "listen to" these changes.—*Vince Staffo, WB2FYZ, Ilion, New York*

☐ The articles entitled "Tune in to Glasnost" were very well written. They helped me to understand my fellow hams "over the pole." —*Jim Spaulding, W0UO, Englewood, Colorado*

SAINTS OF THE AIR

☐ Hams do not always receive the recognition they deserve. I am referring to the recent earthquake in San Francisco. I have a son living in San Jose. I could not get through by phone and I then started listening on 20 meters and heard Dave, WO7K, and John, KB6GOZ, passing traffic on 14.300. I managed to get in and gave them my son's name and telephone number. A short time later, I received word that my son was okay. Thanks to these two hams, a mother's concern was relieved.

In the past, I have passed health-and-welfare traffic, but only now do I fully realize the importance of this service we provide for the public. I think a lot of hams regard this part of emergency traffic handling as insignificant. I now have a new appreciation for traffic handling.

Dave and John handled the net very well with no nonsense. All they wanted was the call sign, the name of the party to contact and the phone number. They did not spend 20 minutes explaining the rules of the net and another 10 minutes patting themselves on the back. They did an outstanding job and I hope this letter will bring them some small measure of public recognition.—*Minnie Flynn, KB5JM, New Orleans, Louisiana*

☐ I commend highly those who devoted so much time and energy to helping others. Many, many operators were involved in the earthquake relief efforts, but these are a few I personally observed helping their fellow man in every way possible: KE9MA, N9HMZ, K6JJU, WW6J, KH6OE, KD9IV, KB6ZZ, WD6BPT, N6WJA, AA6G, N6LSO. Thanks ham radio!—*A.A. Mack, WD6DNE, Porterville, California*

☐ My intent is to give well deserved credit to Merritt Dean, W3ISS, as well as providing yet another example of how Amateur Radio has served the general welfare of not only licensed operators, but also their families.

My wife's concern after the earthquake was to get word to our elderly parents that all members of our family in California were safe and unharmed. I put out a CQ on 15 meters for anyone outside of California willing to place a phone call. Within seconds, W3ISS responded with an offer to assist. Needless to say, my wife has a new level of respect for Amateur Radio.—*George Taylor, AA6QZ, San Jose, California*

☐ I would like to call to your attention the outstanding job performed by Amateur Radio Station WA6GFY during the recent San Francisco earthquake. The station of the Lockheed Amateur Radio Club, located near Santa Cruz, handled health-and-welfare traffic throughout the evening of the disaster.—*Art Rideout, WA6IPD, Fallbrook, California*

THE NEW FCC RULE BOOK: FB!

☐ I received my copy of the new FCC Rule Book this morning. Outstanding! The book certainly puts the new Part 97 in proper perspective. The various charts, photographs, and forms make it very interesting and informative reading. I particularly like the various items with gray backgrounds which are presented throughout the chapters. Those alone will help to answer many of the questions which often arise.

The overall balance of the material presented shows a lot of thought and concern for clarity. The 214 pages of discussion, out of the total 278 pages, will go a long way toward helping the newcomer and the old-timer understand the new Part 97.—*George Race, WB8BGY, Albion, Michigan*

LINGUISTICALLY SPEAKING... "YOU KNOW?"

☐ There's a linguistic lameness pervading the airwaves, and it's causing me to make fewer and fewer entries in my logbook. This repugnant gibberish is the constant overuse of "you know" by English speaking people expressing their thoughts.

Of the three forms of human communication—oral, written, and mechanical—there seems proof that man's ability to speak is rapidly eroding. This is evident as we listen to people stumbling, trying to verbalize thoughts.

According to a noted psychologist, people who stratify speech with the boring and meaningless "you know" do so because they are talking too close to their thinking. He called it "speech crowding the heels of thought." It's like a soldier marching out-of-step, toes thumping heels. He further theorized that people use such utterances as "pauses." A pause permits thought time to get ahead and out of the way. It seems that when thought leads speech sufficiently, there is no need for verbal rubbish such as "you know," "ahh...ahh," "what I mean is..." and "okay?"

Why should a person say "you know" when it hasn't been determined that you know what the person is talking about? If an original statement is properly presented, then why is "what I mean is..." ever necessary?

After offering an argument that seems plausible, why add "okay?"

Perhaps written and mechanical communication can hold the line during this period of decay in oral expression. I doubt it, though, for they both depend heavily on the first. In the interim, spoken communications can be improved immensely by limiting the uttered "pause" to a single timesaving word: "duhh." Know-what-I-mean?—*Lloyd G. Lewis, WB4VOP, Greenville, South Carolina*

HUGO!

☐ A big "thank you" to the nets on 14.300 MHz who came to our rescue in the aftermath of Hurricane Hugo. Many hams gave generously of their time and equipment. I personally owe a vote of thanks to Jonesy, K4QJN, who went all out with phone patches.

To the many operators who came to my assistance and the assistance of other St Croix operators, a sincere thank you! Once again, it has been proven that when commercial and public communications fail, the hams will come through.—*Joseph Feeham, KP2BL, St Croix, US Virgin Islands*

☐ I am writing to say how impressed I have been with many amateurs during both the Hurricane Hugo and the California emergencies. I would like to single out KP4IX because he called many people in the affected areas for concerned relatives here in the States. By his own admission, he had made over 100 calls in one day alone. Unfortunately there has been a dark side to the crisis. I witnessed abusive language, spurious emissions, and people calling CQ on top of or close enough to the net to cause problems. Nobody is perfect, but we should all think before we speak because we may, by our words and actions, give others outside our group the wrong impression.—*John Levis, KB2FXI, Rochester, New York*

THE PRESENT AND FUTURE STATE OF AMATEUR RADIO

☐ I have repeatedly encouraged many youngsters to get excited about this wonderful activity of ours. For the most part my efforts have failed. Most kids today want nothing to do with Amateur Radio. What can we do?

I shall make some personal recommendations knowing that nothing I say is cast in stone, but they may be good starting points.

1) If you don't own a computer then buy a good one and learn how to use it. Computers are the most advanced and best communications tools ever invented and there are plenty of user groups around with whom you can share your learning experience with your new computer.

2) Build something—anything. If you can't find anything to build, then fix something. If you can't find something to fix, then break it first so you can have the thrill of fixing it.

3) Read a book on science.

4) If you belong to a club, insist that activities on digital technology be part of the norm and not the exception.

5) Teach a kid how to solder. Become his or her friend.

6) Write a letter to the ARRL and insist that you and I get dragged kicking and screaming into the 21st century.

7) Stand in front of a mirror and practice the Gettysburg Address. We all need improvement in public speaking. Every time we press the mike button on the radio, we are speaking in public.

8) Recognize that the airwaves belong to the citizens of this country. We do not have a special claim to ownership of the spectrum. If the public use of the spectrum changes, then we must change with it.

9) Write a congressman somewhere. Tell him you want Amateur Radio to survive just as badly as he wants his political career to survive. He'll figure it out.

10) Pray like crazy we can pull this off.

It's time to let go of some of our old perceptions about who we are and what our purpose is. We can do it. I know we can. —*Larry Myers, KA2DDX, Tonawanda, New York*

IT HELPS TO CARE

☐ I recently sent a letter to Tom Requist, N6SKS. Tom made a very special effort to welcome me as a Novice operator by sending me a personal letter. I feel sure that his attitude is the very substance that reflects the reputation of the ARRL, put in yet another way.—*Jim Milliken, KB5IXU, Baton Rouge, Louisiana*

HANG IN THERE

☐ Have you ever wondered why so many new Novices never use their tickets or get on the air? Could it be that the jokers who send 18 WPM on the Novice bands are keeping them off the air? I work all the slow senders I can find. I am the first contact for many and have received quite a few thank you letters for being patient. Let's help the newcomers stay with us.—*Clyde Stanfield, WA6HEG, Upland, California*

OUR COMMON DESTINY

☐ I believe those who do not use code are missing a crucial opportunity for the promotion of international goodwill—important for our times and our future.

CW is the choice of many non-English-speaking hams. The reason is not solely because CW propagates at lower power, nor that some foreign hams cannot obtain SSB equipment. Have you noticed that hams of many countries, even where voice equipment is plentiful, congregate on CW for DX work?

CW is an international language, even more so than English. Its various abbreviations and conventions allow meaningful communication between those who do not share a language. Q-signals cut down misspelling and mispronunciations, and also help maintain correct word order.

Sometimes we understand ourselves better through the eyes of others. By exchanging ideas with foreign hams, we hope to better realize that we are one human family sharing our one Earth and one common destiny. Since our lives are forever interconnected, communication is and will be required from the broadest possible base of people. CW helps accomplish this goal of Amateur Radio and of survival itself.—*Goh Kawai, N6UOK, Mountain View, California*

QSL MORALITY

☐ US hams are the winners of the award for "Not Answering QSLs." Here are two examples: After the 1988 ARRL 10 Meter Contest, I sent out 51 QSLs. To date, I have received only six in reply!

In the 1989 ARRL International DX Contest, I made 162 QSOs. From these 162 QSOs, I sent out 136 QSLs on February 25, 1989 and now, on August 25, 1989, I have received only four QSLs. I am working toward my WAS award and am hoping for better QSLing results from US amateurs in the future. —*Hans Tscharner, HB9XY, Opfikon, Switzerland*

NCJ NATIONAL CONTEST JOURNAL

NCJ features articles by top contesters, letters, hints, statistics, scores and much more. Big gun or small, the NCJ provides you with a valuable source of information on the exciting world of competitive radio.

The January/February issue includes:

- Scoring Trends in the November Sweepstakes
- Contesting on Wheels
- Honesty in Contest Exchanges
- Single-Op USA Championship
- *NCJ* Profiles: W6OAT and F6BEE
- Results, September 1989 North American Sprints, Phone and CW
- Results, ARRL VHF/UHF Spring Sprints
- Score rumors from the fall contest season
- ARRL DX Contest all-time records

Other features include humor by Bill Schrader, K2TNO, and columns on VHF/UHF contesting, contest tips, state QSO parties, and propagation.

National Contest Journal is edited by Tom Taormina, K5RC, PO Box 800228, Houston, TX 77280-0228, and is published by the ARRL. Letters, articles, club newsletters and other editorial material should be submitted directly to the *NCJ* editor.

Subscription rate for 6 issues (one year) is $10. There are additional postal surcharges for mailing outside the US; write to HQ for details. *NCJ* subscription orders and changes of address should be sent to *NCJ* Circulation, ARRL, 225 Main St, Newington, CT 06111

Strays

I would like to get in touch with...

☐ anyone who has assembly instructions for a Wilson Systems, Inc MT-61 tower and RB-61A rotating tilt-over base. Roy G. Jackson, NY9B, PO Box 2013, Michigan City, IN 46360.

• *At the Foundation*

A Look At Your Generous Spirit

What does the "typical" Foundation contributor look like? What's the truth behind the perception that hams are naturally more generous than other folks?

By Mary E. Schetgen, N7IAL
ARRL Foundation Secretary

Demographics are useful to those trying to compare the characteristics and practices of diverse groups. If we could precisely define the "typical" ham, we'd have reams of information that would allow manufacturers and organizations to tailor their products exactly to our needs or for governments precisely to know the nature of their Amateur Radio constituency. But of course, there is no more a demographically pure ham than there is a typical golfer, photography buff or model railroad enthusiast.

About the most that can be said about any hobby group's characteristics are obvious generalizations. Still, there are enough characteristics shared by the members of any hobby group to enable us to form an opinion or consensus about its nature.

Let's leave the word "typical" for a moment and take a look at our Foundation contributor. He or she usually includes a contribution on his or her ARRL membership renewal notice—by far the most popular (and easiest) method of contributing. About one third of our contributions accompany hand-written correspondence to the Foundation, and roughly half of these are memorial contributions. Because memorial contributions are most often meant as remembrances of well-liked amateurs, clubs and civic organizations often contribute as a group. Whatever the form of memorial contribution, we send an ARRL Foundation Memorial Certificate to the family of the SK so they are aware of the contributor's gift, as well as a direct acknowledgment to the contributor.

Letters accompanying contributions tell us a great deal about our contributors. Most letter-writing contributors are articulate, involved hams, often active club members who truly care about the programs they support through their gifts. They speak with pride of their years of ARRL membership and on-the-air experiences. We hear from hams who not only have been generous with their contributions, but generous with another precious commodity—their time. These hams tell of years as traffic handlers or hours spent participating in emergency communications activities. We hear from Elmers interested in passing the baton of Amateur Radio knowledge and practice on to the next generation, or from the students themselves, grateful for the aid from these selfless Elmers. Although age is no barrier to those interested in supporting our programs, most contributors have been hams for a while and have a personal investment in seeing Amateur Radio continue to progress.

Packeteers, moonbounce enthusiasts, contesters, DXers, you name it—all types of Amateur Radio operators number among our contributors. But along with being hams, they represent a myriad of occupations, traditions, ideologies and income levels and they uniformly do something inherently beneficial: They show their generosity whenever they talk on the air. That this spirit of selfless giving should extend to supporting programs to perpetuate this cycle should come as no surprise. To be a ham is to be generous. It's our tradition.

There's No Time To Lose

With your arms loaded with school books as you trudge through the February snow, your thoughts may be more on your "Valentine" than the scramble to get scholarships lined up for the fall semester. After all, there's a whole summer in between, so why sweat it?

One good reason to think about scholarships is that the deadline for applying for our Scholarships Program is June 1, 1990. Transcript acceptance will continue until June 15th, but after that, you'll have to apply for next year's awards. Why miss this chance to be in the running for one of our scholarships when it's so easy to apply? Send for our complete scholarship package by writing: The ARRL Foundation, 225 Main Street, Newington, CT 06111.

Willing to Help?

If you're looking for an easy and straightforward way to include the ARRL Foundation in your will, why not send for our Simple Will Kit? We include all the forms you and your lawyer will need to make your sustaining support of Foundation programs possible. Write today for our free package: Simple Will Kit, The ARRL Foundation, 225 Main Street, Newington, CT 06111.

Contributor's Corner

We wish to thank the following for their generous contributions to:

The Bill Bennett, W7PHO Memorial Scholarship Fund
Danville S. Webber, W1PCD
C. P. Lamb

The Edmond A. Metzger Scholarship Fund
Rose M. Keith
in memory of George E. Keith

The Goldwater Scholarship Fund
Eastern Long Island ARES

The General Fund
Ross D. Lepaine, WG7I
Richard W. Wittwer, N7LNG
Matthew C. Grohgans, N2IDW
H. C. Griffin, W4DXI
Peter R. De Bruyn, W3EXP
Lowell H. Popp, K4KKV
Phil F. Colonnelli, KA6YLT
Irvin D. Dunmire, W6SJV
Francisco A. Herrera, Sr, W1JLC
Frank P. Dalcanton, KA9PWW
Marion L. Bartlett, KØOBY
Earl K. Moore, W7JZQ
Ralph F. Bergman, W9RPW
McDowell Mountain RC (AZ)
in memory of Ralph Bugg, W7OZ
Friedrich Ulm
La Porte ARC (IN)
Ketsuke Ookuma
Maury ARC (TN)
Mr & Mrs Dennis F. Manning
in memory of Austin L. Morrill, W4PCH
Geza Csige
Gunnar Egebjerg
William S. Jackson, Jr
North Orange County ROP (CA)
in memory of John E. Beardsley, W6TFM
Dick Birbeck, K6CID
in memory of Floyd Henderson, W6KON
Hamfesters Radio Club, Inc (IL)

As received and acknowledged during the month of **November**

THE ARRL FOUNDATION, INC.
"for the advancement of amateur radio"

Conducted By Luck Hurder, KY1T
Deputy Manager, Field Services Department, ARRL

There's More Than One Way to Skin a Cat!

By Bruce Eggers, WA9NEW

We've all heard that line before. I don't know where it came from—I'm not big on cat skinning—but I do know what it means and I know how it applies to Amateur Radio public service communications. In Raleigh, North Carolina, we've found a different way to "skin a cat."

Part 97.1(d) says, "Expansion of the existing reservoir...of trained operators, technicians and electronics experts." Well, I'm not sure about that "expert" part, but clearly, every ham who's put in a little time with the NTS and ARES is a "trained operator" and almost *any* ham has to know more about radio communications than the average Joe. So we are a "reservoir." How can that reservoir be put to good use?

Every year, the Department of Agriculture hosts the North Carolina State Fair in the Tar Heel capital city of Raleigh. For ten days, somewhere between 50,000 and 100,000 people pass through the gates each day. You know there are going to be problems. How can Amateur Radio help? Well, probably lots of ways—here's how our group helps.

Our local chapter of the American Red Cross provides a number of services to the public during the fair. I think the most important is at the Red Cross first aid station. On any typical five hour shift (of which there are three each day of the Fair's run), you'll find a dozen or so volunteer first aid technicians making up four or more response teams; two or three nurses handling triage and treatment; a couple of folks handling patient registration; a senior volunteer acting as shift supervisor; a medical doctor on call; a couple of ambulances standing by (usually volunteer rescue units), and two Amateur Radio operators.

The first aid station includes a communications center. Located in the center is a direct intercom link to Public Safety, providing direct access to fairgrounds security, the Raleigh police department, the Wake County sheriff's department, the Highway Patrol, and both the fairgrounds and Raleigh fire departments. Also included is telephone access to several hundred fixed points on the grounds such as gates, major display buildings, fair administration, paging services, radio links to Raleigh ResCom (the command center that dispatches all rescue units in the county), and a radio link to the inspectors on the grounds who assure the public's safety on the rides and in the displays. And, most importantly, telephone access to radio communications with the first aid teams which are positioned at a few of the major attractions for dispatch by the shift supervisor.

Now, I hope it's obvious there's no way Amateur Radio operators could possibly provide communications to all these locations using Amateur Radio frequencies. But the communications center has the hardware to get the job done. All the Red Cross needs are operators. If we weren't doing the job for them, as until recently we hadn't been able to, the Red Cross would, as they did in the past. But they'd have to assign Red Cross volunteers with medical skills to work in the communications center.

You can't administer first aid to someone who's been injured on the "Thunderbolt" ride on the other side of the midway and handle the communications center job at the same time.

Hey, I can mess up trying to put an adhesive bandage on my finger. And although I can get a sliver out of my grandson's hand with a sterilized needle, I get a little green around the gills if I see more than a few drops of blood at a time. But I can operate radios, I can copy traffic, I can maintain a log. And I can do those things better than many of the Red Cross folks could do them and I can do them just as well as the Red Cross folks can administer CPR to an apparent heart attack victim, set a compound fracture or apply a dressing to a third-degree burn. And so can most hams.

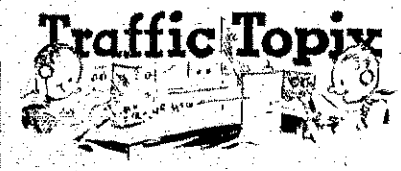
I also can set a radio to the right channel, tell whether or not a NiCd pack is properly charged and make a good guess as to whether or not two deployed units should be able to communicate between their locations with the equipment available.

We don't do it with Amateur Radio equipment on Amateur Radio frequencies. We couldn't. We're just a "...reservoir...of trained operators (providing a) service to public..."

But before I quit, let me tell you one more thing. Every time I've walked into that first aid station to pull yet one more shift in the communications center, I've always had my hand-held with me. I've never turned it on. But we've never had a tornado, an earthquake or a power outage hit us, yet. One of the double-wheeled Ferris wheels hasn't fallen over, yet. A fire hasn't forced the evacuation of our communications center and the several other emergency service centers which are located in the same building, yet.

I sure hope none of these things ever happen. But if it does, I know I can hit any one of five widely-separated, emergency-powered, autopatch-equipped Amateur Radio repeaters and a multistate linked repeater system from that location with 100 milliwatts and a wet noodle. The Red Cross can't do that. And there's always more than one way to skin a cat.

Traffic Topix



ARL Nineteen

By L. E. Patience, W4DRF

When Hurricane Hugo swept through South Carolina, there was at least one thing that caused a bit of confusion among traffic handlers—the correct use of "ARL NINETEEN." This confusion stemmed from the fact that there are presently two common uses for the text.

In the following example, the message is sent to an agency for action:

```
NR 100 W W4DRF ARL 12 BELTON SC OCT
25
AMERICAN RED CROSS
25 LEE HIGHWAY
PODUNK MA 02000
617 555 9999 BT
ARL NINETEEN JANE DOE 25 HILL RD PO-
DUNK MA 617 555 8888 BT
JOHN DOE
12 RICE STREET
BELTON SC 29627 803 555 7777
```

The originator (John) is asking the Red Cross for the status on Jane, whose address is contained in the text of the message. Note that the originator's complete address is also included so as to make the success of return message generation that much more likely.

In the following example, the query is being made directly to the addressee, rather than an agency:

```
NR 102 W W4DRF ARL 3 BELTON SC OCT
25 JANE DOE 25 HILL RD PODUNK MA
02000 617 555 8888 BT ARL NINETEEN
ADDRESSEE BT JOHN DOE 12 RICE
STREET BELTON SC 29627 803 555 7777
```

Note that the second example is the most common, certainly, and that it also contains the originator's complete address and telephone for ease of return message origination.

Traffic handlers should be aware of both versions of ARL NINETEEN, as they are each being seen in the aftermath of emergency and disaster situations on a regular basis.

Field Organization Reports November 1989

Section Emergency Coordinator Reports

Twenty-six SECs reported this month, denoting 16,256 registered ARES members. Those sections reporting were: EPA, GA, IA, IN, KY, ME, MI, MN, MO, NFL, NLI, NV, OH, OR, PAC, RI, SD, SDG, STX, UT, VA, WMA, WNY, WPA, WTX, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	110	91.70	506	1035
TCC Central	83	92.20	480	480
TCC Pacific	110	91.67	492	988
Summary	303	91.85	1478	2503
Cycle Three				
TCC Eastern	62	100.00	44	88
Cycle Four				
TCC Eastern	112	93.33	563	1118
TCC Central	76	84.40	352	718
TCC Pacific	111	92.50	525	1035
Summary	299	90.07	1440	2871

TCC Roster

Eastern Area, Cycle 2: KW1U Director. K1EIC W1FYR KA1MDM KT1Q W1QYY KW1U N2EIA WA2FJJ W2FR NN2H WB2MNA W2MTA N2XJ N3AZW N3EMD NC3V WA3YLO AA4AT W4FRR N4GHI WBPNY W4SQQ N4SS KA8CPS WT8L W8PMJ NJ8S KA8WNO WB8YDZ W8YP VE3ORN.

Central Area, Cycle 2: NØFBW Director. WA4JDH WB5YDD KD5KQ W5YQZ NS5M K5UPN W6CTZ WØGRW AE5I WØFE KFØFI VE5KZ KE5ZV WBØWNJ

Central Area, Cycle 4: K5GM Director. K5GM WB5J W5JDF KM5L K5MXQ N5TC K5TL W5TFB W5TNT KB5W W9CBE NR9K W9LKN KFØFI WØGRW AIØO NRØS NBØZ

Pacific Area, Cycle 2: ND5T Director. W5JOV K6UYK WF6O KI6ZH KF7AG VE7EIL KF7R K7OVK NØIA W7TGU W7IGC NØIA WAØYNP

Eastern Area, Cycle 3: KN1K Director. N3EMD W3JKX W3OKN AA4AT WT8L K8TPL KA8WNO

Eastern Area, Cycle 4: KN1K Director. KB1AF W1CE N1FNN KN1K W1NJM W1QYY KA1MDM KY1T KW1U W1UD W2FR W2GKZ NQ2H W2LWB W2RQ WA2SPL W3GL WB3GZU W3PQ KQ3T NC3V N4GHI W4SQQ N4SS N4TE W4UQ K4WJR K4ZK W8BO WT8L W8PMJ N8XX VE3FAS VE3GSQ

Pacific Area, Cycle 4: KØDJ Director. N2IC KA5NNG ND5T W6EOT K6LL WF6O W6VZT KA7CPT W7EP NR7E KN7B W7GHT NN7H W7LG W7VSE KJØG KØSN KØTER

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN						
CAN	30	852	28.40	.650	100.0	
PAN*	60	582	10.39	.857	93.3	
Region Nets						
1RN	60	344	5.73	.434	84.0	
2RN	59	268	4.50	.411	98.0	
3RN						
4RN	30	407	6.78	.350	73.7	
RN5	60	631	10.52	.433	87.0	100.0
RN6	60	166	2.76	.313		93.3
RN7						93.3
8RN	60	403	6.71	.352	98.3	
9RN	60	152	2.53	.260	100.0	100.0
TEN	60	907	15.10	.597	87.0	100.0
TWN	60	444	7.40	.697	81.6	93.3
ECN						
Cycle Three						
Area Net						
EAN	29	230	7.93	.572	92.6	
Region Nets						
1RN	30	75	2.50	.332	93.3	89.6
2RN	30	81	2.70	.240	100.0	82.7
3RN						96.5
4RN						96.5
8RN						93.1
ECN						93.1
Cycle Four						
Area Nets						
EAN	30	1273	42.43	1.400	94.7	
CAN	31	1105	35.65	1.213	100.0	
PAN	30	659	21.97	.843	96.1	
Region Nets						
1RN	60	469	7.82	.587	97.6	96.6
2RN	48	149	3.10	.404	77.3	86.6
3RN	30	94	3.13	.360	90.8	90.0
4RN	60	570	9.50	.396	97.3	100.0
RN5	60	505	8.42	.570	89.4	100.0
RN6	60	313	5.22	.569	97.5	98.3
RN7	60	323	5.38	.650	88.0	98.3
8RN	58	339	5.84	.426	91.0	100.0
9RN	62	318	5.13	.420	92.0	100.0
TEN	60	450	7.50	.763	72.3	100.0
TWN	56	246	4.39	.402	91.7	91.6
ECN						
ARN	30	88	2.93	.085		93.3

*PAN operates both cycles one and two.

ARRL Section Traffic Managers reporting: AL, AR, CT, DE, EMA, EPA, GA, IA, IN, LA, MDC, ME, MN, MI, NC, NE, NLI, NFL, NNJ, NTX, OH, OR, ORG, RI, SCV, SB, SC, SD, SDG, SFL, SNJ, STX, UT, VT, WMA, WNY, WPA, WTX, WWA, WV.

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 PSHR certificate from HQ.

493
W8AKF

153
WA2SPL

144
WTØG
WD8V

134
W4ANK

128
W7VSE

126
K4KFU

124
WA4VND

123
WB7WOW

122
KF8AU

120
N4GHI

118
N1FLO
N4EXQ

117
KØBXF

115
WA4EIC
K4ZK

113
WØOYH
W2MTA
WB1HIH

111
N5MEA
WB2VUK
WI2G

110
WB6DOB
WI2G

109
WB2OWO
WA4PFK

108
WA9VLC

107
KA1GEP
WB2ZJF
KA1GWE
W4PIM

106
WA7MEL

105
WA1TBY
N2EIA
KD8HD

104
WF8O
KT1Q

103
WA2ERT
KF5BL
W7LRB
WA4JDH
K9CNP

102
N3EMD
KI4YV

101
WT7A
KA2VZX
K4NLK
K5UPN
WB4DVZ
WB4FDT

100
KB9LT
W4JLS
K3JL

99
W2RRX
N2XJ
N5NZH
KC4ESG/T

98
KD6CL
NØFOO
WB8SYA
WD5GKH
WB4ZTR

97
WB8KQC
N5PGZ
KA7AID

96
W7GHT
WB7EMO
W4CKS

95
WB4WII

94
KJ3E

N4JAQ
WD9CIR
KA1JXH
WD4LOO
AA4ZV

93
N3DRM
KJ4VT
W4QAT

92
K8CQF
K1KX
K4IWW

91
N8FPN

90
W3FA
W1KX
WA2FJJ

88
N6CRV

89
W9DM
KB1AF
NM3K
W4DWN
KC4GCK

88
KE2JX

87
KØERM
AA4AT

86
KAØPDM
WT8J
N4KSO
K4MTX
KD9DX

85
WB2UVB
KA2VZX
N7MAL
NR9K
WE2G

84
KT9I
W5CTZ
W7LNE
N4JTG

83
N7JLC
WR2E

82
NO3M
WB8FSV

81
N4MEJ
KB5BNU
W7TVA
ND2S
N2GPA

79
N5ILI
WB4VMX
WA4RUE

78
WA3UNX
KA2INE
N3AZW
N7BGW
N2HLZ

77
W2MTO
KC3Y
K3RXK

76
WAØTFC
WB5J
KA1S

75
KA2QOO

74
KW1U
NY8W
N5NAV
KC2HJ
WA2ERT
KA4FZI
NB2D
WB4WQL
KA1IFC

73
KAØARP
K4FFM
KD3JK
KA1JXH
WA6WJZ
K2YAI
NN2H
NJ3V
KK4M
N8EFB
W9HBI

72
N8HSC

KA1KML
N7CSP
KB4CAU
N2AKZ
W1KK

71
WDØGUF
KA4HHE

70
N2IMP
KI4BR
N8CEI
KB2EPU

69
N6FWG/T
N6CVF
KAØVEQ
WB1BTJ
N4WFU

68
N2GPA
AC5Z
N4RHV
N8FWA
K8JDI
N1DHT

67
K1GGS
W2DMW
K2VX
K3GHH
WB8YPG
WB5YDD
W7LBK
W7LG

K4BGZ
KA8WNO
KA9QXI
K5WOD
KB7LX

66
WI8J
N2AKZ
N2HLZ
WB2QIX
NV9A
KJ9J
KM4LS

65
KØQBE
W6VOM
NR3Q
N6NLW
KB5ADE
NØIA
KD8KU
WA4RNP

64
KDØNH
NC3V
WB8R
W6SX
NB2D
KC5NG
N2IMP
NC9T

63
WA2PAC
WA8DHB
KA8CPS

KA2ZNZ
W2FR
KDØYL
NW3K
WB8KWC

62
WB2OEV
W9UMH
WA1JVV
KA1KML

61
WB2FTX
WB8SIW
K2TWZ
KA2ZKM
WS7U
WD8KBW
KA7EEE
K2MT
N4VVX

60
N2DXP
KA6HJK/T
NZ5J
WA2UKM
WB5CPY
KF7GB
WB4MMD
K2TWZ
KA2UIU
WA2UKM
WB2ZIE
KA9TVU/T

59
KA1UCU/T

WBØZNY
WB2ZIE/T

58
N2EVG/T

57
KA2KJF

56
N4ORZ/T

52
KA2JMA/T
N8INP

51
KA1RSY/T

50
KB4CYC/T
KA2UTI/T

49
N4LST

46
KA2JMA/T

44
KA2CQX/T
KA8ZGY/T

43
KA7WZM/T

40
N8JYV
N2JBA/T

The following stations qualified for PSHR during the month of October, but were not listed in last month's PSHR column: KA1GWE WB1HIH KA1IFC NM1K W1KK KA1RVN KA1UCU/T KA2UIU/T N2GPA K5CXP N6NLW W8AKF KE9DX.

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.

The Brass Pounders League Medallion is available to individual operators who achieve BPL and are listed in the BPL column for the third time. This medallion is a one-time-only award, ie, it is not issued more than once. It is not necessary that the three months involved be consecutive. Any three months will qualify an operator. Stations that qualify for the BPL medallion, upon written notification of the qualifying months to the ARRL Public Service Branch, will be awarded the callsign-engraved BPL medallion.

Call	Orig	Rcvd	Sent	Dlvd	Total
W8AKF	597	2582	2631	451	6261
W3CUL	814	926	1531	84	3355
W5TOO	0	1370	1370	0	2740
NØFBW	0	764	764	4	1532
WBØTAX	0	693	693	0	1386
W3IWI	0	646	656	0	1302
W3VR	339	391	536	36	1302
K1UGM	0	597	597	0	1194
W9ZRX	0	543	543	0	1086
WA2SPL	23	494	482	52	1051
K5UPN	0	563	471	0	1044
WD4IIO	408	77	406	77	966
K4DOR	61	379	434	6	880
KA1IFC	23	417	341	28	809
WA4JDH	1	321	387	2	711
NM1K	200	195	285	20	700
N3AZW	12	298	300	19	629
K8TVG	---	---	---	---	611
WF6O	6	270	283	8	567
N4GHI	7	310	232	14	563
KF8AU	0	230	338	11	579
WAØYJX	116	167	235	41	559
W1UD	23	257	210	22	512
WA9VND	11	251	217	28	507
WA4EIC	0	237	223	43	503

BPL for 100 or more originations plus deliveries: WB4OBC 195, NQØG 140, N5DST 137, KC4ESG 122, KØORB 111.

The following stations qualified for BPL during the month of October, but were not listed in last month's BPL column: W8AKF 8894, K1UGM 726, KA1IFC 733, W1UD 542.

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	26	331	388
Central Gulf Coast Hurricane Net	31	91	2295
Empire Slow Speed Net	30	137	439
Golden Bear Amateur Radio Net	30	136	1158
Great Lakes Emergency & Traffic Net	30	63	1158
IMRA	26	857	1677
Mission Trail Net	30	157	956
NYSPTEN	30	56	504
Southwest Traffic Net	30	268	1711
20 Meter ISSBN	26	857	272
7290 Traffic Net	47	387	3313
75 Meter ISSB Net	30	334	1321

How's DX?

Conducted By Ellen White, W1YL/4
19620 SW 234 St, Homestead, FL 33031

WA4DPU—Honor Roll at Age 28

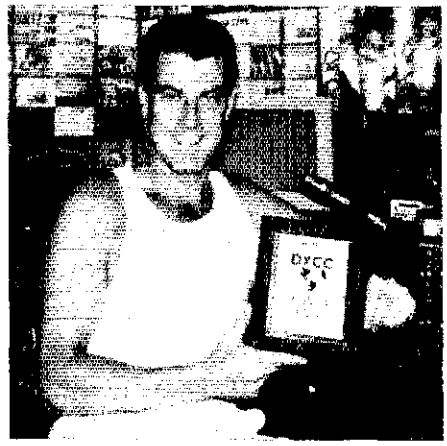
A familiar line in our DX world goes something like this: "The Honor Roll is too hard to achieve." That can be loosely translated as it "takes too long to get there" (and, therefore, *something must be wrong with the program*). Sure it's hard to make the Honor Roll, and therein lies the glory.

But not all DXCC participants are gray beards. See for yourself, with this brief visit with ARRL Life Member Ed Blalack, WA4DPU, courtesy of Charles Browning, W4PKA, publicity chairman for the North Alabama DX Club (NADXC).

Ed was first licensed at age 15. His Elmer, William Lawson, W4DJJ, was an ardent DXer at the time. Ed became a Novice DXer almost immediately. By the time he headed off to college, Ed held an Extra Class license and had confirmed 303 countries. After seven years in college and graduate school (without a radio or a single new country), Ed became a radar engineer in Huntsville, Alabama.

It took just one North Alabama DX Club meeting to get that DX bug started again. In two and a half years, Ed's Mixed DXCC totals have jumped to 319. One more new one will put him on the Phone Honor Roll, and he needs five for the CW Honor Roll. Ed is a recent past president of his club and an active participant on the DX Packet Cluster that covers five southeastern states. The equipment at WA4DPU includes an old TS-520, Alpha 78, Mosley CL-33 at 65 feet, a delta loop on 40 and an inverted V on 80.

It is also worth nothing that other NADXC members in the same league as Ed are John Pearson, KU4J (age 29), who recently submitted cards to qualify for the Honor Roll, and Mark Clark, WB4CSK (28), who is only three countries away from that achievement.



Ed Blalack, WA4DPU, earned this DXCC Honor Roll plaque at age 28. Is it tough to make the Honor Roll? Sure, but it can be done with persistence.

ARRL COUNTRIES LIST

The December 1989 printing of *The ARRL DXCC Countries List* is introduced in a particularly nice way with a *1935 QST* quote from Clinton B. DeSoto, W1CBD: "...the number of countries worked is increasingly becoming the criterion of excellence among outstanding DX stations."

From simple beginnings, membership in DXCC has been the mark of distinction among radio amateurs the world over. That DXCC membership is regarded with such prestige by DXers is a testament to its integrity and level of achievement; its high standards are intensely defended and supported by its membership.

The rules established by the founders of DXCC were consistent with the art of Amateur Radio as it existed at the time. As technology improved the ability to communicate, the rules were progressively changed to maintain a competitive environment and complement the gaining popularity of DXCC. Today's DXCC rules represent the aggregate of experience gained from administering post-WWII DXCC. Some countries on the DXCC Countries List do not, of course, meet the present criteria. These include countries grandfathered from the WWII era or those that met the criteria as it existed at the time and are not subject to deletion.

But, there's more than just a listing of ARRL countries in the December 1989 *Countries List*. There's more than information on rules, criteria, prefixes, countries, continents, zones, deleted countries, prefix cross references and the allocation of international call signs. This $1 publication is in itself a synopsis of more than 50 years of world history and geography.

Next month, XT2CW by Rudi, DK7PE/AH0G.

CIRCUIT

☐ **Glasnost:** The Western Washington DX Club is planning to host a group of Russian hams this Spring, following the superb Soviet hospitality during a July 1989 USSR visit by WWDXC club members. Please help avoid a "Glasnost Gap" by aiding this endeavor. Check with Jim Hartwell, K7UDG, 12608 Machias Cut Off, Lake Stevens, WA 98258, tel 206-334-2116.

☐ **GADX:** The Argentine DX Group will operate L73GADX and the series LQ1DX to LQ26DX through March, commemorating their first anniversary. Cards to Box 36, 1834, Temperley, Buenos Aires, Argentina. (The group also manages LU4ZS cards on and after August 26, 1989.)

☐ **Colvins:** W6KG/W6QL are on the road until April, hoping to include Niger, Burkina Faso, Bahrain, New Zealand and Tahiti on this trip. They'll spend three to four weeks at each stop. Cards to the Yasme Foundation, Box 2025, Castro Valley, CA 94546.

☐ **Cycle 22:** *KH6BZF Reports* indicates that the peak of Solar Cycle 22 may be later than the February-March 1990 time frame.

☐ **12 Meters:** Several months back, K6STI noted that the DX champs on this band were GW3AHN and KV4AD. Brian notes that a big station isn't needed and there is more of an opportunity to ragchew. You might want to check out his MN Antenna Analysis and YO Yagi Optimizer Software packages (see ads elsewhere in *QST*).

☐ **ST2:** G4WYG has a sked with his QSL manager (G4OHX) daily at 1800Z, after which he remains on frequency to work members of the RSARS, then going to the low bands. QSL direct only to G4OHX.

☐ **Stamps:** WV4V practices what he preaches and got a turnaround A22 QSL return with a Botswana stamp. Check with Brian at DX QSL Associates, 434 Blair Rd NW, Vienna, VA 22180.

☐ **VR6TC** will be attending the July 1990 Seventh Day Adventist World Conference in Indianapolis, and hopes to bring his wife **VR6YL** and visit the US for several months. *(thanks W6YO)*

☐ **WAB:** VE3OCP has obtained his Platinum Award for working 800 of the WAB grid areas; GWØECO worked 600 for his Gold Award. G4WSB has activated over 3500 of the 4000 WAB areas. 4X4JU reached new heights by working 2200 areas! Full info from WAB Awards Manager Dave Rogers, G4VID, 5 Braemar Close, Kettering, Nothamptonshire NN15 5DD, England. WAB celebrates its 21st anniversary in 1990 by providing sufficient funds to train a guide dog for a blind person interested in Amateur Radio. Details from A. C. Keeble, 1 Manor Cottages, Debden, Saffron Walden, Essex CB11 3JY, England.

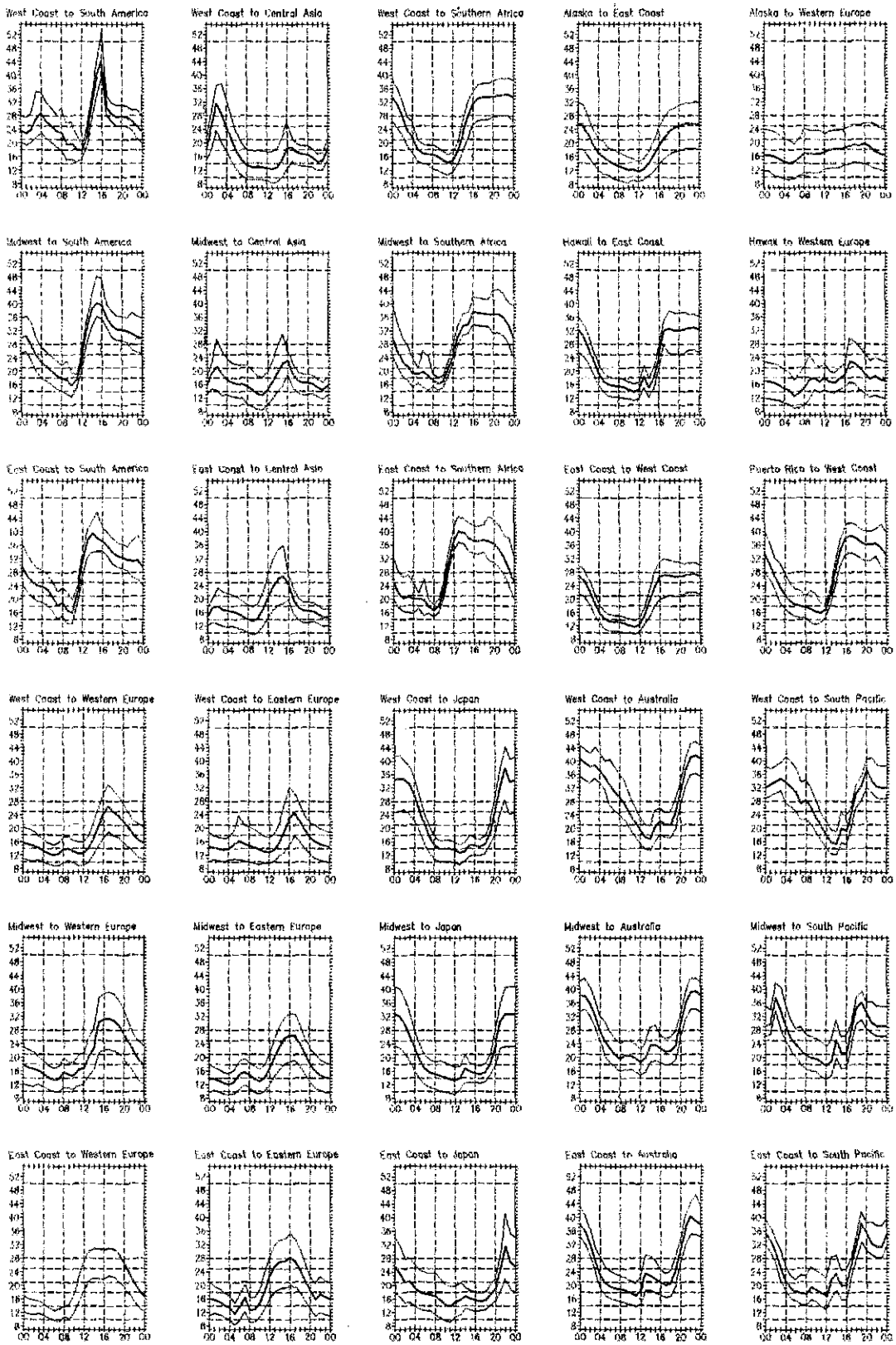
☐ **RB5FH/MM** participated with a group sailing around the Black Sea in a replica of an ancient vessel in recent months, visiting many old archaeological sites and ruins. Confirm via Bob Sherbinin, RB5FH, Box 2, Arciz, Odesskoj Oblast, 272500, USSR. *(thanks N4IA)*

☐ **VP2V:** NP2CG cards go via Howard Messing, 90 Nellis Dr, Wayne, NJ 07470. Mail for Lee Reisenweber, VP2V/NP2CG, goes via a familiar address, c/o Bob Denniston, WØDX/VP2VI, Box 8873, St Thomas, US Virgin Islands 00801-8873.

☐ **10 MHz:** The 30-meter band should get quite a shot in the arm with contacts now being acceptable for DXCC and WAS awards worldwide. However, any new or single band awards should be avoided in an effort to avoid interference to stations operating in the Fixed Service.

☐ **VE7IR:** "Big John" has moved to Toronto and will operate as VE3ABF. He urges the SE Asia Sea-Net gang contact W4EVG (ex-XV5AC) for reunion details.

☐ **Good News:** VE2GO wrote RA9YD per July '89 *QST*, and Bruce's missing card came through in about four months.



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 February 16 to March 15, 1990, assume a smoothed sunspot number of 188, which corresponds to a smoothed 2800-MHz solar flux of 232.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmation for contacts with 100 or more countries on the official DXCC Countries List. An SASE will bring you the rules and application forms for participation in the DXCC program. Send $1.00 to request the ARRL *DXCC Countries List*.

DXCC Notes

1989 DXCC Annual Listing in March 1990 *QST*: Because of the unusually high volume of applications received by the DXCC Desk during the past year, the 1989 DXCC Annual Listing will be published in the March 1990 issue of *QST*. Those amateurs who submitted applications during the month of September 1989 will have their updated DXCC totals included in the Annual Listing. We apologize for the delay and appreciate your patience.

Conway and Banaba—New DXCC Countries: By unanimous vote (7-0), the ARRL Awards Committee has accepted the recommendations of the ARRL DX Advisory Committee to add Conway (3D2) and Banaba (T33) to the ARRL DXCC Countries List, by virtue of point 2(b) of the *Countries List Criteria*.

Conway (3D2), a territory of the Republic of Fiji, lies about 280 statute miles southwest of Viti Levu (3D2), and more than 500 miles from Rotuma (3D2).

Banaba (T33), part of the Republic of Kiribati, is an island located approximately 260 miles southwest of Tarawa of Western Kiribati (T30), and more than 500 miles from the Phoenix Islands of Central Kiribati (T31).

Because no activity is believed to have taken place from Conway prior to the 3D2CR operation of April 1989, contacts with the reef are creditable effective with the start of this operation.

On the other hand, there were a few operations using call-sign prefix VR1, from Banaba, formerly known as Ocean Island, before the T33JS/T33RA activity of May 1989. Those VR1 operations will also be creditable.

QSL cards may be submitted for Conway and Banaba credits on or after March 1, 1990. Cards submitted before that date will be returned with no action.

There are a few DXCC members who have been given credit for Western Kiribati (formerly known as Gilbert Islands, including Tarawa) based on an Ocean Island QSO with a VR1 station before 1979. They may resubmit this QSL card for proper Banaba credit (along with a Gilbert Islands or Western Kiribati card for Western Kiribati credit) on or after March 1, 1990.

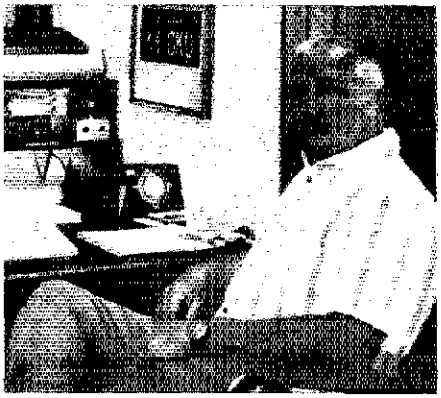
Strays

TA PROFILE

☐ By now, most people who have a keen interest in propagation have heard of the computer program dubbed MINIMUF. Technical Advisor Bob Rose, K6GKU, was a co-developer of that program. Bob has been active in ham radio since he was 16 years old and held the call KN6GKU. Bob obtained his General class license in 1954 and got his Advanced ticket in 1964.

An active amateur, Bob has employed every mode authorized for Amateur Radio use on 10 meters. His DXCC list stands at 180 countries confirmed. In the 1970s, using a QRP 5-W transmitter, he garnered 4-band WAS.

Although Bob's favorite band is 10 meters and he enjoys CW and AMTOR operation most of all, he also enjoys SWLing and is a weather-facsimile enthusiast.



League Technical Advisor Bob Rose, K6GKU, a co-developer of the MINIMUF program.

An ARRL Technical Advisor since 1982, Bob revised the 1987 *ARRL Handbook* propagation section. He's lectured to professionals and radio amateurs on the solar effects on HF propagation. Bob earned his degree in electrical engineering form California State Polytechnic University and is the Senior Program Manager for the Naval Ocean Systems Center (NOSC) in San Diego.—*Paul K. Pagel, N1FB*

QST congratulates...

☐ The Bartlesville (OK) Amateur Radio Club, Inc on its 50-year affiliation with the ARRL. Oklahoma Section Manager Joe Lynch, N6CL, presented a plaque to Orin Montgomery, W5EST, first president of the club, and current president Art Harban, W5LFS.

☐ Kenneth Miller, K6IR, on his election to the Board of Directors of Palmer National Bank of Washington, DC. Miller is an ARRL Life Member, a member of the ARRL DXCC Honor Roll, a member and past president of the Potomac Valley Radio Club, and is on the Board of Directors and Chairman of the Grants-In-Aid Committee of the Radio Club of America, Inc.

☐ Ken Wessels, WWØW, on being named chairman of the National Association of Securities Dealers (NASD) for 1990. Wessels is a partner in the Minneapolis brokerage firm of Wessels, Arnold, & Henderson. NASD is the largest self-regulatory organization in the US securities industry, and operates the NASD Automated Quotations system (NASDAQ), the third-largest equities market in the world.

New Products

ETCHED-GLASS DESK PLACARD

☐ Crystal Creations makes QSL-card-size etched-glass call-sign placards with solid oak bases. Your name and call sign (up to eight characters each) are etched into the glass using freehand techniques, making each placard unique. Price: $7.95 each (postpaid in the US). Wisconsin residents must include 5% sales tax. Manufacturer: Crystal Creations, Rte 1 Box 1B, Boyceville, WI 54725.—*Rus Healy, NJ2L*



The World Above 50 MHz

Conducted By Bill Tynan, W3XO
Send reports to HCR 5 PO Box 574-334, Tierra Linda Ranch, Kerrville, TX 78028 or call 512-257-1296 to record late-breaking information.

Over the Top, at Last

Ever since W1HDQ and other East Coast stations made it across the Atlantic on 50 MHz in 1947, VHFers have been speculating on the eventual achievement of 6-meter DXCC. Some said it couldn't be done, and most HF DXers, when the possibility was posed to them, simply scoffed. There have been many obstacles. F2 propagation reaches 50 MHz during only a few months at the height of the solar cycle. Even when the band does open to some areas, the duration of the opening may be very short—often measured in minutes. Sporadic E is more prevalent, but the E layer, being at a lower level, is less effective for extreme-range work.

Until about 15 years ago, most radio propagation experts would have said that E-layer propagation at VHF is limited to two hops, or about 2500 miles. Then, West Coast 6-meter operators began working Japan on what was concluded to be multihop sporadic E. Similar contacts were later made by East Coast stations with some of the Europeans then active, such as ZB2BL. By his travels during the off years—when F2 was not a factor—W6JKV conclusively demonstrated that sporadic E is useful for paths of up to 5000 miles or more. Not bad, but it would be difficult indeed to achieve DXCC using a propagation mode limited to such distances.

F2, even with its limited availability at 50 MHz, provides the potential for getting the job done. But, even with superb propagation—and we have had some pretty superb propagation in recent months—6 meters is not permitted in a number of countries, namely many European countries (including all of the Eastern Bloc). It is permitted in other countries, but activity is scant or nonexistent. The gradual process of granting amateur access to the band by some European and African countries, however, has made all the difference in the world in terms of achieving the elusive goal. But, even with operation permitted, power limitations have made working some of these countries difficult at best.

All of these factors drive some of us to spend many hours per day in the quest. This effort finally has paid off for some half-dozen 6-meter enthusiasts. Although no DXCC awards have been issued as of this writing in early December, it certainly won't be long. VE1YX submitted the first 6-meter DXCC application early in December, and K5FF, W5FF, K8WKZ, W4CKD/8, and K1TOL are also said to be at the 100 mark. It's only a matter of time before they collect those last few QSLs and get them to ARRL Headquarters to claim their DXCC awards. And special awards these will be. The first 10 to qualify will receive 50-MHz DXCC plaques. Everyone will receive numbered awards, so there is no reason to quit just because you don't make it in time for one of the plaques. You can bet that W3XO/5 will still be in the chase.

Congratulations to all those who have made it and good luck to the rest.

ON THE BANDS

How can anyone hope to describe the 6-meter propagation that visited the entire planet in 1989? Although some experts maintain that we have not reached the peak of Cycle 22, we are witnessing what might very well be peak-cycle conditions. Transcontinental openings have been occurring almost daily, and several southern California stations have worked into Europe. The entire US, including the East Coast, has completed QSOs with Japanese stations. These are but samples of what has been transpiring everywhere.

From the preceding section, it is clear how some of the "big guns" have been faring. Rather than continuing an expose of their accomplishments, we will feature the accounts of a few of the "not-so-big" guns. Certainly qualifying in this category is K4KLK in Raleigh, North Carolina. Roger does his 6-meter DXing from his car using an IC-502 driving a home-brew 15-W solid-state amplifier. One of two antennas is selected, depending on which provides the best signal—a squalo or a quarter-wave vertical. K4KLK admits that he doesn't work them all. On November 20, he heard, but was unable to work, W6JKV/CT3. He did much better on the 18th when he worked 8P6JW, and the 27th, when he completed 14 contacts with West Coast stations. But the big day came on the 30th, in the form of a QSO with GMØEWX, followed by an exchange with PZ1AP.

Another ham in the same category is K5JRN, Denton, Texas, EM13. Si's home-brew transverter puts out just 1 W. The antenna is a "bent half-wave vertical in the attic." An appreciation of the conditions we have been experiencing can be gleaned from the fact that K5JRN was able to contact G3POI on November 20.

Along with the almost daily openings to Europe from the East Coast, the month of November saw Far East openings spread beyond the West Coast into the Midwest and even the East Coast. Japan has, heretofore, been very hard to work from the East Coast. I can testify that it is especially difficult from the Washington, DC, area. No Japan-to-DC contacts were made during Cycle 21, but, November 1989 saw a number of DC-area stations log QSOs. Known to be included among the fortunate ones are W3OTC, W3ZZ, W3WFM, W3IFM, K1HTV/3 K3ICH/4, K4LHB, and N4VA. A Midwesterner, WB9QNX in Chippewa Falls, Wisconsin, EN44, tells of one such opening. Dave terms F2 conditions in his area "somewhat nonexistent" until November 16. He did work ZS3KC on the 5th, two Gs on the 11th and seven Caribbean stations on the 12th, but the 16th opened his eyes

1¼ Meter Standings

For WAS holders, listings are WAS number, call, state, call areas worked and grids worked. For others, call, state, US states worked, call areas worked and grids worked. Call areas are the 10 US call areas plus KH6 and KL7 plus each VE and XE call area plus DXCC countries not located within the continental limits of the US, Canada or Mexico. (The UN does not count as a call area.) Grids are those Maidenhead designators worked since the VUCC award was instituted January 1, 1983. To make the standings a true reflection of current 1¼-meter activity, those not reporting within the past two years are subject to being dropped. They will be reinstated upon presentation, in writing, of a statement indicating continued activity. It is not necessary to show additional states, call areas or grids worked in order to be relisted. This list was compiled on December 8, 1989. Updates for the next listing must be received by June 5, 1990. * = EME used for some contacts.

WAS Holders

1	WØVB*	MN	13	—
2	WØSD*	SD	—	—
3	WBØTEM*	IA	—	—
4	K5FF*	NM	14	—
5	W5FF*	NM	13	—
6	WB5LUA*	TX	—	—
7	VE3EMS*	14	—	
8	W3GPY*	PA	—	—
9	K9KFR*	IN	—	—
10	KAØY*	IA	—	—

W1JR*	MA	47	15	87
AF1T	NH	21	10	—

WA1HYN	RI	15	9	42
W1EJ	NH	15	8	—
K1LPS	VT	14	6	35
W1RIL	MA	13	8	30
W1FAJ	CT	12	7	15
WC2K	NJ	36	11	90
N2WK	NY	25	10	65
W2PGC	NY	23	10	40
K2GK	NY	22	8	57
N2BJ	NY	21	10	51
WB2IEY	NY	17	6	50
KU2A	NY	15	8	43
WA2FUZ	NY	14	5	11
WB2YZV	NY	13	5	62
KU2A	NY	10	6	22

KU2A	NY	10	6	22
KD5RO/2	NY	10	4	18
WB3LJK	MD	28	10	56
WA3FYJ	PA	23	10	44
W3RUE	PA	18	10	20
WS4F	GA	36	11	79
KC4EG	KY	36	9	55
WA4SBC	VA	21	7	25
WB4SLM	GA	20	7	54
K4CKS	GA	13	4	15
N4MW	TN	10	4	—
KK4NQ	SC	7	3	14
NA4I	GA	3	2	12

W5RCI	MS	35	8	64
K5UR	AR	34	11	116
K5SW	OK	27	8	74
W5HN	TX	23	7	28
WA5VJB	TX	17	6	—
N5KWB	LA	14	5	29
WB5AFY	TX	12	5	39
KE5EP	TX	7	—	9
K7ND*	WA	20	11	—
W7JF*	MT	18	7	—
WB8BKC	MI	34	9	99
WB8PAT	OH	23	8	42
K8AXU	OH	20	8	43

NN9K	IL	26	8	56
WB9OJR	IL	21	8	50
WB9MSV	IL	19	7	47
WØUC/9	WI	17	9	49
KØDAS	IA	32	11	59
KØALL	ND	30	10	—
WAØTKJ	KS	27	8	76
KØTLM	MO	24	7	57
KØIFL	MO	22	7	50
KCØQR	NE	21	6	48
WØJRP	MO	7	3	19
KØRZ	CO	5	3	6
VE3LNX		21	9	55

as to what 6 meters can do when it gets going. From 2240 to 2325Z, beginning with JA7NAM, Dave worked 46 JAs in 14 grids.

KØCS, Elizabeth, Colorado, recounts contacts beginning October 23 with ZS3E. On November 4, Steve worked VK4BRG at 0216Z—a late hour for such propagation. On the 11th, he heard about half a dozen Europeans but managed to work only F6DBI. On the 12th, four KL7s were snagged, followed by two JAs. November 18 brought PZ1AP, and the following day V29OA, ZS3KC, HC8GR and KL7NO. On the 23rd it was G4GLT, VO2AG and W6JKV/CT3 followed by three more KL7s. On the 24th, HC8U, GMØEWX, VO1MP and ZF1RC were contacted. On the 25th, KØCS worked KG6DX followed by ten JAs. But the 26th was the big day. Beginning at 2240Z, a string of 74 JAs were worked, along with HL9TG. Steve notes that the intensity of the Japanese signals was "simply unreal." Some of the stations were running low-power mobile rigs.

K5IRO, Edmond, Oklahoma, says that in 35 years on 6 meters he has never heard anything like the November 26 Japanese opening. At his location, "all stations just pinned the S-meter—I had to turn the RF gain down." Ben came up with 53 JA contacts on that memorable day.

W6JKV reports on his CT3 operation: The first few days, Jim was hampered by strong winds at his location, some 6000 feet above sea level. For a time, he was able to get up only a sloping wire dipole. Later, a 5-element beam was fashioned from the remains of his big 11-element job. For the final four days, he was able to get the 11-element beam up but found openings not as good as earlier.

Nevertheless, W6JKV/CT3 was able to work 41 countries on all continents, with a total of 940 contacts. In the US, he QSOed 134 1s, 126 2s, 56 3s, 101 4s, 39 5s, 39 6s, 20 7s, 110 8s, 51 9s, and 44 Øs. He was able to make only a single contact on 2-meter EME; not surprisingly, it was with W5UN. The Madeira trip represents another job well done by W6JKV.

W5UN continues to rack up new countries on 2-meter EME. Besides W6JKV/CT3, Dave's other recent acquisitions include HC8K and ZD8MB. HC5K took a 2-Yagi array and 150-W amplifier along on his October trip to the Galapagos Islands and completed a contact with W5UN. Ted says that plans call for a 4-Yagi array and a high-power amplifier to be available in the islands for use by future DXpeditioners.

ZD8MB has been using 18 W to an 18-element Yagi. Mike has also been trying TEP tests with various Southern European stations. He's had no luck so far, but reports having been heard by an IT9.

From K2UYH's *432 and Above EME News* comes word that the F6KSX group should be ready for 10-GHz moonbounce before this appears in print. According to F6HKA, they have a 4-meter dish and a TWT capable of 40 W. SM6CKU, SM4DBN and K2UYH are also reportedly about ready to go on the band.

The November/December issue of *Feed Point*, the publication of the North Texas Microwave Society, provides an account of last October's microwave conference hosted by the group. It was a great success both technically and financially. One of the popular features of the event was the noise-figure measurement competition, which included bands from 902 MHz to 47 GHz. One of the technical features in this issue of *Feed Point* is an article by NØCIH on adapting the WA7CJO cavity preamp design for other bands. Dimensions for all bands from 144 to 2304 MHz are included. A second article, by Rick Campbell, KK7B, of the Electrical Engineering Department of Michigan Technological University, deals with a single-board bilateral transverter for 5760 MHz. For information on joining this active group of microwave experimenters, contact Wes Atchison, WA5TKU, Rte 4 Box 565, Sanger, TX 76266. The publication alone makes it worthwhile to join, even if you don't live near Dallas.

Another prominent microwave group is the San Bernardino Microwave Society. Its December newsletter features a discussion of a proposal by K1LPS to change the rules of the 10 GHz Contest to take advantage of better weather. The proposal calls for the contest to be run over a total of 16 weekends and then taking the best to calculate the score. The group's position is that the rules should not be so changed. The only change they would recommend is that the contest begin earlier to take advantage of early morning propagation. Views, pro or con, should be addressed to John Lindholm at ARRL Headquarters.

Beginning January 1, Harry Schools, KA3B, began publishing the *KA3B 6 Meter Report*. The new newsletter will come out 12 times per year and feature DX news, such as upcoming DXpeditions, QSL information and activity reports. An annual subscription in the US, Canada and Mexico is $20; for others, $25 for airmail delivery.

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 2

In December, I presented W7JAT's proposal for a National DTMF Tone Squelch Frequency. Accordingly, stations could install DTMF decoders in their transceivers to keep the squelch closed until the national DTMF tone was received. The tone would be sent when hams needed assistance. This would permit operators to monitor a repeater without having to listen to incessant repeater chatter, yet alert them when assistance was needed.

Your response to this proposal has flooded my mailbox (and continues to do so). Some of your comments follow.

DTMF, CTCSS or Tone Burst?

"I agree that a system is needed, however, I am not in agreement as to the method. I'd prefer CTCSS tones. Most modern transceivers have the capability to transmit CTCSS tones. I suggest that 250.3 Hz be considered for a National Tone Squelch Frequency. It is the highest tone in the CTCSS list, which makes it a memory jogger. Also, many repeaters attenuate so-called subaudible tones, but 250.03 Hz is high enough to go through as an ordinary audio frequency."—*W4GVD*

"Although many manufacturers provide subaudible tone capability in their transceivers, it is of limited use...the number of tones available is limited, therefore, a large number of unique selective squelch codes cannot be supported...unless repeaters are specifically configured otherwise, they filter out subaudible tones and do not retransmit them.

"An audible tone burst or sequence sidesteps these problems. Audio tones will pass through repeater systems and multiple-tone sequences can support many unique codes. The problem is that very few existing radios are compatible with it.

"A DTMF system does not suffer from any of these problems. Multiple digit sequences can support any number of unique codes and the audio tones are easily retransmitted by repeaters. Although very few radios have DTMF decoders, almost all have DTMF encoders. Decoders are readily available and inexpensive and can be added to existing transceivers without much problem. At least one FM transceiver (ICOM's IC-901) offers DTMF decoding as an option."—*KBØCY*

"Keep it simple. Many decoders are sensitive to the relative amplitudes of the input tones, hence, I'd suggest using digit 3, a high tone in the low group, and a low tone in the high group, so that most transceivers will transmit both tones at nearly equal amplitude.

"I'd also suggest setting five seconds as the length of time that the tone must be present before the detection circuitry recognizes it as the emergency tone. Such a system would be very simple, and very unlikely to trigger by accident. In fact, in most cases, it wouldn't be necessary to decode both tones to make the circuit work.

"This system would be similar to the National Weather Service's emergency alert, but would use two tones instead of one. (Experience with the weather radio has shown that detecting one tone with a very simple circuit isn't always adequate to eliminate false triggerings.)"—*KØRLT*

Code Selection?

"What about 911? That could be remembered by everyone."—*N6PZU*

"Perhaps 767 (SOS) would be good...our repeater IDs could say, 'Dial 767 for help if no answer.' "—*KM4DY/5*

"...to call for help, simply press the 0 key on the DTMF encoder for 10 seconds, and that should open the squelch on anyone's receiver (decoders should respond within five seconds). I like 0 because that's what every kid is taught (or should be taught) to dial to call for help...other single digit tones with long durations could be used for other functions."—*AD7I*

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716-2702
CompuServe ID no. 70645,247

Taking the Bulletins by the Horns

My last blast at packet radio ("Can Packet Radio Be Saved?") in August 1989 On Line generated some feedback from you. If you recall, the problem I presented was that the packet-radio channels are becoming clogged by a high volume of usage, resulting in a logjam of packets that are not getting through to their destination. I suggested that the RF equipment being used on packet radio was not cutting it because that equipment was not designed for high-speed data transfer, but rather for FM voice applications. I concluded that there was hope because clubs and manufacturers were working on RF equipment designs that were optimized for transferring data at high speeds, and that when these designs were in place, the clogging of our packet-radio channels would be alleviated.

A few readers differed with these views. Rather than blaming low-speed radios for the problem, they pointed their fingers at the PBBS bulletins that nearly every Tom, Dick and Harriet in packet radio today feels the need to send addressed to ALLUS (all US PBBSs), ALLNA (all North American PBBSs), or worse, ALLOVER.

Bulletins On Stampede

I did a little research on the matter. In the First Edition of *Your Gateway to Packet Radio*, which I wrote during the spring and summer of 1987, I included a sample of PBBS W1AW's response to the L (list messages) command. The sample lists 13 messages ranging from message number 7631 to 7671 (a range of 41 messages). Two of the messages in that list were bulletins. According to my calculations, those two bulletins represent 4.9% of the 41-message range.

Last summer, I wrote the Second Edition of *Your Gateway to Packet Radio* (on sale now at your favorite ham radio emporium or from the ARRL) and I updated the sample response from PBBS W1AW. The new sample lists 15 messages ranging from message number 12794 to 12860 (a range of 66 messages). All 15 messages were bulletins, representing 22.7% of the 66-message range. In the intervening two years, the number of bulletins increased 4.6 times.

Admittedly, these statistics represent a very small sample. The increase in the number of bulletins may be a lot higher or a lot lower, but one thing is for sure: There is a definite trend toward more and more bulletins.

To make matters worse, after Tom posts a bulletin on every PBBS in the world, Dick connects with the local PBBS and reads Tom's bulletin. When Dick is done, Harriet connects with the local PBBS and also reads Tom's bulletin. When Harriet is through, I connect with the local PBBS and also read Tom's bulletin. When I am finished, there is a long line of packet-radio users who will also connect with the local PBBS and read Tom's bulletin. Not only has the percentage of bulletins increased, but the number of packet-radio users waiting to read Tom's bulletin has also increased.

Corralling Bulletins

One of the letters I received was from Bill Cromwell, KU8H, who not only described the problem, but also offered a solution. Bill suggested that some NAVTEX-style features be included in TNC software so that all packet-radio stations on frequency can copy a bulletin while one station is reading it. In other words, one station would actually be connected to a PBBS and, when it reads a bulletin, every other station on frequency could copy that bulletin intact, thus eliminating the need for everyone to connect to the PBBS and reread the same bulletin over and over again.

Great minds think alike. I picked up the proceedings of the ARRL's 8th Computer Networking Conference and found Paul Newland's paper, "AMTEX—NAVTEX-like Dissemination Procedures for Amateur Radio." AD7I's paper describes how Amateur Radio bulletins may be disseminated using NAVTEX-compatible equipment via AMTOR FEC with specific character strings at the beginning and end of messages. These character strings would permit receiving equipment to identify and ignore messages that have already been received without error.

Elsewhere in the proceedings is "A Packet Broadcast Protocol" by J. Gordon Beattie, Jr, N2DSY. In his paper, Gordon describes a protocol that, among other things, addresses the packet-radio bulletin dissemination problem. N2DSY's solution is implemented in software called *BBC* (named in honor of the British Broadcasting Corporation). To take advantage of the solution provided by *BBC*, packet-radio users must have computers that are capable of running *BBC*, that is, MS-DOS computers, and must be within monitoring range of a ROSE X.25 Switch that is also running *BBC*.

These "solutions" are not the final answer to the problem. KU8H's solution is an unimplemented proposal, AD7I's offers a solution for AMTOR, but not for packet radio, and N2DSY's solution is limited to stations running MS-DOS computers that are within range of the limited number of installed ROSE X.25 Switches.

Although a total cure has not been found, at least there are people working in the right direction. Perhaps it won't be long before a solution will be achieved. In the meantime, think twice before generating a bulletin to ALLOVER. (Do packet-radio operators in the Philippines really need to know about the Podunk Ham Swap and Spaghetti Dinner?)

A Quick Fix

In the meantime, here is a quick and dirty solution to the problem for stations that can copy PBBS transmissions without the need of a digipeater or network node. Tune your packet-radio station to your favorite PBBS's operating frequency. Use the LCALLS command to enter your favorite PBBS's call sign, and *only* your favorite PBBS's call sign, into your TNC (make sure you include the PBBS's SSID when entering the call sign, for example, LCALLS W1AW-4). Next, turn the MONITOR and BUDLIST functions on (MON ON and BUD ON). Now, your terminal will display only packets transmitted by your favorite PBBS. When someone reads a bulletin from your favorite PBBS, it will be displayed on your terminal as well.

If your terminal is a computer and its terminal-emulation software is capable of saving received data, let it save everything that is received for an extended period of time (an hour, 6 hours or 12 hours, computer memory permitting). At your leisure, you can read everything that was transmitted by the PBBS during that time period and it is likely you will read some bulletins that you intended to read the next time you connected to the PBBS. If you have a word processor with a search-and-replace function, you can clean up the bulletins by deleting all of the displayed headers (for example, "W1AW-4>WA1LOU"), PBBS prompts, PBBS beacons and other extraneous matter transmitted by the PBBS.

This is not the final solution, but it can be implemented today by most packet-radio users without any modification of hardware or software. If everyone tries this quick and dirty remedy, it would be a step in the right direction.

Strays

I would like to get in touch with...

☐ anyone who would like to trade VIC-20 programs, especially ham radio programs. Cecil K. Johnson, W5SRO, 1009 Crest Park Dr, Garland, TX 75042.

☐ anyone who has a Vidtex communications program for the Radio Shack Model 4 computer. Bill Nelson, N2GGQ, 52 Dykes Park Rd, Nanuet, NY 10954.

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.

†**Florida (Brooksville)—February 24.** *Sponsor*: Hernando County ARA. *Time*: 8 AM. *Place*: Hernando County Fairgrounds Auditorium, about 3 miles south of Brooksville on US 41. *Features*: dealers displaying and selling new radios, equipment, computers, two seminars on digital (packet) communications (in the Sun Bank room starting at 9:30 AM), free parking, overnight parking available (no facilities), refreshments. *Talk-in*: 146.115/715. *Admission*: advance $3, door $4. *Tables*: $8. *Contact*: for advance tickets and table reservations send check and SASE to Hernando County ARA, PO Box 34605-1721, Brooksville, FL 34605. For additional info call Pat Brayton, WB4EXA, 904-796-4840 after 7 PM.

†**Florida (Pensacola)—February 10.** *Sponsor*: Pensacola Area Hamfest Assn. *Time*: 8 AM-3 PM. *Place*: take US Hwy 29 south through Pensacola to its termination at Pensacola Bay. *Features*: refreshments, VE exams. *Talk-in*: 146.16/76. *Admission*: $2. *Contact*: Mike Brown, N4MAD, 519 S Edgewood Circle, Pensacola, FL 32506.

†**Georgia (Dalton)—February 24.** *Sponsor*: Dalton ARC. *Time*: 9 AM-4 PM. *Place*: N Georgia Fairgrounds. *Features*: refreshments, ARES forums, ARRL booth. *Talk-in*: 144.63/145.23. *Admission*: $3. *Contact*: Harold Jones, N4OTL, 404-673-2291 or James Jordan, K4FLG, (D) 404-278-2025, (N) 404-278-0630.

†**Illinois (Sterling)—March 11.** *Sponsor*: Sterling-Rock Falls ARS. *Time*: setup Saturday 6 PM-9 PM, Sunday 6:30 AM, public 7:30 AM. *Place*: Sterling High School Field House, 1608 4th Ave. *Features*: distributors, dealers, flea market, space to accommodate self-contained campers overnight. *Talk-in*: 146.25/85. *Admission*: advance $3, door $4. *Tables*: $5, including electricity (bring your own cord). *Contact*: Susan Peters, KA9GNR, PO Box 521, Sterling, IL 61081, 815-625-9262.

†**Indiana (Bloomington)—March 11.** *Sponsor*: Morgan County Repeater Assn. *Time*: setup 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.

Indiana (LaPorte)—February 24. *Sponsor*: LaPorte ARC. *Place*: LaPorte Civic Auditorium. *Features*: forums including the Midwest Microwave Society's Construction Exhibit and seminar (bring your SHF projects). *Talk-in*: 146.52. *Admission*: $3.50. *Tables*: $3.50. *Contact*: send SASE to LPARC, PO Box 30, LaPorte, IN 46350.

†**Iowa (Davenport)—February 25.** *Sponsor*: Davenport ARC. *Time*: 8 AM. *Place*: Davenport Masonic Temple. *Features*: flea market, commercial exhibits, refreshments, VE exams. *Talk-in*: WØBXR repeater, 146.28/88. *Admission*: advance $2, door $3. *Tables*: $7 each. *Contact*: Dave Johannsen, WBØFBP, 2131 Myrtle St, Davenport, IA 52804. For exam info contact Al Broendel, N9OK, 2712 38th St, Rock Island, IL 61201.

†**Kentucky (Cave City)—March 3.** *Sponsor*: Mammoth Cave ARC Inc. *Time*: 8 AM-3 PM. *Place*: take exit 53 off I-65 to Cave City, left at stop light; ½ mile to hamfest. *Features*: refreshments, forums, flea market. *Talk-in*: 146.34/94. *Admission*: $4. *Contact*: Mike Goad, N4HCO, 1379 White's Chapel Rd, Glasgow, KY 42141, (N) 502-678-7713.

†**Louisiana (Lafayette)—March 10-11.** *Sponsor*: Acadiana ARA. *Time*: Saturday 9 AM-5 PM, Sunday 9 AM-1:30 PM. *Place*: Holiday Inn Central Holidome, I-49 and I-10. *Features*: MARS, AMSAT, DX, ARRL, QCWA, swap tables, distributors. *Talk-in*: 147.81/21, W5DDL/R. *Admission*: no advance, door $2. *Contact*: Jack Broussard, K5EGW, PO Box 2577, Lafayette, LA 70502, (D) 318-234-7377, (N) 318-235-3666.

Massachusetts (Marlboro)—February 17. *Sponsor*: Algonquin ARC. *Time*: sellers 8 AM, public 10 AM-3 PM. *Place*: Marlboro Middle School Cafeteria, Union St, off Rte 85. *Features*: electronics, flea market, wheelchair accessible. *Talk-in*: 146.01/61. *Admission*: $2. *Tables*: advance $10, door $12. *Contact*: Ann, KA1PON, 508-481-4988 or write AARC, Box 258, Marlboro, MA 01752.

Massachusetts (Northampton)—March 4. *Sponsor*: Mt Tom ARA. *Time*: 9 AM. *Place*: Smith Vocational High School on Rte 9. *Features*: refreshments, VE exams, handicap accessible. *Talk-in*: 146.34/94, 223.82 rptrs, 146.52. *Admission*: $2, under 12 free. *Tables*: advance $10, door $12. *Contact*: Marvin Yale, N1CDR, 6 Laurel Terrace, Westfield, MA 01085, 413-562-1027.

†**Michigan (Dearborn)—February 25.** *Sponsor*: Livonia ARC. *Time*: 8 AM-4 PM. *Place*: Dearborn Civic Ctr, 15801 Michigan Ave. *Features*: refreshments, free parking, VE exams. *Talk-in*: 144.75/145.35, 146.52. *Admission*: advance $4 with table reservations, door $4. *Tables*: reserved table space of 8-ft minimum available. *Contact*: send SASE (4 × 9) to Neil Coffin, WA8GWL, c/o Livonia ARC, PO Box 2111, Livonia, MI 48151, 313-427-3905.

Michigan (Traverse City)—February 17. *Sponsor*: Cherrland ARC. *Time*: 8 AM-1 PM. *Place*: Immaculate Conception School, near Division and Second Streets. *Talk-in*: 146.86. *Admission*: $3. *Tables*: $4. *Contact*: Paul Nepote, KA8HIB, 802 Fern St, Traverse City, MI 49684, 616-947-2991.

†**Minnesota (Minneapolis)—February 24.** *Sponsor*: Robbinsdale ARC. *Time*: 7 AM-2 PM. *Place*: Medina Ballroom, 4 miles west of 494 on Hwy 55. *Features*: commercial exhibits, flea market, VE exams, refreshments, free parking. *Talk-in*: 147.60/147.00, 146.52. *Admission*: advance $3, door $5. *Tables*: (4 feet) $5, (booth) $45. *Contact*: send SASE to Robbinsdale ARC, PO Box 22613, Robbinsdale, MN 55422, or call Bob Arel, (D) 612-425-2424, (N) 612-545-1059. For VE info contact Dave Harrell, 8722 Greystone Ave, S Cottage Grove, MN 55016.

†**Missouri (Kansas City)—February 18.** *Sponsor*: Mid-America FM Assn Inc. *Time*: 9 AM-4 PM. *Place*: National Guard Armory, 7600 Ozark Rd. *Features*: refreshments, flea market, ARRL representative. *Talk-in*: 146.34/94. *Admission*: free. *Contact*: Ruth Atkeisson, WBØPVI, 816-331-6033.

Missouri (St Louis)—March 9. *Sponsor*: Jefferson Barracks ARC. *Time*: 5 PM. *Place*: Concordia Turners Hall, 6432 Gravois Ave. *Features*: auction 7:30 PM, refreshments. *Talk-in*: 146.34/94, 144.61/145.21. *Admission*: free. *Contact*: Carl Hohenberger, WBØBZP, 5266 Parker Ave, St Louis, MO 63139, 314-351-7084 after 1 PM.

New Jersey (Dover)—March 3. *Sponsors*: Splitrock ARA & West Morris Wireless Society. *Time*: vendors 6:30 AM, public 8 AM. *Place*: Dover Armory, Rt 15, just south of I-80. *Features*: VE exams (10 AM), dealers, flea market, refreshments. *Talk-in*: 146.385/985, 223.860, 146.52. *Admission*: $4, (vendors preregistration to PO Box 610, Rockaway, NJ 07866). *Tables*: $9, tailgating $6. *Contact*: Harvey Klein, WS2Q, 201-538-1768 before 9 PM.

†**New York (Melville)—February 11.** *Sponsor*: Long Island Mobile ARC. *Time*: 9 AM-4 PM. *Place*: Electricians Hall, 41 Pinelawn Rd. *Features*: refreshments, VHF tune-up clinic. *Talk-in*: 146.25/85. *Admission*: no advance, door $5, exhibitors $20 advance. *Contact*: Neil Hartman, WE2V, 516-462-5549 or Mark Nadel, NK2T, 516-796-2366.

†**New York (Valhalla)—March 11.** *Sponsor*: Westchester Emergency Communications Assn. *Time*: 8:30 AM-3:30 PM. *Place*: Mt Pleasant Armory, easy access from I-287 and all Westchester Parkways. *Features*: forums, VE exams, technical clinic, free parking. *Talk-in*: 147.66/06, 222.8/224.4, 442.475/447.475. *Admission*: no advance, door $4. *Contact*: Bob Wilson, N2DVQ or Sarah Wilson, N2EYX, 2 Soundview Ave, White Plains, NY 10606, 914-997-8491.

†**North Carolina (Elkin)—February 18.** *Sponsor*: Briarpatch ARC & Foothills ARC. *Time*: 8 AM-5 PM. *Place*: 2 miles west of I-77 from exit 85. *Features*: VE exams (preregistration only). *Talk-in*: 144.77/145.37, 146.52. *Admission*: no advance, door $5. *Tables*: table reservations contact Ed Mulholland, WA4WWV, Rt 4 Box 702, N Wilkesboro, NC 28659, (D) 919-838-2171, (N) 919-667-1568. *Contact*: for other info Dortha Talbert, N4SHE, Rt 1 Box 93B, Low Gap, NC 27024, 919-320-2955.

†**Ohio (Circleville)—March 11.** *Sponsor*: Teays ARC. *Time*: 8 AM-4 PM. *Place*: on Rte 22 east of Circleville at fairgrounds, 4H Building. *Features*: refreshments. *Talk-in*: 147.78/18, 146.52. *Admission*: advance $3, door $4. *Tables*: 8-ft advance $5, door $6. *Contact*: Larry Martin, N8EPY, 126 Pleasant St, Circleville, OH 43113, 614-474-6582.

†**Ohio (Cuyahoga Falls)—February 25.** *Sponsor*: Cuyahoga Falls ARC. *Time*: 8 AM-3 PM. *Place*: Akron North High School, easy access from Tallmadge Ave, off ramp on North Expressway (Rt 8); Rt 8 connects to all major expressways and Ohio Turnpike. *Features*: refreshments, wheelchair accessible. *Talk-in*: 147.87/27. *Admission*: advance $3, door $4. *Tables*: advance $5, door $6 (sellers may bring their own tables). *Contact*: send SASE for ticket orders and table reservations to Bill Sovinsky, K8JSL, 2305 24th St, Cuyahoga Falls, OH 44223, 216-923-3830.

†**Ohio (Lorain)—February 4.** *Sponsor*: Northern Ohio ARS. *Time*: 8 AM-3 PM. *Place*: on Rte 254, 1.7 miles west of Rte 57, in Sheffield Village in Gargus Hall. *Features*: refreshments, VE exams. *Talk-in*: 146.10/70. *Admission*: advance $2.50, door $3.50. *Contact*: John McKenna, WD8IQJ, 4122 Bush Ave, Cleveland, OH 44109, 216-398-8858.

†**Ohio (Mansfield)—February 11.** *Sponsors*: Intercity ARC and Mansfield Amateur Service Emergency Repeaters Inc. *Time*: 7 AM-4 PM. *Place*: exit north off US 30 bypass at Trimble R Rd, follow signs to fairgrounds. *Features*: refreshments. *Talk-in*: 146.34/94. *Admission*: advance $4, door $5. *Contact*: Dean Wrasse, KB8MG, 1094 Beal Rd, Mansfield, OH 44905, (N) 419-589-2415 after 4 PM.

Oklahoma (Elk City)—March 3. *Sponsor*: West Central Oklahoma ARC. *Time*: 8 AM-5 PM. *Place*: from I-40 exit 40 go 1½ miles west to Civic Ctr, on left side of road. *Features*: refreshments, guest speaker. *Talk-in*: 146.16/76. *Admission*: advance $5, door $8. *Tables*: $5 each. *Contact*: West Central Oklahoma ARC, PO Box 2023, Elk City, OK 73648, 405-243-1094.

Ontario (Bramalea)—March 3. *Sponsor*: Peel ARC. *Time*: setup 7:30 AM-9 AM, public 9 AM. *Place*: North Peel Secondary School, 1305 Williams Pkwy, from Hwy 401, north on Dixie Rd, or Hwy 410 to Williams Pkwy, east on Williams Pkwy to Bramalea Rd. *Features*: refreshments, radio, computer, electronic equipment. *Talk-in*: VE3PRC 146.28/146.88. *Admission*: $3. *Tables*: flea market vendor $5, 6-ft table & admission; commercial vendor, $10 6-ft table & admission. *Contact*: PARC Flea Market, 20 Hillbank Trail, Bramalea, Ontario, L6S 1P6, James McMurray, VE3BDI, 416-458-0505.

Oregon (Salem)—February 17. *Sponsor*: Salem and Oregon Coast Emergency Repeater Assn. *Time*: 9 AM. *Place*: Polk Cty Fairgrounds. *Features*: flea market, exhibits, commercial dealers. *Talk-in*:

†ARRL Hamfest

146.26/86. *Admission*: advance $5, door $6. *Contact*: Salem Repeater Assn, PO Box 784, Salem, OR 97308.

†**Pennsylvania (Belle Vernon)—March 4.** *Sponsor*: Two Rivers ARC. *Time*: setup 7 AM, public 8 AM-3 PM. *Place*: Rostraver Volunteer Fire Hall, Rte 51 south, 3 miles north of I-70 and PA 51 Interchange. *Talk-in*: 146.13/73. *Admission*: $1. *Tables*: $6 for full or $4 for half (50% in advance). *Contact*: Jim Lundberg, KC3HJ, 571 Washington St, McKeesport, PA 15132, 412-672-0915 between 10 AM to 10 PM.

†**South Carolina (Charleston)—February 24.** *Sponsor*: Charleston ARS. *Time*: 8 AM-4 PM. *Place*: I-26 to end take Hwy 17S exit, take 17S cross town to Hagood, take right at Hagood, hamfest is on left at Armory across from stadium. *Features*: refreshments, forums, meetings. *Talk-in*: 146.19/79. *Admission*: $5. *Contact*: Jenny Myers, 803-747-2324 or John Price, 803-795-1737.

Texas (Angleton)—February 24. *Sponsor*: Brazosport ARC. *Time*: 8 AM-3 PM. *Place*: Brazoria County Fairgrounds Auditorium, 3 miles south of SH 35 on 523. *Features*: swapfest, refreshments, ARRL booth. *Talk-in*: 147.98/38. *Admission*: no advance, door $2. *Contact*: Susan Webb, 410 S Yaupon, Richwood, TX 77531, 409-265-6439.

Texas (Orange)—February 24. *Sponsor*: Orange ARC. *Time*: setup 7 AM, public 8 AM-4 PM. *Place*: National Guard Armory. *Features*: refreshments, flea market. *Talk-in*: 147.78/18, 444.35/449.35. *Admission*: free. *Tables*: $4 for individuals, $10 for dealers, first come first serve (no advance sales). *Contact*: Sherwood Buckalew, KA5VOT, 409-883-6111, Dan Killough, WB4GYS, 409-769-9603.

Vermont (Milton)—February 24. *Sponsor*: Eighth Annual Northern Vermont Winter Hamfest. *Time*: 9 AM-3 PM. *Place*: Milton High School, Rte 7 in Milton; 4 miles north of I-89 exit 17 or 5 miles south of I-89 exit 18. *Features*: flea market, auction, forums, meetings, demonstrations, ham videos, VE exams (1 PM, no preregistration is necessary, bring copy of current license and two forms of ID). *Talk-in*: 144.87/145.47, 146.25/85, 444.025/449.025. *Admission*: $2, age 18 or younger free. *Tables*: no charge, limited number available. *Contact*: Mitch Stern, WB2JSJ, 802-879-6589.

Virginia (Vienna)—February 25. *Sponsor*: Vienna Wireless Society. *Time*: setup 6 AM, public 7:30 AM. *Place*: Vienna Community Ctr, 120 Cherry St, off Rte 123 and I-66. *Features*: refreshments, exhibit area. *Talk-in*: K4HTA/R 146.085/685 or W4LBL/R 146.190/790. *Admission*: no advance, door $5. *Tables*: tailgate $10, $15 noncommercial and $20 commercial. *Contact*: Harry Kaklikian, W4ACN, 4941 Andrea Ave, Annandale, VA 22003, 703-978-4402.

West Virginia (Fayetteville)—February 25. *Sponsor*: Plateau ARC. *Time*: 9 AM-3 PM. *Place*: Fayetteville High School Gym. *Features*: flea market. *Talk-in*: 146.19/79. *Contact*: John Witt, W8OQC, 135 Daniels St, Fayetteville, WV 25901, 304-574-0532.

Wisconsin (Menasha)—February 24. *Sponsor*: Fox Cities ARC. *Place*: Sabre Lanes. *Contact*: Don Baker, NB9J, 621 W 7th St, Kaukauna, WI 54130, 414-766-3886.

Coming Conventions

FLORIDA SECTION CONVENTION

February 17-18, 1990, Sarasota

The Florida Section Convention is sponsored by the Sarasota Amateur Radio Assn. It will be held at the Robarts Arena, Sarasota Fairgrounds, 3000 Ringling Blvd. Doors will open on Saturday from 9 AM-4 PM, and Sunday 9 AM-3 PM. Admission is $5 in advance and $7 at the door. Features include refreshments, technical forum, ARRL forum, new products forum. Talk-in is on 146.31/91, 147.90/30, 444.925/449.925. For further information contact Hadley Carrigan, N4ODK, 101 N Adams Dr, Sarasota, FL 34236, 813-388-2868.

GREAT LAKES DIVISION CONVENTION

February 24-25, 1990, Cincinnati, Ohio

The Great Lakes Division Convention is sponsored by the Committee for Amateur Radio/Hamilton County Amateur Radio Public Service Corps. It will be held at the Cincinnati Gardens Exhibition Ctr (I-75 to Paddock Rd, east on Paddock to Seymour, east on Seymour to Cincinnati Gardens; or route I-71 to SR 562 to Norwood exit, north on Montgomery Rd, left on Langdon Farm Rd to Cincinnati Gardens). Ticket sales start at 8 AM, doors open to public at 8:30 AM. Admission is $6 in advance (with an SASE), and $8 at the door. Features include VE exams, technical forums, ARRL forum, ARRL officials, public service, flea market, dealers, commercial vendors, manufacturer's displays, banquet, Wouff Hong, club meetings, parking, ladies' programs both days, Convention Hotel 513-351-6000. Talk-in is on 144.61/145.21, 144.59/145.19, 146.10/70, 146.28/88, 222.46/224.06. For further information contact Stan Cohen, WD8QDQ, 2301 Royal Oak Ct, Cincinnati, OH 45237, 513-531-1011, or Joe Halpin, W8JDU, 11615 Geneva Rd, Cincinnati, OH 45240, 513-851-1056.

TEXAS STATE CONVENTION

March 3-4, 1990, Brownsville

The Texas State Convention is sponsored by the South Texas Amateur Repeater Society. It will be held at the Jacob Brown Auditorium & International Friendship Pavilion on International Blvd, off US 77. Doors open for setup at 8 AM, public 9 AM-5 PM Saturday and Sunday. Admission is $5 advance, $6 at door; ham & family $6 advance, $7 at door. Features include VE exams (accept walk-ins, prefer advance registration for tests, PO Box 1382, San Benito, TX 78586; bring original FCC license and photocopy; certificate of successful completion of elements, check or money order for $4.75 payable to ARRL/VEC, and photo ID. Questions to Fred Wasielewski, WA2VJL, at San Benito address, VE questions 512-399-0328), vendors, swapfest, reserved special rate rooms at Ft Brown Hotel and Holiday Inn, forums, ARRL Director, packet, AMSAT, ARARM from Mexico, police secured parking, luncheon $22 advance only. Swapfest tables $7 advance, $10 at door. Talk-in will be English 147.99/39, Spanish 146.10/70. For further information contact STARS, 2210 Sunshine Strip, Harlingen, TX 78550, 512-425-7744, vendors 512-423-6407 (advance registration postmarked by February 21, 1990).

1990
February 17-18
Southern Florida Section, Sarasota, FL
February 24-25
Great Lakes Division, Cincinnati, OH
March 3-4
Texas State, Brownsville, TX

ARRL NATIONAL CONVENTIONS
June 8-10, 1990—Kansas City, Missouri
August 23-25, 1991—Saginaw, Michigan

Attention Hamfest and Convention Sponsors

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You are encouraged to register your event with HQ as far in advance as your planning permits. Note that the hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register: Registering dates with ARRL HQ does not constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your Division Director. For conventions, approval must be made by your director and, additionally, by the Executive Committee. Application forms can be obtained by writing to or calling the ARRL Convention Program Manager, tel 203-666-1541, ext 283.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Date may be recorded at ARRL HQ for up to two years in advance.

Strays

***QST* congratulates...**

☐ Robert Wallar, WB6QNR, of Lakewood, California, on receiving the 1989 AEA Amateur Ambassador Award. Bob and his Luther Burbank Elementary School students in Artesia, California, use ham radio to study topics by talking to the respective authorities in the field. AEA confers the annual award for outstanding service outside of the amateur community that promotes Amateur Radio and recruits new licensees.

Bob arranges QSOs that allow students to have exciting learning experiences. Examples include Dr Clyde Tombaugh, the only living person to discover a planet (Pluto), who answered students' questions about the solar system; the Wright Brothers scholars, who, with the help of the Dayton (OH) Amateur Radio Association, answered questions about airfoils, wind resistance and lift; Dr Kate Hutton, seismologist at the California Institute of Technology, talked about earthquakes (the students then wrote articles for the school paper on what they learned); the crew of the US Coast Guard sailing vessel *Eagle* (the students worked math problems on ocean depth, and the vessel's rate and time of travel, then took a field trip to see the ship); the Palmer station scientists in Antarctica—questions covered climate, plant life and colonization.

You can use Bob's methods in your classroom by utilizing university and local club Amateur Radio stations for interviewing professors and other area experts. These authorities, pleased to be able to excite youngsters about science and the world, welcome the opportunity and become aware of the value of Amateur Radio themselves. Congratulations go to Bob for thinking of innovative ways to teach our youth and spread the Amateur Radio word. Thanks, Bob!

I would like to get in touch with...

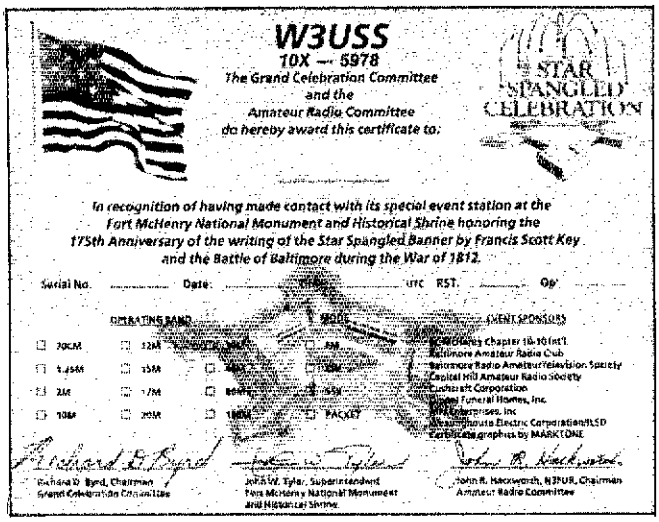
☐ fellow amateurs interested in pre-1970 Ford Mustangs or drag racing. Marshall Dominick, AA4VG, 401 Summit View Rd, Knoxville, TN 37920.

Fort McHenry Station Sings Anthem's Praises

To celebrate the 175th anniversary of the writing of the US National Anthem and the bombardment of Baltimore in September 1814, the Fort McHenry Chapter of Ten-Ten International Net, Inc, the Baltimore ARC, and Baltimore Radio Amateur Television Society joined forces to operate special-event station W3USS at the Fort last September. W3USS is the call sign of the Capitol Hill Amateur Radio Society.

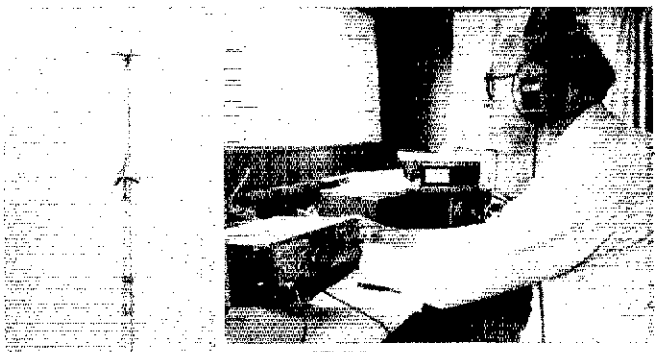
The station's 43 operators made 1,613 contacts, reaching 45 countries. The operators ranged in age from 14 (KA3UQL) to 81 years (WA3RBQ) and included VIPs Atlantic Division Director Hugh Turnbull, W3ABC, and Charlie Anderson, NF3X, whose father participated in the 100th anniversary celebration.

Each operator's name and call was recorded in the Fort's historical archives, becoming part of American history!—*John Hackworth, N3FUR, Chairman, Amateur Radio Committee for 175th Anniversary Celebration*

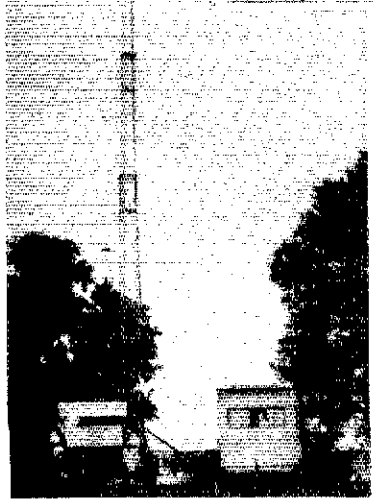




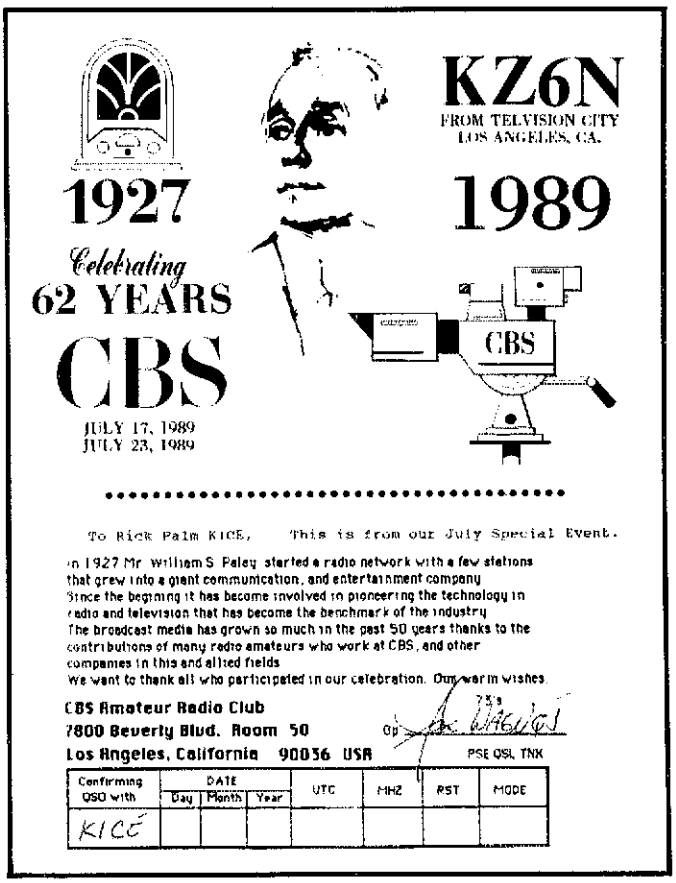
Members of Minnesota's South East Metro Amateur Radio Club demonstrated HF, VHF, packet and Morse code to members of Tiger Scout Pack 287, and presented the pack with two *Tune In The World With Ham Radio* packages. *(photo courtesy of KEØC and KEØCD)*



NF3X operates CW at the W3USS special event station.



The Baltimore ARC's 22-foot equipment trailer, complete with transceivers and a 100-foot tower, housed the W3USS operation.



The handsome special event QSL card of the CBS Amateur Radio Club, celebrating 62 years at Television City, Los Angeles.

IARU News

Conducted By Richard L. Baldwin, W1RU
HC 60, Box 60, Waldoboro, ME 04572

President: Richard L. Baldwin, W1RU
Vice President: Michael J. Owen, VK3KI
Secretary: Larry E. Price, W4RA
Assistant to the Secretary: Naoki Akiyama, NX1L/JH1VRQ

Regional Secretaries:
John Allaway, G3FKM
Secretary, IARU Region 1
10 Knightlow Rd
Birmingham B17 8QB
England

Thomas B. J. Atkins, VE3CDM
Secretary, IARU Region 2
55 Havenbrook Blvd
Willowdale, ON M2J 1A7
Canada

Masayoshi Fujioka, JM1UXU
Secretary, IARU Region 3 Association
PO Box 73, Toshima
Tokyo 170-91
Japan

The International Amateur Radio Union—since 1925 the federation of national Amateur Radio societies representing the interests of two-way Amateur Radio communications.

60 Years of PZK

Polski Zwiazek Krotkofalowcow (PZK), the Polish national Amateur Radio society, celebrates its 60th anniversary in February 1990.

The beginning steps of Amateur Radio in Poland were taken in 1921, shortly after Poland regained her independence. That year, a group of Warsaw Boy Scouts started training in Morse code and began transmitting on military surplus spark equipment. The first successful two-way amateur spark transmission took place in 1922, when Wladyslaw Treminski (later to use the call sign TPAD) and Jerzy Mokrzycki (later TPBL) contacted each other on a wavelength of about 100 meters. That contact was, according to the law existing at that time, illegal. Radio regulations permitting reception and transmission were introduced in 1924. In a short time, more than 100 radio clubs were established in Poland, and the first monthly *Radio Amator* was issued. With the support of Stanislaw Odyniec, the editor of *Radio Amator*, a delegation of Polish radio amateurs took part in the IARU founding congress in Paris, in 1925.

The first logged and confirmed foreign QSO was established on December 6, 1925, between Radeusz Heftman, TPAX, and the Dutch station NØPM. By the end of 1925, there were 33 amateur stations in Poland.

In Warszawa: TPAA, TPAB, TPAF, TPAG, TPAI, TPAJ, TPAK, TPAL, TPAM, TPAN, TPAO, TPAS, TPAT, TPAU, TPAV, TPAW, TPAX, TPAY, TPAZ, TPBC, TPBD and TPPW.

In Krakow: TPAD and TPAE.

In Wilno: TPAC and TPAQ.

In Lwow: TPAR, TPBB, TPBF and TPBG.

In Poznan: TPAP.

In Kalisz: TPBA.

In Wolyn: TPAH.

(Our correspondent doesn't tell us, but it would be fascinating to know if any of those original Polish amateurs are still active, and with what calls.—*W1RU*)

The most active Amateur Radio clubs existed in Lwow (Lwowski Klub Krotkofalowcow) and in Warszawa (Polski Klub Radio Nadawocow). The number of Amateur Radio stations in Poland was growing quickly. Because of the call-sign provisions adopted at the Washington Conference of 1927, SP3 and SP1 prefixes were introduced. Two important events took place in 1929—the monthly amateur journal *Krotkofalowsiec Polski* began publication, and the first WAC award for Poland was issued by ARRL (in its role as headquarters of IARU) to Zygmunt Bresinski, SP3KX.

Five regional Amateur Radio clubs (in Warszawa, Lwow, Wilno, Poznan, and Krakow) decided in 1929 to join together and to establish a nationwide Amateur Radio society. The first founding convention took place in Warszawa on February 22-24, 1930, and the name "Polski Zwiazek Krotkofalowcow" was unanimously adopted. The famous scientist and director of the Radiotechnical Institute in Warszawa, Prof Ing Janusz Groszkowski, was elected the first president of PZK.

(Today, PZK continues to be prominent in IARU activities. One of its members, SP5FM, is the vice-chairman of IARU Region I. Another of its members, SP5HS, is chairman of the IARU Region I Amateur Radio Direction-Finding Working Group. And another of its members, SP9ZD, is a leader in EMC activities in Region I.)

New Books

FROM SPARK TO SPACE: A PICTORIAL JOURNEY THROUGH 75 YEARS OF AMATEUR RADIO

Edited by Debra A. Jahnke and Katherine A. Fay, NIGZO. Published by The American Radio Relay League, 225 Main St, Newington, CT 06111. First printing, 1989. Softcover, 8½ × 11 inches, 95 pages. Available from ARRL for $20 plus postage and handling.

Do you enjoy hamfests partly because you get the chance to twiddle the knobs and dials on equipment we fondly call boat anchors? Do you smile while leafing through ancient ham radio books and wrinkled old issues of *QST*? If so, you'll want your own copy of *From Spark to Space*, tracing Amateur Radio's steps through time. Right from the beginning you'll see hundreds of delightful photographs of Amateur Radio people, places, and things—some familiar and some never before published. The camera's lens has captured those figures from the hobby's illustrious past whom we can thank for much of the fun we're having today, including "the old man," Hiram Percy Maxim, with his Uncle-Sam-wants-you piercing eyes, and rare photos of the ARRL flagship station W1AW—old, middle-aged, and newly renovated.

You'll laugh at cartoons published over the years, and catch a few glimpses into the "far side" of Amateur Radio. Discover what home-brew was like way back when. Even nonhams will enjoy seeing photographs of the old modes of dress and cars from over the years. You'll smile when you read the story of the infamous Wouff Hong. If you've ever visited ARRL HQ, you'll recognize a photo of the building no matter when or where—Hartford, West Hartford or Newington. The editors even included a chronology of ads for equipment and items like the UV-200. (Don't know what that is? You will.) Then there are remembrances from the war years, pictorial journeys through UHF DX records, ICs, microwaves, packet, spark-gap transmitters, audion tubes, and more. What about space, meteors, moonbounce, satellites, and the space shuttle? And what's next? A space station?

The final pages sum it up, from past to future, with the 1929 story of the Elser-Mathes Cup—the trophy that will be presented to the hams who make the first QSO between Mars and Earth!

No matter what your age or favorite Amateur Radio niche, you'll find pages of interesting items in *From Spark to Space*. The editors rummaged through League archives (and boxes and file drawers) to choose pictures and text for this book, which you'll proudly display on your coffee table or in your shack. Plan to spend hours looking at the photographs because the book is full of them. You'll see examples of all that *was* and *is* Amateur Radio—and you may even see a photo of yourself!—*Rosalie White, WA1STO*

Silent Keys

Administered by Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

KA1BVF, Harold M. Belknap, Woonsocket, RI
KA1DVH, Joseph E. Reyen, Chicago, IL
W1GVZ, Joseph R. Alfano, Southington, CT
WB1GXZ, E. M. Baxter, Trenton, NJ
W1IPQ, Donald W. Waterman, Easton, CT
W1KTS, Mario Santilli, Waterbury, CT
KA1LUM, George R. Senn, Monroe, CT
W1OI, Carl S. Anderson, Scarborough, ME
W1OPJ, Melvin Dupont, Bedford, MA
K1PEF, Carman E. Seaman, North Attleboro, MA
K1RFX, Paul Price, Port Charlotte, FL
*KA1WP, Richard T. Dunn, Georgetown, MA
W1WXV, Alfred Bolton, South Kingstown, RI
WA1ZGH, Calvin W. Maddox, Rockport, ME
N2EOD, Jack H. Wilson, Jamaica, NY
W2FCO, Erik A. Berglund, Riverhead, NY
N2GOI, William B. Kelly, Bricktown, NJ
W2NPT, Frank C. Leonard, Fair Lawn, NJ
K2OIJ, Eugene B. Mullen, Bricktown, NJ
K2PRK, Gilbert P. Weeden, Watchung, NJ
WA2QOE, Maurice D. Bravman, Calverton, NY
K2QWD, Earl B. Whitt, Syracuse, NY
*W2SNJ, Frank J. Wojcik, Maplewood, NJ
W2SOV, Arlo C. Bacon, Hilton, NY
W2YRV, Joseph E. Gomola, Colonia, NJ
K3ASV, John B. Murray, Tower City, PA
K3CYM, John J. Lazar, Pittsburgh, PA
WB3JGS, John G. Roth, Frederick, MD
W3LB, Louis D. Breetz, Fort Washington, MD
W3LPF, J. M. Moore, Furlong, PA
W3LW, Harris A. Robinson, Palmyra, NJ
KA3PTJ, Robert Koonty, Cranberry, PA
KC3TB, R. H. Barr, Salisbury, MD
W3UEJ, Brennan J. Wishner, Washington, PA
W3VAG, Rowland B. Schnick, Plyesville, MD
W3VQA, Gilbert D. Murphy, Milford, DE
W3ZCY, John B. Trnosky, Bethel Park, PA
WB4ABW, John W. Bachrach, Hendersonville, NC
W4AGT, Donald J. Melvin, Jacksonville, FL
K4CP, W. E. Alexander, Yulee, FL
K4DLA, William G. Blankenship, Louisville, KY
K4FZA, Wafford E. Melton, Charlotte, NC
W4KAO, Frank S. Anderson, Emporia, VA
*W4KOJ, S. B. Robertson, Midlothian, VA
WA4LUM, William J. Cappleman, Winter Garden, FL
N4MUD, J. C. Gantt, Fort Lauderdale, FL
KE4NT, Everett L. Frank, Seminole, FL
W4OIF, Alan M. Messing, Maryland Heights, MO
KB4RFO, Maynard M. Boyce, Stephens City, VA
WB4WQT, Arvin Campbell, Russellville, TN
N5AQC, Charles W. Cook, Dallas, TX
N5FUM, Rosemary Kays, Sand Springs, OK
KA5IRZ, Shelley P. Broussard, Lake Charles, LA
K5IVB, Harold P. Cox, Kemp, TX
W5KJO, Thurman M. Wynn, Roswell, NM
WA5LFO, Paul V. Fairley, San Dimas, CA
WB6AEA, Denson H. Morgan, Porterville, CA
W6BYH, Leon Brammer, Delano, CA
KA6DQB, Harry Estes, The Sea Ranch, CA
KA6EME, Robert L. Freund, Fresno, CA
WA6GMX, Marvin R. Leitzel, Grass Valley, CA
K6ICV, Willard H. Nix, Los Angeles, CA
K6IFL, Edward D. Pinheiro, Fresno, CA
W6KEY, Wayne A. Shirer, La Mesa, CA
WA6LCG, George Whitmore, Grass Valley, CA
K6MD, W. M. Canterbury, La Jolla, CA
N6ODQ, Harold E. Winfield, Winslow, WA
WA6PFO, Charles R. Hawley, Seal Beach, CA
WB6ZKN, Clifford Skoog, Livermore, CA
W7AB, Robert R. Mallory, Tucson, AZ
KL7CUK, Leroy J. Davie, Deltona, FL
*W7FU, A. G. Norris, Issaquah, WA
W7HRK, Maurice E. Scheibner, Coulee City, WA
K7IDA, Frank E. Huffman, Tempe, AZ
*KL7IHH, Roy H. Woodin, Westwood, NJ
W7LM, Grant Massie, Seattle, WA
W7LUQ, Duane H. Harris, Congress, AZ
W7MCQ, George Galley, Corvallis, OR
W7MJM, Andrew L. Schorr, Klamath Falls, OR
W7PZM, Robert L. Ratliff, Boring, OR
W7TRM, Henry J. Keyes, Roy, UT
K7VQZ, George F. Buckley, Tacoma, WA
W8ATO, Raymond S. Schaub, Lake Leelanau, MI
WD8BZF, Donald W. Brown, Petoskey, MI
N8CCF, Harold J. De Witt, Newaygo, MI
N8CTT, Fred A. Bessant, Detroit, MI
W8FCA, Benjamin E. Windle, Granville, OH
WB8FGB, Carvel L. Clark, Alpena, MI
KA8FYS, Robert K. McAllister, Hilliard, OH
N8GIQ, Edward Kellachow, Dearborn, MI
K8JGF, Arthur Foreman, Southfield, MI
W8KCY, Louis V. Balogh, Lakewood, OH
K8NYK, Robert L. Ward, Vicksburg, MI
KA8UMU, Alvin E. Gould, Springport, MI
WB9EAQ, Max L. Wagoner, Mishawaka, IN
K9EEQ, Ken L. Foss, Marshall, WI
WA9ESK, Horace J. Hess, Fitzgerald, GA
W9FSV, Millard S. Oscherwitz, Wilmette, IL
WA9HJB, Welby X. Coop, Muncie, IN
W9IG, Edwin A. Golec, Albia, IA
KA9INV, Arthur O. Fink, Glendale Heights, IL
W9RZL, Richard R. Nelson, Neenah, WI
WBØIKF, Bill Rodman, Springfield, MO
WØLSR, Myles C. Grabau, Ironton, MO
KAØMJG, Earl H. Tessman, Atlantic, IA
WØWRC, George E. Galster, Harlingen, TX
WBØZZI, Carl Struck, Dimock, SD
9L1VJ, Vidal Johnson, Freetown, Sierra Leone

*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 CRRL 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

February, 1940

☐ How practical is f.m. for amateur v.h.f. use? The Editor calls on the 2½-meter fraternity to build such simple gear and check it out under normal operating conditions.

☐ By Goodman, W1JPE, follows up with a simple but complete 112-Mc. f.m. transmitter. The plate circuit is a quarter wavelength of copper tubing.

☐ Back to a.m., George Grammer shows the results of an intensive check of microphones commonly used by amateurs in handling "lop-sided" speech polarity, particularly true of the male voice.

☐ W2BFD remote controls his gear not by long wires but through a carrier current setup; good for intercommunication as well.

☐ The closedown of most foreign amateurs requires a change in this year's March DX contest. It will run two weekends rather than spread out over the usual nine days. You can choose voice or C.W.

☐ The November u.h.f. relay produced the longest record yet—W1HXP (Boston) to W9VHG (Chicago), 1150 miles in ten hops.

☐ Bell Telephone Labs has invented an "absolute altimeter," using the entire 420-450 Mc. band. (Someone will later get the bright idea that amateurs can share this portion of the spectrum.)

☐ It isn't a corpse, but it's just as sad—the picture of OZ2ED's transmitter wrapped and sealed by the authorities—an event going on in many European countries.

☐ W6CHE recommends, for the ham hoping some day to go high power, a start with medium-power push-pull output tubes, later adding another pair of 'em in parallel rather than discarding old and purchasing new, bigger ones.

☐ Trying to cater fully to varied amateur interests, the League is sponsoring a 112-Mc. contest and relay this month, and on the following weekend a W.A.S. Party at the other end of the amateur spectrum—1.75 Mc.

25 Years Ago

February, 1965

☐ If amateur license fees were used to provide expanded FCC services (additional examinations, more extensive monitoring), the League would have much less objection to the "tax." The Editor hopes Congress will be more generous this year when deciding on the Commission's budget.

☐ Our third amateur satellite, this one a relay "bird," should be up shortly and the Project Oscar crew provides last-minute data, including a system of "quickie" predictions for orbits. Life of Oscar III is estimated at only four weeks.

☐ Separation of transmit-receive frequencies beyond 200 kc. is not provided for in many v.h.f. converters, such as the Collins 62S-1. WØHRQ added a separate injection source to allow system efficiency over the nearly 2 Mc. required for Oscar participation.

☐ W1DX's "Telematch" permits tuning your final at full kilowatt power with only a fraction actually reaching the antenna, thus sharply reducing QRM to others in the necessary tuneup procedure.

☐ Novices: Be sure to take your General exam before the end of your term or you won't get a counterpart call, but rather some brand new one.

☐ The usual folded chunk of coax to form a balun is fine except for 144 Mc. and above. K6HCP and WA6GYD revert to the coaxial-sleeve transformer; the novelty is use of empty beer cans soldered together for the detuning sleeves.

☐ Dedication ceremonies for the amateur radio commemorative stamp were held both in Anchorage, Alaska (in tribute to our public service during last year's earthquake) and in the nation's capital. Postal and FCC top officials praised amateur accomplishments over the years.

☐ A bonus issue for the teleprinter enthusiast: K8DKC continues his series, this month covering codes, speeds, keyboards and loop circuits, while W1NJM's traffic-handling series installment points out the capabilities of RTTY which make it ideal for message work.

☐ W1ICP shows the beginning amateur how he can wind coils on ladies' hair curler forms, with turns and spacing determined by use of the League's *Lightning Calculator.—W1RW*

Results, 1989 IARU HF World Championship

By Billy Lunt, KR1R
Contest Manager

and

Mark R Burke, KA1MIS
Contest Assistant

This year's IARU HF World Championship was held during the weekend of July 8-9, 1989. Dan, W7WA, finds that "summertime propagation makes this contest quite different from spring and fall contests." Even though the IARU HF World Championship may be quite different, good propagation was reported from all continents. KO9Y found, "The signals were strong with great openings throughout the night, even on the high bands." Hein, DL2OBF, had great fun and reports, "Wow! Nearly 700 QSOs in about 17 hours! All bands were open! Wait till next year, I will make 1000 QSOs." Even with all the good reports, 10 and 15 meters surfaced as the bands that produced the largest QSO totals. Multiop-station UQØA claims, "We heard the US on 15 meters all 24 hours of the contest. There were nice pileups on 15 meters." IO4UFH conveyed, "Fantastic propagation to the US on 15 meters during the night!" WA2IUO was excited about "a great JA long-path opening on 10 meters during Sunday morning."

Contesting has the ability to draw casual operators into the main stream of the contest. Like many a casual operator, KC8WR relates, "I started out just giving other stations a few QSO points." Then the "contest bug" bit and Michael started going full bore and had a ball! His only resentments were that "if I had known the 'contest bug' would bite so hard, I would have taken a nap and operated the entire contest."

Activity increased for the 1989 contest with Box AAA receiving a total of 1477 logs. The CW-only entry category remains the most popular, with the phone-only entry category as the next favorite, followed by mixed-mode and multioperator.

Fourteen IARU member-society HQ stations submitted their logs. HG89HQ set a new record with 10 million points for first place. Second-place Y61HQ scored 8 meg followed by LZ7A with 6 meg. Thanks to all the HQ stations that participated and gave out those extra multipliers.

The entire top ten in the world mixed-mode category scored over a million points as opposed to only the top six places in 1988. Gyozo, HAØMM, tried the mixed-mode category this year and finished on top, scoring 1.9 million points. 5H3TW (K3TW,op) finished second with 1.46 meg, with OK1RI close at his heels with 1.41 meg for a respectable third place. Rich, K1CC, took top stateside honors and finished sixth worldwide, scoring 1.2 meg. Seventh-place worldwide and second-place W/VE went to veteran K3ZO, with 1.1 meg.

ZPØY (ZP5JCY,op) scored over 2 million points to take first-place in the world phone-only category. C4ØA (5B4MF,op) finished in second place scoring 1.6 meg, and RB5MT finished third with 1.4 meg. Dan, W7WA, mustered 1.2 meg to finish in first place on W/VE phone-only and fifth place worldwide. Jack, W1WEF, finished second among W/VEs and sixth worldwide with 1.0 meg.

UWØLT moved up the ladder from sixth place in 1988 to win first-place worldwide CW, scoring 1.2-million points. RL7AB racked up 1.1 meg for a strong second-place finish. Dan, K1TO, mustered 1.0 meg for third-place worldwide and first-place W/VE. Jeff, KRØY, stayed at home this year and secured fourth-place worldwide and second-place W/VE with close to 1.0 meg.

In the multioperator category, the top four scores were all from the USSR and were well over 2-million points each. Contest team, UC1OWA edged out rival RB8M for the top worldwide honors with RQ7W finishing third in the multioperator category. K6TMB moved up from sixth-place W/VE last year to finish first among W/VE multiop entries. N5AN finished second for W/VE and N8CXX third.

This summertime contest provides plenty of activity from around the world and with the 24-hour format, you still have time left over to spend with the family. If you haven't tried it, give the next one a whirl and see how you stack up against the worldwide competition. See you in the fifth IARU HF World Championship on the weekend of July 14-15, 1990.



Spyros, C4ØA (5B4MF,op), finished second-place world phone-only from Cyprus.



Alfredo, CU2BR, pictured with his dog, operated mixed mode from the Azores.



Sergio, IK4AUY, finished first-place phone in Italy.

Top World Scores

Mixed

Call	Score
HAØMM	1,928,690
5H3TW (K3TW,op)	1,464,672
OK1RI	1,416,012
RA9JX	1,281,852
UA1DZ	1,259,280
K1CC	1,203,210
K3ZO	1,180,155
RB5IM	1,177,405
RZ9UA	1,102,188
HA5PP	1,091,270

Phone

Call	Score
ZPØY (ZP5JCY,op)	2,001,846
C4ØA (5B4MF,op)	1,618,871
RB5MT	1,473,342
RB5FF	1,311,393
W7WA	1,252,672
W1WEF	1,058,688
EA4KK	862,240
YU3HR	811,008
RB5DX	810,968
YU2W (YT2FI,op)	772,507

CW

Call	Score
UWØLT	1,253,212
RL7AB	1,105,247
K1TO	1,093,652
KRØY	998,880
W2GD	945,496
I2VXJ	865,985
WB2Q	848,817
CR5NH (CT1BOH,op)	827,480
VS6BG	821,500
DFØRX (K5ZD,op)	807,402

Multioperator

Call	Score
UC1OWA	2,858,612
RB8M	2,774,778
RQ7W	2,537,280
UB3IWA	2,319,648
UQØA	1,806,080
UT4UXW	1,724,020
UP1BWW	1,550,855
IO4UFH	1,465,280
RL8PYL	1,438,896
RØC	1,411,580

IARU Headquarters Stations

HG89HQ (HA1s VQ, WD, YA, YU, HA3s NX, UZ, HA4s FF, XH, XT, ZD, ZZ, HA5s BNL, DW, FM, GF, IW, LN, MK, ML, OM, RY, WA, WE, YLN, HA6s ND, NF, NQ, NY, ON, OQ, PX, HA7s JAO, UG, HA8s FM, IE, JP, JV, LKE, LLK, PG, RF, HAØDU, HA8-806,ops)
10,061,280- 10457- 272

Y61HQ (Y21s TL, YK, Y23EK, Y24UK, Y25ZO, Y27FN, Y32s JK, VK, Y37XJ, Y38YK, Y42s FK, GK, LK, MK, OK, Y58WA, ops) 8,024,109- 9515- 237

LZ7A (LZ1s BV, CL, MG, MK, NE, NQ, 1A245, 1F109, 194, 313, 1E289, LZ2s AB, AO, JE, KK, MG, QV, RS, UU, VU, ops)
6,891,424- 8183- 248

CT1REP (CT1s AHU, BOP, DIZ, ops)
1,269,492- 2429- 127

4U1ITU (KU2C, op)
863,330- 1941- 130

JA3RL (JA1VYI, JA3s MAU, NDM, JG2ULB, JG3s KUT, RPL, JI3s ERV, OYM, JJ3FZS, JR4ISF, JP3LKR, ops)
751,961- 1999- 119

IR2MQP (I2MQP, op)
517,041- 1443- 87

ON4UBA (ON4XG, ON5WL, ON6JG, ops)
364,670- 1108- 102

W1AW (KJ4KB, op)
171,996- 760- 66

LG5LG (LA9VDA, op)
166,740- 634- 70

SQØDXC (SP9s ADV, BRP, JPA, ops)
100,200- 597- 60

HK3LR (HK3s BED, MLN, NTI, ops)
77,658- 381- 42

EIØRTS (EI2CL, op)
9,680- 70- 40

OK5MVT/P (OK1s DVK, FWW, ops)
1,800- 36- 12

Top W/VE Scores

Mixed

Call	Score
K1CC	1,203,210
K3ZO	1,180,155
AA4NC	903,638
K2SD	710,565
N9AG	641,684
WZ4F	629,481
KA5W	511,438
KVØI	381,988
WE7B	365,120
WA6FGV	305,600

Phone

Call	Score
W7WA	1,252,672
W1WEF	1,058,688
KA1ION	687,899
WB8JBM (NZ4K,op)	582,360
WB2K	412,335
VE3CPA	375,597
W2OW (N2HR,op)	363,092
K5XI	342,693
KA5WSS	334,044
K6SVL	331,905

CW

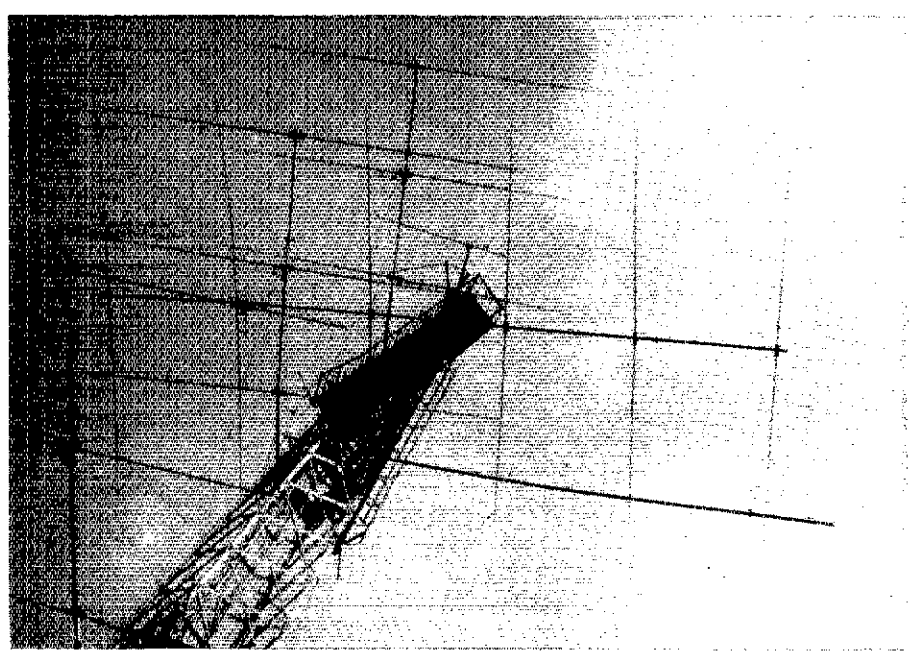
Call	Score
K1TO	1,093,652
KRØY	998,880
W2GD	945,496
WB2Q	848,817
K8CC	762,723
K6LL	687,401
KBØG	671,957
AD5O	666,115
NØBSH/9	657,340
K2SX/1	599,424

Multioperator

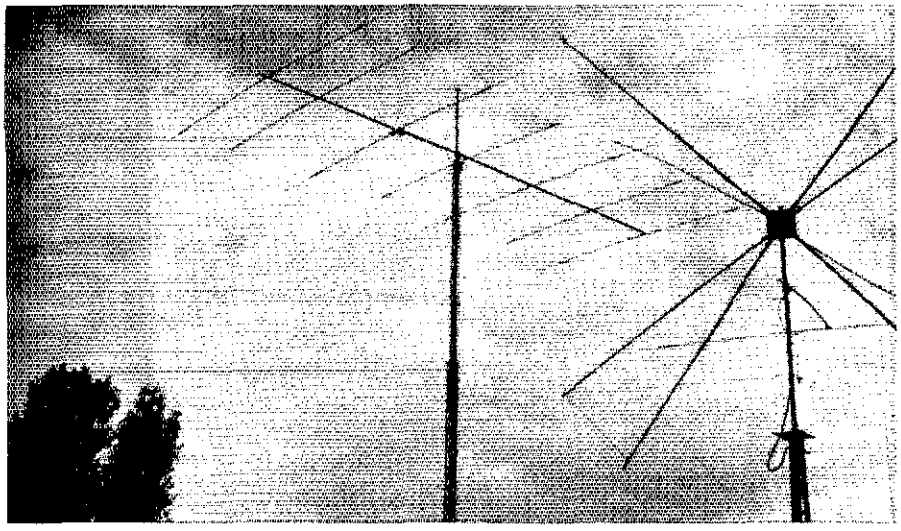
Call	Score
K6TMB	1,106,930
N5AN	834,392
N8CXX	814,212
N5EA	781,621
K2WI	643,734
NØBNG	612,846
K9SD	610,743
AB4CQ	482,996
WD8LLD	430,464
KD9ST	354,256

SOAPBOX

Great contest! This was my first try at this one. I still enjoy contesting with no gadgets, computers and etc. I hope to get more than ten hours in the contest next year (W7HS). The IARU contest seems to be popular everywhere except in the US (W7WA). Sure was a nice European opening on 15 meters! I enjoy the 24-hour format. See you with more activity next year (NØAX/7). Wow! Conditions were superb! I had a great time. Thanks to K8CC for the use of his logging program (KRØY). All my contacts were made using attic dipoles (NZ5V). I had a good time missing out on my sleep! This is the first time that I have entered a contest. The bands were not very cooperative in opening worldwide. Twenty meters was really dead to the west with no ZLs and only one VK (WØVKP). FB contest! I like the 24-hour format (WF5E). It was a lot of fun and was my first 24-hour contest. I drank lots of coffee. The only casualty was my preamp. It got zapped with RF around 2 AM. See you next year (KA1J). Good contest! I was glad that I stayed home for the weekend (W1WEF). Good conditions and interesting DX! I wish that I had more time to operate in the contest. Wait till next year (KB1BE). I thought that I was in the Everglades. There were so many "alligators" about! (KT2D). Good activity, beautiful weather, tough choice, I went 50/50 outside and on the air (K3WW). Thanks for sponsoring the contest. I would like to see it moved to lower QRN months (K4PQL). Incredible conditions to Japan from central Florida all night! Thanks to the JAs for standing by during checks for other parts of the world (AB4CQ). This was my first CW contest in 10 years. I had a great time! I missed some operating time due to a receiver failure. Murphy was born in my house! (WI8W). It was basically a three-band contest here. I have no antennas for 160, 80 and 10 meters. I didn't miss them; 15 meters was open for all 24 hours. Enjoyed it! (N9AG). Last year, we went 57 days without rain. Guess which weekend the drought broke. I was off the air for four hours with thunderstorms! Had a great time anyway (KO9Q). Excellent contest but what happened to 10 meters? Why did I fall asleep two hours before the end? (XE1THR). Conditions were not good. Fifteen meters was the best band. There was a great deal of aurora activity to the north (LA5QFA). Ten meters: poor conditions; fifteen meters: excellent conditions; twenty meters: in-between (LA2AD). I couldn't believe the pileups on 15 meters! Super conditions and great fun! (OH6NIO). A national ham meeting and no beam for 20 meters resulted in limited operating time in the contest. Super propagation helped me to make nearly 1400 QSOs in about 12 hours! (OH1AF). Thanks for FB contest. GL and 73 (OH7NW). Thanks for the nice test (OH3OJ). I worked eight new prefixes! (OZ7AX). GL! DX! 73! (UA1OAM). Very enjoyable as it was my first contest. I wasn't able to operate all the time as a new baby daughter played havoc with the household that evening (EI6GP). What an excellent contest! CW operation was down a bit due to the chief CW operator twisting his ankle while chasing a wild goat away from the mast guy ropes at four in the morning! Luckily he can send with the other foot but not as fast! See you next year (EJ1D). I was only able to operate for half of the contest. I found 21 and 28 MHz quiet (GM4ZFE). No activity on the low bands! See you next year (ON6AH). A good contest, but a great deal of QRN (PAØIJM). Nice contest as usual (PA3EOB). The contest was fun. I did well for my poor rig and antenna. See you next year (DF1LX). This was my first time in this contest. It was very interesting (DF8WS). Good conditions with much QRM, but it was one of the best contests (DL8PC). It was great fun working in the contest. I would have loved to be QRV for 24 hours, but I had to work the weekend (HB9CSA). It was fun (HB9CVO). Thanks for the interesting contest. I hope for a better score next year (IK5IIU). Wonderful conditions, but a local thunderstorm didn't allow a good job on the low bands (I2VXJ). During the night, the propagation was beau-



A view of some of the antennas used by HQ-station HG89HQ.



Gyozo, HAØMM, finished first-place world mixed mode using these antennas.

tiful to the US (IN3ZNR). Next time, I will have a better 15-meter antenna. It was practically a single-band contest, and 15 meters is my worst band (OK1RI). We had bad conditions and thunderstorms (SP9MRO). This was my first IARU contest. It was fun. I hope to do better next time (YO5BQ). Very good contest! (YO2DFA). Extremely bad propagation! (RV6AF). Thanks for the nice contest (UA4LU). Thanks for FB contest (UA6LQ). Many thanks for the nice contest! It was my first championship (UA3RMN). Thanks for contest (UA3YAO). FB contest! (RV1AF). Sincere thanks for the fine contest. I hope to enter again next year (UA6EED). Thanks for the nice contest (UZ4CYJ). Thanks for the contest. The conditions were very good (RB5MT). This was my first time in the IARU championship. It is a very dynamic contest (RC2AZ). Great contest! Does anybody need zone 29? (UC2AB). Very FB conditions in Northern Europe (UQ2GD). Thanks for the nice contest QSOs (UQ2PP). FB contest (UR2RND). Thanks for the good contest (UA9CBO). I did not have good conditions! Hope they are better next year (UW9CP). Cheerio! (R18BN). Thanks for the very nice contest (UL7MU). The conditions were very poor for this important contest especially on 28 and 14 MHz (CT1BWW). Nice contest (EA7AAW). Very, very tired! (JI1UTP/1). Good conditions for 10 meters! (JA1AAT). This is my first time in the contest (JR1TFR). The conditions and activity were not very good on 10 meters (JE1CKA). I was amazed when K3ZO called me on 28 MHz at 0749Z! Great conditions on all bands including many long-path openings (5H3TW). This was my first time in the contest. See you next year (VK8XX). There seemed to be plenty of activity, just a pity some stations don't spend a little more time listening between their CQs! Good to see 10 meters coming to life (ZM2AGY). Thanks for the FB contest! Greetings from FJL (UAØBEZ/UA1O). Thanks for the nice contest. 73 from FJL (UA1OT).

Scores

Scores are listed by ITU zone and then by country within that zone. The line score indicates the call sign, final score, QSOs, multipliers and entry class. The entry class letters indicate: A = single operator, mixed mode; B = single operator, phone only; C = single operator, CW only; D = multioperator, single transmitter.

Zone 1

Alaska

NL7DU 200,664- 701- 72- B

Zone 2

Alberta

VE6DZ 34,055- 169- 49- A
VE6BF 113,967- 409- 67- C

British Columbia

VE7EEE (VE7EBI,op) 162,720- 926- 48- B

Zone 4

Quebec

VE2WAT 7,140- 63- 30- C

Ontario

VE3CPA 375,597- 1093- 81- B
VE3BXY 51,435- 277- 45- B
VE3TJL 2,324- 44- 14- B
VE3KP 341,140- 1038- 74- C

Zone 6

W6

East Bay

N6EK 240,240- 606- 91- C
K6TMB (+K3EST,JA7RHJ) 1,106,930- 1766- 145- D

Los Angeles

N6IBP 25,312- 110- 56- A
K6SVL 331,905- 933- 87- B
KI6BN 92,352- 322- 78- B
AI6Z 83,160- 295- 72- C

Orange

NX6M 26,132- 171- 47- A
WB6DFA 43,650- 213- 50- B
WAØYRX 360- 29- 6- B
K6MJ 36,720- 148- 54- C

Santa Barbara

WA6FGV 305,600- 1021- 80- A

Santa Clara Valley

N6IP 86,265- 281- 71- A
WA6GFY (KJ6PJ,op) 43,448- 211- 64- B
WA6HRK 8,450- 100- 25- B
KA6INQ 738- 28- 9- B
N6TV 419,453- 965- 101- C
WD6ERA 257,855- 701- 89- C

San Diego

KI6ZH 196,350- 452- 105- B
W6UQF 322,300- 758- 100- C
K6ZH 39,180- 150- 60- C

San Francisco

WB6SRM 49,619- 227- 59- A
WA8LLY/6 41,028- 175- 52- A
KI6OT 28,665- 145- 49- B
WW6D 11,948- 100- 29- C
K6LRN (+NET) 14,208- 88- 37- D

San Joaquin Valley

WW6O 120,714- 481- 62- B
KD6FW (+KB6EEK) 111,166- 584- 62- D

Sacramento Valley

N6WR 52,305- 253- 55- B
WA6AUE 298,980- 742- 90- C

W7

Arizona

K8LL 687,401- 1319- 121- C

Montana

KS7T 68,420- 307- 52- A
KW7I 12,630- 97- 30- B

Nevada

NC7K 90,712- 380- 58- A
WB7VVH 1,485- 31- 11- B

Oregon

WA7OEM 115,620- 379- 82- A
W7TWL 39,500- 204- 50- A
KA7FEF 5,590- 59- 26- A
WR7E 45,297- 218- 63- B
KB7CXI 34,800- 204- 50- B
WA7IIM 15,810- 112- 31- B
W7YAQ 329,725- 629- 121- C
AD7T 45,954- 135- 74- C

Utah

WE7B 365,120- 1176- 80- A
W7HS 59,840- 190- 68- A

Western Washington

NX7K 170,872- 611- 62- A
K7LXC 42,330- 204- 51- A
W7WA 1,252,872- 1999- 148- B
K7LED (WA7UVJ,op) 78,147- 323- 57- C
NØAX/7 40,119- 195- 43- C
W7QN 23,001- 150- 33- C

Wyoming

KB7M 2,964- 36- 19- B

Zone 7

W5

Arkansas

WA5VBE 46,255- 229- 55- A
KC5TA 126,370- 457- 88- B
AA5CH 63,394- 289- 58- B
AA5CV 10,360- 70- 37- B
KB5EHR 2,028- 55- 12- B
KM5G 305,604- 891- 78- C
NS5C 44,888- 260- 49- C
W5EIJ 21,462- 110- 49- C

Louisiana

K2SD 710,585- 1377- 127- A
KG5VK 161,536- 714- 54- B
WA5KNC 8,888- 101- 28- C
N5AN (+W5WMU) 834,392- 1790- 113- D

New Mexico

AA5JF 89,856- 345- 72- A

North Texas

KA5W 511,438- 1068- 113- A
KD5GD 57,702- 218- 59- B
WBØNSA 57,014- 261- 58- B
KB5IQV 6,408- 258- 9- B
KRØY 998,880- 1473- 160- C
KO9Y/5 338,026- 804- 102- C
W5UDA 169,572- 512- 78- C
NJ1V (+WA4KBJ,N5s MTS,OOP) 163,371- 682- 71- D

Oklahoma

KF5DA 62,748- 335- 54- A
N5JKN 152,366- 548- 74- B
NW5H 22,536- 232- 24- B
N5KXI 2,737- 43- 17- B

South Texas

NZ5V 43,017- 309- 39- A
K5XI 342,693- 904- 101- B
KA5WSS 334,044- 868- 108- B
KB5HOE 68,456- 388- 52- B
WØVKP 42,600- 222- 50- B
AD5O 686,115- 1225- 127- C
KG5U 478,170- 1068- 105- C
W5NR 21,294- 115- 42- C
N5EA (+K5RVK, W5ASP,WB5BIR, GWØECD) 781,621- 1634- 113- D

West Texas

WF5E 215,138- 774- 77- B

W8

Colorado

WØGOQ 51,408- 235- 54- B
WBØZ 34,936- 208- 44- B
WØBWJ 1,309- 33- 11- B
AC0S 283,080- 802- 84- C
ADØO (+NØs DV,ST,WDØGVH) 272,599- 735- 101- D

Iowa

WØPPF 31,046- 205- 38- B

Kansas

WBØYJT 45,325- 226- 49- B
KBØG 671,957- 1250- 127- C
NØFMR 30,033- 180- 47- C

Minnesota

WØRXL 22,386- 132- 42- A
NØHUQ 10,410- 89- 30- B
NØHBS 5,834- 63- 22- B
NØBNG (+KØET,KAØs JZV,YFN,KSØT, NØEOB,WJØL) 612,846- 1480- 97- D
NØILS (+NØIOS) 79,820- 320- 65- D

Missouri

NSØB 24,840- 120- 54- A
WBØGFV 1,788- 40- 12- B
KA1J 130,451- 457- 73- C
NI0C 30,192- 132- 51- C

Nebraska

KVØI 381,988- 1078- 89- A
WBØSYV 30,969- 257- 37- C
KØSW 14,469- 83- 39- C

South Dakota

WDØBMR 55,347- 221- 57- B

Zone 8

W1

Connecticut

K1CC 1,203,210- 1910- 145- A
K1SSN (WB7EZO,op) 151,620- 541- 78- A
NF9K 98,624- 402- 67- A
W1WEF 1,058,688- 1823- 126- B
KA1ION 687,899- 1454- 109- B
KC8PE 176,700- 603- 76- B
KB1BE 6,669- 55- 27- B
K1TO 1,093,652- 1762- 139- C
K2SX/1 599,424- 1256- 112- C
NG1J 5,610- 57- 22- C
NJ2L 4,095- 48- 21- C

Eastern Massachusetts

WB2DND 100,492- 296- 74- A
WA1NPZ 83,300- 307- 68- B
WA1OEZ 53,800- 242- 50- B
W1/CE2FYX 4,152- 244- 24- B
W1AX 19,890- 129- 34- C
K1UCA 4,452- 48- 24- C

Maine

KN1M 230,289- 631- 87- A
AJ1T 16,632- 122- 38- A
K1SA (+KA1PRD,KQ1V,KY1K,N1s AFC, FHS,KD2EU) 49,448- 223- 58- D

Rhode Island

K1PLX 228,570- 590- 95- B

Vermont

WB1GQR (NW1N,WB2JSJ,W3LPR, KA1CSB,ops) 94,024- 411- 56- D

Western Massachusetts

KG1S 1,056- 34- 11

W2

Eastern New York

KE2GL 53,290- 53- 5
KC2QF 186,720- 602- 8
N2FTR 944- 30- 2
WB2Q 848,817- 1705- 11
N1CC 38,720- 263- 3
W2QYA 1,104- 22- 1

NYC—Long Island

KD2TT 104,432- 450- 6
WB2AMU 30,385- 153- 5
KS2G 20,090- 150- 3
W2GKZ 43,725- 178- 5

Northern New Jersey

KT2D 25,152- 136- 4
WB2K 412,335- 887- 11
W1GD 314,478- 677- 11
K3FNW 127,194- 365- 6
W2GD 945,498- 1529- 14
W2HCA 35,904- 153- 6
WA2ASQ 31,581- 234- 2
KE2CG (+KB2s FYS,GQS,KO2K, N2JLW,WA2E,KB4CYC) 341,711- 949- 8

Southern New Jersey

K2PS 22,200- 105- 4
KB2BF 208,215- 709- 6
KC2TA 8,282- 115- 1
W5KI 552- 18- 1
K2WI (+N2NU,WA2IUO) 843,734- 1201- 12

Western New York

KB2DE 97,308- 331- 6
NA2Q 8,283- 63- 3
W2OW (N2HR,op) 383,092- 961- 6
KW2J 146,522- 549- 8
W2TZ 57,929- 271- 5
W2FUI 10,452- 90- 2
KB4VL (+KB2GIR) 32,948- 190- 5

W3

Eastern Pennsylvania

KB3TS 82,541- 311- 5
W3BGN 81,640- 413- 5
K3ZPG 22,085- 137- 3
WA3YTI 13,101- 95- 3
KA1CLH 6,300- 76- 2
NM2Y 432,060- 1002- 9
K3IPK 413,777- 1050- 9
KL7HIR/3 42,300- 242- 5
N3GAN 29,785- 231- 3
N3CZB 57- 9- 1
K3WW (+NET) 347,805- 829- 9

yland-DC

D	1,180,155-	1885-	145- A
D	93,890-	311-	82- B
KX	36,195-	178-	57- B
B	18,009-	157-	27- B

stern Pennsylvania

HIE	261,261-	633-	99- C
A	133,704-	459-	72- C

bama

IF	629,481-	1497-	107- A
NQ	65,946-	314-	58- C
XM	11,253-	87-	31- C

orgia

LX	22,704-	134-	43- A
GC	52,155-	395-	61- B
YYQ	11,840-	84-	37- C

ntucky

IQMQ	69,840-	336-	60- A
WQO	44,556-	218-	47- B
M	206,690-	611-	85- C

rth Carolina

NC	903,638-	1673-	131- A
RVS	105,124-	347-	82- B
TI	67,600-	260-	65- B
IMI	7,854-	90-	21- B
WAU	7,300-	82-	25- B
QL	169,176-	510-	84- C
ISM	44,688-	268-	49- C
IOH	18,658-	143-	38- C

rthern Florida

CSD	68,325-	262-	75- A
DIW	66,674-	263-	74- A
INKA	55,220-	406-	69- B
IE	421,170-	1078-	101- C
CQ (+KW4T)	462,996-	1434-	81- D

uth Carolina

4BHM	17,612-	144-	37- B
AMV	4,608-	122-	12- C

uthern Florida

NJ	106,476-	540-	57- A
HW	307,154-	1251-	59- B
4F	26,215-	157-	45- B
4AHZ	243,426-	726-	67- C
YN	3,497-	59-	13- C

nnessee

IX	58,355-	329-	55- B
IDO	255,256-	754-	65- C
R	73,536-	347-	48- C

rginia

AM	127,571-	374-	83- B
KMS	2,032-	35-	16- B
PF	58,980-	270-	55- C
YE	20,596-	118-	38- C
TM	7,824-	76-	24- C
9B (+KB4WZR,WA4s OAE,ZBF)	64,476-	299-	54- D

ssissippi

5ECK	4,786-	102-	18- B

chigan

OC	762,723-	1493-	117- C
W	62,593-	283-	53- C
CWE	14,110-	109-	34- C
CV	3,703-	43-	23- C
CXX (K8s BTH,JM,N8BTU,NE8T,ops)	814,212-	1502-	126- D

lo

AG	641,684-	1300-	118- A
MR	40,545-	211-	45- A
XT	26,836-	171-	54- A
NI	5,192-	73-	22- A
8JBM (NZ4K,op)	582,360-	1024-	136- B
8ZNZ	174,710-	325-	62- B
EWR	26,832-	234-	26- B
8Q	20,387-	156-	37- B
9FTZ	6,233-	71-	23- B
EF	37,576-	158-	56- C
8LLD (+WD8AUB)	430,464-	1060-	96- D

est Virginia

DQL	84,402-	250-	81- A
8BMX	13,920-	105-	32- B
VEN	8,900-	84-	25- B
SLR (+KC4LAC,WB8YZV)	115,656-	568-	61- D

nois

DI	83,300-	340-	70- A
9DGE	61,773-	333-	59- A
LYA	18,962-	133-	38- B
9CRY	870-	29-	10- B
9U	270,368-	920-	68- C

K9MMS 117,650- 424- 65- C

K8SD (KC9AL,W9NNE,WB9SBO,K9FU, KA9GGI,KW9A,ND8F,W9HBH,ops) 610,743- 1099- 127- D

KD9ST (+KA9s SOR,SQS,SQT) 354,256- 921- 112- D

KA9YMV (+KA9YMW) 49,896- 250- 54- D

Indiana

KB8C 227,388- 699- 84- B

Wisconsin

KO9Q 79,928- 292- 77- A
K9OSH 29,796- 158- 47- A
KB9RX 14,313- 101- 39- B
WD9EGC 3,564- 270- 9- B
N8BSH/9 657,340- 1328- 115- C
W9HE 50,820- 203- 60- C

Zone 9

VE

Maritime-Newfoundland

VO2AC 23,000- 218- 25- A
VE1CBF 45,000- 210- 50- B
K4JHT/VO2 14,476- 125- 28- B
VO1AW 36,873- 169- 51- C

Zone 10

Mexico

XE1THR 32,052- 204- 41- B
XE1/K1ZZ 5,130- 108- 15- C

Zone 11

Dominican Republic

JP1DMX/HI8 415,880- 1212- 87- C
HI9UD (HI3s AMF,JMP,LFE,LRR,ops) 20,040- 501- 40- D

Dominica

J79T (W5EW,WC5N,ops) 481,137- 1757- 69- D

Guantanamo Bay

KG4UN (K8UNP,op) 476,064- 1468- 87- B

Puerto Rico

KP4DQ 26,508- 157- 39- B

St Maarten, Saba, St Eustatius

PJ7/K2KTT 43,838- 243- 52- B

Costa Rica

TE5T 61,460- 702- 35- C

Cayman Islands

ZF2AH (+ZF2KN) 339,660- 1050- 74- D

Zone 12

Ecuador

HC1OT 619,256- 1421- 88- B

Colombia

HK3JJH 699,335- 1505- 91- B
HK3NTI 4,384- 58- 18- B

Peru

OA4ZV 119,829- 413- 59- C

Venezuela

4M3B (YV3BKC,op) 26,652- 141- 38- B
YV5LAS 18,207- 179- 21- B
YV7QP 67,320- 264- 51- C

Zone 14

Chile

CE3BFZ 7,222- 65- 23- A

Argentina

LV3F (LU6FAZ,op) 336,087- 659- 107- B
LU9F 31,680- 270- 24- B
LU1EWL 23,712- 132- 38- C

Paraguay

ZP9Y (ZP5JCY,op) 2,001,846- 2650- 154- B

Zone 15

Brazil

PP5JD 573,975- 1542- 75- B
PP2YY 28,098- 314- 18- C

Zone 16

Argentina

LU2WM 15,552- 118- 27- C

Zone 18

Svalbard

UA8HZ/JW 413,259- 1421- 67- C

Norway

LA5QFA 191,962- 560- 82- B
LA1XDA 69,840- 409- 45- B
LA8DY 67,158- 204- 77- B
LA2AD 15,855- 13- 35- B
LA6ZFA 410- 11- 10- B
LA6FC 136,338- 368- 93- C
LA9HFA 91,336- 437- 56- C
LA9DBA 19,884- 332- 19- C

Finland

OH6NIO 715,680- 1625- 105- A
OH1AF 551,900- 1352- 100- A
OH8NEV 131,600- 449- 79- A
OH7NW 29,598- 166- 49- A
OH3OJ 90,060- 642- 38- B
OH2PM 768,430- 1503- 130- C
OH2YL 7,119- 75- 21- C

Aland Island

OH8/OZ1JVN 108,518- 546- 58- C

Denmark

OZ1CTK 122,724- 372- 84- A
OZ5EV 135,924- 342- 94- B
OZ1LTB 113,520- 618- 40- B
OZ2ACL 100,023- 349- 77- B
OZ7AX 12,840- 104- 30- B
OZ1FAO/A 594- 18- 9- C

Sweden

SM4BTF 25,071- 172- 61- B
SM7HSP 9,022- 158- 26- B
SM6CCE 95,915- 408- 62- C
SM6/W6FA 91,377- 355- 71- C
SM5RE 44,480- 268- 64- C
SM7LAZ/6 15,666- 160- 42- C
SM4SWF 13,940- 175- 34- C
SM6BDS 10,200- 76- 34- C
SM6CGO 7,080- 67- 24- C
SM6NUE 6,021- 47- 27- C
SM4CJY 1,628- 32- 11- C

Zone 19

European Russian RSFSR

RA1DZ 1,259,280- 1970- 165- A
RA1AA 284,915- 721- 105- B
UA1ZGH 264,095- 727- 89- B
UA1NDI 65,600- 374- 50- B
U1BA 19,561- 190- 31- B
UA1OKR 107,212- 538- 49- C
UA1OLL 67,672- 314- 78- C
UA1ZFT 63,745- 286- 61- C
UA1NDR 42,674- 345- 38- C
UA1OAM 38,640- 280- 40- C
UA1ZGT 34,938- 293- 31- C
UZ1AWO (RV1AW,op) 9,926- 221- 14- C
4L1NV (RA1NA,UA4s HVV,UBC,ops) 483,809- 1389- 103- D
UZ1ZWO (UA1s ZGM,ZHL,ops) 127,140- 525- 65- D
UZ1NWF (UN1-088s 24,65,302,ops) 78,903- 675- 33- D

Zone 20

Asiatic RSFSR

UA9XFJ 50,970- 362- 30- A
UA9XR 602,655- 1281- 113- C
UV9CC 203,915- 519- 65- C
UA9KCC 111,700- 275- 50- C
UA9XHT 88,556- 385- 52- C
UA9CAQ 37,620- 251- 27- C

Zone 21

Asiatic RSFSR

RA9JX 1,261,852- 2064- 132- A
UA9LU 316,498- 811- 91- C

Zone 23

Asiatic RSFSR

UA9QBR 326,374- 677- 106- C
UA9QQQ 366- 15- 6- C
UZ9QXU (UA9QEZ,UA9-98s 206, 210,220,221,ops) 157,040- 862- 40- D
UZ9QWE (UA8s QAA,QJ,-098-107,ops) 95,506- 444- 53- D

Zone 24

Asiatic RSFSR

UA9QO 292,347- 704- 99- A
UA9QGY 65,184- 339- 48- B
UA9ICM 9,360- 107- 20- B

Zone 26

Asiatic RSFSR

UA9KCL 18,146- 101- 43- C
UA9KG 10,912- 120- 22- C
UZ9KWT (U9KH,UA9KCC,ops) 143,520- 636- 48- D

Zone 27

Ireland

EI6GP 122,496- 492- 64- B
EJ1D (EI2s CA,GB,EI5DI,EI6EW,EI7s CC,CD,EI8CC,EI9COB,ops) 982,017- 2147- 111- D

France

F8S/FE1JDG 38,184- 306- 51- A
F8S/F1LBL 271,062- 864- 99- B
F8S/F6BVB 200,777- 585- 83- B
F8WG 91,960- 388- 62- B
FE8DRP 19,035- 191- 27- B
F9DK 27,960- 177- 40- C
FF1CJX (FD1s MFL,MLJ,MNC,ops) 95,864- 509- 46- D
F5WA (F1JVP,F6DKV,F6ENO,ops) 59,245- 361- 41- D

England

G6/AA6MC 84,616- 347- 56- A
G3ESF 182,942- 504- 97- C
G3TXF 72,964- 266- 58- C

Scotland

GM4OBK 20,200- 106- 50- A
GM3CFS 127,764- 398- 84- C
GM4ZFE/P 42,416- 301- 44- C

Wales

GW8GT (GW4JBQ,GW5NF,GW8ZUQ, GW8UCQ,ops) 359,840- 1119- 80- D

Belgium

ON8WN 1,287- 21- 13- A
ON4ALL 49,210- 309- 37- B
ON5CZ 13,024- 110- 36- B
ON5KI 7,000- 66- 25- B
ON5MT 2,085- 36- 15- C
ON6AH (+ON5IQ,ON6s MH,VL,ON7PC) 468,700- 1215- 100- D

Netherlands

PA9JM 21,312- 165- 37- A
PA3EOB 8,684- 104- 26- A
PA9LOU 30,848- 240- 32- C
PA9UV 12,120- 108- 30- C
PA3BTH 6,275- 65- 25- C
PA3DKX 3,190- 35- 22- C
PI4DEC (PA3s ATA,AWW,CZW,PA9BOE, PA/G4YSD,PAJL1EEE,ops) 522,200- 1311- 100- D
PA3EQV (+PA3s DZN,ENM) 406,116- 967- 116- D
PA6KHS (+PA3ENJ,PE1LBX) 105,524- 430- 66- D

Zone 28

Federal Republic of Germany

DF1LX 287,988- 758- 103- A
DK8KC 65,624- 240- 75- A
DF8AN 10,608- 72- 51- A
DF8WS 638,318- 1429- 102- B
DL8PC 410,832- 862- 108- B
DL5YCQ 73,901- 293- 67- B
DL2BAY 40,064- 322- 32- B
DJ4FU 26,406- 143- 54- B
DL8SCP 8,118- 95- 22- B
DF9RX (K5ZD,op) 807,402- 1384- 159- C
DL2OBF 185,268- 846- 92- C
DK3GI 149,952- 424- 88- C
DL7RAG 91,770- 221- 105- C
DF3QN 16,644- 130- 38- C
DL1ZQ 12,390- 111- 30- C
DL4GBR 6,141- 76- 23- C
DL5ZBA 1,130- 29- 10- C
DF8SSB (DK8ZB,DL6FBL,ops) 1,129,408- 2296- 112- D

Hungary

HA6MM 1,928,690- 2636- 190- A
HA5PP 1,091,270- 1959- 145- A
HA5HH 219,414- 706- 87- A
HA1SL 103,812- 356- 82- A
HA3HU 53,340- 451- 35- A
HA8XX 313,992- 803- 96- B
HA1XR 632,125- 1409- 125- C
HA6OI 436,988- 1086- 107- C
HA6NL 362,176- 1026- 114- C
HA7UI 324,384- 908- 109- C
HA5LZ 237,639- 566- 113- C
HA5NW 134,261- 547- 71- C
HA6IAM 96,876- 352- 81- C
HA7ML 73,224- 309- 72- C
HA6VA 55,407- 229- 69- C
HA7JB 42,399- 177- 63- C
HA3GJ 2,970- 41- 18- C
HA3KZ 675- 75- 9- C

Switzerland

HB9CSA 71,583- 268- 79- A
HB9DX 34,375- 185- 55- C
HB9DFY 31,005- 153- 45- C
HB9CVO 30,038- 157- 51- C
HB9AYZ 2,587- 69- 13- C

Italy

I8KHP 91,581- 307- 89- A
IK2JEX 66,704- 258- 76- A
IK2GPQ 26,544- 172- 48- A
IK4AUY 373,062- 892- 97- B
IK1NDB 105,562- 327- 94- B
IK8OWN 94,700- 544- 50- B
I8KHY 63,862- 281- 74- B
IK5IIU 34,784- 318- 32- B
IK4FNF 24,700- 138- 50- B
I4CSP 21,788- 120- 52- B
IK2IKW 4,530- 52- 30- B
I2VXJ 865,985- 1489- 155- C

IK8FWI 187,740- 633- 84- C
IK8ADY 14,364- 124- 36- C
IK8FUX 9,261- 101- 27- C
IC4UFH (+I4JMY) 1,465,280- 2108- 160- D
IN3ZNR (+IN3s QBR,SAU) 261,063- 677- 80- D

Sardinia

IS8JOO 49,533- 367- 33- B
IS8OMH 49,444- 454- 47- C

Bulgaria

LZ2KSQ 978,692- 1773- 143- A
LZ1RN 6,360- 149- 20- A
LZ1TA 283,494- 834- 111- C
LZ1LG 43,668- 47- 28- C
LZ1MC 38,898- 216- 44- C
LZ1MG 37,843- 358- 41- C
LZ1EP 3,570- 45- 35- C
LZ1KVF (LZ1Cs 75,94,187,ops) 124,550- 406- 94- D
LZ1KAU (LZ1s TR,VB,ops) 78,658- 348- 67- D

Austria

OE1BKW 15,004- 93- 44- B
OE9SLH 21,600- 114- 50- C

Czechoslovakia

OK1RI 1,416,012- 2121- 156- A
OK2RU 429,133- 996- 127- A
OK3EA 190,232- 620- 79- A
OK2KR 96,712- 280- 88- A
OK1KZ 79,084- 332- 71- A
OK3CDZ 72,261- 357- 63- A
OK2PGT 44,517- 223- 57- A
OK1FGS 5,880- 59- 24- A
OK2KVI/P 1,562- 34- 11- A
OK1DQW 216,000- 624- 100- B
OK1FUA 75,406- 334- 74- B
OK2BQL 64,881- 223- 81- B
OK1DKS 32,886- 177- 54- B
OK1BB 19,740- 149- 35- B
OK3CQG 3,435- 63- 15- B
OK2PCF 204,525- 597- 101- C
OK2PDT 195,994- 584- 86- C
OK3YCA 169,818- 488- 93- C
OK3GB 158,420- 407- 95- C
OK1MNV 111,300- 367- 75- C
OK3CEL 93,104- 272- 92- C
OK1TW 90,060- 277- 79- C
OK1FKW 75,144- 312- 62- C
OK3FON 72,917- 233- 79- C
OK3CVF 70,586- 352- 58- C
OK2HI 40,544- 196- 56- C
OK3CWF 32,054- 227- 47- C
OK2BBQ 26,674- 243- 39- C
OK2BND 25,172- 250- 29- C
OK3CTX 22,230- 149- 40- C
OK3CAB 18,784- 175- 32- C
OK1MZO 17,945- 119- 37- C
OK1JDJ 12,903- 104- 33- C
OK1AXA 12,575- 116- 25- C
OK1DWU 10,800- 114- 27- C
OK3CDN 9,555- 120- 29- C
OK3YDP 7,518- 108- 21- C
OK1DFT 3,840- 54- 16- C
OK3TNA 2,233- 93- 11- C
OK1DWJ 1,098- 55- 9- C
OK2BXR 1,089- 83- 9- C
OK8AEW/P (Y24OL,op) 850- 54- 10- C
OK1CZ/M 370- 24- 5- C
OL7BTG 345- 34- 5- C
OK2PBG 296- 15- 8- C
OK2PXJ 85- 5- 5- C
OK1KSO (OK1s CF,JJB,WT,ops) 1,339,681- 1984- 161- D
OK3KAG (+ops) 870,875- 1621- 141- D
OK1KQJ (OK1s AYP,BY,DLE,DXS, VKX,ops) 806,911- 1548- 133- D
OK3RKA (+ops) 712,790- 1352- 130- D
OK1KLV (OK1s ADT,AGA,DVZ,FDT,ops) 312,480- 886- 105- D
OK1OFM (+ops) 249,534- 687- 107- D
OK2KDS (+ops) 188,584- 604- 88- D
OK2KMR (+ops) 118,990- 471- 73- D
OK1KYY (+ops) 100,575- 404- 75- D
OK3KGQ (+ops) 82,167- 430- 61- D
OK3KWW/P (+ops) 74,970- 417- 51- D
OK1OAW/P (+ops) 74,400- 378- 62- D
OK3KXM (+ops) 7,344- 76- 24- D
OK1KZD (+ops) 550- 23- 10- D

Poland

SP2NA	199,998-	415-	123- A
SP9RI/A	67,020-	284-	60- A
SP8LZC	2,360-	127-	10- A
SP5MXZ	198,436-	667-	76- B
SP1DTG	169,840-	514-	88- B
SP6DVP	137,826-	408-	93- B
SP9MRO	100,152-	450-	72- B
SP4CJA	20,295-	175-	33- B
SP8HPW	16,850-	117-	41- B
SP9DGO	76-	5-	4- B

SP8NR 181,396- 498- 101- C
SP9BBH 132,314- 359- 91- C
SP1AEN 90,506- 424- 59- C
SP6EIY 65,431- 294- 59- C
SP4GFG 59,148- 302- 62- C
SP5CJQ 42,924- 354- 42- C
SP3LPR 920- 28- 10- C
SP3PLD (SP3s IBM,NYS,SBB,ops)
284,834- 787- 107- D
SP1PBW (SP1s AMU,BZZ,ops)
223,890- 589- 102- D

German Democratic Republic

Y21RM/A 834,240- 1402- 158- A
Y35VM 413,187- 880- 129- A
Y34SG 393,471- 815- 118- A
Y21VF/A 343,090- 959- 110- A
Y25TO 330,210- 721- 135- A
Y22EK 284,592- 677- 112- A
Y48HL 271,953- 758- 99- A
Y31WI 190,992- 692- 92- A
Y32WF 189,274- 551- 101- A
Y32PI/P 151,296- 512- 96- A
Y21WI 114,390- 431- 82- A
Y44NO 113,442- 547- 74- A
Y22IH 103,968- 410- 76- A
Y52QH 98,358- 463- 67- A
Y36UE 95,264- 622- 42- A
Y31SJ 77,482- 298- 77- A
Y25PE 74,814- 306- 74- A
Y22WK 73,125- 438- 65- A
Y42VN/P 68,180- 319- 70- A
Y55TD 67,536- 335- 63- A
Y21XI/P 63,180- 309- 65- A
Y48YN 57,980- 284- 65- A
Y22BC/P 44,287- 190- 67- A
Y62SM 42,592- 298- 32- A
Y25FI 39,435- 300- 55- A
Y21NE/A 37,732- 325- 33- A
Y42ZG 36,820- 270- 35- A
Y61ZA 33,318- 206- 54- A
Y27BG/A 28,461- 172- 53- A
Y36ZM 27,931- 133- 53- A
Y67UL 27,600- 167- 48- A
Y49RF 27,120- 136- 48- A
Y64XH 22,545- 155- 45- A
Y22LE 22,064- 202- 28- A
Y25UA 20,988- 108- 53- A
Y52ZA 19,188- 125- 39- A
Y26WM 12,740- 125- 28- A
Y39YE 10,062- 99- 28- A
Y42ZH 10,052- 88- 28- A
Y65KM 9,801- 99- 33- A
Y47PM 8,954- 106- 22- A
Y22HF 7,320- 66- 30- A
Y44WA/P 3,876- 90- 17- A
Y51OG 3,728- 64- 23- A
Y22WH 2,982- 99- 14- A
Y62RM 2,835- 39- 15- A
Y32EE 2,304- 42- 16- A
Y24XH 1,911- 39- 13- A
Y25TM 1,887- 33- 17- A
Y28DM 1,862- 33- 14- A
Y71ZA/P 1,550- 100- 10- A
Y49ZD 1,456- 31- 16- A
Y25MO/P 1,290- 58- 15- A
Y24HB 896- 26- 14- A
Y26RL 594- 26- 9- A
Y36SG 140- 7- 4- A
Y22VI 38,008- 190- 62- B
Y45LJ 36,396- 176- 54- B
Y25ML 34,503- 211- 53- B
Y68TH 34,498- 198- 56- B
Y66YF/P 25,806- 189- 46- B
Y54TA 19,395- 125- 45- B
Y41JH 15,414- 103- 42- B
Y87PN 14,314- 123- 34- B
Y25PO/P 11,340- 110- 35- B
Y46ZC/P 9,857- 97- 33- B
Y43XE 6,340- 95- 20- B
Y25DF/P 2,720- 43- 16- B
Y25AH 1,872- 33- 16- B
Y24MB 1,320- 54- 10- B
Y31CN 1,092- 18- 13- B
Y24QE/A 174- 7- 6- B
Y25TG 215,670- 730- 91- C
Y75IN 135,490- 512- 85- C
Y56ZA 124,800- 450- 80- C
Y28QH/A 115,423- 527- 77- C
Y23IA/A 107,756- 390- 79- C
Y23TL 74,324- 328- 69- C
Y35ZJ 69,642- 281- 73- C
Y25JI 54,072- 244- 72- C
Y23VB 45,668- 261- 49- C
Y71TA 36,250- 166- 58- C
Y25SG 31,868- 170- 52- C
Y25QE 30,654- 333- 39- C
Y71RA 27,195- 162- 49- C
Y23HJ 24,274- 153- 53- C
Y23CM 22,750- 142- 35- C
Y23GB 20,331- 209- 27- C
Y79WN 16,610- 110- 55- C
Y61XM 15,429- 126- 37- C
Y59ZF 10,164- 91- 33- C
Y21YA 9,085- 99- 23- C
Y47YM 8,883- 103- 27- C
Y23YM/A 8,180- 125- 20- C
Y21CL 5,792- 79- 24- C
Y23HN 5,627- 98- 17- C
Y74XG 4,950- 43- 30- C
Y77YH 2,700- 112- 15- C
Y37NM 2,236- 46- 13- C
Y23UE 1,017- 59- 9- C
Y23JA 900- 42- 10- C
Y24SH 440- 33- 8- C
Y49ZL 351- 9- 9- C
Y24TG 336- 12- 7- C
Y35YG 1- 1- 1- C

Y36I (Y44s TI,XI,ZI,ops)
1,314,039- 1932- 179- D
Y35L (Y26BL,Y33s TL,UL,ops)
1,013,235- 1722- 155- D
Y22YD (+Y24YH,Y25TD)
729,820- 1381- 140- D
Y39CH (Y39s OH,SH,ZH,ops)
496,188- 1034- 132- D
Y32CN (Y24LN,Y32s WN,YN,ops)
396,858- 975- 113- D
Y55CJ (Y24WJ,Y55TJ,ops)
377,194- 1097- 113- D
Y62CI/P (Y62s SI,UI,XI,ops)
364,068- 1008- 108- D
Y44CN (Y23TN,Y44s SN,ZN,ops)
316,511- 905- 97- D
Y33CC (Y21BC,Y22IC,ops)
305,200- 839- 109- D
Y43CO (Y21RO,Y43s GO,ZO,ops)
304,408- 896- 104- D
Y33CJ/P (Y33s QJ,UJ,WJ,ops)
275,216- 777- 103- D
Y73SOP (Y21s EA,FA,Y23FA,Y42HA,
Y25QA,ops)
236,104- 916- 88- D
Y54CO (Y54s NL,TO,ZO,ops)
178,958- 705- 87- D
Y44CF (Y25OF,Y63YF,ops)
122,049- 438- 71- D
Y52CE (Y22KE,Y52s DE,TE,ops)
106,789- 485- 73- D
Y53CN/P (Y53s VN,XN,YN,ops)
95,130- 421- 70- D
Y66CA (Y66s QA,ZA,ops)
63,224- 449- 56- D
Y49CM (Y49s JM,LM,MM,ops)
56,615- 298- 65- D
Y33CB (Y33s UB,YB,ZB,ops)
53,280- 323- 48- D
Y42CB (Y22YB,Y23UB,ops)
52,608- 273- 64- D
Y72CM (Y72s XM,YM,ZM,ops)
49,242- 248- 58- D
Y34CC (Y34s TC,UC,YC,ops)
47,840- 273- 60- D
Y37CE (Y25LE,Y37ZE,ops)
20,852- 210- 26- D
Y54CE (Y54s SE,YE,ZE,ops)
19,152- 150- 36- D
Y36CB (Y36s RB,YB,ops)
15,880- 135- 40- D
Y63CG (Y63s VG,-09-G,ops)
14,171- 126- 37- D
Y39CL (Y39s UL,ZL,ops)
10,130- 113- 30- D

Romania

YO5BQ 107,325- 425- 81- A
YO2AQB 85,190- 333- 70- A
YO5KLE 56,628- 435- 52- A
YO2AOB 39,738- 291- 37- A
YO6ADW 33,239- 249- 43- A
YO2BLP 11,067- 150- 31- A
YO2ARV 8,517- 133- 17- A
YO6BFC 3,840- 138- 12- A
YO9DIA 143,985- 535- 87- B
YO3DCO 66,432- 300- 64- B
YO2LBN 13,764- 120- 37- B
YO8BVG 5,700- 74- 25- B
YO8AHX 3,111- 53- 17- B
YO9DHY 2,795- 72- 13- B
YO7AOZ 2,365- 57- 15- B
YO5QAW 2,262- 81- 13- B
YO9IAB 2,028- 63- 13- B
YO9FEH 840- 30- 10- B
YO5OBL 300- 33- 5- B
YO4BEX 129,108- 521- 84- C
YO2DFA 117,572- 409- 91- C
YO3AAQ 29,256- 180- 52- C
YO2BKK 12,150- 147- 27- C
YO6VZ 6,556- 112- 22- C
YO8BPY 2,100- 40- 15- C
YO9AWV 864- 18- 16- C
YO6BTY 140- 20- 5- C
YO8KZD (YO8s CQQ,DDP,EB,ops)
428,512- 137- 112- D
YO8KGX (YO5OAL,YO8RAX,ops)
3,418- 108- 14- D

Yugoslavia

YT7M (YU7RU,op)
433,920- 1198- 113- A
YU2TY 179,902- 510- 89- A
YU3HR 811,008- 1579- 126- B
YU2W (YT2FI,op)
772,507- 1439- 131- B
YU7FT 112,340- 405- 82- B
YU1ADO 14,605- 168- 23- B
YU5DC 7,896- 117- 21- B
YU3EA 607,050- 1160- 142- C
YU7BJ 574,362- 1526- 102- C
YU7SF 258,774- 641- 118- C
YU4BR 215,628- 725- 84- C
YU5GX 172,304- 544- 88- C
YU1BM 153,540- 538- 90- C
YU5GB 142,272- 552- 72- C
YU3JZ 116,272- 327- 86- C
YU7KM 49,848- 225- 62- C
YU3NP 13,050- 118- 25- C
YZ3A (YT3s CT,EF,IN,YU3WF,
4N3BMK,ops)
456,722- 1225- 101- D
YU4ELI (+ops) 37,131- 563- 89- D

Malta

9H3KL (HA8UB,op)
477,064- 1676- 98- A

Zone 29

Kaliningrad

UA2EC 23,850- 141- 50- C
UA2FU 8,160- 56- 30- C
UZ2FWN 2,444- 98- 13- C

European Russian RSFSR

UA3RAR 1,077,072- 1727- 152- A
RW3AU 400,928- 846- 134- A
UW4CO 175,350- 715- 70- A
UA3SBW 157,130- 459- 95- A
UA1WBV 145,029- 549- 87- A
RA3AOD 113,057- 389- 81- A
UA6JD 64,388- 303- 68- A
UA3TS 81,216- 397- 64- A
RA3AQ 78,300- 483- 60- A
RA3VA 65,928- 224- 82- A
UA3DCZ 65,036- 292- 71- A
UA3DK 53,656- 355- 58- A
UA3SFH 52,746- 265- 58- A
UZ6HC 50,917- 503- 63- A
RA1QM 44,419- 389- 43- A
UA3RLZ 42,126- 435- 42- A
UA3RMW 38,300- 279- 50- A
RV6LA 36,556- 318- 38- A
UV6HKL 35,130- 209- 65- A
UA3DJG 34,743- 255- 37- A
RA3DJA 26,028- 155- 52- A
RA3QSU 24,530- 128- 55- A
UA4LU 23,100- 250- 39- A
RV6AF 20,540- 120- 52- A
RW3DD 17,889- 109- 67- A
UV3QMU 13,734- 281- 21- A
UA3TAM 12,454- 154- 26- A
UA1ANA 7,317- 89- 27- A
UA3MBE 520- 13- 8- A
UA6ADC 613,184- 1303- 134- B
UA6LQ 325,458- 855- 98- B
RA3ZH 243,324- 766- 87- B
UA6XT 200,970- 675- 90- B
UA3RMN 168,245- 670- 95- B
RW3DW 154,979- 561- 81- B
RA6LBS 109,798- 422- 82- B
RW3ZC 98,185- 343- 73- B
UA4NC 96,900- 468- 76- B
UA4CO 75,520- 324- 80- B
RW3ZA 69,615- 321- 65- B
UA3TN 69,108- 258- 76- B
UW3ZI 67,900- 322- 70- B
UV6LGP 61,301- 295- 59- B
UA3DNR 55,158- 300- 58- B
RA3DNC 49,020- 305- 38- B
UA4ACP 40,420- 276- 47- B
UV6LAP 38,556- 223- 54- B
UA6ECU 34,144- 370- 32- B
UA6HON 32,760- 351- 54- B
RA3TFU 26,676- 252- 38- B
UW6LL 22,103- 197- 31- B
UA3SBJ 18,352- 176- 31- B
UA3CS 17,561- 267- 65- B
UW6LO 16,884- 142- 36- B
RA1CQ 14,280- 153- 35- B
UA4LEW 13,311- 185- 27- B
RA4SBV 12,087- 254- 38- B
UV3DCR 4,335- 81- 17- B
UA6LTA 2,610- 52- 15- B
UW3AA 773,924- 1427- 163- C
RA3ZC 303,105- 795- 121- C
UZ6AXE (RA6AOS,op)
278,616- 776- 114- C
UA3YAO 208,280- 588- 108- C
UA4AGP 205,766- 687- 94- C
RA4AV 203,500- 615- 100- C
UA4YR 184,128- 645- 84- C
UA4CPW 151,126- 557- 82- C
UA1ANP 144,910- 555- 88- C
UA1AUA 137,982- 583- 78- C
RV1AF 133,384- 582- 77- C
UA6EE 129,184- 493- 88- C
RA3RN 128,415- 355- 105- C
UA4AHA 120,480- 512- 80- C
UW3TU 114,700- 497- 74- C
UV6HPI 107,408- 335- 112- C
UA3DEW 98,915- 458- 73- C
RA3PQ 89,391- 327- 83- C
UW4CU 88,232- 343- 82- C
UA4YJ 87,872- 321- 72- C
UA6BJQ 81,055- 429- 65- C
UW3AO 80,960- 370- 64- C
UA4FFV 75,680- 469- 39- C
UA4HKJ 75,276- 323- 68- C
UA4LDJ 75,226- 409- 48- C
UA3VLO 72,072- 290- 77- C
UA6BGL 70,040- 270- 68- C
UA4QK 67,184- 372- 58- C
UA1AJ 65,659- 513- 47- C
UA6EED 65,270- 323- 61- C
UZ4HWS 59,276- 332- 58- C
RA4AI 58,536- 284- 72- C
RA1CT 57,688- 374- 56- C
UA4LAF 57,164- 328- 62- C
UA4HNP 55,278- 303- 52- C
UA3ICJ 52,650- 303- 54- C
UA3TU 50,715- 105- 105- C
UA3RU 48,550- 302- 50- C
OK3IA/UA3 42,300- 274- 45- C
UA4HVW 39,824- 352- 38- C
UA4ANZ 38,016- 172- 66- C
UA3AAJ 36,387- 300- 32- C
UA6HPT 32,780- 276- 44- C
RA1QZ 32,025- 293- 35- C
UA3IIA 30,855- 285- 33- C
UA3YFT 26,433- 306- 33- C
UA4SS 24,583- 338- 31- C
UV6LEC 19,834- 190- 47- C
UA6LAK 15,490- 251- 31- C
UW4SA 15,300- 119- 34- C
UA3BK 12,800- 157- 40- C
UA6LIE 12,258- 145- 46- C
UV6LDP 5,180- 43- 28- C
RA6LE 3,738- 52- 21- C
UV6LIP 585- 65- 9- C
UV6AGF 185- 15- 5- C
UZ1AWT (UA1ALZ,UW1AE,UV1AA,
UA1-169-100,ops)
1,183,912- 1870- 166- D
US4P (RA4PO,UA4s PBX,PO,QM,RL,RZ,
-094-152,-094-883,K7s RA,UDG,ZR,
KE7V,WR7Q,ops)
1,070,740- 1940- 157- D
UZ4CYJ (+ops)
724,128- 1322- 152- D
UZ3EWD (RA3EA,UA3s EDQ,EKG,EKI,
UA3-147s 386,389,421,ops)
513,760- 1209- 130- D
UZ6LWA (UA6LTY,UW6NU,ops)
464,116- 1268- 116- D
UZ1TWB (RA1TE,UA1s TAF,UM,ops)
455,948- 1238- 116- D
UZ1AWO (+ops)
438,518- 1107- 119- D
UZ6HXK (UA6-108s 1838,1870,1874,ops)
424,731- 1053- 93- D
UZ8HWA (RA6HIT,UA6s HRZ,HSV,ops)
410,034- 1168- 111- D
UZ6LWU (UA6s LCW,-150-1092,
-150-1415,ops)
399,726- 1170- 106- D
UZ4FWA (UA4FZ,UA4-148s 363,
465,481,ops)
374,256- 1017- 119- D
UZ3XWC (UA3-127s 585,577,578,ops)
290,456- 911- 88- D
UZ3TWO (+ops)
276,992- 371- 42- D
UZ4FWZ (+ops)
248,776- 645- 109- D
RZ6LXN (RW6s LP,LQ,UZ6LC,ops)
199,296- 588- 98- D
UZ4LWZ (+ops)
190,732- 721- 82- D
UZ4YWY (+ops)
170,786- 683- 77- D
R3AFG (UA6BHF,UA4-156-876,ops)
163,350- 580- 75- D
UZ3RWM (RW3RW,UA3RLP,ops)
157,766- 668- 82- D
UZ3DWX (+UA3-170-998)
118,620- 388- 90- D
UZ3MWA (UA3MA,UA3s MDL,MES,ops)
107,589- 417- 77- D
UZ6LWB (RA6LW,UV6ARS,UA6-150s
1344,-1443,ops)
96,720- 462- 78- D
UZ3DWH (UA3s DVB,-142-610,ops)
71,253- 307- 63- D
UZ3YXP (UA3s YFO,-118-152,-118
-478,ops) 70,800- 308- 60- D
UZ4AYN (+ops)
53,400- 457- 40- D
UZ4PWY (+ops)
37,349- 339- 47- D
UZ3TWW (UW3TX,UA3-122-1258,ops)
21,236- 54- 54- D
UZ3LWF (UA3s LID,LGN,-155-581,ops)
18,873- 270- 27- D

Ukraine

RB5IM 1,177,405- 1649- 181- A
RB4IRO 495,180- 1214- 126- A
UB5CGN 361,680- 782- 120- A
UB5FAN 174,000- 709- 75- A
UY5TE 149,234- 588- 89- A
UB5MLP 130,464- 425- 96- A
UB4JDM 123,878- 792- 48- A
UB5IF 84,864- 399- 52- A
RB4IUM 79,395- 435- 67- A
UB5HDQ 79,254- 300- 63- A
UB5EQA 78,480- 309- 80- A
RB5IQ 73,432- 312- 67- A
UB4AR 64,160- 499- 40- A
UB8MZ 62,144- 253- 64- A
RB5IIU 47,920- 181- 80- A
UB5IFH 41,664- 254- 48- A
UB5CDX 40,098- 221- 56- A
RB5IF 35,448- 270- 37- A
UB5EVN 34,695- 271- 45- A
RB5CL 25,428- 267- 39- A
RB5IKY 24,192- 118- 54- A
UB5CCP 18,370- 102- 55- A
UB5AJP 15,840- 131- 36- A
RB5NK 8,235- 127- 27- A
UB8QZ 1,411- 40- 17- A
RB5MT 1,473,342- 2184- 169- B
RB5FF 1,311,393- 1910- 177- B
RB5DX 810,968- 1384- 134- B
UB5EAZ 291,555- 1002- 93- B
RB5VT 234,270- 819- 90- B
UB5MDD 145,700- 750- 80- B
UY5IX 70,224- 440- 56- B
UB5CBB 53,380- 308- 58- B
UB5BCX 34,858- 230- 54- B
RB5TK 33,345- 259- 45- B
UB4JO 32,298- 254- 42- B
RB5ICY 26,714- 234- 38- B
UB4ED 19,260- 184- 30- B
UB5IKN 18,540- 200- 30- B
UB4LPF 15,776- 136- 32- B
UB5ZHQ 4,176- 72- 18- B
UB5SEL 780- 32- 10- B

RB5GW 686,424- 1392- 14
RB5QF 493,107- 1225- 12
UB5IAN 309,384- 845- 11
UB5IOM 279,748- 864- 10
UB5LF 263,403- 691- 11
RB4JF 256,841- 805- 10
UB5JCF 214,840- 751- 8
UB5QBC 210,780- 695- 8
UB5PAG 154,468- 599- 9
UT4UN 134,421- 343- 11
UB4LAA 111,311- 499- 7
UB5ARG 99,840- 488- 6
UB5EF 96,633- 413- 8
UY5ZI 89,131- 277- 8
US0CG 86,760- 516- 6
RB5UE 75,150- 340- 7
UB5MTM 70,380- 322- 4
UB5PAN 70,200- 429- 3
UB3MP 69,660- 315- 7
UB5IHQ 62,080- 293- 6
UB5EOB 60,770- 288- 5
UB4AO 59,451- 293- 5
UB4IX 56,808- 300- 7
UB5TN 52,984- 198- 7
RB5IOV 52,458- 374- 4
UB4LAT 51,744- 253- 5
RB5MU 49,408- 222- 6
UB5ZFN 49,077- 297- 4
RB5FT 47,034- 295- 5
UB5BCJ 46,280- 890- 5
UB5JNW 42,330- 419- 3
UB5EEP 38,205- 277- 4
UB5AEI 32,802- 290- 3
UB4JL 32,457- 292- 3
UB5XCU 30,852- 257- 3
UB5JS 29,016- 302- 3
UB5SBN 26,880- 253- 4
UY5WA 24,928- 258- 3
UB5FCN 23,470- 311- 30
UB5QBF 22,194- 291- 4
UB5REF 21,896- 262- 3
UT5LF 14,819- 115- 3
UB5DCD 12,914- 265- 2
UB4IM 9,044- 81- 2
UB5LFG 5,168- 92- 1
UB5VK 3,024- 72- 1
UB5NCD 1,848- 34- 1
UB4JW 708- 74- 6
UB5SBR 520- 17- 8
RB8M (RB4s MB,MF,RB5s MA,MP,
UB4ML,UB5s MDA,MN,-059-12,ops
2,774,778- 3477- 222
UB3IWA (UB5s IFZ,IML,IOK,ops)
2,319,648- 2619- 219
UT4UXW (UT3UA,UT4UZ,UT5UGR,
1,724,020- 2552- 195
UB4CWW (RB5s CB,CQ,CW,UB5s
-080-70,ops)
1,292,581- 2452- 157
UB4WZA (UB5WCX,UB5-068s 995,9
997,998,ops) 702,190- 1352- 142
UB4AWW (UB5s AEM,AFM,ops)
499,348- 1310- 124
UY8ILK (RB5s IIU,IKY,UB5INO,ops)
416,916- 1113- 111
UB4FWC (+UB5FBV)
295,785- 1029- 105
UB4MXR (UB4s MLD,MLP,UB5MVK
218,925- 669- 105
UB4QYA (+ops)
183,722- 788- 77
UB4FXX (RB5FK,UB5s FEO,
-070-433,ops)
149,798- 674- 73
UB4LWY (UB4LRG,UB5-077s 1880,
2252,ops) 143,673- 488- 83
RB4MYC (UB5s MAA,MFC,ops)
141,805- 497- 79
UB4IWI (RB4IVM,UB5s INT,-073
-4328,ops) 100,711- 558- 61
UB4DWW (+ops)
76,160- 355- 68
UB4VZR (+ops)
61,712- 369- 58
RB5EXN (+ops)
47,640- 266- 55
UB4RWO (UB5s RCL,RCU,-061-602
37,726- 298- 94
RB5XQ (UB5s XCA,XCU,ops)
34,817- 310- 37
RB4IYJ (RB5IQD,UB5-073s 3972,
4384,ops) 21,361- 255- 48
UB4JXB (+ops)
20,933- 288- 43

Byelorussia

RC2AZ 633,500- 1383- 140
RC2CR 92,562- 516- 42
UC2AB 76,020- 363- 60
UC2AJE 37,370- 276- 37
UC2AHZ 25,778- 288- 52
UC2AI 84,194- 289- 86
UC2OS 254,553- 736- 107
RC2AU 137,361- 632- 79
UC2SAU 43,164- 355- 33
UC2AW 32,364- 134- 58
UC2AT 16,598- 143- 36
UC2OT 462- 40- 7
UC1OWA (+ops)
2,856,612- 3693- 214
UC1LWN (+ops)
305,704- 1067- 103
UC1WXE (+ops)
12,544- 216- 25

rbaijan

OKZ 173,583- 453- 81- C
OKW 66,742- 320- 57- C

rgia

QR 202,350- 588- 71- B
FFH 18,110- 139- 30- B

ienia

GQ 383,225- 1415- 75- C

davia

OW 106,896- 412- 68- A
OA 71,001- 318- 63- A
ON 65,892- 406- 57- A

uania

OU 296,120- 777- 110- A
BQ 95,036- 567- 46- A
OM 70,512- 335- 68- A
BNC 61,642- 578- 37- A
BKT 44,505- 423- 43- A
BDN 23,920- 124- 5- A
PBM 384- 18- 8- A
BH 270,664- 771- 103- B
BQQ 73,261- 407- 61- B
ER 67,118- 334- 74- B
ND 31,835- 232- 42- B
BZ 112,770- 473- 70- C
BPO 72,343- 311- 73- C
BB 6,164- 68- 23- C
BWW (UP2s BA,BIJ,BMW,BO,BRP,
-038-1162,UW9CF,ops)
1,550,855- 2273- 185- D
BWR (RP2BJT,UP2BIL,ops)
184,628- 541- 102- D
BZR (+ops)
67,575- 315- 75- D

via

3D 1,055,700- 1863- 153- A
CR 83,570- 364- 65- A
GHB 43,493- 224- 61- A
PP 5,278- 41- 29- A
GTF 56- 8- 4- A
3CV 90,335- 285- 89- C
GMB 68,704- 366- 72- C
GEO 52,542- 421- 42- C
GEC 44,574- 306- 51- C
GN 11,688- 140- 24- C
W (UQ2s GAG,GJR,GOU,-037-83,
-116,ops)
2,537,280- 3373- 192- D
A (RQ2GN,UQ2s GKL,GID,GM,ops)
1,806,080- 2736- 170- D
QWW (+ops)
313,710- 1205- 110- D
GXJ (+UQ2-037-221)
120,080- 518- 69- D

onia

RND 243,504- 665- 114- C
RO 5,126- 112- 22- C
RWL (+ops)
123,000- 577- 75- D
RWQ (UR2-083s 1081, 1082,ops)
79,857- 426- 57- D

ne 30

opean Russian RSFSR

HRZ 43,950- 237- 50- A
RC 244,316- 640- 103- C
WAM 61,932- 378- 39- C
WAD 28,830- 217- 30- C
WWY (RW4s WR,WZ,UA4s WAW,
,ops) 353,312- 870- 122- D

tic RSFSR

CDV 165,596- 553- 64- A
CBO 68,520- 180- 94- A
SG 55,814- 327- 43- A
TZ 26,334- 129- 57- A
CT 17,264- 86- 52- A
QA 405,662- 868- 106- B
QA 404,992- 817- 112- B
AB 244,964- 560- 94- B
SN 73,514- 272- 59- B
FG 41,107- 247- 37- B
SG 22,392- 141- 38- B
FR 6,960- 100- 15- B
ND 653,012- 1235- 118- C
CP 456,940- 945- 110- C
WB 376,110- 808- 105- C
OZ 192,465- 493- 73- C
SCU 147,064- 523- 62- C
CGL 107,778- 369- 71- C
CBR 95,820- 353- 60- C
CM 87,178- 283- 68- C
GFV 55,830- 391- 30- C
AKS 43,719- 225- 39- C
CZ 34,891- 221- 37- C
CHU 25,626- 354- 49- C
FAZ/UA9G 24,140- 301- 20- C
MZZ 2,420- 41- 20- C
AFV 672- 20- 7- C
WWB (UA9s WPI,WQK,UV9WR,
9-084s 1535,1539,ops)
445,094- 971- 108- D
C (+ops) 399,100- 877- 100- D
AYN (UA9-165s 1836,1841,1842,
1,1852,ops)
132,930- 436- 76- D

UZ9CWF (UV9CAG,UA9-154s 1198,
1220,ops) 19,412- 179- 23- D
UZ9AXX (+ops)
12,809- 331- 26- D

Uzbekistan

RI8AB 543,356- 1133- 108- B
UI8ZAA 178,228- 565- 68- B
UI8ADQ 249,600- 795- 65- C
UI8BAA 90,915- 235- 87- C
RI8BN 84,240- 582- 30- C

Tadzhikistan

UJ8KA 75,756- 263- 59- A
UJ8JME 17,498- 165- 24- A
UJ8JCM 457,520- 1087- 95- B
UJ8JA 584,064- 1157- 108- C

Kazakhstan

RL7AE 51,537- 281- 41- A
RL7PEO 96,822- 399- 54- B
RL7I/RA9SB 58,803- 270- 51- B
UL7OBA 47,926- 338- 30- B
UL7OBH 11,858- 103- 21- B
RL7AB 1,105,247- 1853- 131- C
UL7MU 554,082- 1162- 106- C
UL7BN 317,191- 692- 113- C
UL8I/UZ9SWO 48,081- 330- 31- C
RL8PYL (UL7s PCZ,PL,RL8s PY,PZ,ops)
1,438,898- 1942- 176- D
UL8LYA (UL7s LEG,LO,-026-177,ops)
1,139,648- 1973- 122- D
UL8CWW (UL7s CAA,CC,CT,ops)
741,831- 1484- 107- D
UL8RWR (UL7s RER,-178-5,-178-15,
-178-18,ops)
35,019- 285- 27- D

Kirghizia

UM8MAU 23,825- 209- 25- B

Zone 31

Asiatic RSFSR

RZ9UA 1,102,188- 1562- 159- A
UW9PW 32,650- 153- 50- C
UZ9HYN (+ops)
902,421- 1711- 117- D

Kazakhstan

UL7JW 553,110- 1187- 103- C
UL8GBV 213,476- 610- 83- C
UL8FWA (RL7s FGP,FGV,UL7FCP,ops)
44,157- 258- 41- D
UL8GWK (UL7GAL,UL8s GDM,
-190-088,ops) 11,946- 179- 22- D

Kirghizia

RW3QA/RM3M
211,487- 775- 61- A
RM1M/UW3QD
52,777- 390- 39- A
UM8MBA 61,576- 310- 43- C
UM9MZA (+ops)
56,975- 299- 43- D

Zone 32

Asiatic RSFSR

UA9TO 1,008,432- 1711- 141- A
RA9SK 63,140- 270- 55- A
UA9SR 532,152- 1254- 114- B
UA9SU 47,435- 214- 53- B
UA9SAU 732,530- 1196- 139- C
U9AL 153,328- 605- 58- C
UA9SY 105,630- 538- 42- C
RW9AM 63,140- 188- 82- C
UZ9AXX (UA9s AFC,AGI,AMA,ANW,
-103-73,103-267,ops)
1,268,629- 1714- 163- D
UA9T/UZ4FWO (RA3FB,UA3RZ,
UA4s FAO,-148-677,-148-669,ops)
870,247- 1688- 119- D
UZ9WWR (+ops)
66,339- 373- 39- D

Zone 33

Asiatic RSFSR

UA9UAG 80,703- 313- 61- A
UA9JB 48,195- 371- 27- C
RA9JD 26,156- 133- 52- C
RA9UAR 24,808- 219- 28- C
UZ9DWD (RA9DAG,UA9s-111-1,
-111-8,ops) 88,808- 349- 68- D

Zone 34

Asiatic RSFSR

RA9LDX 574,893- 1459- 99- A
UA9FF 238,329- 606- 91- B
UW9LAP 125,400- 766- 36- B
UW9LT 1,253,212- 1830- 173- C
UA9LH 267,710- 553- 89- C
UA9LJ 80,736- 334- 58- C
UA9IBB 15,325- 172- 25- C
UW9FP 7,878- 83- 26- C
UA9CS 3,315- 51- 15- C

R9C (RW9CA,UA9s CDX,CIJ,UW9s CA,
CN,CW,ops)
1,411,580- 1996- 163- D
UZ9LWK (UW9s LCN,LDU,ops)
7,521- 107- 23- D

Zone 35

Asiatic RSFSR

UA9ADD 185,640- 474- 92- B
UA9ZCL 25,740- 172- 36- B
UA9ZDA 19,803- 157- 69- C

Zone 36

Madeira Islands

CU2SR 764,604- 1564- 134- A

Canary Islands

EA8BDR 31,383- 203- 33- B
EA8AB 345,802- 937- 74- C
EA8ABG 16,150- 190- 17- C

Zone 37

Portugal

CT1BBJ 23,576- 240- 26- B
CT1QF 16,834- 121- 36- B
CT1BWW 15,381- 160- 51- B
CR5CQK (CT1CQK,op)
6,153- 77- 21- B
CR5NH (CT1BOH,op)
827,480- 1610- 137- C
CR8CWT 44,520- 229- 53- C

Spain

EA2CR 21,285- 133- 43- A
EA4KK 862,240- 532- 44- B
EA5CPH 36,660- 167- 52- B
EA5DIT 36,120- 161- 68- B
EA7BYM 23,500- 148- 47- B
EA5JC 17,974- 98- 43- B
EA1AHA 12,121- 117- 31- B
EA7GHB 2,016- 40- 14- B
EA4EHQ 1,694- 48- 11- B
EA7CA 57,568- 286- 56- C
EA7AAW 10,583- 163- 19- C
EC7DMU 2,988- 77- 12- C
EA4BV 480- 12- 8- C
EA2BSJ (+EA2s CFZ,CGA)
1,130- 37- 10- D

Balearic Islands

EC6PG 23,985- 183- 39- A

Zone 39

Jordan

JY9SR 53,218- 495- 22- A
JY9LC 68,024- 368- 44- B

Cyprus

C49A (5B4MF,op)
1,618,671- 2293- 151- B

Zone 41

India

AT9T 73,374- 393- 42- B

Zone 44

China

BY5RF (+ops)
59,046- 396- 39- D

Hong Kong

VS6BG 821,500- 1499- 124- C

Zone 45

Japan

JG3KIV 275,236- 775- 79- A
JE7WBI/1 260,178- 588- 103- A
JE3ZFS 254,127- 625- 87- A
JH4UTP 178,984- 408- 104- A
JH4NMT 129,978- 360- 83- A
JA6BSL/1 110,400- 330- 75- A
JA6BMS/1 64,501- 301- 53- A
JA6BPY/6 56,408- 229- 58- A
JA7DOT 56,608- 216- 81- A
JH1WBG 55,650- 270- 53- A
JA1BUI 44,288- 158- 84- A
JI1PGO 40,320- 124- 80- A
JE7JZT 23,405- 191- 31- A
JO1CRA 10,452- 53- 52- A
JM1NKT 8,978- 94- 24- A
JR2IGV 5,538- 55- 26- A
JA9RYL 4,515- 47- 41- A
JI1UTP/1 2,360- 36- 17- A
JA1AAT 1,596- 25- 14- A
JR1GSE 167,090- 470- 77- B
JA7NVF 126,228- 408- 67- B
JH1UUT 55,408- 199- 67- B
JE7DOT 54,117- 212- 63- B
JL1MWI 41,930- 256- 35- B
JA4DUD 28,600- 118- 54- B
JP1SRG 18,136- 103- 39- B
JA8AD 17,625- 155- 25- B
JA7JH 13,665- 81- 35- B
JA2YIL 12,731- 103- 29- B
JH4UHW 11,880- 114- 22- B

JA6EFT 10,125- 85- 27- B
JA2BEY 9,800- 68- 35- B
JR7LVK 9,048- 83- 29- B
JA2ONH 8,175- 71- 25- B
JA6AW 6,118- 64- 23- B
JR1TFR 5,675- 49- 25- B
JA5EO 5,375- 53- 25- B
JA6AJ 3,122- 47- 14- B
JA1JLP 2,516- 30- 17- B
JA1XPU 2,348- 34- 17- B
JA3HPD 2,337- 27- 19- B
JA3FZI 1,848- 25- 18- B
JH1RMH 1,558- 20- 19- B
JA2JEG 1,458- 29- 18- B
JH2WHS 1,440- 26- 18- B
JR1MRG 1,391- 25- 13- B
JO1MCC 910- 18- 13- B
JR3KAH 640- 16- 10- B
JA1QE 540- 12- 9- B
JH9CAV 366- 13- 6- B
JR1GWE 135- 11- 3- B
JH7WKQ 710,640- 1248- 126- C
JA1NUT 489,600- 1002- 105- C
JR1IJV 484,596- 947- 108- C
JA6DAI 445,380- 750- 130- C
JA9CWJ 282,816- 644- 96- C
JR3BOT 237,180- 746- 67- C
JR7OMD/2 208,125- 428- 111- C
JE1CKA 186,626- 462- 98- C
JF3GKE 174,760- 554- 68- C
JA1BNW 167,160- 448- 84- C
JH1YDT (JO1IDL,op)
161,664- 479- 77- C
JA6NCE 108,792- 337- 72- C
JA9TSI 104,842- 268- 89- C
JH4JNG 98,454- 362- 61- C
JK2CZL 98,368- 355- 64- C
JE4VRF 80,592- 254- 73- C
JA2NNF 79,950- 253- 82- C
JA3ARM 65,880- 214- 74- C
JA1WYQ 48,251- 173- 81- C
JA4ETH 48,188- 369- 28- C
JR4ISK 41,470- 183- 58- C
JA9YE 28,755- 106- 71- C
JA1KFX 23,114- 203- 28- C
JO1QZI 22,724- 105- 52- C
JA7ASD 21,935- 117- 41- C
JA2KPV 13,202- 176- 41- C
JA8AJE 12,352- 84- 32- C
JA8HBO 9,090- 89- 30- C
JN1MKZ/2 7,890- 83- 30- C
JA1OP 5,957- 55- 23- C
JA8GVS 3,560- 40- 20- C
JG1BPS 2,865- 40- 17- C
JH1PXY 2,090- 24- 19- C
JA8GZ 1,428- 18- 17- C
7J2AAF (W1END,op)
836- 26- 11- C
JE3CYH 729- 19- 9- C
JA2QVP 680- 17- 8- C
JA7YAA (JQ1JCV,JJ3CNL,JE7JZC,
JE8AWL,JH8ORW,ops)
987,200- 1415- 160- D
JE2YRD (JF2s DCJ,EOC,ops)
984,857- 1627- 129- D
JA8YBY (JO1DFG,JH8s GFB,PNE,JE8s
BRO,KLL,JR8DHA)
903,150- 1502- 135- D
JA9YBA (JH9VSF,JR9EUZ,JE8ELG,ops)
417,954- 1109- 82- D
JA6YJS (JS1PWV,JQ3BAM,JF4ETK,
JG4SVN,JR5BMM,JI6KYX,ops)
228,540- 693- 78- D
JA9YAK (JS1PTU,JK2PVL,JE7GWO,
JI7OED,JH9VYG,ops)
65,088- 212- 72- D
JA1YAD (JS1s DSC,IKQ,MNF,ops)
58,080- 247- 55- D

Zone 46

Ivory Coast

TU2UI (KA6IJU,op)
9,664- 62- 32- B

Zone 50

Philippines

KE9A/DU3 111,294- 420- 54- A
4F3BAA 99,432- 705- 36- A
DU3GDX 67,564- 489- 28- B
N7JJQ/DU3 (K4SXT,KC6BJF,KJ6WO,
KA9FWV,KE8SC,ops)
337,218- 738- 93- D
DX9HT (DU9s AA,AU,BI,XU,ops)
222,940- 631- 71- D
4G1A (4Z1s FZ,DMD,ops)
125,502- 649- 39- D

Zone 51

Indonesia

YC9VGB 102,287- 628- 33- B

Zone 52

Gabon

TR8SA 663,290- 1404- 95- B

Zone 53

Tanzania

5H3TW (K3TW,op)
1,484,672- 2248- 132- A

Zambia

9J2AL 13,425- 180- 15- A

Zone 54

Indonesia

YC2GW 85,544- 474- 37- B
YC3OSE 46,248- 232- 41- B
YC2GAM 33,180- 241- 28- B
YC6RFF 17,524- 150- 26- B
YC2JWB 6,992- 90- 19- B
YB2FEA 59,829- 253- 49- C

Singapore

9V9RH 2,655- 49- 14- B

Zone 55

Australia

VK8XX 950,866- 1222- 161- A
VK4TT 2,238- 38- 13- C

Zone 58

Australia

VK6AJ 95,990- 339- 58- C

Zone 59

Australia

VK2AYK 52,170- 229- 47- B
VK5GN/P 6,408- 57- 24- B
VK2PWS 1,331- 25- 11- B
VK2APK 428,127- 795- 111- C

Zone 60

New Zealand

ZL3GQ 790,500- 1080- 150- C
ZM2AGY 41,634- 165- 54- C

Zone 61

Hawaiian Islands

KH6FKG 201,135- 769- 53- B
AH6JF 92,628- 308- 62- C

Zone 63

French Polynesia

FO5IW 487,200- 1237- 80- B

Zone 64

Guam

NY6M/KH2 134,852- 650- 42- C

Zone 65

Marshall Islands

KX6OI 34,188- 208- 33- C

Zone 75

Franz Josef Land

UA9SEZ/UA1O
96,525- 703- 33- B
UA1OT 13,500- 147- 27- C

Checklogs

CT1TM, EA3GBU, EA5EFV, EA5GGK, HA3RB, HA8KWG, HA8KWO, HA8LKM, HA8LG, HK3MAH, IK8JMS, JA6FYM, JL3AYU, JM3COI, JR1XKU, KO4D, KQ4G, LA1PHA, LA4KQ, LA6KJ, LA8CE, LA9FFA, LZ1AX, LZ1KWZ, LZ1UQ, LZ2JR, N5MLL, OK1US, OK2PLH, OK3KJF, OK3TEP, OK3TIR, ON5FV, OZ1INN, OZ1KWG, OZ5PA, OZ6EDR/A, PA9PUR, PA9TV, RA1QX, RA3ALA, RA3AUU, RA4PR, RA8SU, RB5EAJ, RB5IA, RT4UM, RT5UE, RT5UO, RV6ACZ, RV6LD, RW3AL, RW6LZ, RZ1QA, RZ3DC, RZ3DM, SM4JOW, SM5ARL, SM6CDN, SM7BAH, SM7HEC, SM7KWE, SM8CSX, SP4GDC, SP5ILO, SP8CZ, SP8FEB, SP8KEA, SP9HZF, U8AG, UA1NDX, UA1OB, UA1P/UA4SC, UA3DPX, UA3EDH, UA3ET, UA3MED, UA3NU, UA3RE, UA3TJW, UA3VQP, UA4HLD, UA4NBD, UA4PKN, UA4YBR, UA6HJI, UA6HPK, UA6LAX, UA6LDF, UA6PCH, UA6YAV, UA9XS, UA9FZ, UB4JFO, UB4LXD, UB5AKA, UB5JAR/UT5J, UB5KV, UB5PCS, UB5QJA, UB5VCK, UB5ZDA, UB5ZR, UF6FBI, UL7LAH, UL8GWW, UM8DX, UM8MGM, UO5OOW, UP2BEI, UQ2GLQ, UV3AOQ, UV3AFB, UV3DN, UV3DPA,UV6ARL, UV6HLC, UV6LJS, UW1BI, UW3HY, UW3RR, UW8HWD, UW9JC,UW8CM, UY5GG, UY5JC, UZ3SWB, UZ3VWL, UZ3VXT, UZ4AXQ, UZ4FWX, UZ4WWB, UZ9AWQ, UZ9AZA, UZ9CWW, UZ9CXA, UZ9FZD, VE3AWE/W6, WA3EOP, YT21UD, Y22AN, Y23BF, Y23KF, Y23OH, Y23WM, Y24JJ, Y24WJ/A, Y25ID/P, Y25KA, Y25MG, Y26IUA, Y26RD/P, Y27FL/P, Y27YH, Y39RE, Y47XF, Y54WM/P, Y55TJ, Y56SG, Y84CF/P, Y65UM, YC2EMK, YO2BP, YO2CMI, YO3OFF, YV4AZF

ARRL International DX Contest Plaque Program

Listed below are all of the plaques that will be awarded in the 1990 ARRL International DX Contest. Sponsors as of October 16 are shown adjacent to the corresponding category. If you are interested in sponsoring one or more of these awards that have not been sponsored, contact the Contest Branch at ARRL HQ.

The list of sponsored plaques may change because of *QST* lead time, so please call us for a list of what is available before sending payment. We salute all who have helped make the Plaque Program such a success!

W/VE CW—Single Operator

Category	*Donor*
All Band	Frankford Radio Club
1.8 MHz	
3.5 MHz	Dayton Amateur Radio Assn
7 MHz	Northern Arizona DX Assn
14 MHz	Fox Cities Amateur Radio Club—W9ZL
21 MHz	Carl Luetzelschwab, K9LA
28 MHz	W5MYA
Low Power	Dauberville DX Assn
QRP	
Assisted	Billy Lunt, KR1R

W/VE CW—Multioperator

Category	*Donor*
Single Transmitter	Northern Illinois DX Assn
Two Transmitter	Kenwood USA Corporation
Unlimited	ETO Inc/ALPHA

W/VE Phone—Single Operator

Category	*Donor*
All Band	Frankford Radio Club
1.8 MHz	Butch Greve, W9EWC, Memorial
3.5 MHz	Lance Johnson Engineering, KØCS
7 MHz	Dave Thompson, K4JRB
14 MHz	Dayton Amateur Radio Assn
21 MHz	Kenwood USA Corporation
28 MHz	Windsor Amateur Radio Club VE3OW
Low Power	Dauberville DX Assn
QRP	
Assisted	

W/VE Phone—Multioperator

Category	*Donor*
Single Transmitter	Kenwood USA Corporation
Two Transmitter	Kenwood USA Corporation
Unlimited	Western New York DX Assn—W2RR

DX CW—Single Operator

Category	*Donor*
World	North Jersey DX Assn
Africa	WB3KTX
Asia	Alamo DX Amigos
Europe	Clarke V. Greene, K1JX
North America	Potomac Valley Radio Club
Oceania	Robert J. Halprin, K1XA
South America	Herbert Hoover, Jr, W6ZH, Memorial Award
1.8 MHz	
3.5 MHz	Mad River Radio Club
7 MHz	
14 MHz	Bencher, Inc
21 MHz	Southern New England DX Assn
28 MHz	ZP6XDW (N4PW)
QRP	Gerald Griffin, MD, W8MEP
Assisted	

DX CW—Multioperator, Single Transmitter

Category	*Donor*
World	John Brosnahan, WØUN
Africa	Kenwood Employees ARC, WD6DJY
Asia	Kenwood USA Corporation
Europe	The Radio Place
North America	Kenwood USA Corporation
Oceania	Gary Stilwell, KI6T, and Glenn Stilwell, WR6O
South America	Kenwood USA Corporation

DX CW—Multioperator, Two Transmitter

Category	*Donor*
World	Kenwood Employees ARC, WD6DJY
Africa	Kenwood Employees ARC, WD6DJY
Asia	Kenwood USA Corporation
Europe	Kenwood USA Corporation
North America	
Oceania	
South America	Dave Goggio, W4OGG

DX CW—Multioperator, Unlimited

Category	*Donor*
World	H. Stephen Miller, NØSM
Africa	Kenwood Employees ARC, WD6DJY
Asia	Kenwood USA Corporation
Europe	Texas DX Society
North America	ETO Inc/ALPHA
Oceania	David W. Brandenburg, K5RQ
South America	David W. Brandenburg, K5RQ

DX Phone—Single Operator

Category	*Donor*
World	North Jersey DX Assn
Africa	Kenwood USA Corporation
Asia	Acadiana DX Assn
Europe	Gerald Griffin, MD, W8MEP
North America	Chod Harris, VP2ML
Oceania	Doc Sayre, N7AVK
South America	Kenwood USA Corporation
1.8 MHz	Fred Race, AL7JO, in Memory of Charlie, W8TCS
3.5 MHz	Kenwood USA Corporation
7 MHz	Central Arizona DX Assn
14 MHz	Don Wallace, W6AM, Memorial, Central CA DX Club
21 MHz	Ray Molony, W2NCL, Memorial, Long Island DX Assn
28 MHz	LIMARC
QRP	Gerald Griffin, MD, W8MEP
Assisted	

DX Phone—Multioperator, Single Transmitter

Category	*Donor*
World	
Africa	Kenwood USA Corporation
Asia	Kenwood USA Corporation
Europe	Kenwood Employees ARC, WD6DJY
North America	Society of Midwest Contesters
Oceania	
South America	Kenwood USA Corporation

DX Phone—Multioperator, Two Transmitter

Category	*Donor*
World	Kenwood USA Corporation
Africa	Stanley Cohen, WD8QDQ
Asia	Kenwood USA Corporation
Europe	KB4OMW and WB4CKY, The Middletons
North America	Jan Hubach, OH1ZAA & John Brosnahan, WØUN
Oceania	Kenwood Employees ARC, WD6DJY
South America	Kenwood USA Corporation

DX Phone—Multioperator, Unlimited

Category	*Donor*
World	Wayne Yoshida, KH6WZ
Africa	Kenwood Employees ARC, WD6DJY
Asia	Kenwood USA Corporation
Europe	
North America	
Oceania	David W. Brandenburg, K5RQ
South America	Kenwood Employees ARC, WD6DJY

Special Plaques

Single Operator

Category	*Donor*
W/VE Combined Score	*National Contest Journal*
W/VE Low Power, Combined Score	Rochester (NY) DX Assn
W/VE Under 18 Combined Score	Connecticut DX Assn
World Combined Score	Mike Manato, K3UOC, P46S, 4M4A
Japan Combined	JA7WME, JG7SVZ and JH7AFR
Atlantic Division, CW	K2NY Memorial—Salt City DX Assn
Great Lakes Division, CW	Livonia Amateur Radio Club, Livonia, MI
Great Lakes Division, Phone	Livonia Amateur Radio Club, Livonia, MI
Hudson Division, CW	W2AO Memorial—Order of Boiled Owls
Israel, CW	Robert B. Weinstock, KN1K
Japan, L/P, All Band, CW	Western Washington DX Club
Poland, Phone	Stan Wisniewski, FO5IW
Seventh Call Area, CW	Willamette Valley DX Club
Seventh Call Area, Phone	Willamette Valley DX Club
Single Op Under 18, CW	Virginia A. Greene, WB1AVA
Single Op Under 18, Phone	Virginia A. Greene, WB1AVA

Multioperator

Category	*Donor*
Caribbean Multi-Single, CW	The YASME Foundation
Caribbean Multi-Single, Phone	W5MYA
Multi-Multi Combined World	W2PV Memorial—Schenectady ARA

Contest Corral

Conducted By Billy Lunt, KR1R
Contest Manager

FEBRUARY

3-4

New Hampshire QSO Party, Jan *QST*, p 83.

Ten-Ten International Net Winter Phone QSO Party, Jan *QST*, p 83.

Vermont QSO Party, Jan *QST*, p 83.

4

North American Sprint, CW, Jan *QST*, p 83.

6

West Coast Qualifying Run, 10-40 WPM, at 0500Z Feb 7 (9 PM PST Feb 6). 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 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.

8

W1AW Qualifying Run, 10-40 WPM, at 0300Z Feb 9 (10 PM EST Feb 8). Transmitted simultaneously on 1.818 3.5815 7.0475 14.0475 18.0975 21.0775 28.0775 50.08 147.555 MHz. See Feb 6 listing for more details.

10-11

PACC Contest, Jan *QST*, p 83.

YL-OM Contest, phone, sponsored by YLRL, from 1400Z Feb 10 until 0200Z Feb 12 (CW portion will be 1400Z Feb 24 until 0200Z Feb 26). Phone and CW are separate contests. YLs work OMs, OMs work YLs only. Use all bands; no crossband operation. No net contacts or repeater contacts. Work stations only once per band. Exchange QSO number, signal report and state/province/country. Count one point for each station worked and multiply by the total number of states/provinces/countries worked. Stations running 100-W CW or 200-W PEP SSB or less multiply final score by 1.5. Entries with more than 200 QSOs must submit dupe sheets and must score each band separately. Time limit for this contest is 24 hours and logs must indicate rest periods. Suggested frequencies: phone—3.940-3.970 7.240-7.270 14.250-14.280 21.380-21.410 28.380-28.410; CW—3.540-3.570 7.040-7.070 14.040-14.070 21.180-21.200 28.170-28.190. Awards. Logs must be received by Mar 31. Mail them to Dana Tramba, c/o Dandy's, 120 N Washington, Wellington, KS 67152.

11

North American Sprint, phone, Jan *QST*, p 83.

Rats Nest & Crooked Stick Contest Sprint, sponsored by the Issaquah ARC, 2000Z-2300Z Feb 11. Phone and CW. Frequencies: CW—28.100 to 28.110; phone—28.300 to 28.320. Work stations once per mode. Max 200 watts PEP output. Exchange signal report, QTH and serial number of contact. QSO points: CW—5 pt; SSB—1 pt. Multipliers: times 2 if with an apprentice; times 2 if using a wire antenna constructed especially for this contest. No part of this antenna may be more than 20 ft above ground and no more than 100 ft of wire; times 2 if using 10 watts PEP or less output. Bonus points: 100 points for a newly licensed Novice making first ever contact; 100 points if operator or apprentice is physically handicapped; 50 points for working all 10 US call areas; 25 points for description of contest activity or a photograph of antenna, contest operation or contest group. Total QSO points times multipliers plus bonus points for final score. Awards. Send log by Mar 15 to Martha Stedman, N7IVX, 15423 SE 7th Pl, Bellevue, WA 98007.

17-18

ARRL International DX Contest, CW, Dec *QST*, p 79.

23

W1AW Qualifying Run, 10-35 WPM at 2100Z Feb 23 (4 PM EST). See Feb 8 listing for more details.

23-25

CQ World Wide 160-Meter DX Contest, phone, Dec *QST*, p 81.

24-25

UBA Contest, phone, Dec *QST*, p 82.

24-26

Maine QSO Party, sponsored by the Southern Maine Contest Club from 1900Z Feb 24 until 0300Z Feb 26. Categories: All band QRO; 10 meter only, 200 watts or less. Work stations once per band and mode. Exchange signal report and QTH (county for ME stations; state/province/country for others). Suggested frequencies: CW—50 kHz up from low band edge; phone—3.960 7.230 14.280 21.380 28.480 50.130. Work station on CW and phone on each band. Count 1 point for phone and 2 points for CW. Multiply by number of ME counties worked for final score (ME stations multiply by states/provinces/countries worked). Mail entries within 30 days to SMCC, PO Box 3422, Portland, ME 04104.

YL-OM Contest, CW, see Feb 10 listing for more details.

28

West Coast Qualifying Run, 10-35 WPM at 0500Z Mar 1 (9 PM PST, Feb 28). See Feb 6 listing for more details.

MARCH

3-4

ARRL International DX Contest, phone, Dec *QST*, p 79.

9

W1AW Qualifying Run, 10-35 WPM, at 0300Z Mar 10 (10 PM EST Mar 9). See Feb 8 listing for more details.

9-11

Japan International DX Contest, CW, sponsored by *Five Nine Magazine*, from 2300Z Mar 9 until 2300Z Mar 11. Operate a maximum of 30 hours. Rest period must be at least 60 minutes and noted in log. Multioperator stations can operate full 48 hours. 80, 40, 20, 15 and 10 meters. Entry classes: single op, single band; single op, multiband; multiop, multiband. No crossband QSOs. Single ops may have only one transmitted signal at any given time. Once operation begins on a band, the station must remain on that band for at least 10 minutes. Listening time counts as operating time. Multiops may have a maximum of one signal per band. JA stations send RS and prefecture number (01-50). Others send RS and progressive serial number starting with 001. Contacts among DX stations or among JA stations do not count. Count 1 point per QSO on 40, 20 and 15 meters. Count 2 points per QSO on 80 and 10 meters. Multiply by the number of different prefectures worked (max 50) per band for final score. Use separate logs for each band. Mark multipliers the first time worked. Awards and plaques. Provide a complete summary. Enclose SAE and IRC for results. Mail logs to arrive by Apr 30 to *Five Nine Magazine*, Japan International DX Contest, PO Box 8, Kamata, Tokyo 144, Japan.

10-11

Wisconsin QSO Party, sponsored by the West Allis RAC, from 1800Z Mar 10 until 0100Z Mar 11. CW and phone. Entry categories (12): single operator—fixed, mobile, Novice, Technician; multioperator single transmitter—fixed, mobile, Novice, Technician; multioperator, multi transmitter—fixed, mobile, Novice, Technician. Work stations once per band and mode. Work mobiles again as they change county. No repeater QSOs. Exchange signal report and QTH (county for WI stations; state or province for others). Suggested frequencies: CW—3.550 3.725 7.050 7.125 14.050 21.150; phone—3.890 7.290 14.290 28.400. Count 1 point per phone QSO, 2 points per CW QSO. WI stations multiply by total WI counties, states and provinces worked. Others multiply by total WI counties worked (max 72). WI mobiles/portables may add 500 points to their score for each county outside of their home county that they make at least 15 QSOs from. Awards. Mail logs by April 15 (include large SASE for results) to WARAC, PO Box 1072, Milwaukee, WI 53201.

17-18

Bermuda Contest, sponsored by the Radio Society of Bermuda, from 0000Z Mar 17 until 2400Z Mar 18. Operate 36 hours maximum. Off times must be clearly indicated and must be at least 3 hours each. Single operator only. All stations must operate from their own private residence or property. 80, 40, 20, 15 and 10 meters, phone and CW. No crossband or cross-mode QSOs. Exchange signal report and QTH (W stations send state; VE stations send province; UK stations send county; West German stations send DOK number; Bermuda stations send parish). W/VE stations work West German, UK and Bermuda stations only. A phone contact and a CW contact with the same station on the same band counts for score if the contacts are made at least one hour apart. Multipliers are Bermuda stations worked per band per mode (if QSOs are at least one hour apart) and Bermuda Novice stations (VP9 station with 3 letter suffix begining with N [CW only]). Count 5 points per QSO and multiply by the total number of multipliers worked per band. Separate logs for each band and mode. Logs must be received by Jun 1. Include a dupe sheet if more than 200 contacts were made. See sponsor for awards. Mail to RSB Contest Committee, Box HM275, Hamilton HM AX, Bermuda.

20

W1AW Qualifying Run, 10-35 WPM, at 1400Z Mar 20 (9 AM EST). See Feb 8 listing for more details.

24-25

CQ World Wide WPX Contest, phone

YL-ISSB QSO Party, phone, coordinated by Bill Early, WA9AEA, from 0000Z Mar 24 until 2400Z Mar 25. Suggested frequencies are in the General portion of 80, 40, 20, 15 and 10 meters. Single operator, DX-W/K partners, YL-OM teams. Logs shall indicate two 6-hour rest periods. Exchange call, signal report, state/province/country, name, ISSB number (if member) and DX-W/K partner. Score 3 points per member QSO within same continent, 6 points per member QSO in different continent, 1 point per nonmember QSO. Member stations only count as multipliers. Multiply by 1 for each DX-W/K partners; YL-OM team; US, VK, ZL, VE state or province; DXCC country. Bonus multipliers: 1 for working 15 or more members on a second band; 2 additional for 15 or more members on a third band. Multiply by 5 for maintaining a dc input under 250 watts throughout contest. Mail logs before April 30 to Bill Early, WA9AEA, PO Box 401, McHenry, IL 60050-0401.

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 Bulletin Board 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 **March 1** to make the **May issue.** Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

Standard Contest Guidelines
1) Make sure your log details the date, time, band, call sign and complete exchange sent and received, for each QSO claimed for contest credit.
2) Your summary sheet should indicate your score, including how you figured it, and a declaration that you followed FCC/DOC regulations and the contest rules. Your name, call sign and complete address should be typed or printed in block letters.
3) Crossband, crossmode and repeater contacts are usually not permitted. Contacts with the same station on different bands are usually permitted.
4) Your log should be checked carefully for duplicate QSOs; and if more than 200 QSOs are made, dupe sheets should be included with your entry.
5) Your log may be considered a checklog or disqualified if it is incomplete or if too many errors are detected by the contest committee.
6) Avoid standard net frequencies.
7) International contests generally offer awards to top scorers from each US call area and each country, state QSO parties to each state/province.
8) Your summary sheet should include the following statement: "I have observed all competition rules as well as all regulations established for Amateur Radio in my country." The declaration should be signed and dated.

Special Events

Conducted By Billy Lunt, KR1R
Contest Manager

Quebec, Canada: The Club Radio Amateur de Quebec will operate CY2CQ from 0000Z **Feb 1** until 2100Z **Feb 11** to commemorate the Carnaval de Quebec. Operation will be on 80-10 meters (excluding WARC bands). A plaque will be awarded to the first five operators who contact CY2CQ on three different bands on the same mode. For QSL, send SAE with two IRCs to CRAQ, VE2CQ, CP 2341 Quebec, Quebec, Canada G1K 7P5.

Sun Prairie, Wisconsin: The Four Lakes ARC will operate W9JZ **Feb 2-3,** 1400Z-0200Z each day, from the groundhog capital of the world. Operation will be in the lower portion of the General class 40, 20, and 15-meter bands and Novice 10-meter band. For certificate, send QSL, QSO number and 6- × 9-inch SASE to Jake Kitzinger, N9ITN, PO Box 277, Sun Prairie, WI 53590.

Dry Tortugas, Florida: WA4DAN/4 and K5MK/4 will operate from 2000Z **Feb 2** until 1600Z **Feb 4.** Suggested frequencies: phone–14.260 21.260 28.560; CW—7.030 14.030 21.030 28.030. For QSL, send SASE or IRCs to the operator's *Callbook* address.

Mt Clemens, Michigan: The Flying Beers International Broadcast Society will operate WB8F 1400Z-2000Z **Feb 3** to commemorate the Winter Festival "Hams on Ice." Operation will be on 7.270, 14.321, 146.58 and 446.00. For certificate, send SASE to Don Beckmon, WB8F, 929 Chippewa, Mt Clemens, MI 48043.

Punxsutawney, Pennsylvania: The PARC will operate N3HDJ **Feb 4** 1400Z-2200Z to celebrate Ground Hog Day. Operation will be in the General class 80-10 meter bands and Novice 10-meter band. For certificate, send 9- × 12-inch SASE to Fred Hummel, N3HDJ, 232 Pine St, Punxsutawney, PA 15767.

Schenectady, New York: The Schenectady ARA will operate special-event stations 1100Z **Feb 8** until 2300Z **Feb 11** conducting the Schenectady Massacre on the Air. Suggested frequencies: CW—3.550 3.725 7.050 7.125 14.050 21.050 21.125 28.170; phone—3.950 7.250 14.275 21.375 28.375. Work three members for certificate and send 9- × 12-in SASE to SARA, PO Box 207, Alpaus, NY 12008.

Alpena, Michigan: The Thunder Bay ARC will operate special-event stations **Feb 9** starting at 1500Z to celebrate the Winter Carnival. Operation will be on SSB on 80, 40, 20, 15 and 10 meters. For certificate, send SASE to TBARC, 1241 Long Rapids Rd, Alpena, MI 49707.

San Benito, Texas: The San Benito ARC will operate N5COW (SSB) and N5HOG (RTTY) **Feb 9-18,** 1800Z-0100Z each day, from the Cameron County Fair and Live Stock Show. Suggested frequencies: SSB—14.335 21.350 28.360; RTTY—14.090. For certificate, send a 9- × 12-inch SASE to San Benito ARC, PO Box 1382, San Benito, TX 78586-1382.

Loveland, Colorado: The Loveland Repeater Assn will operate KAØVFF **Feb 10-11 and 14,** 1500Z-0500Z each day, during the Valentines Festivities. Operation will be 25 kHz from the lower phone and CW General band edges. For certificate, send 9- × 12-inch SASE to Michael Walker, KAØVFF, 3816 Ash Ave, Loveland, CO 80538.

Show Low, Arizona: The Kachina ARC will operate a special-event station 1500Z-2400Z **Feb 14** to celebrate Arizona's 77th birthday. Operation will be in the General 40-and 20-meter phone bands, Novice 15-meter CW band and the Novice 10-meter phone band. For certificate, send SASE to Kachina ARC, PO Box 2996, Show Low, AZ 85901.

Apache Junction, Arizona: The Superstition ARC will operate WB7TJD **Feb 17-18,** 1500Z-2400Z each day, to commemorate the annual Superstition Mountains Lost Dutchman Days Celebration. Suggested frequencies: CW—Novice portions of 40, 15 and 10 meters; phone—low end of General 40, 20 and 15 meters and 10-meter Novice. For certificate, send QSL and 9- × 12-inch SASE to SARC, PO Box 1551, Apache Junction, AZ 85220.

St Louis, Minnesota: The St Louis RC will operate KØAGF **Feb 17-18,** 1400Z-2300Z each day, from the Pavek Wireless Museum commemorating the issuance of the audion triode tube and the birthday of Joseph Pavek, WØOEP. Suggested frequencies: CW—7.047 14.047 21.147 28.147; phone—3.860 7.247 14.287 21.387 28.387; 2 meters locally. For certificate, send 9- × 12-inch SASE to Jay Smith, KKØO, 6931 Carmen Ave E, Inver Grove Heights, MN 55075.

George, Washington: The Central Washington ARC will operate W7WMO/7 on **Feb 19,** 1800Z-2400Z, from George, Washington, to celebrate the Community's Birthday Party. Operation will be on 21.425 and 28.425 MHz. For certificate, send 9- × 12-inch SASE to Eugene Bye, W7WMO, 18 J St NE, Ephrata, WA 98823.

Fairbanks, Alaska: The Arctic ARC will operate KL7KC from Feb 23 until Mar 16 in celebration of the eighth running of the Yukon Quest International Sled Dog Race. For QSL, send SASE to Arctic ARC, PO Box 81389, Fairbanks, AK 99708.

Utica, Michigan: The L'Anse Creuse ARC will operate special-event stations from 0000Z **Feb 24** until 2400Z **Feb 25** to commemorate their 25th anniversary. Suggested frequencies: CW—3.545 3.725 7.045 7.125 14.045 21.045 21.125 28.045 28.125; phone—3.925 7.275 14.325 21.425 28.425. Work five stations for certificate and send SASE to Vince Cuker, WA8BIJ, 145 Huron St, Mt Clemons, MI 48043-1713.

Felicity, California: The Amateur Radio Emergency Service of Yuma, Arizona, will operate KJ6OZ 1500Z **Feb 24** until 0100Z **Feb 25** from the Official Center of the World. Suggested frequencies: SSB—7.238 18.114 21.318 28.418. For certificate, send QSL and 9- × 12-in SASE to Yuma ARES, c/o US Post Office, Felicity, CA 92283.

Chesterton, Indiana: The Indiana Lakeshore Amateurs will operate KQ9Q **Feb 24-25,** 1800Z-1400Z each day, to commemorate the third annual NW Indiana Steelheaders Spring Fever Outdoor Show. Operation will be in the 40, 20, and 10-meter phone bands. For certificate, send SASE to PO Box 701, Chesterton, IN 46304-0701.

New Orleans, Louisiana: The Jefferson ARC will operate W5GAD from 2000Z **Feb 25** until 2300Z **Feb 27** during the Mardi Gras Carnival season. Operation will be in the General 40, 20, and 10-meter bands and in the Extra portion of the 40, 20, and 15-meter bands. For certificate, send QSL and a business-size SASE to JARC, W5GAD, PO Box 73665, Metairie, LA 70033.

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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 **March 1** to make the **May 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- × 12-inch envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail 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.

Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

ATLANTIC DIVISION

DELAWARE: SM, Walt Dabell, KD3GS— ASM: Bill Ryan, WA3DPJ. The Air Force held its annual NMDS drill in November. Several amateurs from Kent County participated and once again proved our worth to the Air Force. Nice work! Several clubs held their Christmas/awards dinners before this writing. I enjoyed meeting new faces and seeing some familiar ones too. The AWARE club had its usual extravaganza. It was quite a festive occasion and a very enjoyable affair. I have presented several awards for outstanding amateur service. Receiving the Certificate of Merit were Jay Leibforth, KC3JM, Carl Schulak, NS3G, and Randy Carlson, WB8JJX. All three provided outstanding service to the amateur community in 1989. Their efforts should be an inspiration to us all. Nov net rpt: DTN stns 328 tfc 44 in 22 sesns, DEPN stns 42 tfc 15 in 4 sesns, SEN stns 50 tfc 1 in 4 sesns. Traffic: W3QQ 76, WB3DUG 41, W3FEG 22, KA3GRQ 20, K3JL 20, KD3GS 18, WA3WIY 16, K3YBW 15, N3FLD 14. TOTAL 242.

EASTERN PENNSYLVANIA: SM, Kay Craigie, KC3LM— ASM: WA3PZO, KA3A, KO3B, K3ZFD. SEC: KB3YS. ACC: KC3QB. OOC: W3IS. SGL: WA3IAO. STM, BM: KB3UD. PIO: W3ZXV. TC: W3FAF. If you haven't sent in your ballot in the Section Manager election, please do it today. A good voter turnout in League elections helps keep the organization responsive to the membership. Because I believe EPA deserves an SM who can give you undivided attention, I decided not to run for a third term after being elected Vice Director. In the December column, Penn Wireless Assn. was accidentally omitted from the list of Special Service Clubs in EPA. SSC's are encouraged to send in your 1990 renewal forms promptly. Questions about renewal should be directed to Affiliated Club Coordinator KC3QB. Section Managers and other ARRL leaders from around the Division will head for Western NY this month for our annual Cabinet meeting called by W3ABC. If there are issues of general membership interest you would like us to consider, please write to Hugh or me. In appointment news, we'd like to commend our ORS roster for good reporting last year. W3ZID and W3BNR were added to the roster; we expect to have more new ORS's to announce next time. Hamfest season dawns next month, with the York Springfest in Dover on March 4. Lebanon Valley's 1990 officers are KA3MVM, N3CIP, NW3J, and N3HHI. York's leaders are NU3Q, WB3CQN, WA3SRE, WB3BZA, N3DYT, and W3HSR. PARA has elected K3ITH, K3HLN, N3AYT, N3GPA, and WA3CQU. PARA's Valley Forge Mtn. antenna tower was shredded by the windstorms that ripped the Philly area last November. Severe weather poses dangers to all — so attend the next Skywarn training session in your area! Delaware-Lehigh set up a QSO between officials in Northampton County, PA, and GB8OO in Northampton, England. Hats off to the club newsletters who list VE tests offered by other organizations in addition to their own sessions. On the other hand, some newsletters do not announce the home club's tests. Something to think about? Do you know someone who has a technical problem that club members and friends haven't been able to solve? Our Technical Coordinator W3FAF and his Assistant TC's may be able to help. John also has several very informative presentations available for your club meeting. Contact John at his CBA. Traffic (November): N3AZW 629, N3DRM 250, W3JKX 128, W3IVS 102, N3CD 80, KD3AO 64, W3KOD 59, W3ZID 59, W3DP 57, W3NNL 50, WA3EHD 48, WB8KPE 46, W3KAG 40, W3IPX 33, KU3R 30, N3EFW 28, K3TX 27, N3GXK 24, KA3MVM 23, W3BNR 19, KO3M 17, KA3SKT 17, WB3EVL 13, WA3CKA 12, W3FAF 10, W3CL 9, KA3QYH 9, K3ARR 8, N3FGC 7, W3HK 6, W3ADE 4. Nets (November ONI/QTC): EPAEP5N 447/138, PTTN 203/68, D6ARES 126/12, MARCNET 58/4, MARCTN 168/54, SEPATN 261/9. @BBS: K3RLI 387, WA3TSW 279, WB3JOE 117, N3ET 1.

MARYLAND-DC: SM, Ken Cohen, NI3F—ASM/PKT: KJ3E. ASM/ACC: WA3YLO. OOC/BM: NB3P. PIO: N3BMB. SEC: KN3U. TC: W3VVN. STM: N3EGF. SGL: KW3X. A proposed MD law prohibiting use of pagers on public school grounds could have threatened our use of HT's there, as well. Fortunately, our SGL, KW3X, had an amendment introduced which would exempt licensed hams from the proposed provisions, provided that they have the permission of the principal to use their handies. Well done, John! W3IWI informs us that the microsats are finished, awaiting Jan. launch. NF3X reports that he was busy with the SF quake. MD/DC leadership congratulates W3ABC and KC3LM on their election as Atlantic Director and Vice Director. EC's, AEC's and section cabinet will meet in Savage on Feb. 4. CUL es 73! With the nets: MSN/KC3Y 30/67/361, PON/WB3BFK 26/30/283, MDD/W3FA 60/259/483 (TOP BRASSW3FA/118, W3QQ/93, K3GHH/83), MEPN/K3RXK 31/103/761. Traffic: W3IWI 1302(BPL), WB4OBC 390(BPL), NB3P 306, KJ3E 246, K3GHH 228, NC3V 180, KC3Y 177, KA3RFE 164, N3ETI 148, K3RXK 146, W3FA 131, NR3Q 108, W3FZV 99, K1LNJ 62, KD0M 42, NT3S 42, NC3Z 35, WB3BFK 32, W3DQI 29, K3USO 26, K1BGT 18, N3GIY 16, N3EGF 15, KA3ENQ 14, KD3JK 14, K3ORW 11, WA3EPT 9, W3ZNW 8, WA3GYW 8. PSHR: KJ3E 94, W3FA 90, KC3Y 77, K3RXK 77, KD3JK 73, K3GHH 67, NR3Q 65, NC3V 64.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB— SEC: K2QIJ. STM: WB2UVB. ACC: K2IXE. TC: N2BQT. PIO: KA2RAF. SGL: VACANT. BM: VACANT. OOC: WA2HEB. ATC's: K2JF, KA2RJA and WB2MNF. For the first time in 73 months, my monthly report didn't make it into January's QST. Even though I mailed it out on the 7th of the month, League HQ. says they didn't receive it until the 17th. Score one for the Postal Service, I guess. VE testing will be given in Bellmawr on Feb. 15 in the basement training room of the Bellmawr Community Bldg., Browning Rd. at Lewis Av. Testing begins at 7 PM sharp. Further info from Bill Helmetag, WA2VQG at (609) 546-7710 or 939-3032. Later this year we will be asked to elect a Section Manager. At that time I will have been in office for 7 years and it's time for me to step aside and let some new blood take over. I will not be a candidate. If any one of you has an interest in running for the very rewarding position and aren't sure what it entails, please feel free to contact me. Our Bulletin Manager, WB2UVB has resigned and SNJ needs someone to fill this position. If you're interested, please contact me. Until next month, 73. Traffic: WB2UVB 274, WA2CUW 153, KB1BD (PBBS) 104, WA4JRP 35, KA2CQX 34, K4FFM 11, W2FFE 9, N2FET 7, NG2R 7, N2IPH 6, WB2SYJ 6, N2EPH 4, N2IVN 2, KA2YKN 1, N2HQL 1.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—ACC: N2EH. ASMs: W2BCH, W2GJ, W2GLH, WB2YQH. BM: K2HWK. OOC: W2MTA (A). PIO: WA2PUU. SEC: NN2H. STM: N2EIA. SGL: WB3CUF. TC: K2QR. ASM appointment this month to W2BCH for Central New York reminds me of MacArthur's landing on Luzon. Appointments: (ASM) W2BCH, (NM) WB2MNA—NYPON, (EC) N2INM—Genesee with thanks to KB2VS for past service. Thanks to KA2UBD retiring manager of NYPON for three years of service. OO Reports: N2FHT, KA2MOO. Syracuse area clubs paid tribute to Silent Key W2CM. Fulton ARC presented Golden Key Award to their H-O-Y KC2HJ. Auburn ARA selected WA2L as their H-O-Y. CLUB OFFICERS: Binghamton ARA WE2K, NE2W, K1MEO, WF2A; Champlain Valley ARC KA2PEJ, WN2F, WA2DAC, KA2VCS, KA2MOO; Fulton ARC W2TQF, WB2NGV, WB2LBI, KA2RRY; Oneonta ARC K2TNN, WA2UXE, KB2FIO, WN2K; RRRA KB2CHY, WA2ZNC, N2EZV, N2HXJ. Thanks to the thirty plus clubs in WNY conducting VE tests. WNY League members at 3474. PSHR: N2EIA, N2EVG, WA2FJJ, W2FR, NN2H, KC2HJ, W2MTA, WB2OEV, WB2OWO, WB2QIX, KA2QOO, ND2S, NJ3V, KA2UTI, K2YAI, KA2ZKM, KA2ZNZ. No BPL in November.

NET NAME	QNI/QSP/QND	NET NAME	QNI/QSP/QND
NYSEMO	093-009-004	NYSR	017-003-004
NYS/M*	274-135-030	NYS/E*	368-175-030
WDN/M*	399-074-030	BLUELINE	109-014-025
NY PHONE*	172-092-030	JCRAC NET	327-019-029
Empire SS	439/137/030	TIGARDS	033-004-004
NYPON*	543/261/030	NYSPTEN	504-056-030
VHF THIN	048-000-005	LCARES	049-002-004
BRVSN	303-005-030	OCTEN/E*	775-132-030
OCTEN/L*	248-061-030	Q Net	425-000-029
Pathfinder	313-003-029	STAR*	340-053-030
Earlybird	195-000-022	WDN/E*	510-180-030
WDN/L*	402-153-030	NYS/L*	328-190-030

*NTS Net.

OARCN Oct. 69/3/4, Nov. 95/4/5. ORTN Oct. 25/0/4 Nov. 26/1/5. Packet Node Stations (KT/ST): NA2B 0/38; KA2JXI 4/2. CLUB ANNUAL REPORTS have been received from 49 of the 64 past affiliated clubs. The following are now on the INACTIVE list: (1987) Auburn; (1986) Champlain Valley, Fort Herkimer, Syracuse University, Carlton Webster; (1983) Rookies; (1982) Univ. of Rochester; (1981) Clarkson; (1978) Buffalo ARRA. These clubs need only to file an Annual Report (available from Newington) in order to be on the active mailing list for club info from ARRL. Oh, by the way, Fulton, Lockport, Niagara, RARA, STARS and Utica ARC, I have not seen my copy of your 1989 Annual Report yet. THANKS to most of the clubs for sending their newsletter to the Section Manager. Other club's newsletters are also welcome by W2MTA. Have a heart on Valentines Day. GB CR. Traffic (November): W2MTA 394, WA2FJJ 327, N2EIA 278, WB2OWO 266, KC2HJ 242, NJ3V 233, WB2NLU 221, W2FR 208, K2YAI 199, KA2ZNZ 136, WB2IJH 126, KA2ZKM 115, KA2UTI 100, NN2H 98, KA2SJG 96, WB2QIX 95, ND2S 94, KA2QOO 81, NA2B 76, KA2DBD 47, KG2D 44, WB2OEV 41, N2EVG 40, AF2K 40, W2UYE 40, KB2EOQ 31, N2DLN 25, W2PPS 22, N8JSO 14, KA2JXI 12, WB3CUF 9, KE2EA 6, KA2AON 3, (October) KA2SJG 59, W2UYE 20.

WESTERN PENNSYLVANIA: SM, John T. Fleming, NO3M @ NO3M—ASM/SGL: KA3OEM @ NM3G. SEC: WA3UFN @ WA7SSO. STM: K3SMB. BM: KC3ET @ KA3NVP. TC: N3EFN @ K3ASI. OOC: KX3V. ACC: AK3J.

NET	QNI	QTC	SESS	kHz	T/D	MNGR
WPACW	235	139	30	3585	7:00P/D	WA3UNX
WPAPTN	410	59	30	3983	6:00P/D	WA3HLN
KFN	143	66	23	3983	1:00P	N3EMD
PFN	200	160	30	3958	5:00P/D	WA3THT
WPA2MTN	312	41	30	14688	8:00P/D	KA3BGC
NWPA2MTN	547	53	28	14513	9:00P/D	KC3NY

I am sad to announce the passing of W3YNE. Our sympathy is with his wife and family. K3SMB's wife, Jay, has a tumor on her heart. Please remember both Otto and her in you prayers. Congratulations to W3OKN and his wife on their 50th wedding anniversary. The new officers for the BCARA are Pres - WA3BVQ, 1st VP - N3GXQ, 2nd VP - N3HLG, Sec - WB3ITS, Treas - WB3HBE, and Trustees - WB3BFC, WA3GDS, NG3A, and KA3RNF. The new officers for the SCARC are Pres - WA3VXJ, VP - N3EQF, Treas - AK3J, Rec Sec - KC3YE, Cor Sec - W3UUH. The new officers of The Radio Association of Erie are Pres - KA3FZO, VP - WB3KGT, Sec - KZ3E, Treas - KA3PEJ. Congratulations to the new leadership teams taking us into the 1990's. Be sure to notify the ARRL of changes in club officers so they can keep information flowing to the correct parties. Congratulations to W3KWH for taking second place nationally as multioperator in the August UHF contest. I have noticed an interesting pattern from the station activity reports that I have received. We as a section don't generate much traffic! I circulated a packet message while writing this month's column which was a format for Christmas Messages. Look for another similar message for use with Valentine messages. By generating traffic, we should be receiving responses. November traffic: N3EMD 317, N3FM 262, W3OKN 193, KQ3T 172, NO3M 140, WA2QXA 136, WA3UNX 120, N3AES 82, W3NGO 82, WA3HJC 43, KA3OEM 30, KC3YE 30, KC3HR 27, KA3VBY 21, W3RUL 20, WA3DBW 10, KA3EGE 10, WA3QNT 8, N3FQQ 6, K3LTV 2.

CENTRAL DIVISION

ILLINOIS: SM, Dave Carlson, AA9D—SEC: W9QBH. BM: K9EUI. ACC: WB9SFT. STM: K9CNP. SGL: K9IDQ. TC: N9RF. OOC: W9TT. PIO: W9EWA. DEC: WD9EBQ.

ILLINOIS SECTION NETS

NET	FREQ	TIME
ISN	3905	1800 DAILY
ILN	3690	1630,2200 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	1645M-F; 0830 SUNDAY
NCPN	3915	0700 M-SAT
NCPN	7270	1215 M-SAT

Hats off to KA9QJX who twice during November relayed automobile accident reports from the WB9FRM repeater to the local police. The Northbrook Park District will sponsor Amateur Radio classes at the Northbrook Leisure Center on Walters Avenue. To register, call Carlos at (708) 272-2816. The Hamfesters Radio Club holds VE exams on the second Saturday of each month. Call 312-247-0650 for more information. New officers for Hamfesters are: Pres, KA9GTX; 1st VP, KA9HDN; 2nd VP, N9DWI; Treas, KC9IC; Sec, N9FPQ. Congratulations to the Joliet Amateur Radio Society—50 years old in 1990! On November 18th, the Egyptian Radio Club presented its first Communications Conference at the Granite City Campus of Belleville Area College. The program covered the ability of amateur radio to support emergency, disaster, public service, and community service activities. The following groups were represented at the seminar: Illinois State Police, Alton-Wood River American Red Cross, St. Louis Bi-State American Red Cross, Granite City ESDA, Jersey County ESDA, Madison County ESDA, Macoupin County ESDA, Jersey County Sheriff's Dept. St. Louis Police Dept. Macoupin County ARES, Madison County ARES, Madison County SKYWARN, the Salvation Army, National Weather Service, Egyptian Radio Club, Lewis and Clark Amateur Radio Club, St. Clair County Amateur Radio Club, Clinton County Amateur Radio Club and the Jefferson Barracks Amateur Radio Club. Congratulations to those involved in the planning and presentation of this fine event! Traffic: KA9FEZ 205, W9HLX 201, W9HOT 194, K9CNP 155, WA9VLC 151, W9HB! 139, WD9CIR 137, K9QEW 96, NS9F 66, W9LWH 63, WD9HQW 56, KA9QXI 53, KE9DX 52, WB9TVD 52, KA9JNE 45, KA9TVU 40, NC9T 36, W9KR 18, WA9SLT 15, WA9AXL 13, N3AIA 9, W9VEY 9, WA9RUM 8, W9LNQ 6. @ WB9MJN-BBS 143, @ N3AIA-BBS 32. (Oct.) KE9DX 78.

INDIANA: SM, Bruce Woodward, W9UMH—SEC: WB9ZQE. STM: WA9OHX. ACC: NX9I. OOC: WB9L. TC: WA9JWL. SGL: WA9VQO. BM: W9OCL. PIO: N9IPA. PM: WB9AHJ. Net Managers: ITN: KA9EIV, QIN: KJ9J, ICN: NR9K, VHF: W9PMT, IWN: KA9ERC. NOVEMBER Net Reports:

NET	FREQ	TIME/DAILY/UTC	QNI	QTC	QTR	SES
ITN	3910	1330/2130/2300	2902	398	2019	90
QIN	3656	1430/0000/0300	336	162	881	60
ICN	3705	2315	133	83	694	29
IWN	3910	1310	1455		316	30
IWN VHF Bloomington			646		450	30
IWN VHF Kokomo			1136		188	30
IWN VHF Ligonier			484		800	30
Hoosier VHF Nets (16)			2838	155	3514	84

D9RN for November 152 QTC 60 ses. IN 100% by WA9OHX, K9ZLS, K9GBR, N9DWU, K9GGS. CAND for November 852 messages in 30 ses. D9RN 100% by K9ZLS, N9DWU. WA9OHX. SILENT KEY: James M. Patterson, W9QCW, Crown Point. APPOINTMENTS: George Utley, N9FMO DEC for district 10. Brad C. Darnell, N9INN AA/OO. Awards were presented at the South Bend Hamfest to 4 XYLs in appreciation for their support of their OMs in the section. Judith Murphy, XYL N9AJM; Delores A Wallace, XYL of WA9OHX, Joan Straup, XYL of KJ9J, and Lois Ree Smith, XYL W9EPT. EC reports: N9DUZ, WD9X, K9ET, KD9HB, N9DTG, WA9OQT, WA9HEE, WB9NCE, W9CFI, KA9ZOR, KB9AVS, KA9KOG, W9EPT, WD9BKA, NX9I. W9YDP, N9FMO, KA9MNR. Packet BBS Reports: W9ZRX 7178, WB9SYK 1921, KD9QB 2177, WA9UXP 2191, N8GTC 2306, N9ABC 690, N5AAA 1419, KA9LQM 1186. NTS Service Awards have been presented to Indianapolis 10/70, Fort Wayne 28/88, PBBS W9ZRX. WB9SYK, and N9BAC. PUBLIC SERVICE REPORTS: DeKalb County W9QWI. Halloween Patrol, Noble County KA9KOG, Simulated Hazardous Materials, Lake County N9DTG. Halloween Patrol. Lucy Schendera, N9DTG, was honored with a picture and an article in the Hammond Times. George Utley, N9FMO, had his picture and an article in the Evansville Courier for his help during severe weather. The Indiana Wet Net was featured in an article in the Elkhart Tribune. N9FOZ reports 404 hours with 2 accidents, 1 lost child, 1 traffic light, transformer fire, 2 directions, 2 road hazards, and 1 medical emergency. Traffic: W9ZRX 1086, NR9K 351, KJ9J 222, N9DWU 144, N5AAA 135, WA9OHX 119, NV9A 95, W9ZGC 92, W9UMH 91, N9BAC 68, K9GBR 62, WD9JAA 62, K9ZLS 54, W9PPO 54, WA9UXP 46, WB9QPA 46, W9OCL 43, WA9QCF 41, K9SBW 35, NX9I 23, KD9QB 21, KA9LQM 20, W9CNE 30, N9DTG 19, NX9A 18, K9ZBM 16, WD9HII 12, KA9ZOD 12, W9PMT 12, N9FMO 10, WB9QZZ 10, KD9DU 10, WB9NCE 9, KB9HH 8, WD9DWD 8, WA8OIZ 7, WD9CIV 7, N9BS 7, K9ET 7, KB9GK 7, W9KMY 6, W9EHY 6, K9DIY 6, W9OZJ 5, W9BTZ 4, K9OUP 4, KB9SU 3, WB9IHR 2, W9RTH 1.

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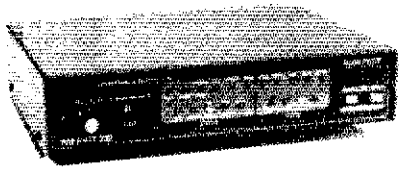

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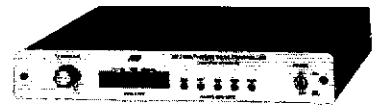

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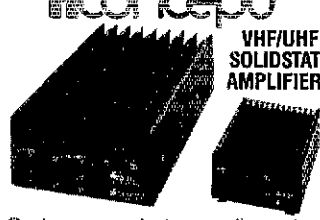

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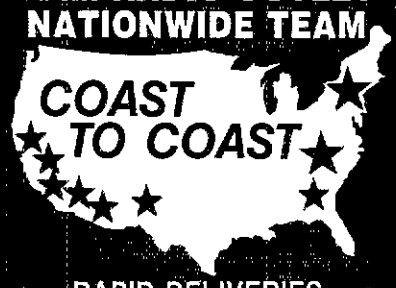

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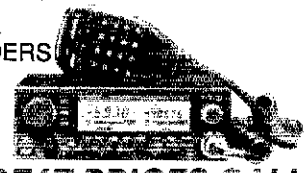

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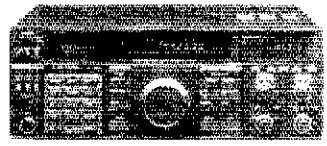

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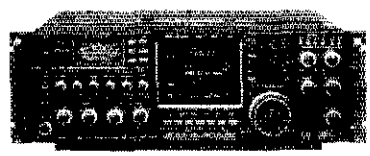

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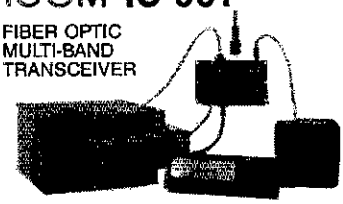

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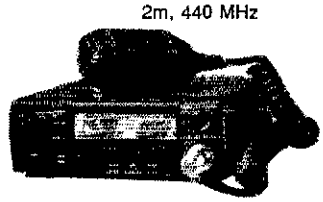

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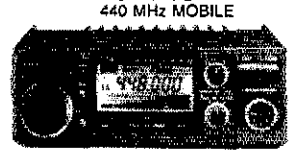

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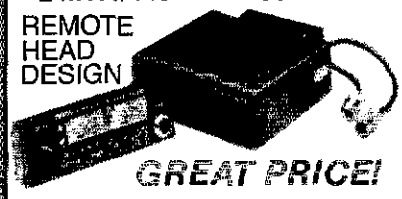

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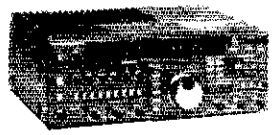

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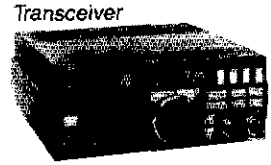

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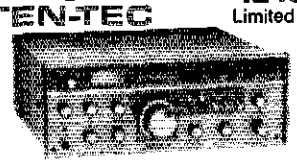

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NEW WITH STAINLESS STEEL HARDWARE



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Whether busting pileups, rag chewing or hunting rare DX, the A3 stands out from the crowd with the perfect combination of easy assembly, the right size, rugged durability and great performance.

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The new R5 has a broadband solid state impedance matching network for full coverage of all 5 bands. Frequency selection is completely automatic. There are no moving parts or remote tuner. The only connection required to the antenna is your 50 Ohm coax.

- The unique counterpoise has four 48" long .100" diameter stainless steel rods for excellent ground isolation
- No radials required

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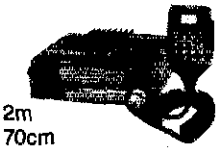
DR-570T The Twin Band

2m/70cm FM Transceiver



45W 2m
35W 70cm
Full Duplex Cross Band Operation
Twin Band Receiver

ALINCO

DJ-500T

2m/70cm

FM Transceiver
Dual Bander H.T.



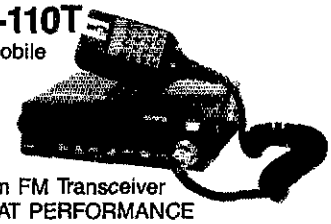
GREAT PRICE

2.5W 2M/2W 70cm
CAP + MARS MODIFIABLE

ALINCO

DR-110T

2m Mobile



2m FM Transceiver
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BOOMER ANTENNAS

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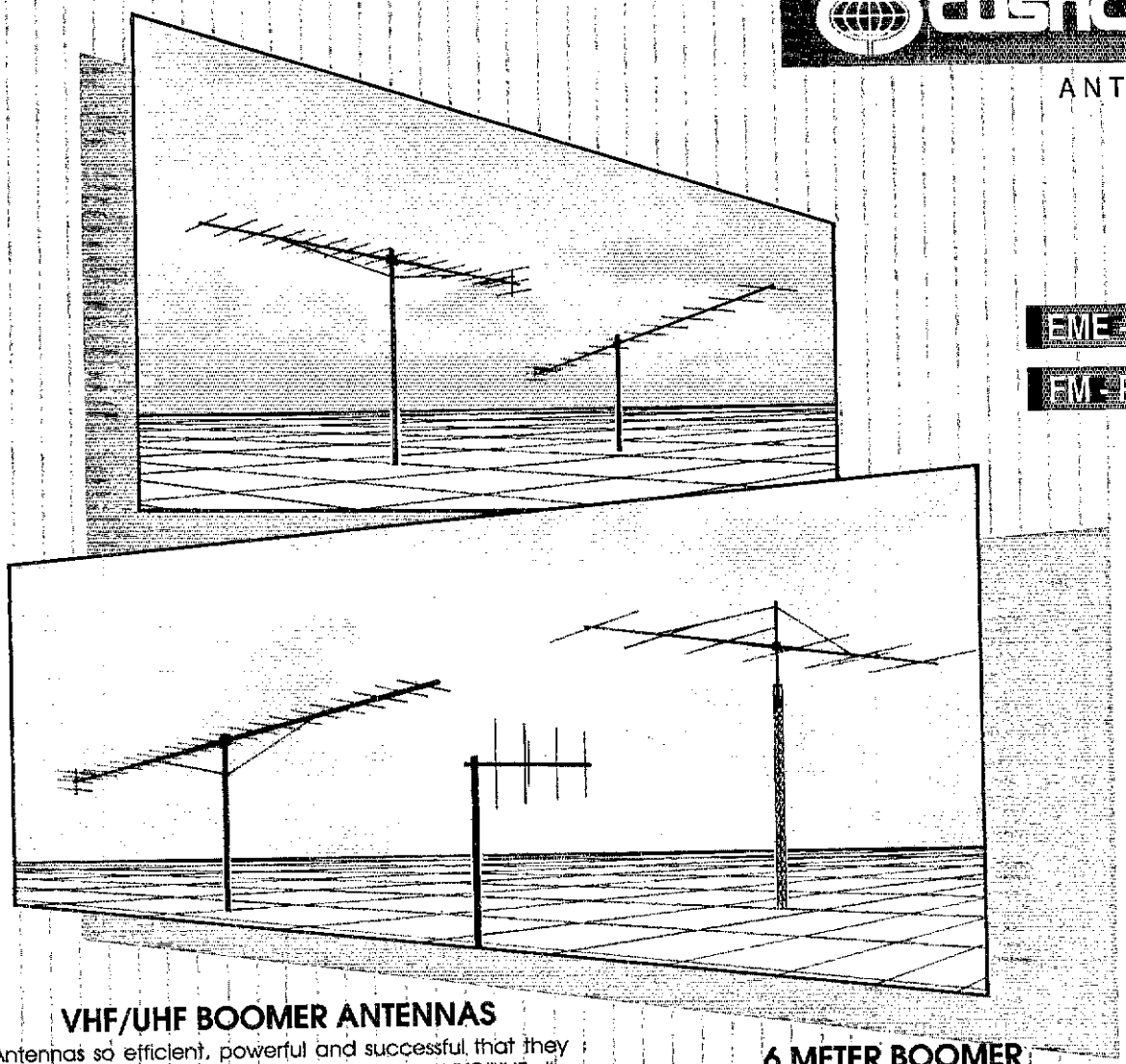
ANTENNAS

EME - CW - SSB
FM - PACKET



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All Cushcraft Boomers are built with stainless steel hardware, ultraviolet stabilized element insulators, coaxial balun and heavy wall boom material with stainless steel locking pins. They are consistent winners in every antenna gain measuring contest and they are the choice of VHF and UHF antennas for hams around the world! **Built to perform and built to last. The best your money can buy.**

SIDEBAND CW BOOMERS

The antennas VHF/UHF operators choose for EME Meteor scatter and contesting. They all have balanced T-Match feed systems and trigon reflectors for precise patterns and maximum performance.

4218XL	144-145 MHz	18 Element	28' BOOMER
32-19	144-146 MHz	19 Element	22' BOOMER
215WB	144-148 MHz	15 Element	15' BOOMER
220B	220-223 MHz	17 Element	19' BOOMER
424B	424-435 MHz	24 Element	17' BOOMER

6 METER BOOMER

Our 617-6B has more gain than any antenna in its class! Serious operators appreciate the design durability of this long boom 6 meter antenna. The excellent gain and front to back ratio are combined with a new clean pattern to focus your signal where you want it. The 617-6B is designed to survive the toughest conditions.

617-6B	50-51 MHz	6 Element	34' BOOMER

FM BOOMERS

Our FM Boomers feature the latest wideband technology to give the high performance required for FM and Packet, or sideband and CW. There are three high performance models for two meters and two models for the new 220 MHz novice phone band. All are designed for quick, easy assembly and horizontal or vertical mounting.

124WB	144-148 MHz	4 Element	4' BOOMER
215WB	144-148 MHz	15 Element	15' BOOMER
230WB	144-148 MHz	2x15 Element	BOOMER
224WB	220-225 MHz	4 Element	3' BOOMER
225WB	220-225 MHz	15 Element	10' BOOMER

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Icom IC-725	799.00
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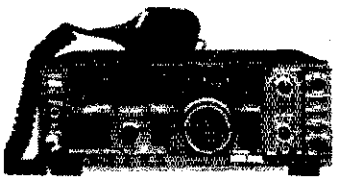
YAESU FT-1000D	Call for price



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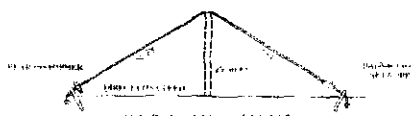
CONTINUOUS COVERAGE ANTENNAS FOR COMMERCIAL & AMATEUR SERVICE

Model AC 1.8-30 1.8 to 30 MHz

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



US Patent No. 4,511,898

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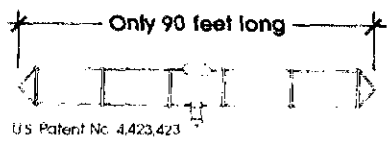
Model AC 3.5-30 3.5 to 30 MHz

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



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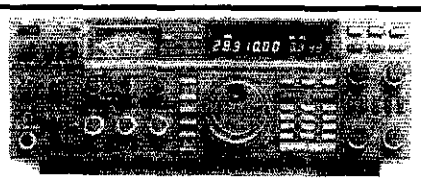
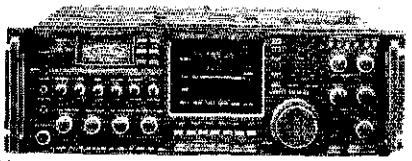
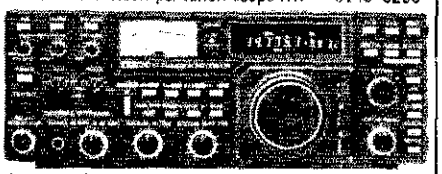


HF Equipment

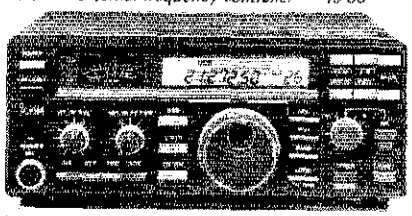
	Regular	SALE
IC-765 Xcvr/ps/keyer/auto tuner	3149.00	2699



IC-781 Xcvr/Rcvr/ps/tuner/scope	6149	5295



IC-751A 9-band xcvr/.1-30 MHz rcvr	1699.00	1469
PS-35 Internal power supply	219.00	199.95
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-52A 500 Hz CW filter (2nd IF)	115.00	109.95
FL-53A 250 Hz CW filter (2nd IF)	115.00	109.95
FL-33 AM filter	49.00	
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	999.95
PS-55 External power supply	219.00	199.95
AT-150 *Auto. antenna tuner (Special)*	445.00	369.95
FL-32A 500 Hz CW filter	69.00	
EX-243 Electronic keyer unit	64.50	
UT-30 Tone encoder	18.50	
IC-725 Ultra compact HF xcvr/SW rcvr	949.00	829.95
IC-726 10-band xcvr/6m/.5-30MHz rx	1299.00	1129

Other Accessories

	Regular	SALE
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	269.95
PS-15 20A external power supply	175.00	159.95
PS-30 Systems p/s w/cord, 6-pin plug	349.00	319.95
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 for 751A	79.00	
PP-1 Speaker/patch	179.00	164.95
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	389.95
AT-500 500W 9-band auto. ant. tuner	589.00	519.95
AH-2 8-band tuner w/mount & whip	758.00	689.95
AH-2A Antenna tuner system, only	559.00	499.95
GC-5 World clock *(Special)*	91.95	69.95

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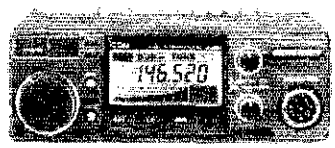
IC-275H 100w 2m FM/SSB/CW	1399.00	1199
IC-375A 25w 220 FM/SSB *(Closeout)*	1399.00	799.95
IC-475A 25w 440 FM/SSB/CW w/ps	1399.00	1199
IC-475H 100w 440 FM/SSB/CW	1599.00	1369
IC-575A 25w 6/10m xcvr/ps *(Special)*	1399.00	1129
IC-575H 25w 100w 6/10m xcvr	1699.00	1469

VHF/UHF/1.2GHz mobiles

	Regular	Sale
IC-28A 25w 2m FM, TTP mic *(Special)*	469.00	379.95
IC-28H 45w 2m FM, TTP mic *(Special)*	499.00	389.95
IC-48A 25w 440-450 FM, TTP mic	509.00	449.95
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	
IC-900A Transceiver controller	639.00	499.95

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IC-900A Transceiver controller with **UX-29H** *2m/25W and* **UX-39A** *220/25W band units.*
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UX-19A 10m, 10w band unit	299.00	269.95
UX-29A 2m, 25w band unit	299.00	269.95
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UX-129A 1.2GHz 10w band unit	549.00	499.95
IC-901 Fiber Optic 2m/440 xcvr	1199.00	1049
IC-1200A 10w, 1.2GHz FM *(Closeout)*	699.00	599.95
IC-2500A 35w, 440/1.2GHz FM mobile	999.00	869.95
IC-3210A 25w, 2m/440 FM/TTP	739.00	639.95
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	39.00	
Larsen PO-K Roof mount	23.00	
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Larsen PO-MM Magnetic mount	28.75	
RP-1510 2m 25w repeater	1849.00	1649

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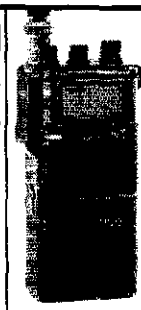

Hand-helds

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IC-02AT/High Power	409.00	349.95
IC-04AT 440 *(Closeout)*	449.00	369.95
	369.00	199.95
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	549.95
IC-12AT 1w 1.2GHz FM HT/TTP *(Special)*	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	479.95
A-20 Synth. aircraft HT w/VOR	625.00	549.95

Accessories for all except micros

	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	79.00
BP-8 800mah/8.4V Nicad Pak - use BC-35	79.00
BC-35 Drop in desk charger for all batteries	79.00
BC-16U Wall charger for BP7/BP8	21.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

Accessories for IC and IC-O series

	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	49.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	39.50
BP-4 Alkaline battery case	16.00
BP-5 425mah/10.8V Nicad Pak - use BC35	65.00
CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.65
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	24.50
MB-16D Mobile mtg. bkt for all HTs	25.99
LC-2AT Leather case for standard models	54.50
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	24.50
HS-10SA Vox unit for HS-10 & Deluxe only	24.50
HS-10SB PTT unit for HS-10	24.50

For other HT Accessories not listed please CALL

Receivers

	Regular	SALE
R-71A 100kHz to 30MHz receiver	$999.00	869.95
RC-11 Infrared remote controller	70.99	
FL-32A 500 Hz CW filter	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-44A SSB filter (2nd IF)	178.00	159.95
EX-257 FM unit	49.00	
EX-310 Voice synthesizer	59.00	
CR-64 High stability oscillator xtal	79.00	
SP-3 External speaker	65.00	
CK-70 (EX-299) 12V DC option	12.99	
MB-12 Mobile mount	25.99	
R-7000 25MHz-2GHz rcvr *(Special)*	1199.00	999.95
RC-12 Infrared remote controller	70.99	
EX-310 Voice synthesizer	59.00	
TV-R7000 ATV unit	139.00	129.95
AH-7000 Radiating antenna	99.00	
R-9000 100KHz-2GHz all-mode rcvr	5459.00	4699

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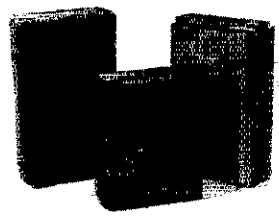

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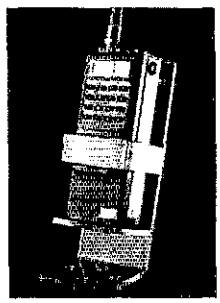

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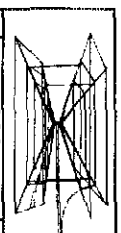

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WISCONSIN: SM, Richard Regent, K9GDF—Congratulations to KC9XH of Verona who is newly appointed District Emergency Coordinator for both South Central and South West districts, and also to W9UDX of Oshkosh who is new Emergency Coordinator of Winnebago County. If you would like to learn how to prepare for emergency communications please contact our Section Emergency Coordinator W9ZAG of Muskego. Rock River RC nets meet Saturdays on 7.277 or 3.985 MHz at 11:00 A.M. and Mondays on 146.04 MHz at 7:30 P.M. February 2nd and 3rd the Four Lakes ARC will operate a special event station from the ground hog capital of the world, Sun Prairie. February 7th exams at Wauwatosa East High School are at 7:00 P.M. Fox Cities ARC will hold a Hamfest at Sabre Lanes in Menasha on February 24th, catch NB9J for details. Exams February 24th will be at Fire Station No. 2 in Madison at 8:00 A.M. Milwaukee RAC will again have their all-classes amateur license school on nine Wednesdays at 7:30 P.M. starting February 28th, contact WB9BWP for more information. Visit the Waupaca ARC on their first Tuesday of the month CQ meetings at King's Table, Highway QQ in King just southwest of Waupaca, at 11:30 A.M. with talk-in on 147.39 MHz. The Oshkosh ARC is proposing some improvements to their club constitution. Sorry to report Silent Keys W9YYY and K9PZH. Thought of the month: If something is confidential, it will be left in the copy machine.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, KCØT—Things are picking up. True, the Thanksgiving Season had something to do with it, but, the significant thing is that we had 27 stations reporting SARs for the month. And that adds up to a traffic count of 2,054! That sure was better than the usual 18 or 19 and you can see what the impact is when everybody sends in a report. I know there could be some more...so don't think your report isn't needed. We want them all, big or small as they all add up. Thanks Gang! Congratulations to Karl, WAØTFC, who is now the Net Manager for MSPN/N (Noon Phone Net). It's a real pleasure to have Karl accept this appointment and we know he will do a great job. But Karl needs your help. He needs NCS stations and Liaison stations. So, let's give Karl the help he needs to revitalize the Section Noon Phone Net. It won't be long now and it will be time for the John Beargrease Dog Sled Races and then comes Mid-Winter Madness! Mark your calendars now for February 24th. MSN invites all MSN participants to join in a Breakfast and Mini-program at 8 AM in the downstairs restaurant. The same place as last year. All that at the Medina Ballroom in connection with Mid-Winter Madness. That's it for this time and until next time, 73 es GL. Jim Swisher, KFØFI, STM.

NET	FREQ	TIME	QNI/QTC/SESS	NET MGR
MSN/1	3685	6:30P	335/78/30	KDØNH
MSN/2	3685	10:00P	228/64/30	KØQBE
MSSN**	3710	6:00P	424/63/30	KAØSBY
MSPN/N	3860	12:05P	344/166/30	WAØTFC
MSPN/E	3860	5:30P	928/237/30	KCØT
PAW	3929	9:00A	3355/317/119	WDØBAC
MAW	3860	8:00P	340/199/22	KDØCI

**MSSN additionally sent 26 training messages. Alt. Freqs. MSN/1 and MSN/2-7070; MSPN/N-7232. Traffic: WAØTFC 363, KFØFI 349, NØFOO 135, WØGRW 118, KAØARP 113, KT9I 89, NRØS 72, KDØCI 68, KDØNH 61, KAØPDM 61, W9DM 52, NØKCM 50, WAØONE 50, KAØSBY 49, KAØBFP 48, KØQBE 48, NØJVV 47, KDØCL 42, NFØG 41, NØKHH 38, KCØT 35, KØOGI 30, WDØGUF 28, NØJP 28, KAØCDC 19, KØWPK 12, WØKYG 8.

NORTH DAKOTA: SM, Bill Kurtti, WCØM—A big thank you to WBØVHW for serving as ND Repeater Frequency Coordinator for the last 4 years. Bill resigned from that position Dec 1. However we were very grateful that Stan WDØDAJ is willing to take the job. WØGFE has the weather net in operation on 3941 kHz again this winter with a strong lineup of net controls WØZVN, KAØTVE, WØGZD, KAØIWM & KBØCH. The Data net has been running smoothly under the direction of NØJR also. With WØGFE, WØOSP, NØJR, WCØM, KBØCH, KDØYX & KAØTVE also on 3941 khz. On 1985 kHz we have NTØV calling the Goose River net on Sunday mornings with KBØCH as the 1st backup. We now have a very good path to the Minneapolis area on Packet and have been noticing slow but steady growth in the number of packet operators in the state. Another thing I am glad to see is the number of young hams I see at the meetings and hamfests around the state. With the vigor of the young hams and the experience of the old-timers working together I see a bright future for ham radio in ND. Traffic: KAØFSM 49.

NET	FREQ	TIME	SESS/QNI/QTC	MGR
GOOSE RIVER	1895kHz	9AM SU	4/72/0	NTØV
DATA	3941kHz	6:30 DA	30/788/24	NØJR
WX NETS	3941kHz		55/788/7	WØGFE

WINTER ONLY 9AM-12:30PM MONDAY-SATURDAY
Storm Net 3941kHz During Storms Only WCØM

SOUTH DAKOTA: SM, R. L. Cory, WØYMB—Asst SM: NØABE, WAØFPR. SEC: KAØKPY. STM: KDØYL. The Hot Springs Amateur Radio Club is planning a South Dakota Ham convention for this coming summer, so watch for details as they become available. Word from Pierre is that WØRTD, Eldon, is recovering from his accident and from Hot Springs, WØHOJ, is back on the air after his surgery. We welcome back on the air KØGSY, Jr. Rousseau at Ridgeview after twelve years of silence. The Watertown Club reports 43 percent requests for QSL cards from their Mellette House special events station. NØHCR reports requests for QSL cards from the SD Wagon Train special events station were one third of the contacts. WØBYP was given a proclamation signed by the Gov. for his nine weeks operating on the Wagon Train. I need to hear from more clubs about their activities. Total traffic reported for November was 305.

DELTA DIVISION

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—ASM: KB5CX. SEC: N5ADF. ACC: K5KR. SGL: KD5SL. TC: W5RWF. OOC: WB4ICV. Packet: WB5ASD. STM: WB4FDT. A round of applause to the recently elected 1990 officers of the Central Louisiana ARC. Pres: John Timm, N5JMO, VP Ray Melvin, N5JBZ. Treas: Joe Zachmyc, KA5WPA, and Sec: Mary McKee, WA5CRU. ARRL appointed Official Emergency Stations are member volunteers who are prepared to handle emergency traffic in their local area and assist in handling emergency traffic to other areas. Welcome aboard to the following new ARRL Official Emergency Stations in Lafayette: Brent Burleigh, KG5VO; John Mayeux, N5NKN; James Chopin, KB5EK and "Allen" Reed, N5OCH. More volunteer

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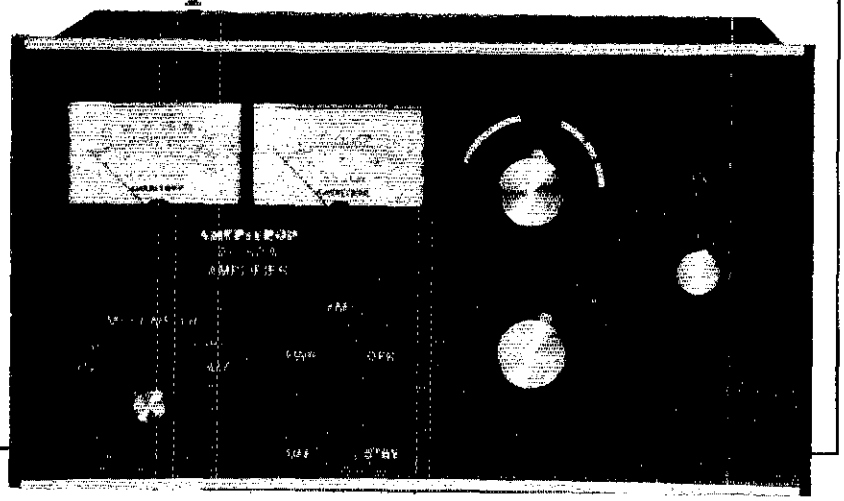

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3-500Z Tube in shielded RF compartment gives you nearly 70% efficiency

You get the rugged time proven 3-500Z tube with an estimated life of 20,000 hours ICAS. That's nearly 20 years operating 20 hours a week -- you may never have to replace your tube.

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

A superb RF design and layout, a Hi-Q tank circuit and commercially rated RF power components give you nearly 70% plate efficiency over the entire operating range. This puts maximum power into your antenna instead of heating up your amplifier.

A whisper quiet internal computer style fan draws in cool air over the power supply components and blows it around the 3-500Z tube. This removes excessive heat and gives you reliable performance.

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 ***heavy*** duty power supply.

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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When you first turn on your amplifier, a massive inrush current flows.

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Don't consider a linear amplifier without this critical protection.

Multi-Voltage Primary protects your amplifier and gives you peak performance

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

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.*

Before you buy an amplifier make sure it has a multi-voltage primary.

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Two large meters give you a complete picture of the operating condition of your AL-80A. They let you know right away if there is a problem.

Grid current of the 3-500Z is monitored continuously by one meter. Grid Current indicates proper amplifier operation better *than any other parameter.*

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A kit could actually end up costing you more than your best price on the AL-80A -- and leave you frustrated if you can't get it to work.

A *factory built AL-80A has much higher* resale and trade-in value than a kit. Why? Because Ameritron's reputation for consistent quality and workmanship is known by hams everywhere.

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No other kilowatt amplifier on the market comes with a 2 year warranty. In the unlikely event that there are defects in materials or workmanship, we'll fix it free for 2 years from the date of purchase.

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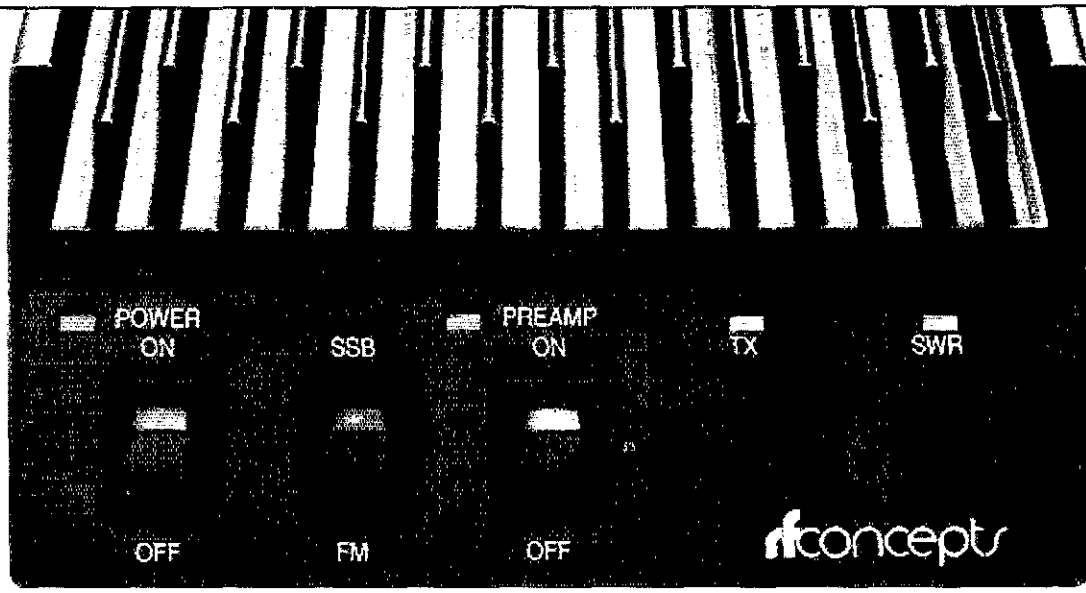

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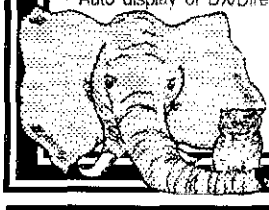

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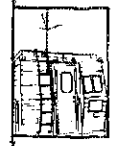

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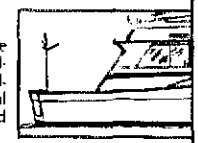



At Home

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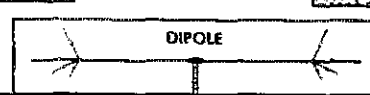

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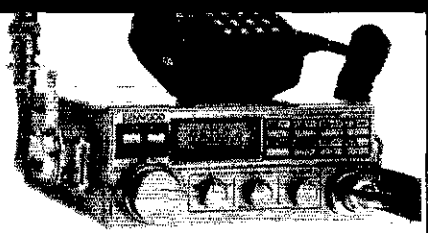

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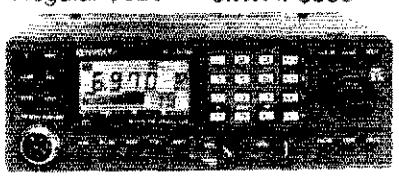
Regular $629.95 • ***Closeout* $399.95**



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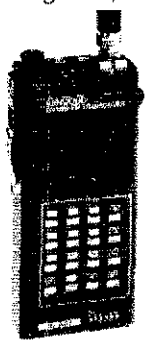
KENWOOD TM-621A • *2m/220MHz, dual band FM* mobile transceiver. Extended 2m receive 138 to 173.9MHz, transmits user modifiable for MARS/CAP. 45W (2m), 25W (220MHz). Dual Watch simultaneous 2m/220 receive, selectable full duplex operation. 30 memories, programmable memory and band scan, lockout, priority watch. CTCSS encoder. With modification can be used as a cross band repeater. 16-key DTMF mic. included. 12V DC @ 9.5A, 2"h×6"w×8"d.

Regular $729.95 • ***Closeout* $599.95**



KENWOOD TH-31BT
220MHz FM Pocket Handheld

1.5/0.15W, 3-digit thumb-wheel and 5kHz upshift switch. DTMF keypad, programmable CTCSS encoder built-in, std. repeater offsets. Flexible antenna, 1.5W Ni-Cd battery (PB-2), wall charger, 4¾"h×2¼"w×1⅛"d, 0.6 lbs.

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TH-215A* 2.5W 2m FM HT/batt/cgr/TTP
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**With TH-25AT, TH-215A or TH-315A purchase, one extra standard battery pack* • $5.00

TM-231A 50W 2m FM transceiver w/TTP mic

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TS-440S 9-band HF transceiver
TS-440S/AT HF transceiver w/auto. tuner
TS-680S 9 band transceiver w/6 meters
TS-140S 9-band HF transceiver

Call for Duo-Band Special Prices

TM-631A 45/25W 2m/220MHz FM trans.
TM-701A 25W, 2m/440MHz FM transceiver
TM-731A 45/35W 2m/440MHz transciever
TH-75A 1.5W, 2m/440MHz FM handheld

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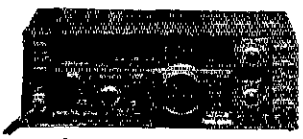
KENWOOD

TS 140S/680S



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TS-680 INCLUDES 6M

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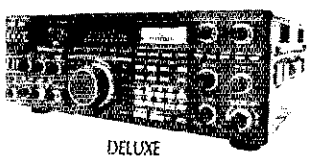
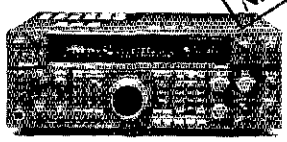


DELUXE
COMPETITION CLASS

TS 950 SD NEW



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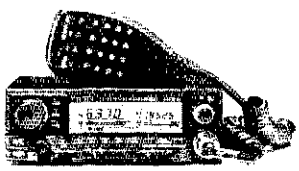

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TM631A 2M/220 TM731A 2M/440

TH 75A



TH 225A NEW



TH 25AT



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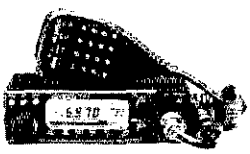
FOR THE KENWOOD HANDHELDS.

TM 231A

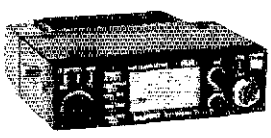


COMPACT 50 WATT
2 METER MOBILE

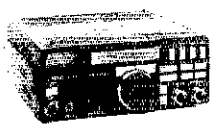
YAESU



FT 470



FT 212 RH



FT 747 GX

AEA

PK-232MBX $319.00



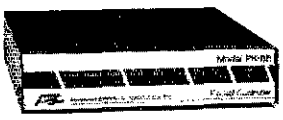
MULTI MODE CONTROLLER

MM-3 $171.00



DELUXE MEMORY KEYER

PK-88 $119.00

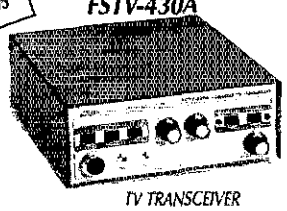


PACKET CONTROLLER

2 Meter $49.95



FSTV-430A

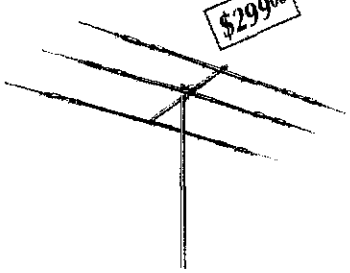


TV TRANSCEIVER

ISOPOLE ANTENNAS

cushcraft CORPORATION

A3S BEAM $299.00



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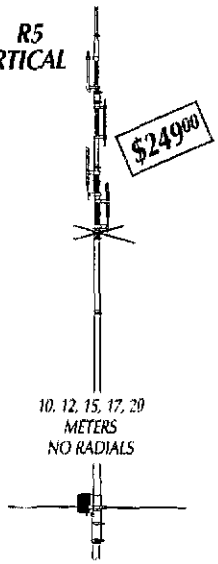
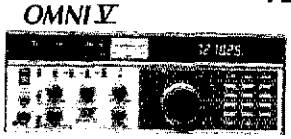


10, 12, 15, 17, 20
METERS
NO RADIALS

ANTENNAS

TEN-TEC INC

OMNI V



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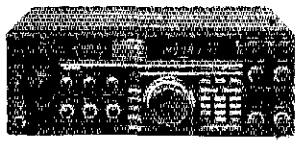
IC-765



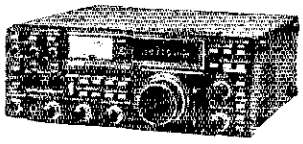
COMPETITION GRADE

IC-781



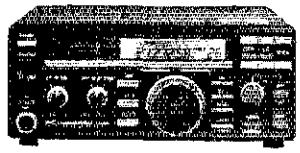
SIMPLY THE BEST

IC-751A



PERFORMANCE PLUS VALUE

IC-725



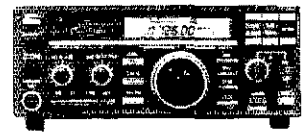
ECONOMY HF

IC-735



PROVEN WINNER

IC-726



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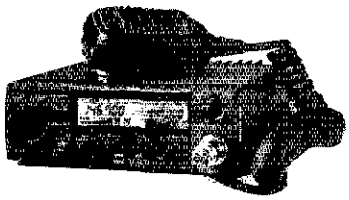
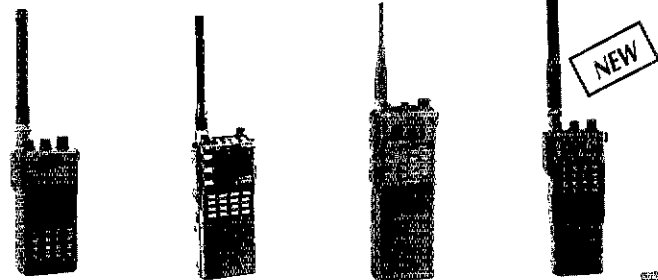
DUAL BAND MOBILES

IC-2400



HANDHELDS



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2 METER MOBILE



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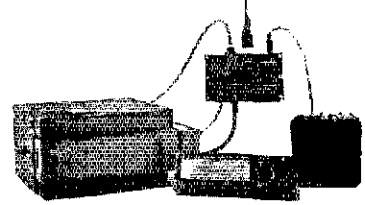
Versatile Multi-Band Remote System



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Will handle 10 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
MA-40	40'	21'6"	2	242	3" sq.	4½"	$ 809.00
MA-550	55'	22'1"	3	435	3" sq.	6"	$1369.00
MA-550MDP*	55'	22'1"	3	620	3" sq	6"	$2909.00
MA-770	71'	22'10"	4	645	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.

Shown w/optional MARB550 rotorbase and rotator.

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	12½"	15"	$1019.00
TX-455	55'	22'	3	670	12½"	18"	$1539.00
TX-472	72'	22'8"	4	1040	12½"	21⅜"	$2529.00
TX-472MDP*	72'	22'8"	4	1210	12½"	21⅜"	$4069.00
TX-489	89'	23'4"	5	1590	12½"	25¾"	$4399.00
TX-489MDPL*	89'	23'4"	5	1800	12½"	25¾"	$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	870	15"	21⅜"	$2309.00
HDX-572	72'	22'8"	4	1420	15"	25¾"	$3959.00
HDX-572MDPL*	72'	22'8"	4	1600	15"	25¾"	$6049.00
HDX-589MDPL*	89'	23'8"	5	2440	15"	30⅜"	$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	12½"	20⅞"	$1319.00
TMM-541SS*	41'	12'	5	430	10"	20⅞"	$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.

Tower ratings to EIA specifications.
Standard bases included with all towers (except MA-770, 770-MDP and 850-MDP).

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36th Annual

HAMFEST

February 25, 1990

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W8VPV

Parish Emergency Coordinators and Emergency Stations are needed in nearly every Parish in Louisiana. Contact me (QST page 8) if you are interested in assisting in an emergency and can devote an hour or two each month by participating in an emergency net. Since 1967, the Ozone ARC in Slidell has conducted the Louisiana Alligator Net on 3.925 MHz at 2030 Fridays. Casey Wright, WA5YJW is Net Control. Everyone is welcome to join in. They have issued nearly 1800 very attractive Alligator Net Certificates to both stateside and many foreign stations. Certificates can be obtained by contacting any member that has received a certificate and sending their name and three dollars for printing and postage to the Ozone ARC, P. O. Box 553, Slidell, LA 70459. 73 de "Wondy," K5KR. Traffic: WB4FDT 104, K5CNK 57, K5WOD 34, WA5LHL 23, WA5TQA 18.

MISSISSIPPI: SM, Butch Magee, KF5DE — ASM: WD5GHW. SEC: N5DVR. TC: W5VZF. STM: KB5W. BM: W5EPW. SGL: KA5WRX. The Mississippi Section had the opportunity to flex its Emergency Preparedness skills this month. The result of a joint effort of the NOAA and Alabama Section SET. Mississippi was requested to participate by the NOAA, Birmingham National Weather Service. 256 MS hams were involved in a severe weather exercise in which storm cells were moving across MS and into Alabama. Simulated, realistic weather reports, created ahead of time and planned for entry at proper times sounded awfully real. Liaison between the MSPN Emergency Net and the Alabama Net was excellent. Bill Fryer, N5DVR, SEC was NCS and did a fine job of coordinating the state HF-VHF. The Laurel ARC got into the emergency operations mode with a simulated train wreck in which 77 victims and 8 organizations were involved. This was one of those times in which an exercise proved to the local area authorities just how valuable Amateur Radio operations were to the community. A fine job, by a dedicated, growing club. Section Nets are looking good. Take a look at these figures will ya. . . .

NET ACTIVITY AND SECTION TRAFFIC REPORT

NET	NET MGR.	SESSIONS	QNI	QTC
MS SEC PHONE NET	W5OXA	30	2,140	31
MAG SEC PHONE NET	N5HBB	30	779	13
GULF COAST SBN	W5JHS/W05JXT	30	1,282	14
FIFTH REGION (DRN5)	WB5YDD	60	—	631

(MS 100% by KT5Z, W5HKW, NS5M, N5HBB, KB5W)

CENTRAL AREA NET (CAND)	K5UPN	30	30	0

(NS5M met 100% of sessions)

MS TRAFFIC NET (MTN)	KB5W	30	226	

(Active stations: KB5W, NS5M, W5DEJ, W5JDF, W5WZ, KT5Z, KG5NI WB4LAL, W5YRX, W5LSG, KF5I, N5HGN)

MERIDIAN ARAC ARES	KB5ASR	5	108	2
RANKIN COUNTY ARES	WD5IKD	5	73	0

73, see you next month Butch Magee, KF5DE

TENNESSEE: SM, Harry Simpson, W4MI—Eastern Assistant SM and PIO: W4TYU. Central Assistant SM WA4GLS. Western Assistant SM and ACC K4CXY. STM: NG4J. SEC: K4UVH. OOC: K4LSP. SGL: N4PQY. TC: W4HHK. The TN Phone 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 sessions are Monday thru Saturday at 7:30 PM Eastern. CW Net Sessions are on 3635 kHz at 8 PM Eastern Monday thru Friday. Congratulations to Joel Harrison, WB5IGF, on his reelection as Delta Division Director, and to Henry Leggette, WD4Q, the new Vice Director. They will serve us well. My sincere thanks for your support during my successful campaign for reelection as Section Manager for Tennessee. Your efforts are greatly appreciated. I know also that Tim Berry would like to thank his supporters as well. Thanks to all of you. During my new term, some different staff members will be appointed while others, thanks to their dedicated work during the last two years, will be retained. New and sad subject: We have four Silent Keys this month: Jim Carter, AC4D of Knoxville (he was my Army MARS Zone Two Coordinator for these many years), Roy Ward, KB4ABI, of Nashville, Gene Bean, WD4KXH, of Knoxville, and the beloved Claude Bass, W4EX, of Crossville. The TN Baptist Disaster Relief Vehicle, equipped with Amateur Radio and a kitchen, went to South Carolina to help with Hurricane Hugo damage. In addition to communications, they prepared up to 6,000 meals per day! Congratulations to K4SXJ, W4GXZ, W4OPJ, W4VWH and WA4NSG. More excellent newspaper publicity in Greeneville when 10 area hams helped with a disaster drill. James Turner, N4VGG, had an excellent story and pictures for his work during Hugo and the San Francisco earthquake. A tip of the hat to David Brown, WA4HGP, Anderson County EC, for the best SET report to come from that area! They now have 47 ARES members! Traffic: WA4FMR 130, K4WWQ 91, W4DDK 54, WB4LAL 53, W4MI 50, K4WOP 42, W4TYV 41, KA5KDB 31, WA4HKU 28, K4CXY 24, WA4GZZ 21, W4PFP 20, W4PSN 4.

GREAT LAKES DIVISION

KENTUCKY: SM, John Thames, WM4T—Asst. SM: KC4WN. SEC: WB4NHO. STM: KA4MTX. (Nov.) Mammoth Cave ARC will hold its hamfest on March 3rd. An ARRL Forum is planned and this is your chance to meet your new director, AB8P. A big thanks to those of you who helped defeat the proposal in Congress for licensing fees. Heard several KY stations on for Sweepstakes this year. It was my honor to present the special services club certificate to the KY. Colonels ARC this month at their annual dinner.

NET	QNI	QTC	SESS	MGR
MKPN	1446	101	30	WD4RWU
KTN	1096	58	30	KC4FRA
KYN(BOTH)	317	125	60	K4AVX/KZ8Q
TSTMN	370	26	30	KZ8Q
KNTN	213	84	38	KB4UJA
CARN	552	30	27	WB4FEW

SAR (Nov.) KV4HF 73, KB4UJA 71, KC4WN 71, WD4RWU 59, KI4QH 58, N4PET 43, K4AVX 31, KA4MTX 30, WA4EBN 19, N4PEK 15, W4TPB 11, WA4HLW 10, N4LAF 9, WB4AUN 9, WD4CQF 7, WB4ZDU 5, KU4A 2. (PSHR) KI4QH 85, KA4MTX 77.

MICHIGAN: SM—George E. Race—WB8BGY (@N8FTY), ASM-WA1LRL (@WA1LRL), STM: WD8KQC (@NT8R). SEC: K8CQF. (@N8JAT). SGL: N8CNY. TC: W8YZ. OOC:

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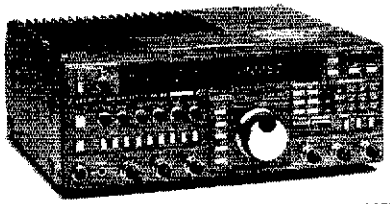
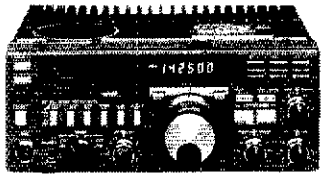
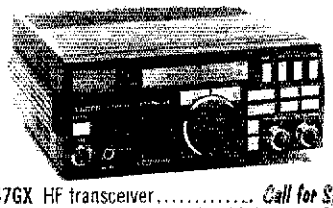


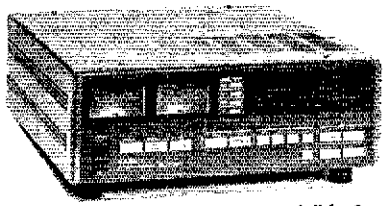
HF Transceivers	LIST
FT-767GX 160-10m xcvr	Call for Special
2M/767 2m module	239.00
6M/767 6m module	196.00
430/767 430-440 module	296.00
440/767 440-450 module	296.00
SP-767 Speaker w/audio filters	99.00
SP-767P Speaker/phone patch	136.00
FAS-1-4R Remote antenna selector	120.00
FIF-232C Interface	95.00
FTS-8 Encoder/decoder	55.00



FT-757GX MkII 9-band xcvr w/mic	Call for Special
FP-757HD Heavy duty supply with fan	309.00
FP-700 Power supply	244.00
FC-757AT Automatic ant. tuner w/memory	429.00
FAS-1-4R Remote antenna selector	120.00
SP-767 Speaker w/audio filters	99.00
SP-767P Speaker/patch	136.00
FRB-757 External relay box	14.00
MMB-20 Mobile mount	26.00

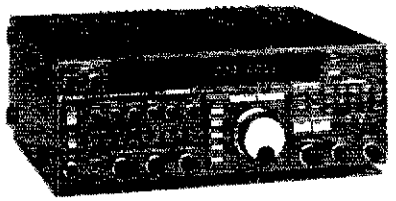


FT-747GX HF transceiver	Call for Special
FP-757HD Heavy duty supply with fan	309.00
FP-700 Power supply	244.00
SP-767 Speaker w/audio filters	99.00
MD-1B8 Desk microphone	115.00
MH-1B8 Hand microphone	29.00
FM-747 FM unit	47.00
MMB-38 Mobile bracket	14.00
TCXO-747 Increased freq. stability unit	42.00



FL-7000 HF linear	Call for Special

Misc. accessories	LIST
MD-1B8 Desk microphone	$ 115.00
MH-1B8 Mobile microphone	29.00
YS-60 1.8-60 MHz 2kw PEP wattmeter	127.00
YS-500 140-520 MHz 200w wattmeter	99.00
YH-55 Lo-Z headphones	28.00
YH-77 Lightweight headphones	26.00



VHF/UHF Base	LIST
FT-736R 25W 2m/430	Call for Special
FEX-736-50 6-meter module	294.00
FEX-736-220 220MHz module	322.00
FEX-736-1.2 1.2GHz module	589.00
TV-736 1.2GHz ATV converter	163.00
Keyer-B Electronic keyer unit	19.00
FTS-8 Encoder/decoder	55.00
FVS-1 Voice systhesizer	37.00

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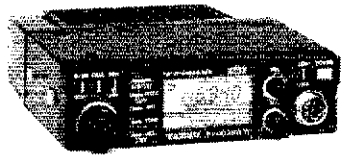

VHF/UHF Mobiles	LIST
FT-212RHT/D8 45w 2m FM w/autodial mic	$499.00
FT-712RHT/D8 35w 440 FM w/autodial mic	536.00
FT-290R MKII 25w 2m FM/SSB xcvr	610.00
FT-690R MKII 10w 6m FM/SSB xcvr	752.00
FT-790R MKII 25w 430-450 FM/SSB xcvr	681.00
FBA-8 Holder for C-cell Nicads	32.00
NC-26B Wall Charger for FBA-8	10.00
CSC-19 Soft case	16.00
MH-10F8 Speaker/Microphone	30.00
MH-10E8 Hand Microphone	24.00
FTS-7 Encoder/decoder	40.00
FT-4700RHT/C8 50/40W 2m/440 FM/TTP	799.00
AD-2 50w 2m/440 duplexer	48.00

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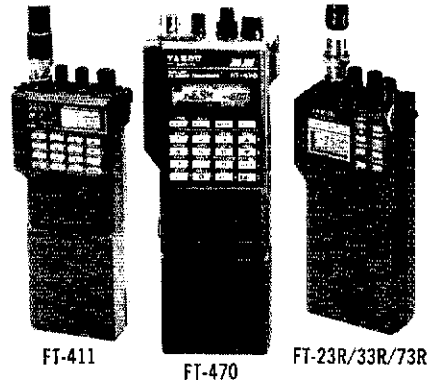
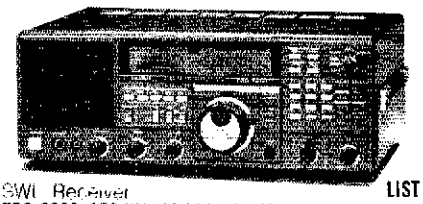


FT-411 FT-470 FT-23R/33R/73R

VHF/UHF Handhelds	LIST
FT-411 2.5W 2m FM HT	Call for Special
FT-811 440MHz FM HT	Call for Special
FT-470 2m/440 FM HT	Call for Special
FT-23R 2m HT	306.00
FT-23R/TTP 2.5w 2m HT w/TTP	351.00
FT-33R 5w 220MHz HT	328.00
FT-33R/TTP 5w 220MHz HT w/TTP	373.00
FT-73R 2w 440MHz compact HT	315.00
FT-73R/TTP 2w 440MHz HT w/TTP	Call for Special



SWL Receiver	LIST
FRG-8800 150 KHz-29.999 MHz Shortwave	$ 784.00
FRA-7700 Indoor active receive antenna	58.00
FRT-7700 Antenna tuner	77.00
FRV-8800 118-174 MHz VHF converter	107.00
FIF-232C Interface	95.00
DC-8800 DC kit	4.00
FM-W/8800 FM-wide kit	21.00

Antenna Rotors	
G-500A Heavy duty elevation rotor	Call for Special
G-5400B Az/El rotor combo	Call for Special

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Belden RG/174 50Ω coax .25¢ $.4
Kilovac HC-1 Vacuum Relay $109
Jennings RD5B Vacuum Relay $75
Jennings CHV1 Vacuum Variable Cap 1.5- 45pf • 5 kv • $65
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500 pf	$29 or 4/ $110	25 pf	80 pf	200 pf
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HP3168	VHF/UHF Switcher	.5Ω	dc -0.5 GHz	10/$ 3.50
HP1N5767	VHF/UHF Switcher		$1.25ea	10/$11.00
UM9651	400watt RF Switch	.18Ω	1 - 30 MHz	5/$15.00
UM9137	400watt RF Switch	.5Ω	dc -0.8 GHz	5/$12.00
UM7104	800watt RF Switch	.5Ω	dc -5.0 GHz	$10.00
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- 811A TUBES for 30L-1 amps–$22 • 6146Bs–$15ea. or $38/ matched set
- 30L-1 caps,100µf, 450v,Sprague TVA1718(slightly larger than original) $7 10/$65
- Oak 10070-4 on/off "AC" end switch for rotary sw. repair on Collins $ 15
- KWM-380 to HF-380 Conversion Kits. Includes A3 Lowpass Filter, Oscillator/Oven, "060" ROM & "HF-380" Emblem, plus instructions. $500
- SM-281 Desk Mike $59; MM-280 Mobile Mike $35; AC-2830 Headset $ 45
- KWM380 Control Interface. Ours is the original, not a substitute $ 75
- KWM380 Speech Processor, factory sealed, AC-3802 $250
- 380Filter New Prices: 140Hz-$199; 360Hz-$149; 1.7KHz-$139; 6 KHz-$99

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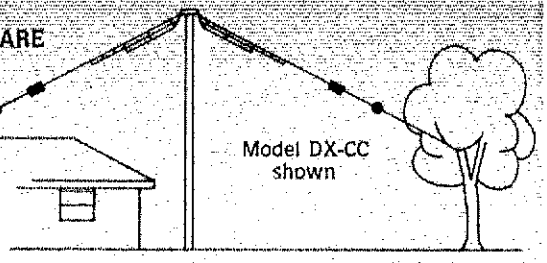

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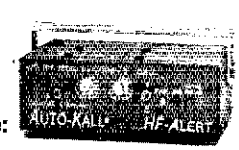

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WA2AJQ. ACC: N8JVA. PIO: N8KBA. I am pleased to announce the appointment of Joe Turner, K8CQF, as the new Section Emergency Coordinator for Michigan. Joe has served as EC, DEC, and District RACES Manager over the past several years. Joe brings experience, expertise, and a lot of new ideas to the office. Joe is an active traffic handler, using all modes. During his term as DEC for District 3, his organization has been the leader in ARPSC activities. Joe has appointed Jim Boyer, KD8YX, as the DEC for District 3. Jim will also hold the State RACES appointment for the District. Don Bannick, N6CRV, has been appointed VHF Nets Manager by Skip, WD8KQC, our STM. If you have any kind of VHF net in your area, please send a monthly net report to Don. Number of check-ins, traffic handled, and number of net sessions are what Don needs, as a monthly summary. Don can be found on the many MI Traffic Nets. Don's home BBS is N8FTY. In spite of bad conditions on the low bands, the 1989 SET appears to have been another record-breaking year. My initial tally, of overall score, indicates that we are about 2000 points above the 1988 effort. My thanks to each of you who make our ARPSC/RACES program so successful. Congratulations to the MCRC, 1989 winners of the Ivory Olinghouse, MI Field Day award. This is the third year running that MCRC has been the winner. New officers for the Novi ARC are; Pres.-WB8UPT, Pres. Elect-N8JHA, Sec.-WA8UMT, Tres.-N8CAK. I thank each of you for the support you have given me during the past 2 years, and your vote of confidence in reelecting me as your SM for 1990-91. As your Great Lakes Division Vice Director and MI SM, I will be doing everything possible to promote League programs. Please let me know what your concerns are, and keep me informed of activities in your area. Please support the following MI area Nets:

NET	FREQ	TIME/DAY	QNI	QSP	SESS	MGR
MITN	3953	7:00PM Dy	683	227	90	WD8EIB
QMN*	3663	6:00PM Dy	710	187	90	WB8R
SEMTN	145.33	10:15PM Dy	313	128	30	N8HSC
MNN*	3722	5:30PM Dy	244	90	60	KF8AU
MACS*	3953	11:00AM M-Sa	315	71	30	K8OCP
GLETN	3932	9:00PM Dy	1158	63	30	NW8M
UPN*	3921	5:00PM Dy	1124	54	34	WA8DHB
NMTN	147.12	7:30PM Dy	318	51	30	N8JCL
WSSBN	3935	7:00PM Dy	634	32	30	W8NDI
VHF Net Activity			360	7	29	N6CRV

*QMN Fast-6:30PM Dy; QMN Late-10PM Dy.; MNN Late-8:00PM Dy.; MACS-1PM Sun.; UPN-12PM Sun. Traffic for November: KF8AU 579, N6CRV 267, KA8CPS 232, WD8KQC 145, WB8SYA 113, N8FPN 106, N8JAT/BBS 90, WD8MJB 76, K8GXV 74, WB8R 62, NY8W 55, WB8SIW 52, W8EOI 50, WB8YDZ 50, WA8DHB 48, N8FTY/BBS 20, K3UWO 38, K6HAP 38, W8YIQ 37, N8CNY 36, K8CQF 35, WB8YPG 35, WD8EIB 35, NW8M 33, K8OCP 30, WI8J 30, W8RNQ 29, KA8VLN 29, WB8BGY 28, K8UPE 27, W8IHX 20, N8IIC 19, N8JCL 18, WT8J 18, N2IYA 16, KA8BYK 15, K8ZJU 14, KI8Q14, W8GPP 12, WB8POL12, K4IHU 10, W8URM 9, KA8NCL 8, N8HBQ/BBS 8, WA8MVH 8, N8EXS 8, KN8JDN 6, KA8JWQ 4, WD8LUM 4, W8VIZ 4, KA8CMH 3, N8JCN 2, N8JVQ 2, NB8TS 2, WB8YTQZ 2, WW8R 2.

OHIO: SM, John Haungs, WA8STX Ph: (513) 563-7373—ASM: David Kersten, N8AUH, Ph: (216) 221-6740. SEC: WD8MPV. STM: KF8J. ACC: KJ3O. BM: W8PH. TC: KB8MU. OOC: WB8ZCE. SGL: N8CVK. PIO: K8QOE.

NET	QNI	QTC	SESS	TIME(LOCAL)	FREQ	MGR
BN(E)	250	107	30	1845 DY	3.577	WD8C
BN(L)	203	125	30	2200 DY	3.577	K8TVG
BNR	255	125	30	1800 DY	3.605	W8EK
OSSBN	2152	1141	90	1030,1615,1845	3.9725	N8IBS
OSSN	185	122	30	0845 M-F	3.577	KD8HB
OSSN	185	122	30	0900 S-SU	3.577	KD8HB
OSN	268	74	30	1810 DY	3.708	WD8KBW
OHIO SECTION ARES NET				1700 SUN	3.875	WD8MPV
OHIO SECTION WX NET				A/R	3.875	WD8MPV

During November, traffic was still being handled from the disaster areas in the Caribbean and California. Amateur emergency communications were winding down. The ARRL Section Leader news letter already had a number of reports on the operation of the emergency nets and some of the The problems they encountered with the use of packet. The problem of Amateur communicators not being able to get into the disaster area to deliver messages without hard hats. Does your ARES group have hard hats? What do you do when your handi-talkie batteries are dead and there is no commercial power to even use a quick charger? Do you own an adapter to run your handi-talkie from your cigarette lighter in a mobile? The last report from the SEC, WD8MPV showed that the Section had 3564 ARES members. The number of ECs/DECs reporting was 33. The number of local nets that were active was 33 and the total number of net sessions, drills or tests was 174. A number of good suggestions were relayed to ARRL as the result of the Ohio Section Conference. Congratulations to Allan Severson, AB8P, who was elected as the new Great Lakes Divsion Director and George Race, WB8BGY, the Michigan SM as Vice Director. The Ohio Section will be hearing from the Director in a proposed Newsletter. The Amateur's efforts to defeat the excessive licensing fee proved successful. Over and over House and Senate staffers said to us, "Your networking is succeeding; keep it up." We all bore the brunt of that, and Perry Williams, W1UED, wants to thank all of us. Congratulations to all those who upgraded during the year and have made a New Year's resolution to get on the air and assist in ARES activities. The SEC reports that Oliver Wallace, KA8M, EC of Tuscarawas County who has served since 1983, passed away. Ike Price, K8IP, has stepped down as EC of Belmont County after serving since 1976. The Section will miss the service of these two amateurs. Successors will be appointed shortly. Traffic: K8TVG 611, KD8HB 321, K8JDI 309, KD8KU 292, W8PMJ 268, W8BO 246, WA8SSI 186, WD8IKC 155, WA8STX 144, N8FWA 142, N8IIP W8JLW 123, WA8HED 107, K8IOW 107, KE8CV 106, W8LDU 99, WD8FIB 95, K8DXZ 93, W8QZK 90, W8EK, K8ALV 87, W8BI 83, KA8HBN 75, WB8KWC 75, KC8NM 72, WD8KFN 72, W8ZOL 69, WB8DPZ 68, WB8JGW 67, WD8KBW 65, WB8HHZ 65, W8PBX 64, KC8TW/PBB 64, K8DHD 62, W8RG 57, WB8FSV 52, N2NS 50, KA8SON 48, KA1S 48, W8VND 48, N8GEC 47, WA8EYQ 46, WD8JYE 46, W8SKP 41, N8EFB 37, KB8ESU 36, NE8X 36, K8JA 34, KA8CGF 33, K8WOQ 31, WD8QXT 31, NS8C 30, N8INP 30, W8LQD 29, N8JRV 29, KA8BNQ 28, N8GOB 27, N8HJB 24, N8JYV 23, N8CEI 22, W8GDQ 22, W8FPA 21, WV8B 20, KD8XL 20, K8EF 20, KB8AKW 19, W8BDC 19, K8WZX 18, WA8RLB 17, NF8B 16, KB8HBQ 16, N8JDH 15, KC8JV 15, K8CKY 13, W9SWM 12, N8AJU 12, NY8V 12.

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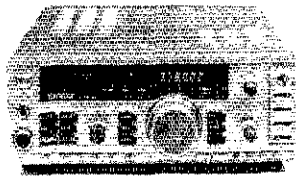




TH-75A
2M/70CM DUAL BAND HT



OMNI V

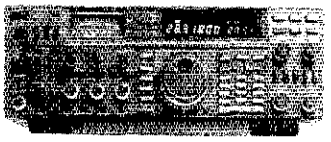


IC-32AT

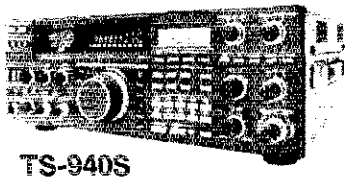
IC-2GAT
IC-4GAT



IC-725



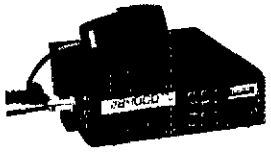
IC-765

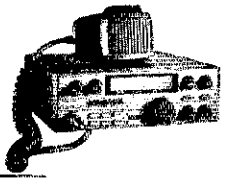


TS-940S

RANGER Communications, Inc.

uniden





RCI-2600 10-Meter Mobile Transceiver



IC-228A



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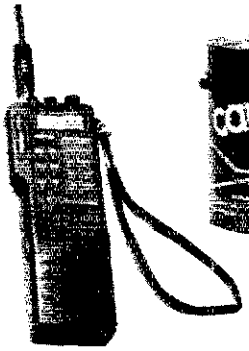
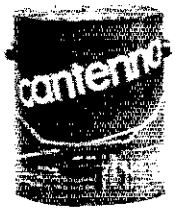
Switch antenna from inside your station with the Remote Coax Switch. Remote and indoor control unit connect through your coax cable to eliminate multiconductor control cable. Tower- or mast-mounted remote operates up to four antennas. Handles 2000 watts PEP and has a VSWR of 1.15: or less. Frequency range is from 1.8 to 54 MHz with impedance of 50 to 70 ohms and loss at 54 MHz of less than 0.2 dB. Uses 120 VAC Control: 2¾" H x 5½" W x 7½" D. Remote: 7½" H x 8⅜" W x 4½" D. **Kit HD-1481**

Heath Company





Heath cantenna dummy load

Eliminate unnecessary QRM during tune-up and minimize mistakes while performing hot gear maintenance or alignment. Handles 1 kW of RF with VSWRs less than 1.5:1 up to 450 MHz. Requires 1 gallon mineral or transformer oil.
Kit HN-31-A (3 lbs.) $24.95

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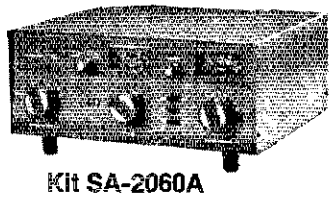
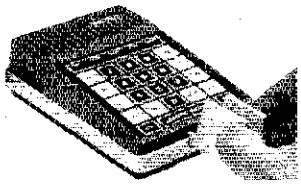
Power inputs up to 2000 watts PEP on SSB and 1000 watts CW.



Kit SA-2060A



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Assembled HWS-24-HT

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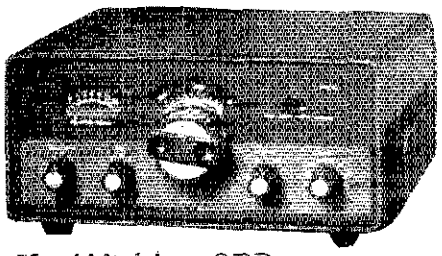
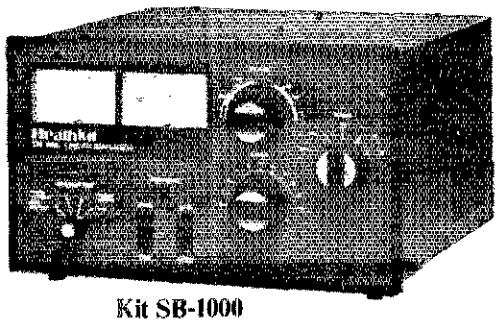


Heathkit deluxe QRP CW transceiver Kit HW-9



Kit SB-1000

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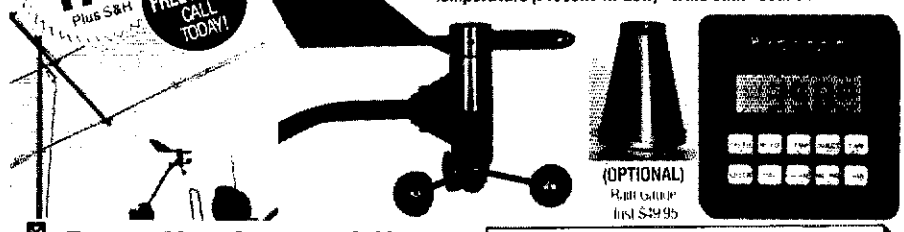

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HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—ASM: K2ZM. SEC: WA2ZYM. BM: WB2IXR. SGL: KB2HQ. PIO: KB2TM. OOC: N2DVQ. ATC: WA2VGM. ACC: KV2A. ASM/PACKET: N2FTR. ASM/NWSLTR: WB2NHC. STM: K2ZM. NET REPORTS FOR NOVEMBER (CHECK-INS/TRAFFIC PASSED): AESN 42/3 CDN 611/91 ESS 439/137 HVN 243/47 NYP 172/92 NYPON 543/261 NYSE 368/175 NYSL 328/190 NYSM 274/135 SDN 310/79. CLUB NEWS: Albany ARA held their elections at the Dec. 8th meeting. They used N1CC and K2CT for operation on Christmas Eve and Day. Saratoga RACES had a program by Tom Miller of Saratoga County Airport. They welcome new members WA2YPM KB2CBG KA2HZB N2IWC. Schenectady ARA held their family night program in December complete with the cookie contest! They welcome new member KB2IQV. They remind everyone of the Schenectady Massacre contest Feb. 8-11,1990. WECA members learned about the early days of radio from W2JAJ, one of ENY's OOs. Yonkers ARC is already working on plans for next year's hamfest. The current big phrase in schools these days is "Say no to Drugs." Albany ARA and SARA will hold a joint venture for the South Colonie school district March 26-30 - "Say no to Drugs through Amateur Radio." How about other groups doing something similar? The challenge is out. Maybe, in addition to helping with the drug problem, we can also add to our numbers. The Capital District Amateur Radio Council has been formed to coordinate activities in the Capital District and surrounding areas. I hope that we can get other clubs to work more closely together. We can get a lot more accomplished if we cooperate and work together on a regular basis. NOV PSHR: N5MEA WB2VUK WE2G KB2EPU WB1BTJ N2JBA. NOV Traffic: N5MEA 197, WB2VUK 179, K2LYE 114, WA2JBO 84, WA2YBM 72, WE2G 47, WF2M 40, WB2IIV 33, KB2EPU 28, WD2K 28, WB1BTJ 26, K2HNW 18, W2CJO 11, N2JBA 9.

NEW YORK CITY-LONG ISLAND: SM, Walter M. Wenzel, KA2RGI—ASM: N2GQR ACC/PIO: KA2LCC. SEC: WA2UJI. STM: K2MT. OOC: NB2T. TC:W2QUV. BM: W2JUP. The following are traffic nets in and around the section that handle NLI:

NET	FREQ	TIME	DAY	MGR
BAVHF	145.350/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	1300	DLY	W2MTA
NYPON	3.913 MHz	1700	DLY	KA2UBD
NYS/M	3.677 MHz	1000	DLY	N2EIA
NYS/E	3.677 MHz	1900	DLY	N5MEA
NYS/L	3.677 MHz	2200	DLY	W2YGW
NLT	28.450 MHz	2100	WED	N2IMP
ESS*	3.590 MHz	1800	DLY	W2WSS

*Independent Net, recognized by NTS, local times.
*** PACKET NODE STATIONS ***
Al2Q -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 Al2Q-4.
On Dec. 1, 1989 N2MH-4 suspended PNS operations due to a recent move. I want to thank Mark for his aid and cooperation through the years. Mark is not disappearing from packet operation he will be maintaining operation as part of the backbone for NTS operation. VE LISTINGS: LIMARC - second Saturday of each month at 9:30 AM at Salten Hall, NY Institute of Technology,Old Westbury - contact Al Jones,W2ZDB 516-676-5790 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, W2QUV 516-354-6861; 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 516-957-5726; If your group holds regularly scheduled license exam sessions and/or classes let me know so they can be added to this listing. Congratulations to the following for their recent appointments and welcome to the New York City / Long Island ARRL Section Leadership: Andy Funk, KB7UV, AEC Queens (Packet); Joe Neuwirth, NB2D, AEC Bronx; Anne Fanelli, WI2G, AEC Queens; Sid Wolin, K2LJH, ATC; and Gwen Neal, KA2VKW, ATC. Please remember that all ARES Membership expired at the beginning of the year and if you have not renewed your membership please contact your local EC and do so today. If you are not sure who it might be please contact me and I will have him contact you. Please note that this is the ARES registration only. The RACES registration is based on a different time schedule.

NORTHERN NEW JERSEY: SM, Rich Moseson, NW2L—(@KD6TH)-ASMs: KA2F/Recruitment, W2VY/Youth, NW2S/NW, KY2S/SE, KC2ZA/SW. ACC: WA2QYX. BM: K2ULR. OO/ACC: KA2BZS. PIO: NW2L. SEC: WB2HBZ. SGL: W2KB. STM: K2VX. HAM RADIO INFO LINE: 201-680-1585. I need to hear from you. One of the responsibilities of holding an ARRL station or leadership appointment is monthly reporting of activity. Right now, only the traffic people report regularly. Our SEC, on the other hand, hears regularly from only one of 12 DECs. The Bulletin Mgr. never hears from anyone. Pse - if you hold a Field Org. appointment, take a few minutes a month to fill out & file a report. All that's needed is a postcard, radiogram or packet message. ARRL HQ will gladly provide pre-printed cards (Form FSD-210), on request, to any appointee. ECs & OESs should report to DECs, DECs to the SEC. OBSs report to the Bulletin Mgr., ORSs to the STM, PIAs to the PIO & ATCs to the TC. All section level appointees should report to me (In fact, any appointee may report directly to me). FIELD ORG. APPOINTMENTS: WR2E is new NM of Old Bridge Trash and Traffic Net (OBTTN), in addition to NJSN. Tnx, Jeff. Tnx also to Jerry, W2RRX, for a fine job running OBTTN to date. New ORS: WB2GJE. NJ Traffic Confab 12/2 drew about 25 traffic folks from around NJ. If you check into VHF nets and have HF capabilities, pse volunteer to be a liaison station. Traffic awards: W2SWE Award (for most helpful old-timer) to W2RRX; W2UEZ Award (for outstanding newcomer to traffic) to W2MTO and K2SE Award (for outstanding VHF traffic person) to KA2KJF. Con-

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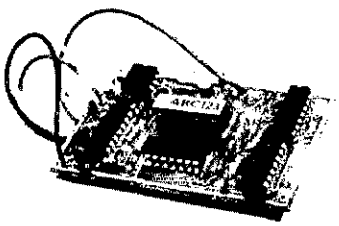

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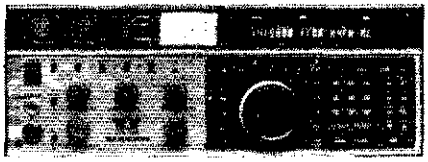

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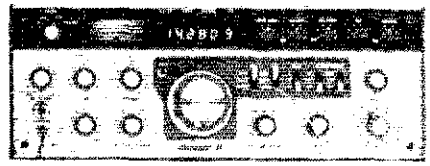
258 RS-232 interface	65.00	
282 250 Hz 6-pole CW filter	69.00	
285 500 Hz 6-pole CW filter	69.00	
288 1.8 KHz 8-pole SSB filter	69.00	
700C Electret hand microphone	37.00	
705 Electret desk microphone	69.00	
1140 18/24.3A DC circuit breaker	18.00	
562 OMNI V 9-band xcvr/xtal mixed osc	2245.00	1899



CORSAIR II	List	SALE
561 9-band transceiver *Closeout*	1495.00	1289
961 Deluxe 22A ps w/speaker	239.00	219.95
263G Remote VFO *Closeout*	269.00	249.95
282 *250 Hz 6-pole CW filter*	69.00	
285 500 Hz 6-pole CW filter	69.00	
288 1.8 KHz 8-pole SSB filter	69.00	
603 KR-1B Dual keyer paddle	69.00	
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705 Electret desk microphone	69.00	
1140 18/24.3A DC circuit breaker	18.00	
Other accessories	CALL	

TITAN	List	SALE
425 1.5KW linear	2995.00	2589
HERCULES II	**List**	**SALE**
420 1KW Solid-State linear	1195.00	1049
9420 100A 12V p/s for 420 (air)	795.00	699.95
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TECH TALK from ICOM

Spotlighting ICOM's New "S" Series Handhelds

ICOM's IC-2SAT/2 Meter, IC-3SAT/220MHz and IC-4SAT/440MHz handheld FM transceivers have generated a new wave of excitement among today's radio amateurs, and with good reason. Never before have so many outstanding features, versatile operation and high power been combined in such a small and rugged package. Each SAT includes, for example, 48 full-storage memories, programmable band and memory scanning, 10 autodialing DTMF memories, 24 hour clock with programmable timer/QSO reminder, simple or advanced operation, plus much more. The SAT's deliver up to 5 watts output on high power with user selectable low power. They measure only 4.0 by 1.9 by 1.3 inches (H,W,D). They are truly a VHF/UHF enthusiast's dream unit for portable operation!

The SAT's 48 memories are arranged in groups of ten for ultra convenient operation. Each press of the keypad's "MR" button and related digits access memories within the groups, or rotating the top knob selects any preprogrammed memory. Unused or unprogrammed memories, incidentally, are ignored when scanning or operating via the top-mounted knob. The SAT's memories can also be custom tailored to your particular needs by utilizing its SKIP and MASK functions. SKIP lets you jump undesired or constantly busy memories like NOAA weather channels when scanning. MASKing is used to blank out and reactivate seldom-used memories like those storing out-of-town or vacationland channels. Note SKIP affects only scanning and MASK affects both scanning and memory selecting.

The SAT's autodialing memories are fantastic for single button autopatching, and each DTMF memory stores up to 15 digits! Their use is a cinch. Simply select a desired DTMF memory on the keypad, press the rig's H/L/DTMF button while transmitting, and your prestored number is dialed in a snap while being displayed on the LCD readout and monitored on the speaker. It is terrific!

Since FM handhelds and traveling are a natural combination, many SAT owners use its built-in clock with timer for a morning "wake up call." They awaken to repeater-announced activities or NOAA weather forecasts, and start the day in a well-informed manner. Clever indeed, and a SAT's time display eliminates the need for a watch!

Additional SAT features include a PRIORITY watch for spot-checking one frequency while operating on another, a CALL channel for single-button access to your favorite frequency, and two electronic locks for security. One lock inhibits the P.T.T. to avoid unauthorized transmissions; the other prevents accidental frequency changes.

Especially noteworthy is an SAT's top-mounted DC socket for powering the unit at 5 watts and simultaneously recharging its internal battery pack while mobile. Optional battery packs like the 13 volt/5 watt BP-85 can also be slipped onto an SAT's bottom for stand-alone portable use, and you can remove them for recharging while continuing to operate with the internal battery.

The SAT also "looks after itself" when left unattended or forgotten. If a switch is not used or a signal is not received for 5 seconds, it shifts into "battery saving mode" and draws a scant 16 ma (feature is keyboard-selectable for Packet operation). When a switch is not used or a signal is not received for 20, 40 or 60 minutes (operator selectable time), the transceiver automatically switches off. Now that is an intelligent handheld!

The SAT's are unquestionably today's most advanced handhelds, yet they can be operated "basic style" using only its top-mounted knobs when desired. Its deluxe features can then be called into action according to your needs or future interests. Either way, you enjoy top performance and rugged dependability that is synonymous with owning the best!

ICOM's SAT handhelds are complimented by a wide array of matching options and accessories like the HM-46 lapel speaker/mic, HS-51 headset with boom mic and VOX/PTT, BC-72 desk/rapid charger, plus a full line of battery packs and carrying cases. Particularly attractive is the optional UT-49 DTMF paging unit that silently monitors any selected frequency for your preselected 3-digit DTMF-keyed calls. Other stations page you with a 6-digit number: the first 3 digits beep your SAT, and the last 3 digits appear on its readout for alerting you to missed calls and identifying the caller. Neat, eh?

While the SAT's are amateur radio's newest and most amazing FM handhelds, they are only one group of world-famous ICOM transceivers. Additional members of this proud handheld family include the following field-proven units. The rugged 7-watt IC-2GAT and deluxe featured IC-02AT for 2 meters; the powerful IC-4GAT for 70cm; and the easy-to-use IC-12AT and deluxe IC-12GAT for 1.2GHz. All of these units are water resistant and sport ICOM's unique metal windowframe-type inner case that withstands abuse.

The SAT's, like all ICOM handhelds, are also confidently backed by the industry's best warranty and customer support program. Additionally, ICOM's four North American Service Centers stand ready to assist you on a moment's notice. Ready to join today's hottest area of amateur radio interest? Visit your local dealer and get moving with your own IC-2SAT, IC-3SAT or IC-4SAT. They are indeed big little radios!

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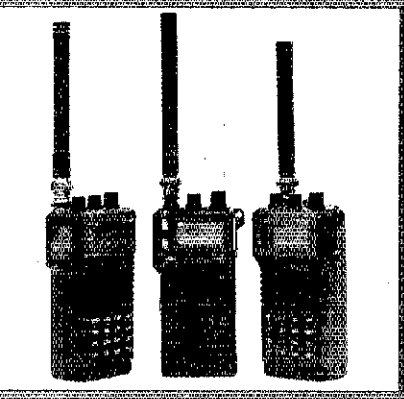

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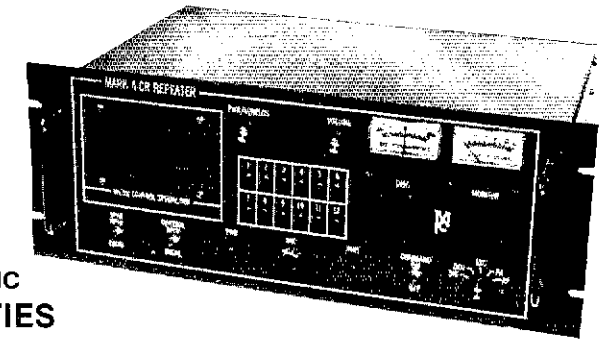

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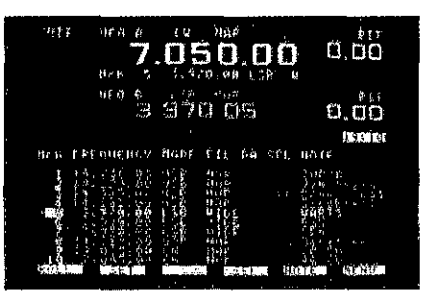
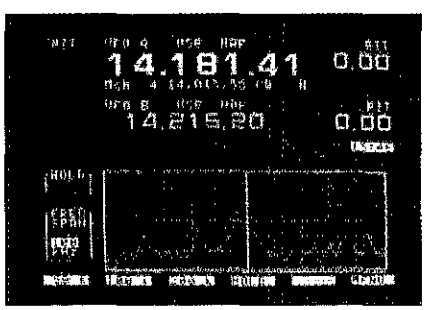
Multi-Function Five Inch CRT. Displays frequencies, modes, memory contents, operating notes, RIT, two menu screens, plus a panoramic view of all signals in a selected range. A portion of the screen also serves as a display for data modes like RTTY, AMTOR, and PACKET.



Unique Spectrum Scope. Continuously indicates all signal activities and DX pileups with your operating frequency in the center. Selectable horizontal frequency spans of 50, 100, and 200KHz for each side of the frequency you're listening to. Vertical range indicates relative signal strengths. A contester's dream!



Dual Width Noise Blanker includes MCF filter plus **level and width controls** to eliminate pulse and woodpecker noise with minimum *adjacent-signal interference.*

Incomparable Filter Flexibility. Independent selection of wide and narrow SSB filters plus CW filters. Second and third CW IF filters are independently selectable!

Dual Watch. Simultaneously **receives two frequencies in the same band!** Balance control adjusts VFO A/B receive strength levels. You can check additional band activity, even tune in your next contact, while in QSO without missing a single word!

DX Rated! 150 watts of exceptionally clean RF output. Easily drives big amplifiers to maximum power.

Twin Passband Tuning *with* **separate controls for second and third IF stages!** Increases selectivity and narrows bandwidth, independently varies low and high frequency response, or functions as IF shift. ***It's DX'ing Dynamite!***

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grats to all. Congrats also to BARA for passing the 1,500 mark in applicants tested at its VE sessions. New BARA officers: WA2INW/Pres, N2CII/VP, WG2Y/Secy. Regret to report KB2DQP of BARA as Silent Key. Enjoyed speaking at BARA dinner 12/9; (I also spoke 12/4 about antennas & propagation to the Society of Manufacturing Engineers - reminds me that we need to do more PR with community/business groups. Pse let me know if you can speak to a non-ham group, or if you're available.) New licensees/upgrades in Nov. (NNJ VE Bd.): Nov- M. Arnold Graham, III; Tech-KB2BLL, KB2IRS, Franklin Reese; Gen'l-KB2IPY, Yoji Aoki, Don Oberman; Adv-N2JYK; Extra-WA3TSK. Congrats to all. Nov. net activity (QNI-check-ins/QSP # messages passed):

NET	FREQ	TIME	SESS	QNI	QSP
NJM	3695	1000	30	229	92
NJN/E	3695	1900	30	293	131
NJN/L	3695	2200	30	160	43
NJPN	3950	1800	34	313	106
NJSN	3735	1830	30	136	39
NJVN/E	146.895	1930	30	536	87
NJVN/L	146.490	2230	30	179	67
OBTTN	147.120	2000	28	222	60
NJTTTN	223.660	2100	30	244	30

Traffic (Call/Messages Handled/PSHR Total): W2MTO/174/77, WR2E/152/83, W2RRX/149/99, KE2JX/133/88, WA2EPI/103/-, N2DXP/101/60, WB2FTX/100/61, N2XJ/99/99, KA2INE/78/78, KA2KJF/76/76, WA2PAC/53/73, KB2BLX-T/50/57, K2VX/36/67, W2DMM/35/67, WA2CLP/28/-, W2CC/21/-, WB4CYC-T/13/50, W2XD/13/-, NW2L/6/-, WB2GJE/4/-.

MIDWEST DIVISION

IOWA: SM, Wade Walstrom, WØEJ—SEC: KDØBG. STM: WBØAVW. ACC: NUØP. OOC: WAØQMU. BM: KØIIR. TC: KØDAS. SGL: WRØG. Recent VE testing by the Iowa-Illinois Amateur Radio Club yielded a new Technician and a new General. A new "CHAT" packet node is up and running in Burlington. Its designed for ragchewing with multiple connects. G3KPO, from the Isle of Wight, was a recent visitor to Des Moines and Cedar Rapids. He was able to gather with the Eastern Iowa DX Association and tour Rockwell International-Collins Divisions. The Fort Madison Amateur Radio Club held a mock disaster which involved local agencies, as well. The Des Moines Radio Amateur Association demonstrated Ham Radio at a local Boy Scout Camporee. WNØT is the DMRAA Ham of the Month. KAØADF replaces WØYLS as net manager of the Tall Corn Net. Congratulations, Ray, and thank you for the years of service, Les. Final traffic count from this past summer's RAGBRAI was 859 messages, 99 percent on packet. Upcoming VE exam dates in Cedar Rapids are January 14, April 7, and August 5. Regrettully, WØESB is a recent Silent Key. I received club newsletters this month from Fort Madison ARC, Iowa-Illinois ARC, Des Moines RAA, Fort Dodge ARC, and Cedar Valley ARC. To see your club news here, please send me a copy of your club news letter. Traffic: WØSS 246, KØGP 92, WØYLS 90, KØCNM 73, WBØAVW 42, WBØMCX 38, KØIPT 34, KAØVBA 32, KAØADF 28, NØJL 8.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: NØBLD. STM: WØOYH. Congratulations to KAØRZO elected to position of President of the Kansas Chapter 110 QCWA. VP is WØBBM and Sec/Tr is WØCY. Have noticed several pieces of traffic lately for Emporia and Liberal area. How about a few of the hams out thata-way QNI KSBN more! Net activity for Oct. KSBN QNI 1380 QTC 169. KPN QNI 406 QTC 15. KMWN QNI 1079 QTC 672. KWN QNI 683 QTC 613. CSTN QNI 2197 QTC 60. QKS QNI 291 QTC 70 and QKS-SS QNI 51 QTC 22. I would like to hear from each of you that do QNI any nets. We are trying to bring all records up to date. There are a lot of nets functioning out there that are not listed in any directory and we want to eliminate this oversight. However unless someone lets us know about the net activity, only a few know of the activity. Congrats to NØFMR on his appointment as HF awards Manager for the JARS INC. a Special Service Club. Validating WAS and 5-Band WAS applications for the area around K C Ks is his responsibility. We need more people interested in PUBLIC INFORMATION ASSISTANT appointment. Every club should have a PR person active, how about submitting that person's qualifications for the spot. Support your local Club and your state NETS. Traffic (October): KAØRCH 471, KØBXF 329, WØFRC 302, WØFIR 235, NZØM 204, WØOYH 183, NBØZ 76, WØFDJ 63, WAØYXK 58, WØQMT 54, WBØZNY 49, KXØI 26, WØMYM 21, WØCHJ 20, WAØTJU 18, WOØE 15, WØPB 12, WT6E 8, WVØR 6.

MISSOURI: SM, Bill McGrannahan, KØORB—NOVEMBER - Jim Berger WAØFQK is the new Public Information Officer. During Hugo and the SF earthquake many Missouri hams earned Emergency Communications Commendations. At the Suburban ARC meeting ASM Roger Volk, KØGOB awarded citations to: KAØAWS, NØJFZ, WBØAZH, NØFDW, WBØD, WØQX, NØEVM, WA4WLA, NØJGU, NØJAO, NØJVK, NØKBS, NØKBA, N7LPY, N9HCI, NØHLI, NØKPC, NØJNC, N8EDI, KBØKK, WKØE, WØMSF, KEØYO, WBØZJT, and WAØFQK. NØFBW was honored in Barry County. Your SM visited the Missouri Valley ARC, St. Joseph to present commendations to W6VX and KØKBD. The first Neosho Hamfest made a great start! Monsanto Amateur Radio Assn. received the OUTSTANDING SERVICE AWARD from the EASTER SEAL SOCIETY. Dr. Rick Reuker, WQØR accepted the award. The Tri-Lakes "Bunch for Lunch" meets Thursdays at the Western Sizzlin Inn - Branson. In Kansas City the QCWA Midcontinent Chapter banquet hosted over fifty people. Retiring president Bill Cramer, WØZL installed new officers: Mac McAllister WØCW - Pres.; Jim Schroeder KFØBM - Vice Pres. and Larry Reeves WAØGKZ - Sec/Tres. Cass Cassing WØGJG presented his slide show which publicizes the 1990 NATIONAL CONVENTION. Three of our brothers are reported to be SK. They are WBØZNW, WØESW and KEØUN. My packet stn. on 145.01 full time. NETS: MEOW sessions 30 QNI 698 QTC 122 MGR WDØELL; MSSB 30/875/139 WBØWLU; MON 60/180/115 AIØO; CARL 4/40/0 WBØWLU; HAM BUTCHER 21/444/27 KØDSQ; HARC 5/167/0 KAØSXY; KCARES 4/58/1 KØUAA; TRIARES 4/41/5; QCWA35 5/90/0 WØWHK; KCABARC 4/101/1 WBØLCW; PRNET 4/238/1 WBØEJJ; CMEN 4/70/0 KØPCK; JCREP 5/81/0 WØORI; PHD 4/499/9 WAØKUH; SLARES 4/245/3. STN ACTIVITY: NØFBW 1532, WAØYJX 559, NQØG 345, NDØN 219, KØORB 213, AIØO 150, WAØHTN 136, WØOTF 107, WBØOIZ 100, WØOUD 63, WRØR 60, KFØBM 57, WBØWLU 37, KEØAH 21, WBØCJB 20, KØPCK 20, WAØKUH 9, WØRL 4.

NEBRASKA: SM, Vern Wirka, WBØGQM—More check-ins are needed for the Blue Valley Amateur Radio Club ARES nets,

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IC-2500 UHF/1.2GHz Mobile



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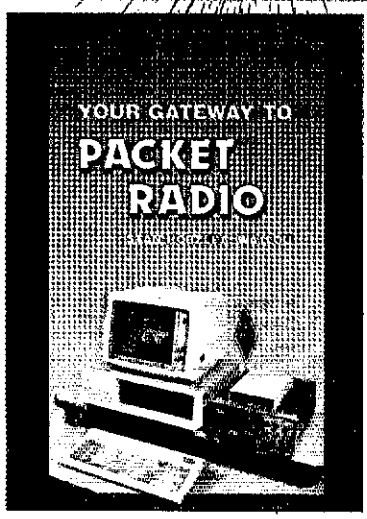
First in Communications

PACKET EXPLOSION!



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.

Experienced "packeteers" will find information on the latest hardware and software available in today's packet radio world. Packet radio is making an impact on all aspects of Amateur Radio. It has become an integral part of the National Traffic System (NTS) and Amateur Radio Emergency Service (ARES). Bulletin Board systems contain bulletins, newsletters, computer programs, DX and multiplier spotting info, directories and loads of other data. With unequaled accuracy and speed, packet radio is being used to move and distribute vast quantities of information to an extent never seen before in Amateur Radio. **Your Gateway to Packet Radio** is written by long-time *QST* "On Line" and "FM-Repeat" columnist Stan Horzepa, WA1LOU. Stan also edits **Gateway** the ARRL packet radio newsletter. You can pickup a copy of the 315-page 2nd Edition of **Your Gateway to Packet Radio** at your dealer or directly from ARRL for $12 plus postage and handling (see the ARRL Bookshelf elsewhere in this issue for ordering information)

ARRL

225 Main Street
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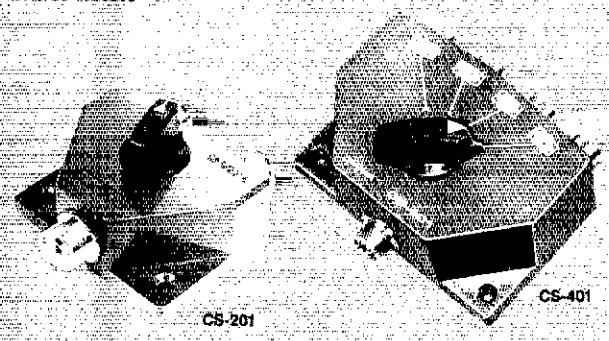
Coaxial Switches

PAT. No. 59-0003803



	CS-201 2 Position	CS-201G 2 Position	CS-401 4 Position	CS-401G 4 Position	CS-4 4 Position
Frequency:	500 MHz	1.3 GHz	500 MHz	500 MHz	1.5 GHz
Connectors:	SO-239	N type	SO-239	N type	BNC type
Isolation:	+60 dB	+60 dB	+50 dB	+50 dB	+60 dB
Power Rating:	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	500 W PEP 250 W CW
Insertion Loss:	All models less than 0.2 dB				

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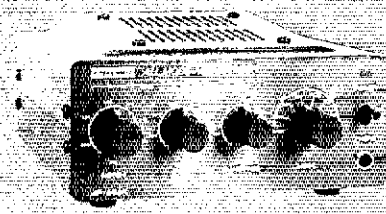
Specifications subject to change without notice. ▪ All models and types not represented.

Audio Filters



AF-806K Razor Sharp Reception...Four Stages of Filtering...Variable Bandwidths...Built-in Speaker...PLL Tone Decoder Circuitry.

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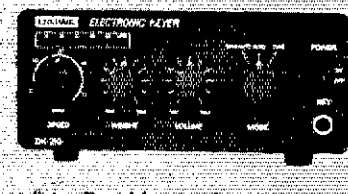

DK-210 *Sharpen your fist*...Provides perfect 3:1 dot/dash/space ratio...8-50 WPM...3 Modes—Automatic, Semi-Automatic, Tone (continuous)...LED speed indicator...Grid Block and Direct Outputs.

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ICOM MONTH

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224 N. Broadway
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Phoenix, AZ 85015
(602) 242-3515

2210 Livingston St.
Oakland, CA 94606
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Saturday 10am-5:30pm

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(818) 988-2212

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WIN!!
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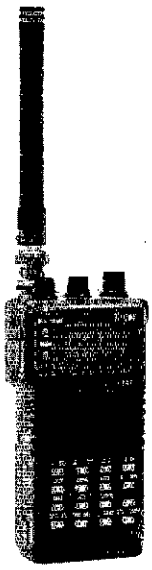
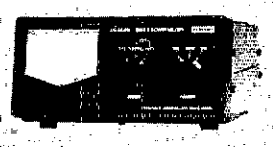


ICOM

Cross Needle SWR/Power Meters for All Bands

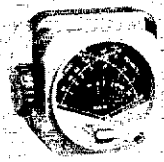

NS-660PA

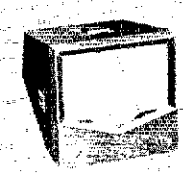
Model	Freq. Range Int. Sensor	Forward Power	Connectors
NS-660A/PA	1.8-150 MHz	30/300 W/3 kW	SO-239
NS-663BM/BN*	140-525 MHz	30/300 W	SO-239/N type
DP-810	1.8-150 MHz	0-1.5 kW	SO-239
DP-820/N	140-525 MHz	0-150 W	SO-239/N type
CN-101	1.8-150 MHz	15/150 W/1.5 kW	SO-239

All models back lit
*Average Power Reading Only

CN-460M

MOBILE/BASE CROSS NEEDLE SWR/POWER METERS




CN-520

Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-410M*	3.5-150 MHz	15/150 W	SO-239
CN-460M*	140-450 MHz	15/150 W	SO-239
CN-465M*	140-450 MHz	15/75 W	SO-239
CN-520M**	1.8-60 MHz	200 W/2 Kw	SO-239

*Back lit with mobile bracket
**Optional mobile bracket available

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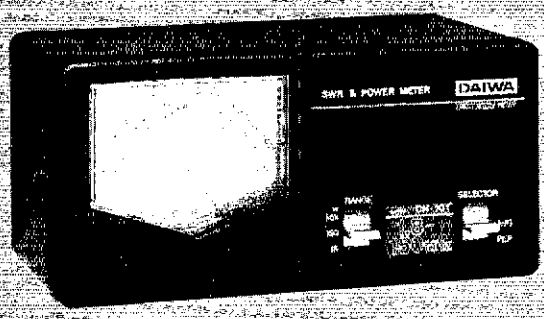
NEW Cross-Needle CN-101 SWR/Power Meter



■ Frequency: 1.8 thru 150 MHz
■ Power Range: 15/150 W/1.5 kW
■ Input Connectors: SO-239

Simultaneous display of SWR and Power readings by quick reference cross needle display...P.E.P. monitoring...Normally displays average RF Power.

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Five models for antenna wind loads of up to 25 square feet. And with up to 9000 in. lbs. braking power. Enough to handle stacked HF "Long Johns" or a full sized 40 meter or VHF monster. With controller accuracy up to 1°. All with stainless steel hardware and rugged, weather protected bell housings.

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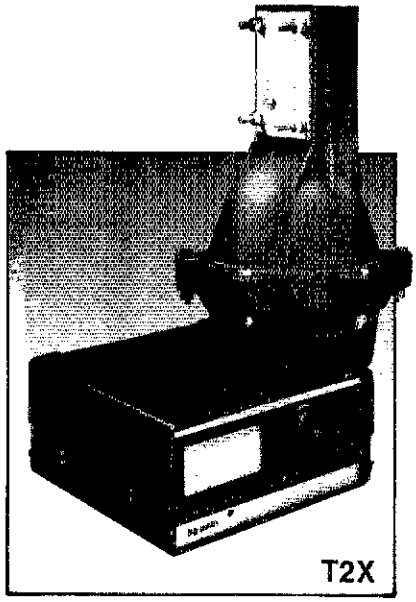

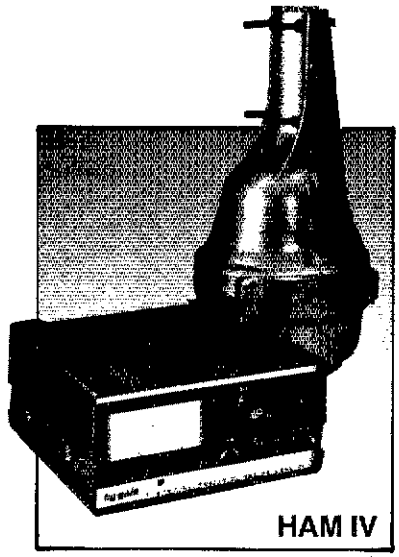

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according to Jack Crowdell, WAØBOK, EC for Seward, Polk, and York counties. BVARC ARES meets every Monday and Thursday on the 147.87/27 repeater at 0300 UTC. WAØBOK plans to issue new ARES I.D. cards in the first part of the new year. The Lincoln Amateur Radio Club is sponsoring a homebrew building project. Interested persons can build a nicad battery charger for a cost of $30 - $50. A pamphlet containing information and theory of operation can be obtained from Michael Ruhrdanz, NØFER. If you are interested in building a nicad battery charger please contact John Dale, NØFYE, in Lincoln at 402-467-1085. The Lincoln Communications Society and the Lincoln Amateur Radio Club participated in a Communications Fair during November. The Communications Fair provided a way to share and exchange information about various modes; including ATV, packet, Oscar, computer networking, and computer bulletin boards. The Lincoln Amateur Radio Club had displays on public service and Novice operation. The Ashland repeater is up and running on 144.71/145.31 MHz. The Ashland club meets on the fourth Thursday of the month at the Ashland City Hall. For further information on the Ashland club and repeater contact KEØSZ at 402-466-8668. Traffic: KØDKM 213, KEØXQ 56, WDØEWH 18, WAØBOK 18, WBØGQM 7, KØGND 5, WCØO 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Caesar Rondina, N1DCS—ASM: KB1H. STM: K1EIC. SEC: N4GAA. OOC: KY1F. ACC: NK1J. BM: N1API. PIO: WA1CMF. TC: W1HAD. SGL: K1AH. I hope everyone had a safe Holiday Season. I am happy to announce that Dan, KY1F, has choosen to stay on as OOC on a permanent basis. Dan has done an outstanding job, and I am happy to have him as a permanent part of our leadership team. His input on section matters will be both valuable, and welcome. I am also happy to announce the appointment of Larry, K1HEJ, as Net Manager of the Nutmeg VHF Traffic Net. Nutmeg is an ARRL NTS Net, which meets every evening at 9:30 P.M., on the ICRC repeater, 146.880. Thanks to Rusty, NM1K, for his role and input as NM of that net. CT had 93.3 & 95 % Rep. in 1RN Cycle 3 & 4. As you all know, our new CT Packet Network is all completed and in place. It is running like a champ. We have received numerous compliments about it. I would like to thank WB1ASH, for all his help in working with me to successfully complete this project, and all the node SYSOPS for the cooperation they have shown us. CT Network Maps are available by sending your request and SASE to N1DCS, PO Box 326, West Haven, CT 06156. Congrats to FARA, their club BBS is becoming quite active. Also remember, N1API, as BM, runs his BBS on 145.05. As BM, he has all the latest ARRL stuff on it. Thanks to W.A.R.C. for assisting in the Fischang-Cicchetti run. Nice article by Bob, WB1DWQ, in the Cricket Wireless Assoc. newsletter on DX and things. Keep um' coming. Congrats to W1OPS for his 3000th message. And congrats and good luck to the new officers of both FARA and SCRAMS. Remember folks, any club help you need can be obtained from Chris, NK1J, our ACC. Also, any things you would like mentioned in this column can be sent to me. My address is on page 8, QST. 73' for now.

Net	Sess	QNI	QTC	NM
CPN	30	404	100	KY1F
CN	60	392	207	W1WCG
CSN	20	77	45	N1FNN
NVTN	30	481	316	K1HEJ
RTN	30	182	43	WA1FCA
WESCONN	30	469	121	KA1GWE
CSN	20	77	45	N1FNN

CSTN N1DCS-4: Rcvd 517, Fwd 356, Total 873. Traffic: NM1K 700, KA1GWE 193, W1EFW 190, W1WCG 139, KA1JAN 136, KY1T 124, K1EIC 118, KA1UCU 82, N1API 61, KY1F 59, W1KYD 41, NX1Q 35, N1GKJ 27, W1BDN 26, KA1RVI 18, K1HEJ 11, KA1ROL 10, W1CUH 7, N1DCS 6, KA1TBM 5, W1YOL 3.

EASTERN MASSACHUSETTS: SM/SEC, Barry Porter, KB1PA— STM: WA1TBY. ACC: N1GTB. BM: KA1NOI. OO/AA: AG1F. SGL: K3HI. TC: KA1IU. PIO: K1HLZ. EMass Hotline: 617-437-0111

Net	Mgr	Freq	Time(EDT)	Day	Sess	QTC	QNI
October Report							
EMRI	KA1GEP	3658	1900/2200	DY	62	153	310
EMRIPN	W1TC	3915	1730	DY	30	80	134
EMRISS	N1CVE	3715	2100	DY	20	18	52
EM2MN	N1DUB	63/23	2000	DY	30	114	472
HHTN	N1FLO	04/64	2230	DY	31	98	375
CITN	KB1AF	745/045	1930	DY	29	74	391
NEEPN	WA1FNM	3945	0830	Sun	5	12	56
November Report							
EMRI	KA1GEP	3658	1900/2200	DY	59	185	306
EMRIPN	W1TC	3915	1730	DY	30	88	129
EMRISS	N1CVE	3715	2100	DY	27	41	78
EM2MN	N1DUB	63/23	2000	DY			
HHTN	N1FLO	04/64	2230	DY	31	110	343
CITN	KB1AF	745/045	1930	DY	30	134	343
NEEPN	WA1FNM	3945	0830	Sun	4	21	28

The holiday season is a time for reflection and Thanksgiving... and do I have a lot to be thankful for..I want to thank all those hams who volunteer countless hours to make the Amateur Radio Service an enjoyable place to "hang a hat," especially those that are members of the local ARRL Field Organization. You deserve a LOT of credit. Most of all I am thankful for a section cabinet made up of real LEADERS, who are capable of doing "their thing" with little or no "supervision," and who are not afraid to let me know when I make a mistake. It makes the position of section manager much more enjoyable. As hams, we should be thankful that we are allowed to have different opinions, and not be afraid that our differences will land us in jail. We should be thankful that we are allowed to operate radios in the very valuable radio spectrum. Our service is depended upon by many agencies who are thankful that we exist. We should be thankful for the dedicated staff of the ARRL, who work behind the scenes to make our hobby more enjoyable by providing needed administrative support that many hams are not aware of, and who ensure our service is not forgotten in the halls of government. We should be thankful that we are allowed to participate in the "governing" of the ARRL, through our division directors and vice directors. No organization is perfect, but it is better than having no say at all..Yes, I as a Section Manager, and we as Hams have a lot to be thankful for. As we enter the last decade of the 20th century, please pause and reflect on what has gone before us, and what new "happenings" might cause us to get more excited about our hobby, so we will have something to give

The art of small talk

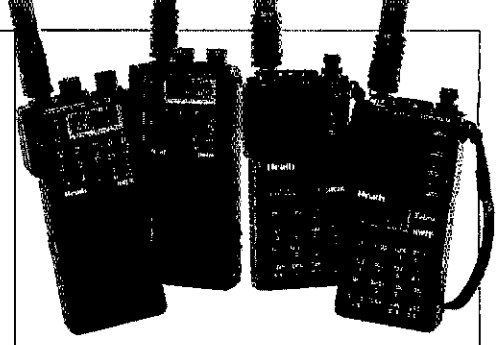
Introducing the only compact HT designed for you—Heath's new 2-meter and 450 MHz Micro-Deluxe handheld transceivers.

Built with a receiver sensitivity of 0.158 µV for 12 dB SINAD, the micro-sized HW2P or HW4P measures an unbelievable 4-3/8"H x 2-1/16"W x 1-1/4"D. Battery-packs hinge onto the back of the unit so the HT retains the same basic form, even with the largest capacity batteries. Slip it into your pocket or hook it on your belt - no more hassles with bent clips or tangles with car seatbelts. Heath's new micro-HTs will go anywhere you do.

The art of Easy Operation. Enter frequencies directly from the full-function keyboard or QSY from the displayed frequency via the rotary frequency selector. Scan between two frequencies, Scan 1 Mhz or scan all except between two frequencies. Scan favorite memory channels (useful for temporarily locking out a busy channel), scan first ten memory channels, last ten or all twenty. All scanning modes support either Pause Scan (stop on active channel then resume) or Busy Scan (stop on active channel and hold). One button Call channel is a quick way to get to your favorite repeater or simplex frequency.

HW2P shown actual size.

The art of Low Power Consumption. With only 46 mA required for RX squelched, and 1200 mA for full 5 watts TX output, these new handhelds are the most efficient designs available. A nine-step battery saver defaults to 22 mA in receive, but life can be further extended, approaching only 10 mA average RX current squelched.



The art of 5 Watts Power. With the optional 12V, 600 mA/h battery-pack, the HW2P and HW4P offer full 5 watts out in High, 3.5 watts in Medium and 300 mW in Low. The 7.2 V battery-packs (400 mA/h, 700 mA/h, 1200 mA/h) offer 2 watts in High, 1 watt in Medium, and 300 mW in Low. The 7.2 V, 700 mA/h battery is included standard with the HTs.

Full Line of HT's. Also new are the Heath 2-meter and 450 MHz Mini-Deluxe handheld transceivers. Only slightly larger than the Micro-Deluxe HTs, with all the same exciting features.

Discover the art of small talk, call your authorized Heath dealer about the complete line of Heath HT's and Heathkit station accessories today.

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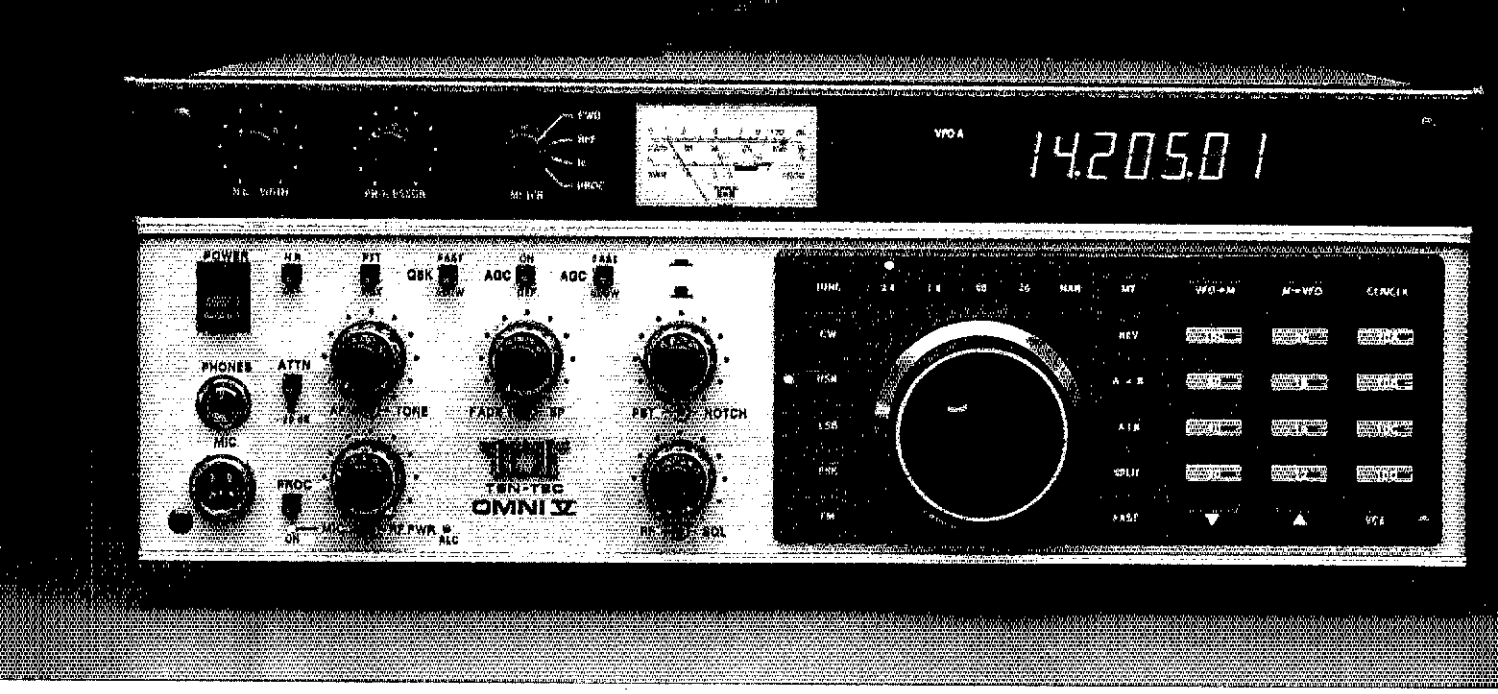


The NEW OMNI V:

The OMNI V is a Paragon with a 12 band crystal mixed local oscillator in place of the general coverage synthesized oscillator. The result is receiver cleanliness like the legendary Corsair and Omni series. The OMNI V local oscillator is a new ultra low noise 5.0 to 5.5 MHz PLL design. Phase noise is simply eliminated as a significant variable. Dynamic range is maintained right up to the edges of the crystal filters, even under the most adverse conditions.

Many of the nifty features made possible by digital technology are included. Dual VFO's with A-B-split select, the frequency stability of a PLL, 25 tuneable memories, VFO to MEM, MEM to VFO and the SCRATCHPAD feature. RS-232 interface is standard and includes remote band switching for the HERCULES II amplifier. The memories are nonvolatile RAM and are retained until you change them. The status registers and clock are backed with a lithium battery (2 year life) so that when the rig is powered up, the status is the same as when you turned it off.

The OMNI V operates USB, LSB, fast or slow QSK CW and real FSK. FM is optional. All bands from 160 through 10 meters are push button selectable. Each band position covers 500 kHz plus 30 kHz over-shoot at the band edges. The four 500 kHz segments of the 10 meter band are switched automatically as you tune through the segment limits. Tuning is in your choice of 10 Hz or 50 Hz increments on SSB, CW and FSK. With the FM option, tuning is in 100 Hz or 500 Hz increments. Up/Down buttons tune in 10 kHz or 50 kHz increments.

The OMNI V Station with Model 961 Matching Power Supply, and the Mighty Titan Amplifier.

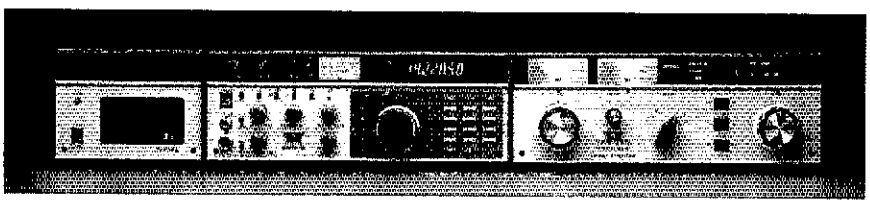
An auxiliary frequency tuning system is available and plugs into the rear panel. This allows you to remotely tune the frequency from the most convenient and comfortable position. It takes about 10 ms to fall in love with this option.

A noise blanker and audio speech processor are standard equipment as is the cw sidetone and speech monitor. The rear panel has a full complement of inputs, outputs and controls for the convenience of the all-mode operator, including an auxiliary RX antenna input. High speed key lines are provided for QSK control of a fast switching amplifier, such as the TITAN or HERCULES II. Changeover in fast QSK is less than 30 ms, great for CW and the digital modes.

The front panel is spacious and friendly. The vacuum fluorescent display uses large, bright, easy to read elements. The frequency display doubles as the 24 hour clock display when the CLOCK button is pressed. Other elements indicate VFO status and warn when the memories are full.

All four of the 6.3 MHz I-F crystal filter positions are push-button selectable, independent of mode. A second filter socket is also provided, in series, behind the standard 2.4 kHz filter in the 9 MHz I-F. This may be used for an optional 2.4 kHz, 1.8 kHz, 500 Hz or 250 Hz filter which is selected with the "NARROW" button. This adds six or eight poles into the crystal filter network and even further reduces the impact of adjacent strong signals. Most impressive!

If you do not need a general coverage receiver in your HF rig, the elegant OMNI V is a great choice. If you are also a serious DX-er and/or contester, the OMNI V is the best choice.

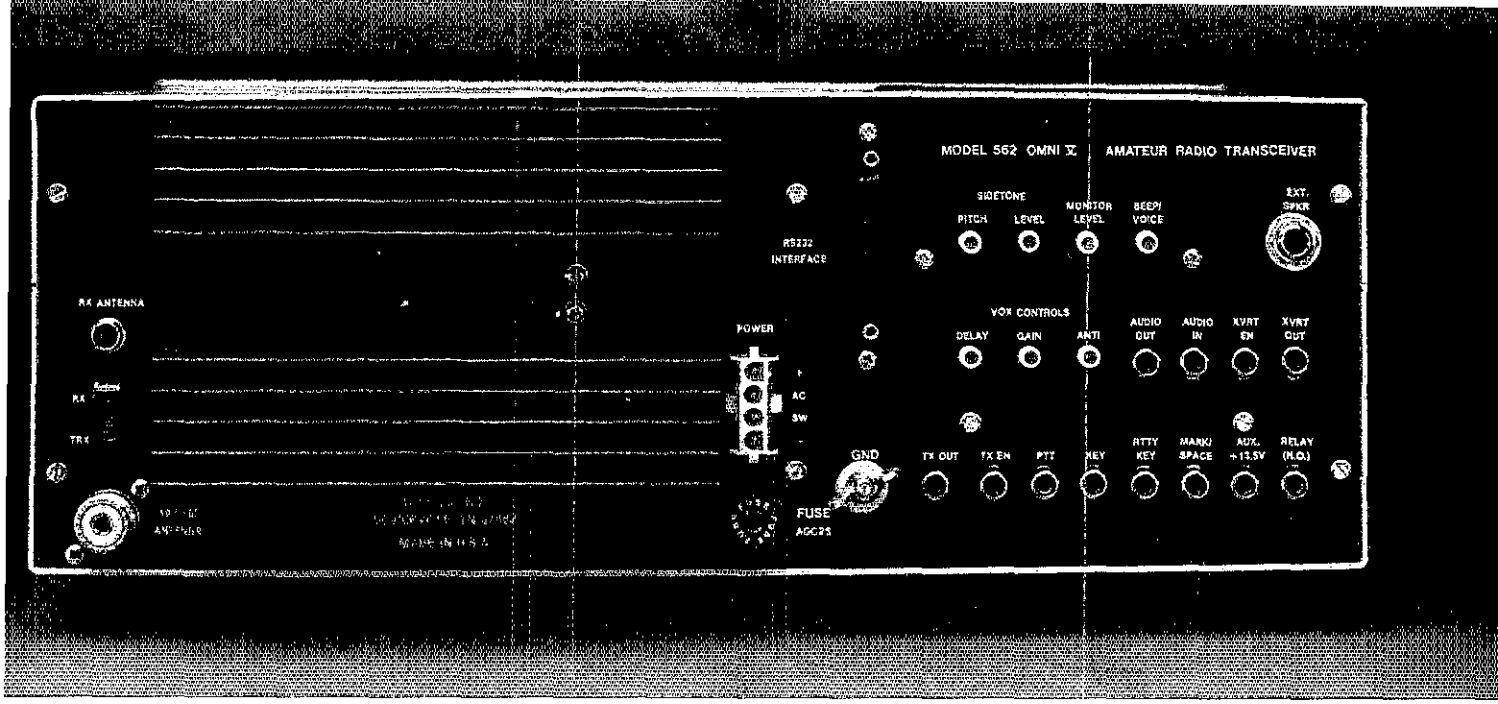


GENERAL SPECIFICATIONS

Frequency Range: Transmit and receive on all ham bands from 160 through 10 meters in their entirety. Twelve 500 kHz segments plus 30 kHz over-shoot at the upper and lower edges of the segments.
Frequency Control: LO generated from a crystal oscillator mixed with a low noise 5.0 - 5.5 MHz phase locked loop.
Frequency Stability: Worst case, 1 PPM per degree C at 29.999 MHz.
Frequency Accuracy: +-100 Hz @ 25 degrees C.
Antenna Impedance: 50 Ohms, unbalanced.
Printed Circuit Boards: G-10 epoxy glass.
Power Required: Receive = 1.5 A. Transmit = 20 A. 12-14 Vdc.
Dimensions: HWD 5¾" x 14¾" x 17". 14.6 x 27.3 x 43.2 cm.
Net Weight: 16 lbs. 7.25 kg.

TRANSMITTER

Modes: USB and LSB (J3E), CW (A1A), FSK (F1A). Optional FM (F3E).
DC Power Input: 200 watts maximum.
RF Power Output: ALC stabilized, adjustable from 20 watts to 100 watts (50 Ohm load) with front panel RF OUT control.
Microphone Impedance: 200 Ohms to 50k Ohms. Bias voltage for electret mic is provided in front panel connector.
CW Sidetone: Internally generated with rear panel level and tone adjustments, independent of front panel audio level control.
SSB Generation: 9 MHz, 8 pole crystal ladder filter, balanced modulator.
Carrier Suppression: Greater than 60 dB.



Impressive from either end... but it's how we make ends meet that really delivers the difference.

Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Third Order Intermod Products: –30 dB from two tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 600 Hz.
FSK Shift: 170 Hz.

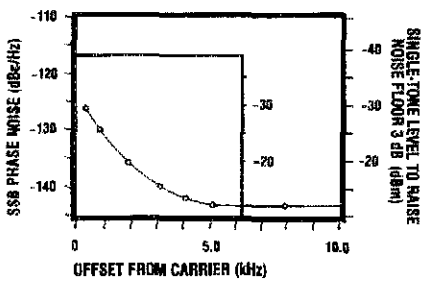
RECEIVER
Modes: LSB, USB, CW and FSK. FM with optional board.
Sensitivity: .15 uV for 10 dB signal to noise ratio at 1.8 kHz bandwidth. With FM option, .3 uV for 12 dB SINAD at 15 kHz bandwidth.
Selectivity:

	–6 dB BW	–60 dB	Shape Factor
Standard 2.4 kHz	2.4 kHz	3.36 kHz	1.87:1
Opt. 1.8 kHz	1.8 kHz	2.90 kHz	1.60:1
Opt. 500 Hz	500 Hz	1.40 kHz	2.80:1
Opt. 250 Hz	250 Hz	85 kHz	3.40:1
Opt. FM	15 kHz	30.00 kHz	2.00:1

Attenuator: –20 dB.
I-F Frequencies: 1st I-F 9 MHz, passband tuning I-F 6.3 MHz.
Image Rejection: ►100 dB.
I-F Rejection: ►60 dB average.
Noise Blanker: Switchable on/off with width adjustment.
Dynamic Range: 97 dB, measured with standard 2.4 kHz filter at 20 kHz spacing. 100 dB + with cw filters.
Third Order Intercept: + 10 dBm.
Noise Floor: –133 dBm @ 2.4 kHz bandwidth.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 30 ms.
Pass Band Tuning I-F Shift: + –2.3 kHz.
Audio Output: Speaker, 1.5 watts @ 8 Ohms. Fixed level 1 mw @ 600 Ohms.
Notch Filter: 250 Hz to 2.2 kHz, greater than 50 dB notch depth.

Audio Bandpass Filter: 4 pole, variable center frequency 220 Hz to 1.7 kHz, 35% band width @ –6 dB.
Tone Control: Variable 15 dB roll-off @ 5 kHz.

PHASE NOISE PERFORMANCE OF THE OMNI V
–127 dBc/Hz @ 250 Hz offset from carrier.
–146 dBc/Hz @ 5 kHz offset from carrier.



Here is a graph of the phase noise performance of the OMNI V receiver. These measurements can only be made under laboratory conditions and, even then, our test equipment is at the limit of its ability to measure the noise at the narrow offsets. The significant measurements are those close-in. Note that this graph does not even go out to 25 kHz offset where many of the published measurements are made. Certainly, we invite comparison.

A WORD ABOUT COST
The OMNI V and the Paragon are the same price. Our 12 band crystal mixed oscillator is the same cost to manufacture as our general coverage synthesized oscillator. The choice between these two transceivers is based on general coverage vs. the best possible receiver performance in the ham bands.

...America's Best!

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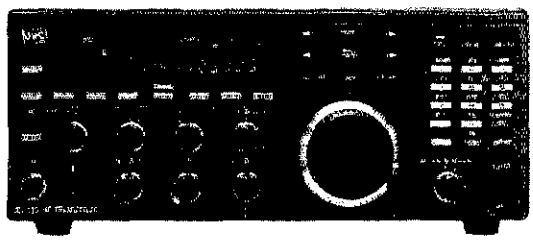
The Global-Communicator

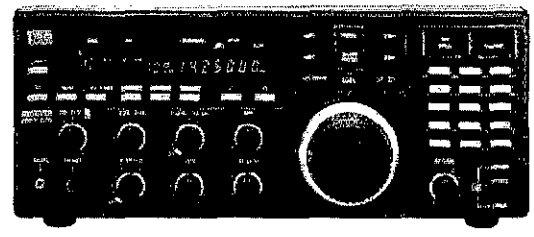
HF TRANSCEIVER
JST-135



- General-Coverage Receiver
- Electronic Tuning
- Heavy-Duty Design
- Transceive Operation with the NRD-525 Receiver

Receiving frequency range	100kHz – 30MHz
Type of emission	SSB(LSB/USB), CW AME, FM, AFSK
Frequency stability	Within ±10ppm 5 to 60 min. and within ±2ppm one hour after powered on
Power Output	150W
Dimensions	330W × 130(142)H × 280(391)Dmm
Weight	Approx. 8.5kg

JRC HF GENERAL COVERAGE COMMUNICATIONS RECEIVER
NRD-525



- Wide Frequency Range
- Scan Reception
- Sweep Reception
- Fully Solid-State. Modular Design

Receiving frequency range	0.09 – 34MHz 34 – 60MHz(*) 114 – 174MHz(*) 423 – 456MHz(*)
Receiving mode	RTTY, CW, SSB(USB/LSB) AM, FM, FAX
Channel memory	200 channels
NOTES	*With option mounted
Dimensions	330(W) × 130(H) × 280(D) (excluding projected parts)
Weight	Approx. 8.5kg

JRC Japan Radio Co., Ltd.

MAIN OFFICE: Akasaka Twin Tower(Main). 17-22, Akasaka 2-chome, Minato-ku, Tokyo 107, Japan Telephone(03)584-8836 Telex:242-5420 JRCTOK J
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ONE GARANT ANTENNA TO WORK ALL 9 HF BANDS

The GARANT WINDOM ANTENNAS GD-3 to GD-9 don't need a matchbox, if they are properly installed, as the SWR on all bands is very low - 1.5:1 or less. The GD-WINDOM is a modified windom (50Ω coax feedline) which uses a special proper-ratio balun. No, it isn't a 1:4. Those don't work. Our GD-BALUN matches the low-impedance (50Ω) coax feedline to the high-impedance windom antenna design. GD-WINDOMS may be installed as straight horizontal dipoles, inverted-Vs, or L-shaped dipoles. GARANT GD-WINDOM ANTENNAS are available for 500W PEP or 2KW PEP. ALL GARANT GD-WINDOMS ARE SOLD WITH A 10-DAY MONEY-BACK GUARANTEE AND A 3-YEAR LIMITED WARRANTY. Who else has that much confidence in his merchandise?

GARANT GD-6 — max. 137'
Balun — max. 41.5m

GD-9: 160-80-40-30-20-17-15-12-10M. max. lenghth 255ft
GD-8: 80-40-30-20-17-15-12-10M BANDS, max. length 137ft
GD-6: 80-40-20-17-12-10M BANDS, max. length 137ft
GD-5: 40-30-20-15-10M BANDS, max. length 67ft

NOTE: The GD-8 and GD-9 work all new WARC bands.

FREE DATA Report

Write or phone for our free data report on all our GARANT GD-WINDOM ANTENNAS with technical data, actual SWR curves, scores of customer comments from the USA and Canada, and our low factory-direct prices. VISA and MASTERCARD phone orders accepted.

The owner of GARANT ENTERPRISES sells ham radio gear for 26 years. We are at our present location for eight years. FAX orders/inquiries DIAL 1-807-767-0888.

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YES, THEY REALLY DO WORK! READ WHAT OUR CUSTOMERS WRITE:

W9HBE, John on his GD-8/500W: "I was impressed by the low SWR on all bands and comparison tests have proved to me that the GARANT GD-8 windom is far superior to any other wire antenna." W8YFK, Fred, "I purchased one of your GD-9/2KW antennas about 6 months ago. It works great - nine bands, no external tuner. Who could ask for anything more?" KI6QE, in California, "I have been using your GD-6/2KW antenna now for over 6 months. I am the net control station for the AMSAT West Coast 75m net and I need good coverage up and down the West Coast from Canada to Southern California. I also need coverage on 40, 30, 17 and 12 meters without having to put up multiple wires. The GD-6 has filled all these requirements adequately. On the 75 meter net I have reports of outstanding signals." IK6JJN, Raffaele writes, "I am using the GARANT GD-6/500W two years now, and it is doing a wonderful job for me. I am very grateful to Garant Enterprises for the high quality products, reasonable price and fast service." WA2YKB, Ken works his GD-8/500W from an apartment, "The antenna works fine even thou it's only 2½ft above the roof. ... As the balun is fairly small, so the antenna is hard to see from the ground." W5DKA, Clovis writes, "I am well satisfied with my GARANT GD-6/2KW windom dipole - working 75 through 10 meter phone bands. Low SWR - good reports. Worked England on 10 meters. (NO ANTENNA TUNER). Also Uva Island, Panama - GOOD ANTENNA." KØMAH, Fritz on his GD-9/2KW, "It works great. Work lots of CW on all bands - including DX. ... Today I made several DX - Europe - contacts in a few minutes on 21MHz SSB." KA3SDO, John on his GD-8/500W, "Prompt delivery, helpful phone ordering and information, combined with A QUALITY PRODUCT. GARANT truly has an unbeatable combination." W9JLZ, Charles, "GARANT GD-8/500W antenna performs very well on all bands with Kenwood TS440. ... Gave me gain in Tampa, FL. on 40 meters over a dipole. Service was excellent. GREAT ANTENNA. Get great signal reports." N8ENO, George writes, "GARANT renders great service and speedy shipping. I ordered my GD-8/500W by telephone and used VISA. The antenna performs really good on all bands. ... Could not put it up full length or proper inverted-V. Had to install it as a lazy-V. FB antenna." N8BED, Michael, "Order received promptly as promised. GD-8/500W antenna works as promised, using your measurements. No trimming required." NØIGE, Don writes, "I am very pleased with the shipping speed, service and the GD-8/500W antenna. This is my only antenna for 10 to 80 meters. What a great performing antenna. I sure get a lot of compliments on my signal. I am very pleased. Thanks." All original letters are on file for your inspection.

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TM-231A/ 331A/431A/531A

FM Mobile Transceiver

Looking for a compact transceiver for your mobile VHF and UHF operations? KENWOOD has a compact rig for each of the most popular VHF/ UHF bands.

- **20 multi-function memory channels.**
- **High performance — high power! 50W (TM-231A), 35W (TM-431A) with a 3 position power switch.**
- **Optional full-function remote controller (RC-20).** A full-function remote controller can be mounted in any convenient location. Using the IF-20 interface the RC-20 may be connected to four mobile transceivers. (TM-231A/ 431A/531A or the TM-701A).
- **Multi-function microphone supplied.** Various controls are provided on the mic. for increased utility.
- **Auto repeater offset on 144 and 220 MHz.**
- **Built-in digital VFO allows selection of the frequency step.** (5, 10, 15, 20, 12.5, 25kHz; TM-531A: 10, 20, 12.5, 25kHz.)
- **Selectable CTCSS tone built-in.**
- **Tone alert system — for true "quiet monitoring"!** When enabled this function will activate a tone when squelch opens.
- **DRS (Digital recording system).** The optional DRU-1 can store received and transmitted messages for up to 32 seconds, allowing the operator to check or return any call using the tone alert system.
- **Automatic lock tuning function (TM-531A).**
- **Repeater reverse switch.**



TM-231A
136–174 MHz receive, TX on Amateur bands only. Modifiable for MARS/CAP. Permit required.

Optional Accessories:
• **RC-20** Full-function remote controller • **RC-10** Handset • **IF-20** Interface unit handset • **DRU-1** Digital recording unit • **MC-44** Multi-function hand mic. • **MC-44DM** Multi-function hand mic. with auto-patch • **MC-48B** 16-key DTMF hand mic. • **MC-55** 8-pin mobile mic. • **MC-60A/80/85** Desktop mics. • **MA-700** Dual band (2m/ 70cm) mobile antenna (mount not supplied) • **SP-41** Compact mobile speaker • **SP-50B** Mobile speaker • **PS-430** Power supply • **MB-201** Mobile mount • **PG-2N** Power cable • **PG-3B** DC line noise filter • **PG-4H** Interface connecting cable • **PG-4J** Extension cable kit • **TSU-6** CTCSS unit

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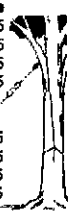
ALL BAND ANTENNAS

MULTI BAND TRAP ANTENNAS



TRAP DIPOLES

Model	Bands	Traps	Length	Price
D-42	10/15/20/40	2	55'	$64.95
D-52	10/15/20/40/80	2	105'	69.95
D-56	10/15/20/40/80	6	82'	114.95
D-66	10/15/20/40/80/160	8	146'	149.95

TRAP VERTICALS-"SLOPERS":*

VS-41	10/15/20/40	1	28'	49.95
VS-52	10/15/20/40/80	2	49'	64.95
VS-53	10/15/20/40/80	3	42'	74.95
VS-64	10/15/20/40/80/160	4	73'	94.95

*Can be used without radials
*Feedline can be buried if desired

*Permanent or Portable Use

ALL TRAP ANTENNAS are Ready to use - Factory assembled - Commercial Quality - Handle full power - Comes complete with: Deluxe Traps, Deluxe center connector, 14 ga Stranded CopperWeld ant. wire and End Insulators. Automatic Band Switching - Tuner usually never required - For all Transmitters, Receivers & Transceivers - For all class amateurs - One feedline works all bands - Instructions included - 10 day money back guarantee!

SINGLE BAND DIPOLES (Kit form):

Model	Band	Length	Price
D-10	10	16'	$17.95
D-15	15	22'	18.95
D-20	20	33'	19.95
D-40	40	66'	22.95
D-80	80/75	130'	25.95
D-160	160	260'	34.95

Includes assembly instructions, Deluxe center connector, 14ga Stranded CopperWeld Antenna wire and End insulators.

LIMITED SPACE DIPOLES



- Reduces overall length over 40%!
- "Shorteners" are enclosed, sealed, weatherproof and lightweight.
- Complete with Deluxe Center Connector, 14 ga. CopperClad antenna wire, end insulators, and assembly instructions.
- Use as inverted "V", or flat-top.
- Excellent for all class amateurs.

Model	Band	Length	Price
LS-40K	40	38'	$44.95
LS-80K	80/75	69'	$49.95
LS-160K	160	100'	$49.95

●Any single band, or Trap antenna with "Pro-Balun" instead of Deluxe Center Connector; Add $8.00 to antenna price.

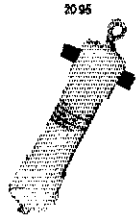
COAX CABLE: (includes PL-259 connector on each end)

Type	Length	With antenna purchase	Separately
RG-58	50'	$9.00	$11.95
RG-58	90'	13.00	16.95
RG-8	50'	21.50	25.95
RG-8	100'	36.00	39.95
RG-8X	50'	11.95	14.95
RG-8X	100'	18.95	20.95

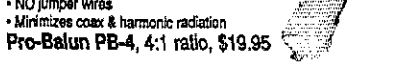
"PRO-BALUN" PB-1 $17.95

- 1:1 For Dipoles, Beams & Slopers
- Handles Full legal power
- Broadband 3 to 35 Mhz.
- Lightweight, Sealed & Weatherproof
- Deluxe connectors require NO soldering
- NO jumper wires
- Minimizes coax & harmonic radiation

Pro-Balun PB-4, 4:1 ratio, $19.95



ALL BAND — LIMITED SPACE ANTENNA



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- Perfect match for your Antenna Tuner with balanced line output
- Handles Full Power
- Works with all transmitters, transceivers, receivers, etc.
- Completely Factory assembled--Ready to install--NO adjustments necessary
- INCLUDES 100 feet of 450Ω Feedline
- Feedline can be shortened
- Only 70 feet overall length!
- Works ALL Bands 160 thru 10 Meters
- Perfect for ALL classes of Amateurs
- Install as Flat-top, Sloper, inverted "V", or almost any configuration
- Shorteners provide full 135 feet electrical length; with only 70 feet physical length
- Utilizes Heavy 14 guage stranded CopperClad (CopperWeld) antenna wire, (30% copper; 70% high-strength steel) NO rust, Will not stretch like copper

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thanks for in the future. 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: October: WA1TBY 307, KB1AF 223, KW1U 204, W1TC 117, W1CE 116, N1FLO 104, KA1GEP 97, N1CVE 90, KA1PEP 88, K1ABO 64, K1GGS 53, WA1FNM 46, KA1RSY 37, K1BZD 36, N1FWV 34, K1UGM 726 KA1DJV 27, NZ1D 22, KA1UXB 21, KB1EB 19, K1SEC 18, N1AJJ 14, N1EGN 11, KA1AMR 11, NV1H 7, KA1KCU 0. (Nov.) KA1PEP 90, KA1CEY 39, N1FWV 80, K1GGS 139, KA1RCY 57, KA1AMR 8. KA1DJV 21, KB1EB 4, K1BZD 71, WA1FNM 106, N1FLO 157, W1CE 219, KA1GEP 208, N1AJJ 16, KB1AF 405, K1ABO 66, WA1TBY 452, K1UGM, 1,194; K1SEC 26; W1TC, 145; N1CVE 151; KA1KCU, 10 KW1U,155.

MAINE: SM, Ted Bonesteel, WA2ERT—The column didn't make it into the Jan issue of QST. I apologize to all for that. January offered a great start of the year for becoming a ham or upgrading (5 exams were offered). Feb offers more: Feb 16, Fri, 6:30 PM Augusta, Cony HS, N1BCF; Feb 24, Sat, 12:30 PM, Poland Hamfest, KD2EU. K1MZB and WA1SAZ volunteered their time to help with Hurricane Hugo disaster relief in Puerto Rico. Great going Guys! Our First Region Net liaison stations continue to keep Maine on the map with 93/100% 100/96.8% and 98.4/96.8% rep on cycles 2, 3, and 4. On Nov 30th, the Red Cross opened a relief shelter for residents evacuated from the area of a large fire. 12 Augusta area hams responded and provided comms between Red Cross units. They were: N1CMZ, KA1KFS, KQ1L, WA2CJO, K1YNO, N1FJL, N1DZI, KA1LPW, KA1MLF, N1ENB, KA1SQH and K1HCH. They were ready for the real thing. Will you be? Net Activity (net/sess/checkins/tfc/mgr):

MPSN	(OCT)	8/75/26	(Nov)	4/55/4	KA1LPW
PTN	(OCT)	/33/342/129	(Nov)	30/369/142/	W1KX
SGN	(OCT)	26/860/107	(NOV)	26/906/173	K1GUP
CMEN	(OCT)	9/228/25	(NOV)	8/192/28	N1DZI
Kennebec	(OCT)	6/112/3	(NOV)	4/71/1	KA1LPW
Aroostock	(OCT)	6/100/35	(NOV)	4/51/5	WA1YNZ
Cumberland	(OCT)	6/82/10	(NOV)	4/55/1	KA1ODT
Hancock	(OCT)	5/39/0	(NOV)	3/37/2	WA2ERT

Station Activity (Oct): W1KX 181, N1GND 118, WA1YNZ 79, K1UNQ 71, NR1F 69, KA1REB 67, WA2ERT 63, KA1ODT 54, W1JTH 44, W1VEH 35, W1BMX 30, N1BCF 13, N1FPP 10, W1OTQ 5, (NOV) W1KX 212, N1GND 106, KA1REB 104, KA1ODT 84, W1BMX 71, ND1A 61, W1VEH 57, W1JTH 56, NR1F 55, WA2ERT 51, K1UNQ 47, WA1YNZ 24, N1BCF 17, W1OTQ 12, KA1RFD 11, AF1L 2.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—STM: KB4N. TC: W1JY. Well, I missed the Oct Section report deadline due to my work schedule. We held the initial RACES planning meeting with NH Office of Emergency Management and NHARA in Oct and laid out the basic plan and qualification details. And the NHARA meeting was well attended in Laconia with 9 clubs and NHOEM in attendance. Now for Nov- I was at the Contoocook club to discuss current ARS and ARRL activities and did my satellite program. We met again twice in Nov with NHOEM and NHARA on RACES. By this printing RACES will be fully implemented in NH by NHOEM with a core team of operators and a training and qualification program in place. For more information contact Cal WA1WOK at NH Office of Emergency Management or via packet. Butch WB1GXM forwarded more info on his activities in integrating Amateur radio into his school system. He got a good writeup in the school newsletter, has a station going together and is forming the Goshen-Lempster Coop. School ARC! Recent Field Organization appointments include Alan W1FYR as Bulletin Manager with Dan K1OSM retiring from the position and maintaining his OBS appointment. Congratulations, Alan and thank you, Dan for your years of support. Welcome to Karen WA1THQ, our newest ATC. Karen is on the faculty at UNH and is active on packet and satellites And STM KB4N has announced five (!) new ORS appointees this month: W1FYR, K1TQY, KA1ROH, KA1LMR and KA1SXM. Congratulations to all the new appointees! Congrats new SVARC officers-Pres: Bob WA1TKH, VP: Bob N1FOQ, Secretary: Ray NE1K, Treasurer: Rody W1UPL. CVARC Novice instructor K1OPO reports that 4 students have passed the written and CW tests and are awaiting their licenses! NOTE: This report is incomplete due to space limitations imposed by QST! NH Section Traffic for Nov 1989 Nets: VTNH 247, GSPN 111, GSFM 67. Stations: W1PEX 2525, KB4N 1443, K1TQY 614, W1FYR 563, N1CPX 249, W1ALE 107, KA1GOZ 41, KA1ROH 37, KA1HPO 21. KI1M 20, KA1SXM N1ALM 11, WA1YZN KA1LMR 10, WB1HBB NE1J 9, KA1KFX 1. BPL: W1PEX, KB4N, K1TQY, W1FYR. PSHR: W1PEX, W1ALE, N1CPX, KA1HPO/T.

RHODE ISLAND: SM, William M. Foss, KA1JXH—Bristol Co. ARES Net Sun 8:30 AM 145.33 Kent Co. ARES Net Sun 6:30 145.35 Newport Co. ARES Net Sun 8:15 AM 147.36 Providence Co. ARES Net 1st + 3rd Thur. 7:00 PM 145.17 &224.56 Washington Co. ARES Net Mon 7:30 147.165 RI ARES/Red Cross Wed 8:00 146.70 RI ARES/Red Cross HF Net Sun 7:00 28.4 Newport Co. Red Cross Net 1st Fri 7:30 147.36 On Dec 2, OSARG had its Christmas party at Archie's Tavern. Traffic: W1EOF 252, KA1KML 193, PSHR 62, KA1JXH 157, PSHR 94. Let Bob Vota, RI ACC, know of your club's new officers.

VERMONT: SM, Frank Sutter, W1GTM—ASM (packet): K1AUE. ASM (Education): WB2MIC. STM: KT1Q. TC: W1AIM. SGL: WB1AJG. SEC: K1LOO. WA2SPI (Joe) is helping to put VT on the EME (moon bounce) map. He is on 432 MHz with 1 KW and reports 15 states and 11 DXCC countries worked. Contact Joe for more details & possibly a club meeting presentation. Amateur TV (ATV) continues to increase in Chittenden County with a recent Burlington ARC club meeting presentation by N1QG (Ed) and N1CVA (Henry). Ed has volunteered to make club meeting presentations around the state. I wish to thank twin state, central Vermont and Burlington ARC's for ur hospitality during your last club meetings. I have sent a thank you to our congressional delegation on ur behalf for their support in defeating the proposed fees for Amateurs licenses. SGL WB1AJG (Bob) still needs ur support for our special vehicle license plates. Call him at 433-6172 for details. The Warren Firehouse was the setting for the 12/10 ARA club Xmas meeting. KC1BT (Ray) was featured in the latest ARA club newsletter. Let's all support CVARC as they again sponsor the VT QSO Party on Feb 3-4 by getting on the air. WA1PDN & his CVARC crew will be leading the charge to help anyone needing a VT QSO the opportunity to work the Green Mtn State. Tnx again for Burlington ARC's University Mall demo made possible by N1ENH/EXY/EYD/GGY/GPZ, NB1C NW1N, K1HGY/QXK, W1HRM/ICW, WA1DKW/UVW, WB1CZE & WB2JSJ. KA1LEX is in the process of organizing a Boy Scout explorer post. N1CPP is updating the W1KOO-7 BBS directory & libraries—send inputs. Sadly I report that both KT1J & W1EDM have become Silent Keys. They will be remembered for their dedication & service to our hobby. Burlington Area radio classes will begin on 1/31/90. Call 879- 6589 for details. Congrats to W1LTW (Hassel) on another successful year of the WX Net on 148.745 repeater. Border & ARA clubs continue their hamfest plans for next July. Twin state ARC is completing the HF/VHF equipment and ant installation at the new Mountshire Museum in Norwich for meeting info, contact KA1CRP. Their Santa Net for White River Junction area day care kids was very successful. STM KT1Q reports 100% participation for all cycles of the 1st region during 11/89. GMWS reports WB2MIC has a rejuvenated HW202 on the Mountain. N1HFY had 73 check-ins for the Rutland County ARES net. N1AGY reports a new power supply at the 147.045 repeater. Welcome to new Novices KA1UXV (Paul) and KA1UXY (Rob). Section Net report: VTNH 30 211 247, CAR 26 591 51, GMN 26 588 26, VPHN 4 63 7, TSFMEN 4 80. Trstate FMEN 5 78 6. Traffic: WA2SPI, 1051, N1GMU 348, KT1Q 341, N1DHT 265, KC1KI 180, NB1A 67.

WESTERN MASSACHUSETTS: SM, Bill Voedisch, W1UD—TC/OOC: KA1SNA PIO/ACC: K1BE. SEC/SGL: WB1HIH. STM: W1KK. During the last meeting of the MARC a contingent of Explorer Scouts and their sponsor representative (CMARA) presented a program on sponsoring an Explorer Troop to the membership. Now MARA is the second radio club in the section to sponsor an Explorer Troop with a specific intent to promote Amateur Radio. I think this is a great idea and I encourage all clubs in the section to look into sponsorship. Lets face it, we are all getting up there in years and ham radio needs new young blood. These young men and women are the cream of the crop and will enhance our hobby. This is the last column by me as I did not choose to run again for SM. I want to thank all my staff for a job extremely well done. My wife and I plan to do a little traveling during the next few years. It would not be fair to you to not have a full time SM. 73s- Traffic: KA1IFC 809, W1UD 512, KA1EXJ 209, KA1QFV 66, N1FJ 53, W1SJV 45, W1KK 41, WB1HIH 34, WA1OUZ 30, NM1U 27, NX1K 19, KI2L 8, KA1TDL 6, W1ZPB 3, W1GQP 2, WA1OPN 2.

NORTHWESTERN DIVISION

IDAHO: SM, Don Clower, KA7T—ASM: K7REX. SEC: N7MAL. STM: W7GHT. OOC: WB7CYO. ACC: N7BI. PIO: WG7E. Well, the holiday season is over and old man winter is here. When tuning the bands, don't forget the new WARC bands. We all seem to pile-up on 20 or 75 and the new bands sound dead. The 18- MHz band is open nearly 24 hours a day and is seldom used. Check it out, and help cut down on the QRM on the other bands. 73 Don Traffic: W7GHT 341, N7MAL 116, WS7U 31, KA7WZM 15.

NET	SESS	QNI	QTC	MNGR
FARM	30	2245	102	WA7GSM
NWTN	30	934	25	WB7VAO
CD	22	632	13	K7UCB
IMN	30	212	113	KA7EEE

MONTANA: SM, Pete Peters, KF7R—The Herb S. Brier, W9AD Instructor of the Year Award for 1988 a beautiful plaque, was presented by KF7R on behalf of ARRL in cooperation with the (Indiana) Lake County ARC, to Fred M. Cady, KE7X, at the Nov GHRC meeting for outstanding volunteer work as an Amateur Radio instructor.Congrats Fred: Novice; Jess Roberts, Ken Olmstead, Robert Avritt, Herb Welsh, Kyong Hui Cross, Debora McCarthay, Clare Meyers: Tec; KB7IMW: Gen; KB7FSC KA7RDO: Adv: KB7IQO, N7MSI, KB7HLH: Extra; WB7QDL, KA7AON: WM7D earned a W1AW 35 wpm certificate: congrats Missoula HARC for winning Anaconda Club traveling trophy with engraved call NZ7M Traffic: KA7YYR 134, W7TGU 542.

NET	QNI	QTC	NET MGR
MSN	71	0	KF7R
MTN	1962	92	N7AIK
IMN	212	113	KA7EEE

OREGON: SM, Randy Stimson KZ7T—ASM: KM7R. ASM: W7FBP. ASM: WB7EMO. STM: W7VSE. SEC: KV7F. PIO: KC7YN. SGL: KA7KSK. ACC: WF7Q. OO: WN7W. STC: N7ENI. Some interesting news about the six hams that went to Khabarosk Russia, a Portland sister city. While they were over they had permission to give the Russian hams the VE test. Well two passed, one made it to Extra, and the other passed Novice. Mike, UW0CN, now has a American call AA7CH. Gene, UZ3AU, has not received his call yet. One thing that has stemmed from this visit is a new group has been formed. It is called Friendship Amateur Radio Society. There will be memberships, with dues, and they will try to have a club house, with gear, that will be open to all members. This club will be located in the Portland area. There is a lot to be done to get the club organized. Anyone that is interested can write Ron Mayer, K7BT, 6115 SE 13th Ave, Portland OR 97202. Or call Kevin Hunt, WA7VTD, at 503-655-8900. The clubs purpose is the exchanging of hams between sister cities and Portland. I will have more in later issues. We need a state wide organization to handle NTS Traffic that is on the Packet BBS. I discussed this with Vic, W7VSE, the Section Traffic Manager and he felt that Al, WB7EMO, would be a good candidate. I asked Al to head up this group and he has accepted. He will be an Assistant Section Manager. I am trying to convince ARRL that we could use a section level appointment for this job as there is more and more NTS traffic coming over packet. Traffic: (P) = Packet W7VSE 433, N7BGW 289, KA7EEE 198, WB7EMO 180, W7XI 132P, WT7A 92, W7ODG 64, N7DRP 50, W7LNE 46, WB7VMS 40P, KA7AID 22, KA7DEF 23, KA7WFW 21, N7NET 14, KA7OWW 5. Late OCT. N7ERT 10.

EASTERN WASHINGTON: SM, Tom Plaisance, KC7PH—STM: W7GB. SEC: WA7CBX. OOC: W7LKR. ACC: NQ7M. SGL: KD7AC. TC: W7DBV. ASM & WEN NM: KE7WG. Dale Avery, KC7MM has submitted his resignation as Assistant Section Manager due to graduate school commitments. Dale did a great job representing the League in the Spokane area. Po-

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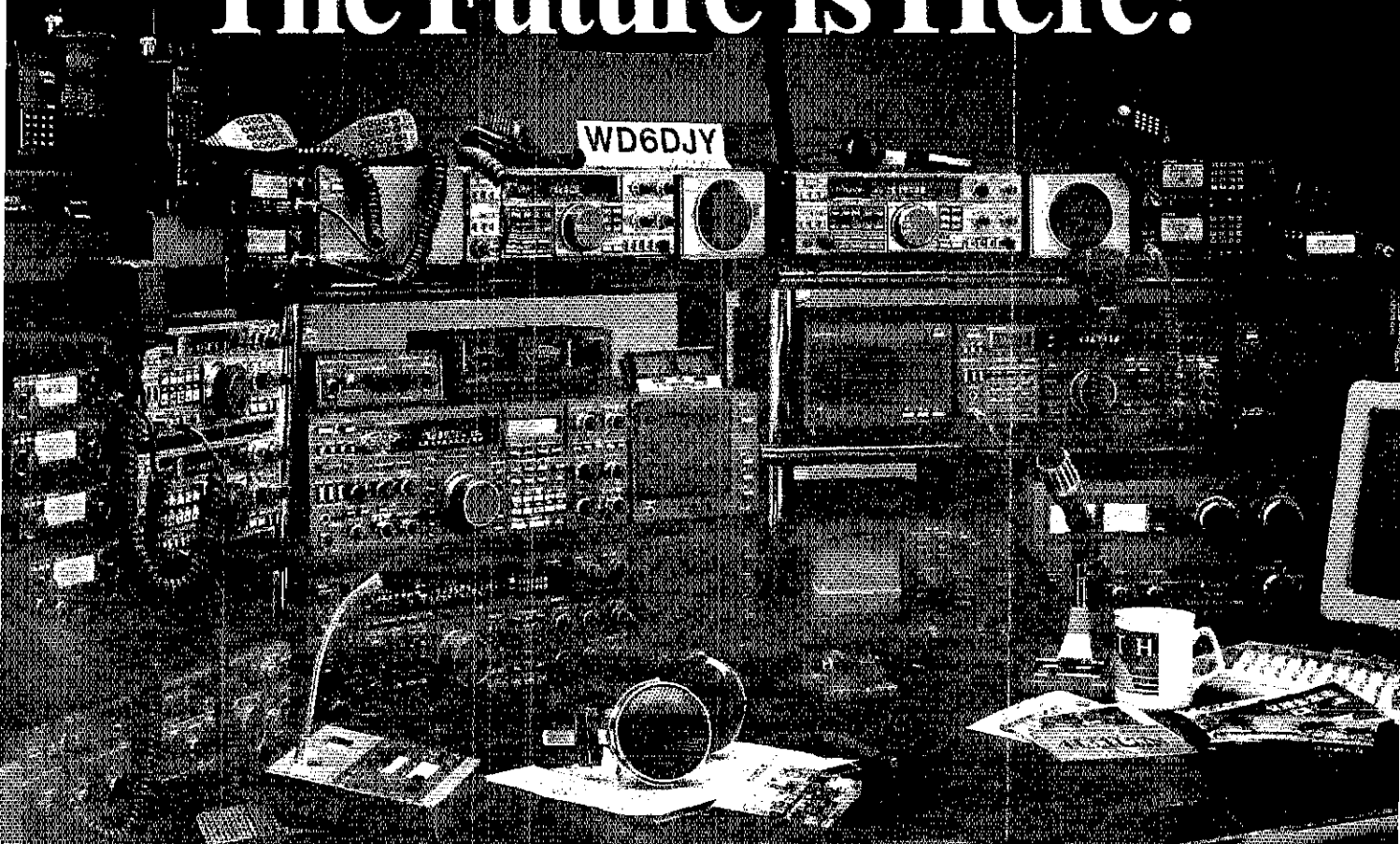

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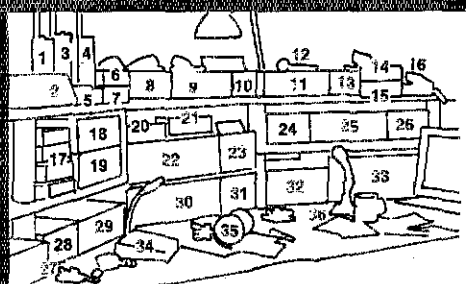

1) TH-26AT: Compact HT. **2) BC-11:** Rapid Charger for TH-26AT. **3) TH-315A:** 220 Deluxe HT. **4) TH-75A:** Dual Band HT. **5) BC-10:** Compact Charger. **6) TM-631A:** 144/220 MHz Dual Bander (shown w/supplied MC-44DM). **8) PS-50:** Heavy Duty Power Supply. **9) TS-440S:** HF Transceiver w/AT-440 (shown w/supplied MC-43S). **10) SP-430:** External Speaker. **11) R-5000:** High Performance Receiver. **12) HS-6:** Small-size Headphones. **13) SP-430.** **14) TM-2530A:** Deluxe 2m, 25 W FM Transceiver (w/optional MC-48B mic.). **15) TM-3530A:** Deluxe 220 MHz, 25 W FM Transceiver. **16) TM-701A:** 144/450 MHz Compact Dual Bander Mobile Transceiver. **17) TM-231A/331A/431A/531A:** 144, 220, 450, 1200 MHz Compact Mobile Transceivers. **18) TS-811A:** 70 cm, 25 W and **19)** 2m, 25 W, All Mode Base Station Transceivers. **20) PC-1A:** Phone Patch (FCC part accepted). **21) SW-2100:** SWR/Power Meter. **22) TS-940S:** Deluxe HF Transceiver w/AT-940 installed. **23) SP-940:** Matching External Speaker. **24) SP-31:** External Speaker. **25) TS-790A:** All Mode Tri-band Satellite Transceiver. **26) PS-31:** Matching Power Supply. **27) PS-430.** **28) AT-250:** External Automatic Antenna Tuner. **29) TS-680S:** 160-6 m Multi-Bander. **30) TS-950SD:** HF Transceiver w/DSP. **31) SP-950:** Matching External Speaker. **32) SM-230:** Deluxe Station Monitor. **33) TL-922A:** HF Linear Amplifier. **34) MC-85:** Multi-function Desk Mic. w/3 outputs and tone controls. **35) HS-5:** Deluxe Headphones. **36) MC-60A:** Base Station Mic.

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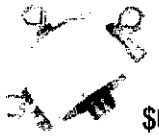

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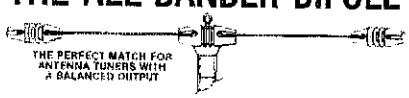

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sitions unfilled in the section include assistant section manager, bulletin manager, and public information officer. Amateurs from the Tri-Cities and Wenatchee are especially encouraged to apply. We are saddened to report that Al Cherry, NA7L, from Yakima became a silent key November 25th. The Central Wa. ARC will operate Special Event Station W7WMO from George, Washington on President's Day February 19, 1990. Work W7WMO or stop by for an eyeball. See Special Event section for details. Contact Bill Mott, WA7IIR for VEC exams in the Spokane area. SEC WA7CBX reports ARES 48 Public Service hours. 73, KC7PH @ N7HHU BBS. Traffic: W7GB 121, WA7YEN 195, W7LBK 19, N7HXT 10.

WESTERN WASHINGTON: SM, Mary Lewis, W7QGP—STM: KD7ME (@K7KNZ). SEC: NM7N (@N7HFZ). SGL: KD7AC. ACC: W7QGP. TC: W7JWJ. Radio Amateurs of Skagit County meet 2nd Thursday 7PM Commissioners' Hearing Room in Mt Vernon and 4th Saturday breakfast meeting 8:30 AM Angela's Restaurant Hi 10 near Sedro Woolley - Interested call Greg N7HOC (h) 424-7790. Boeing Employees Amateur Radio Society (BEARS) are 30 years old. Congratulations. Jefferson Cty ARC helped set-up Amateur Radio classes in Chimacum School. These are the first continuous school classes to my knowledge in W.WA. Has your club contacted your schools yet? Sno-Isle Skills Center (Everett) on the air code practice Tuesday 7:00PM on 28,350 kHz. K7THW and KF7UM net controls. The early spring floods (Late Nov.) in Skagit Valley brought the EC's and flood watch ops. out for long hrs. Tnks to all. W7JWJ and W7QGP attend Christmas parties in Longview, Mike & Kay and Bellingham, good turn outs. I am on Packet (145.01) but some of the messages left on BB's I wouldn't write in a letter. There has to be a kinder way. Write me your INPUTs. Traffic: K7AJT 22, K7CII 14, KA7CRN 19, N7CSP 144, WB7EJS 9, KR7F 125, N7GGJ 73, W7IGC 314, W7LG 242, K7SUX 143, KA7TTY 36, W7TVA 152, K7UGH 58, WB7WOW 378.

PACIFIC DIVSION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, WB3FCV. SEC: W6LKE. STM: K6APW. OOC: K6TI. TC: N6AMG. WB6DOB reports that NCN/2, the slow speed session, has moved to 3705 kHz so that Novice and Technician operators may take part, nightly at 8:30 PM PST; and that NCN/VHF has returned to WA6EUZ/R on 145.41, 7:30 PST, also nightly. EBARC Life Member, WA6KTL recently celebrated his 91st birthday! FB, Carl. Drop him a line at 2825 Shattuck Av., Berkeley, CA, 94708, or give him a call at (415) 848-3760. K6APW reports that the WD6CMU BBS handled 2000 messages (1000 sent/1000 rcvd) the week of the great quake. SBARA election results: N6QWF/P, KB6UOK/VP, WD6GKN/S&T, KA6RKI/Editor, W6QWK/ Membership Chairman. LARK is again conducting Novice and Technician code and theory classes. Call for info: K6TS, 447-5872; N6FOQ, 462-8946, W6RGH, 449-9362. VVRC recommends that we all take advantage of a free training course called "Emergency Management U. S. A." It is available from FEMA. Send your name, address, and Social Security number to FEMA Home Study Program, Administrative Office, Emergency Management Institute, 16825 S. Seton Av, Emmitsburg, MD 21727, for your copy. NBARA mourns the loss of WA6EFP. HRC's long-time editor, N6DOC, reports that their new editor will be N6MON, with help from N6MQQ. I'm sure Effy will enjoy the extra time for operating! All of the club newsletters I received contained reports on the many Section members who participated in the emergency communications associated with October's quake. Unfortunately there is not space in this column to list them all, but a tip of the hat to one and all for a fine job. Oct tfc: WB6DOB/330, W6VOM/153, K6APW/45, WB6UZX/31.

NEVADA: SM, Joe Lambert, W9IXD—ASM: Curly Silva, K7HRW. Nevada hams were on the ball and handled much emergency traffic both during Hurricane Hugo and the San Francisco earthquake. In the San Francisco earthquake, TMARA handled nearly 400 messages through their extensive linking and packet systems. Many Las Vegas Hams also handled traffic through HF and through the Condor Connection. Thanks to all. KK4M has been appointed STM. Keep your traffic reports coming in to Marty for QST mention. The Condor Connection is now on-line in Las Vegas on 224.90 MHz with the PL of 156.7 from Mt. Potosi. This is linked to 10 other repeaters covering all populated areas in Calif. from north of S.F. to beyond the Mexican border. It is an open, linked, all 220 MHz system and everyone is invited to use it. So. Nev. hams provided communication support for the Boulder-Bike Run coordinated by KF7GB and the CPC walk for life, coordinated by N7JMG. Curly and I want to take this opportunity to thank all of the Nevada hams and appointees who have contributed to a successful year for ham radio in Nevada; and we want to remind you that now is the time to reinforce your interest in your local radio club. Sorry about the SNAFU in the last month's column. Hope everybody enjoyed all the club holiday parties. Traffic: (Nov) KK4M 73, N9IA 65, N7CPP 49, KF7GB 15, N7HOA 8, KC7JF 4.

PACIFIC: SM, Wayne Jones, NH6GJ—First, to correct an ommission from last month's column. I inadvertantly omitted WD6CQV from the list. He was elected secretary. There were three public service events reported last month. The Big Island ARC provided communications support to the Iron Man Triathelon, a spectacular event consisting of a six mile swim, followed by a 90 mile bicycle ride, and finishing with a double marathon of 52.4 miles. It was held over three days, November 24, 25, and 26. 26 amateurs, coordinated by NH6RW and NH6NY, participated in the support. What a way to work off your turkey dinner! On November 25, the Guam ARC provided support to the USO/Hilton/USA Today Biathalon, a 2 mile swim and 4 mile run. W1YRM, KH2DN, KH2D and WH2AEN supported the event. The EARC provided support to the Kailua Christmas Parade on November 30. NH6GJ and NH6JW provided the support. More election results: Kauai ARC elected KH6DXO as president, KH6S VP, WH6CDY Secretary, KH6LG, Treasurer, and NH6TL Activity Manager. The Big Island ARC reelected WH6BIR President, and elected AH6P as VP, NH6RW Secretary, KH6ATQ Treasurer, KH6IAA and KA2IXG as Directors. Until next time, Aloha. Traffic: KH6H 10, KH6S 45.

SACRAMENTO VALLEY: SM, Jettie Hill, W6RFF—STM: WA6WJZ. OOC: WY6O. TC: W6IEW. PIO: WA6OWH. BM: WB5FIX. SGL: N6IG. ACC and SEC positions are open at present. Many pieces of traffic were handled during the earthquake, Thanksgiving, Christmas and New Years. The Northern California Net operates on 3830 kHz at 7 PM, 3705 kHz at 8:30 PM and 145.41 at 7:30 PM. The Sacramento Valley Traffic Net meets at 8:50 PM on 146.85 and at 9:10 PM on 146.64 MHz (Southern and Northern sessions). The Sierra Foothills ARC is sponsoring "Have Exams, Will Travel" and Bob W6SUP is the team captain. For more information call Bob at (916) 783-7610. The River City ARCS have scheduled classes and exams for 1990 - call (916) 483-3293 for more information. Special Service Club certificates were presented to the Golden Empire ARS, North Hills RC, Amador County ARC and the Sierra Foothills ARC - Congratulations to these very active clubs!! All section appointees should send a monthly card of their activities to me, also would appreciate a club bulletin from each club. 73. Traffic: WA6WJZ 168, N6CVF 168, WA6ZUD 130, W6CFQ 47, N6LAM 42, K6SRF 37, N6DOJ 19, WB6SRQ 8.

SAN FRANCISCO: SM, Dick Wilson, K6LRN—'Doc' C.C. Everman, W6BCM is a Silent Key. K6SEX, Jim started Novice Classes in SF, Jan 9. Call 566-0790 for info. W6PW-3 PBBS had 4315 connections made in Oct, with 6121 msgs handled. Additionally, W6PW at VA Hosp handled 675 H & W msgs. K6VHP has been appointed DEC for Humboldt County. Officers for Del Norte ARC WA6FWQ- Pres., WB6PHH-VP, NK6Z-Secty-Treas., K6HY continues w/newsletter. WB6FRZ has started a Novice Class in Healdsburg. Amateur Comm Soc. (K6GWE) 1990 officers; WA6BXV-Pres., WB6EFY-VP, WA6CBQ-Secty., WR6D-Treas., w/W6ZGK, N6LQB, W6MJO, WA6MHO, WA6VOI, WB6QPR, K6BMW as BoD members. WB6PER is a new Official Observer and is quite active in RACES-Sonoma County. N6ONZ, N6PTM, N6OOA, N1AL, W6TLK, W6DTV, N6FAX, N6RXA, WD6CKP, K6KZ, KI6QY and N6QAV put in more than 130 hours with CDF and OES in Sonoma Cty. following the Oct 17 Loma Prieta 'quake. What's happening in Mendocino and Lake counties?? Traffic: N6FWG 105.

SAN JOUQUIN VALLEY: SM Byron Smith, WA6YLB—Asst. SMs: K6YK and W6TRP. SEC: WC6U. STM: N6AWH. The new year brings new officers to the Calaveras amateur radio society: Pres. Fred, WB6QVI, V.P. Greg, WB6LPH, Sec/Tres. Jim, KE6OZ, 2M Net Mgr Stan, W7WYY. Also, I have moved to Exeter and the new address appears on page 8. Congrads to the new upgrades: WA6FRO, KK6AW now EXTRA, N6WHF (formerly KB6LEI) made Adv., KA6GUL General, KC6GVB, KC6BNZ made Tech. N6KGE now AA6RY. When you hear Dorothy KB6IFL or JIM KE6OZ on the air congratulate them on their 50th wedding anniversary. Interested in microwave activity? Contact Bill Burns of the San Bernardino Microwave Society at 619-375-8566 in Ridgecrest. Sorry to report Orvral Hart, WB6OCW, as a Silent key - Orvral ran Hart's 66 Ham radio store in Fresno a few years back. Traffic: K6RAU 62, W6DPD 10, KC6ESL 4, WA6YAB 38 - late reports for WA6YAB, Aug 18, Sept 16 Oct 14.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—SEC: N6JGJ. TC:WA6PWW. STM: N6JLJ. PIO: N6HMO. ACC: W6MKM. BM:(vacant). OOC: KA6S. NOVEMBER - A busy month as we begin to put the earthquake behind us and begin looking forward to the holiday season... The EMARC group heard from Ben Vickers WB6FRM on the art and science of transmitter hunting. One of the longest and most enjoyable club meetings I've attended...speaking of T-hunts, why not give it a try at the section T-hunt, 7PM, every third Saturday. Meet at Cristo Rey Drive in Los Altos Hills, talk in on W6ASH/R 145.27-/224.36-...the Naval Postgraduate School Club continues to be a very active group, continuing to plan for their Wintertest'90 hamfest. They also have a Monterrey area T-hunt...the Palo Alto Amateur Radio Association heard from Tom Lott VE2AGF on "The Birth of the Transistor"...the Foothills ARS had a demonstration of antenna design software by Bob Stein N6NBI. Very interesting stuff. The club newsletter "PAARAgraphs" also had a description of the South (San Mateo) County ARES activities in the quake effort...the AMES ARC heard from Mountain View ARES EC on earthquakes (what else?). The AARC seems to be well settled into their new shack...the Silicon Valley Emergency Communications System put out a special earthquake edition of their newsletter, and sent copies to all California Senators and Congressmen. Special thanks to the Gaubatz's W6GJF/N6SPC for their work in producing this excellent newsletter...the Los Gatos ARES newsletter contains earthquake descriptions from several members. It makes VERY interesting reading! Los Gatos ARES EC Jim Atwood KJ6CW spoke to neighboring Saratoga ARES on preparedness. Traffic: NR7E 84(0). Phone numbers: Amateur Radio Classes/Clubs (408) 971-1424. License Exams (408) 984-8353 (ARRL VEC) or (408) 255-9000 (Sunnyvale VEC).

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W— ASM: AB4S. SEC: N4MYB. STM: K4NLK. BM: KI4YV. ACC: WC4T. TC: KM4OX. SGL: KE4ML. PIO: WA9NEW. Sunday, December 10, two 2,000 ft TV towers went down near Raleigh. A third 2,000 ft tower was in danger but remained up. Ice falling down through this tower later in the morning sounded like a rollercoaster. A severe ice storm Friday and Saturday had coated the towers and guy wires with 6-10 inches of ice. Sunday morning was clear, warm, and calm. At ca. 8:30 AM the WPTF-TV tower fell and destroyed its transmitter building. The AK4H repeater was on this tower. Shortly after 9:00 AM the WRAL-TV tower came down damaging its transmitter building. The N4BEA and WD4TQD 2 mtr repeaters and the PCRN 440 MHz linking repeater were on this tower. These repeaters have been the main communications channel for the State Emergency Response Team during the many activations we have had in the last several years. ARES will have to rely more on 80 and 75 mtrs and hopefully packet radio can also fill the gap in our emergency communications capability the loss of these repeaters has created. [BT] Amateur Radio Operator Appreciation Day was held Dec. 3, 1989. This event was sponsored by the Charlotte Office of NWS, WBTV, WCNC-TV, & WSOC-TV. Amateur Skywarn Nets and ARES activities in the aftermath of Hugo prompted this event. The Mayor and Em. Mgt. Coordinator of Charlotte, State Area D and E Coordinators, Asst. Sec. of the NC Div. of CC&PS and several NWS officials were present. An afternoon of tours of the NWS office and the three TV stations was followed by a dinner with presentation of certificates to the Amateurs. The Charlotte area Hams are getting well deserved recognition. [BT] Dennis Decker, the National Weather Service Warning & Preparedness Meteorologist for North Carolina, has also received some well deserved recognition. He was presented with the US Dept. of Commerce Silver Medal for his work in severe weather preparedness. Dennis has been the primary NWS contact for ARES and the success of the NC Skywarn program was a

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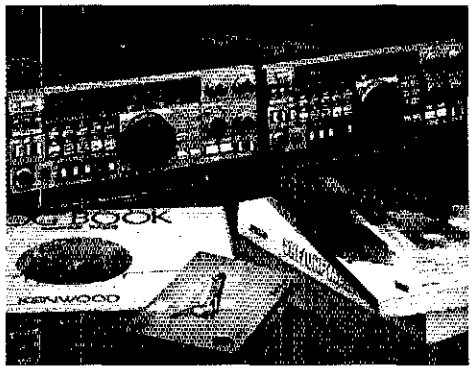

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significant factor is his award. Dennis, who became KB4TYM after coming to the RDU office, has presented his SKYWARN training program to every NC radio club he knows about. Contact him at the RDU NWS office if your club hasn't had the training program recently. [BT] Approximately 30 attended the NC Packet Radio Council meeting held at the State EOC on Nov 11. [BT] SEC N4MYB reminds all ECs to submit SET reports. [BT] Silent Key, W4ENQ, licensed for 55 yrs. [BT] October/November traffic: K4NLK 252/335, N9CGD 164/73, KI4YV 138/132, K4IWW 135/138, KB7LX 116/100, WD4HTE 102/219, KA4EYF 82/91, AA4ZV 74/148, WA9NEW 72/55/(82,Sep), W4EAT 39/62, N4LST 15/62, KA4KGZ 9/63, WB4HRR 55/-, N4WFU -/49, N4SVZ 48/-, WD4MRD 41/42, WB4WII 41/38, N4UE -/36,W4EHF 31/44, WA4MNR 31/28, N4SHE 31/29, N4SMS 30/46, N4JTG 26/21, N4VVX 24/24, N4VHU 24/15, KC4GFR 23/12, WA3EDN -/23, KM4BN 22/18, AB4W 21/23, WD4LOO 17/47, KC4GCK 16/10, N4VHU -/15, KF4NJ 14/14, KC4GFR -/13, KC4ESD 12/-, W8KLF 9/17, KC4GCK -/10, WA9UTM -/10, N4WRR 9/-, N4SSX 4/1, W2JDB 2/9, N4UOE -/4 [AR].

SOUTH CAROLINA: Ned Moeller, N4FVU—Mid Nov '89, Ham of SC took part in a 2-part National Disaster Medical System Exercise. SEC K8AFP, coordinated from the SC Emerg Prep Comm Cen in Columbia. Hams provided ARES commo at the following hospitals: Columbia's Lex Med Center—KK4DZ, Providence, N4QWL, Richland Memorial, KK4UX, VA Hospital, N4AXB. Orangeburg's K4SNE. Greenville's Allen Bennett, K4CLQ & W4FX, Mary Black, W4NTO & K4LNO. Greenville's Memorial W2GW & W2CMZ. Hillcrest's, WA4JWC, W1BNS, & KC4EWP. Greenwood's So. Memorial-AA4TZ & K4DOK. Spartanburg's Regional KA4ONN & WD8PYR. Augusta GA- Aiken Co EC W4TUN. On Dec 3, '89 3 SC. ECs were invited to Charlotte NC Mayor's Amateur Radio Appreciation Day festivities. We are saddened to hear W2ENW is a Silent Key. Seymour Feldman was active from his QTH in Charleston & Columbia. Reml Charleston Hamfest is Feb 24, 1990. Nov. traffic: W4ANK 134, N4MEJ 81, KA4LRM 40, W4DRF 18.

VIRGINIA: SM, Claude Feigley, W3ATQ—STM: N4GHI. SEC: WB4ZTR. ACC: KA4YUY. OOC: W8IRT. TC: N4UA. PIO: AA4VP. SGL: W4UMC. Please note the following field organization changes: Roy, W4TZC, has taken over as VSN Net Mgr. replacing N4KSO. KC4CVG is the EC for Faquier county, N4AKZ becomes the DEC for Southwest Virginia District 14 replacing N4KSO and SEC, WB4ZTR announces the switch of Faquire County for District 4 to District 2. The Rappahannock Amateur Radio Assn. (RARA) held a very successful Jamboree on the Air (JOTA) operation. From a Scout campsite in the woods they had contact with other scouts in the USA, Canada, and several foreign countries, as well as the official scout station in Mexico City. The Massarutten ARA has formed a RFI/RDF Committee for the purpose of advising amateurs on RFI problems and collecting info on interference using RDF procedures. The Winchester group is busy making preparations to supply communications involved in the move of patients and facilities to the new Winchester Hospital. SEC, WB4ZTR and DEC, WB4AXY, presented a program on Virginia ARES/RACES operations to attendees at the Virginia State Convention of the Associated Public Safety Communications Officers (APCO). The presentation consisted of an explanation of amateur communication capabilities along with a demonstration of Packet operation. With the increasing mention of amateur activity in emergency situations by the news media all DEC and EC appointees should take advantage of this and contact their local emergency officials to become involved in their emergency plan. Some brochures and pamphlets are available from the SEC, WB4ZTR, and the SM to help you present the amateur capabilities. An excellent article entitled "Amateur Radio Operators—The Unsung Heroes of Emergency Communications" appeared in the Fall 1989 issue of LIFELINE, the quarterly publication of the VA Dept of Emergency Services. If you would like a reprint of the article, contact the SEC or SM. Upcoming VE exams- Feb. 3, Richmond, contact N4RPI 804-233-6461 also, Hampton Roads ARA, contact N4BDH 804-487-8611- Feb. 24, Vienna, VA contact NK4U, 703-691-0078. The following have been nominated for the post of Section Manager; Ted Dingler, N4KSO; Thomas Gooding, K4LHB, and Von Harbin, Sr. WS8A. Closing date for submission of your ballot is Feb 16th and they will be counted Feb. 20th. BE SURE TO VOTE FOR THE CANDIDATE OF YOUR CHOICE. Traffic: WBØTAX 1386, K4DOR 880. N4GHI 563, N5DST 499, N4HOG 424, WD4MIZ 366, K4MTX 318, N4EXQ 264, KC4ESG 244, W3ATQ 240, W4SQQ 213, W4JLS 192, WB4PNY 171, WB4D 162, AA4AT 147, AA4GL 128, N4KSO 110, WB4ZNB 109, NW3K 99, WD4MIS 96, WB4KSG 89, WB4FLT 88, WB4ZTR 83, N6ANQ 80, WB4KIT 75, K4BGZ 64, KJ4VT 61, N4FZA 58, N4MGO 58, WB4UHC 48, KB4CAU 46, KI4BR 45, KD4NH 38, WB4EDB 30, WB4VMX 27, KB4QPR 24, N4RHV 22, W4TZC 19, N6GVG 17, K4GR 14, WB4DQZ 11, K4MLC 11, WA4TVS 10, W4HU 8, N4FNT 7, WA1VRL 6, WS8A 2, K4JM 2, KI4W 2, W4YE 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: N8FXH. SGL: K8BS. TC: K8LG. ACC: WA8FLF. Repeater Coord. WB8GDY. KA8VNF is new EC for Boone Co. N8FQN is new EC for Marshall Co. WA8IOE is new EC for Boone Co. Thx Guys. I have temporarily moved to Boone Co. New address is SR Box 11A, Seth, WV, 25181. Tel 837- 3681. Perminent move to So. Chas will be in July. 1st annual Long Rifle & Mountaineer Dist. JOTA was big success. TNX WB8CQV & KARC. Chas area hams operated WB8WVA at WWI living memorial in Nitro on Nov. 11.

NET	FREQ	TIME	QNI	QTC	SESS	NM
WVFN	3865	6:00	1203	120	30	WD8DHC
WVN-E	3567	7:00	268	78	30	KZ8Q
WVN-L	3567	10:00	161	30	30	KZ8Q
WVMD	7235	11:45	673	87	30	WD8V
WVRN	3640	6:30	256	47	30	K8LG
WVNN	3730	7:30	61	26	24	KA8ZGY
HILLBILLY	14290	NOONsu	157	6	4	W8YP

Traffic: KA8WNO 305, W8YP 301, WT8L 255, WD8V 248, K8TPF 142, WD8DHC 75, K8QEW 64, KA8ZGY 35, W8JWX 21, N8FXH 20, KA8OGF 14.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Edie Sheffield, KAØMQA—SEC: K4UBU. STM: KBØZ. ACC: WBØDUV. PIO: WBØFQB. OOC: KAØCDN/WØJJR. TC: WØLJF. SGL: WDØHNQ/WDØHNP. BM: KAØVKM. As we move into 1990, Colorado now has completed 5 years of VE testing. I would like to take this opportunity to thank the many VE's who have participated in these tests, and made VE Tests a successful program in the Section. Congrats to The Mile Hi VE Team, The Boulder VE Team, The Greeley VE Team, PPRAA VE Team, Pueblo VE Team, No. Colo VE Team, Durango ARC VE Team, Ski Country VE Team, Montrose ARC VE Team and Grand Junction VE Team. From the STM a reminder that the CWN meets daily on 3715 @ 0230, this is an excellent net to brush up on your code speed, and also will help beginner Novices with their code. Congrats to KØDAP for his 9000 Check-in on CWXN, also WØLVI who is close to 8000 and KØYFK who just completed 4000. WØLVI is in need of NCS. Please let him know if you can help. The ARA annual Swapfest will be February 18th at Jeffco Fairgrounds in Golden, Co. Contact WDØHNP or KA7TYU for info. This is always a good Swap and hope to CU there. 73, KAØMQA NETS: CWN; QNI 66, QNF 296, QTC 51, 30 SESS. CWXN; QNI 1699, QNF 2700, QTC 1468, 30 SESS. COL; QNI 1344, QNF 1076, QTC 71-185, 30 SESS. HNN; QNI 1895, QNF 1039, QTC 160-712, 30 SESS. NCTN; QNI 191, QNF 286, QTC 72, 29 SESS. SCTN; QNI 280, QTC 39, 30 SESS. Traffic: NØBQP 1916, KØYFK 664, KØHOA 624, NØHFZ 567, WØLVI 290, WØLJF 266, WTØG 250, NØGVC 212, NØFCR 138, KAØWIE 124, KØRXK 116, NØCYR 31, KBØZ 28, NØKIA 18.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K6YEJ. DEC: WD5HCB. STM: ND5T. NMs: WA5UNO, KA5NNG, W5QNR. TC: W8GY. ACC: KA5BEM. Southwest Net meets daily, 3583 @ 0230 UTC, handled 18 msgs with 105 checkins. NM Roadrunner Net meets daily, 3939 @ 0100 UTC, handled 67 msgs with 1013 checkins. NM Breakfast Club meets daily, 3939 @ 6:30AM, handled 183 msgs with 959 checkins. Yucca 2-mtr Net, 78/18 handled 18 msgs with 526 checkins. Caravan Club 2-mtr Net, 66/06 with 102 checkins. SCAT Net, 66/06 handled 7 msgs with 576 checkins. Info Net 12/72, with 87 checkins. Had an outstanding dinner meeting with the Eastern NM ARC, lots of packet activity and lots of interst in linking both packet and VHF to other points in NM. They have an excellent EOC and a real interest in ARES. So very sorry to report the passing of W4WRS, always interested in helping others and an Elmer to so many. We will certainly miss Earle. Traffic: Sunday Noon Packet Net 60 checkins, KF5VF 127.

UTAH: SM, Rich Fisher, NS7K—SEC/STM: Jim Brown, PIO: Lon Stuart. Utah held its SET on Nov 18. We had a good turn out with 11 counties participating. Martin, WB7AYK, has been ill. We wish him a fast recovery. Traffic: WA7MEL 74, N4JLC 36, NS7K 25, N7IUN 22, N7ASY 19.

WYOMING: SM, Jim Raister, N7GVV—

NET	FREQ/TIME/DAYS	QNI/QTC	MGR
Cowboy	3923/545p M-F	705/4	WB7K
Pony Express	3923/800a	177/7	W7MZW
Albany ARES	01/61 Su	39/0	WB7K
Area 5 ARES	01/61 Su	55/0	W7LL

Traffic: W7SQT 176. Congrats are in order to Cedar Mtn and Campbell Co. clubs for starting newsletters. I know it's lots of hard work, but it also should reap rewards. I'll be updating the club mailing list. IF U DID NOT GET A COPY OF THE "HAM ON RYE" newsletter by now and would like a copy for ur club, etc., please drop me a line. Address on page 8 of QST. 73 till next month.

SOUTHEASTERN DIVISION

ALABAMA: SM, James Spann, WO4W—ASM: W4XI. STM: W4PIM. SEC: KB4GDN. PIO: KB4KCH. ACC: AA4BL. OOC: KF4VS. SGL: N4FRQ. BM: KA4ZXL. A violent tornado ripped through Huntsville on Nov. 15 killing 19 people and injuring hundreds more. Huntsville ARC members were on the scene almost immediately and they assisted emergency crews and helped relief agencies. Hundreds of health and welfare messages were handled. All Huntsville area amateurs are to be commended for doing a tremendous job in the face of a major disaster. Ironically, the Huntsville tornado struck less than 24 hours after a statewide amateur radio drill involving the National Weather Service. Some of you in the Huntsville ARC might also remember my talk to the club earlier this year - the subject?—severe weather preparedness! The new Alabama Section Manager is Mildred Cullen, AA4XF. Congratulations to Mildred; she is already getting her section staff together. I do know that Jack, W4PIM, will remain STM, Gordon, W4XI, will remain ASM, and David, KB4KCH, will remain PIO. Mildred is going to be a great SM - and I hope you give her the same level of support I received during my two years in office. Mobile UHF enthusiasts in Mobile are encouraged to check into a new weekly net that meets Thursdays at 7 PM on 444.90 MHz. The new EC for Tuscaloosa county is Brian McDaniel, KC4LMD. BPL: WA4JDH. PSHR: WA4JDH, W4PIM, W4CKS, WB4MMD, W4QAT, WA4RNP. Traffic: WA4JDH 711, W4PIM 193, W4CKS 113, W4QAT 99, WA4RNP 58, WB4MMD 31, WO4W 14.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM: KC4MJ. SEC: NC4E. STM: WB4WQL. PACKET: W4QO. ACC: KM4IH. BM: AA4UA. OOC: W8BLA. PIO: WA4LLE. SGL: WB4UVW. TC: W4ZTL. Once agn GA was Tornado Alley in the northern part of the state. This is sort of an oddity for mid Nov but it can happen almost anytime. The efforts that all of u did in preparing shows that the ARES program is really working. From the reports that I have gotten many groups were ready if disaster came. The touchdown in the Palmetto area put the Newnan gang to work for many hours requesting aid from all services. I wish all of u could read the long report sent me on what really took place. It was organization from start to end. My congrats to all who participated & the citizens in the area especially thank u. The Georgia State Patrol now realizes that we are an organization that can do much to help them. By now many of u are sporting that new AMATEUR RADIO TAG on that old bus. From the number who applied for the tag it

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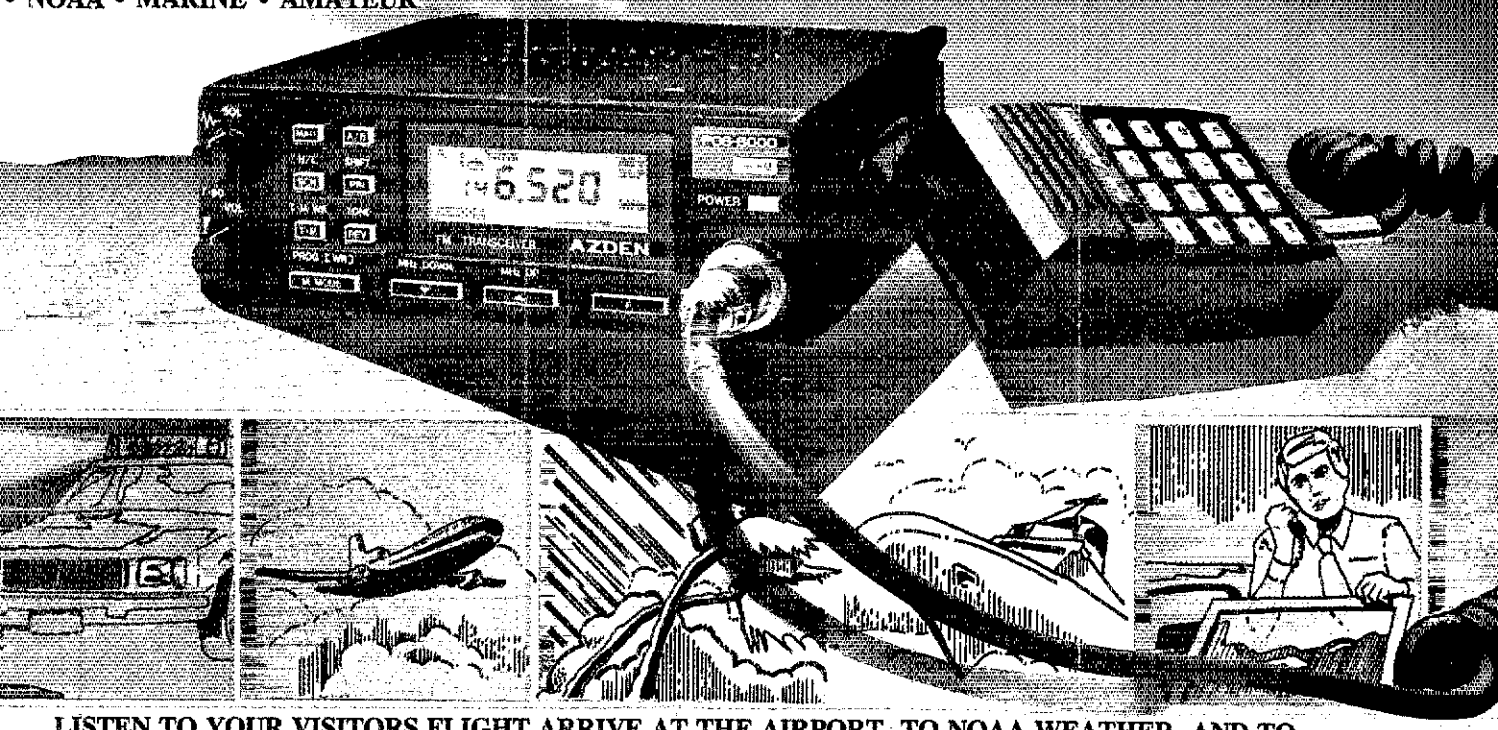

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PRIORITY CHANNEL MONITORING: Memory Channel B@(the first channel in memory bank B) is monitored every four seconds regardless of any operating condition. When a signal is received, a beep is heard.

DISCRIMINATOR CENTERING (AZDEN EXCLUSIVE PATENT): Always stops on frequency desired when scanning.

PROGRAMMABLE FREQUENCY STEPS: In memory, frequency steps can be set at 5KHZ to 20KHZ in any increment.

BUILT-IN PROGRAMMABLE TONE ENCODER: 57 different tones are built in for instant programming of PL tones into memory channels and microcomputer. Tone frequency can be entered independently in RX and TX. A tone decoder is available as an option.

LITHIUM BATTERY BACKUP: Memory information can be stored for up to 5 years even if power is removed.

FREQUENCY REVERSE: Allows you to listen to repeater input frequency.

FEATHER-TOUCH TUNING CONTROL KEYBOARD: The LED backlighted light touch keyboard performs all tuning operations simply by pushing the key(s) and key actuation is audibly verified.

LARGE LCD (LIQUID CRYSTAL DISPLAY): The LCD display shows the operating frequency, S/RF, memory channel in use and various other operating functions. The LCD is back-lighted by green LEDs, making it possible for you to read the display even in total darkness.

FULL 16 KEY TOUCHTONE PAD MICROPHONE: DTMF Microphone functions as auto-patch when transmitting.

DIGITAL S/RF METER: Shows incoming signal strength and relative transmitter power.

MICROPHONE CONTROLS: Up/Down memory and frequency control.

TRUE FM, NOT PHASE MODULATION: Unsurpassed intelligibility and audio fidelity. High/Low Power: 25W/45W or 5W/10W (6000/6000H). Output-Fully adjustable.

SUPERIOR RECEIVER: Sensitivity is better than 0.15 Microvolt for 20-DB quieting. Commercial-Grade design assures optimum dynamic range and noise suppression.

AUDIO OUTPUT: 2 Watts or more.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

OTHER FEATURES: Rugged dynamic touchtone DTMF microphone, built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses and hardware are included.

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THE TWIN BANDER

DR-57OT



The **ALINCO Model DR-57OT** is a dual band transceiver offering big value in a small package. The independent main band and sub-band operation permits full duplex operation. The front panel is easy to read and understand. The LCD display lets the operator know at a glance which functions are in operation. The built-in duplexer has a single antenna output for a dual band antenna. ALINCO has listened to the consumer and in response has created the versatile **DR-57OT** which is truly user-friendly with minimal effort.

- *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*
- *20 MEMORIES (10 FOR EACH BAND)*
  Each memory channel can store frequency, repeater offset, encode/decode frequency.
- *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 andthen resumes approximately 5 seconds after stopping even if the signal is still present.
- *REPEATER OPERATION*
  The DR-57OT can be used as a cross band repeater.

EASY TO OPERATE FUNCTION

- *LARGE AMBER MULTI-FUNCTION LCD DISPLAY*
  Visible in all conditions, it indicates main and sub-band frequencies, frequency step, "on air", "call", "CTCSS", "PRI", "REV", "-", "+", "*", "T" (tone), tone frequency, "MUTE", "LOCK", "ABX", "♪", "BUSY", "F", "S/RF meter", "REV"
- *MHz FUNCTION FOR BOTH BANDS*
  One MHz is increased or decreased per touch
- *SELECTABLE DUAL AND SINGLE BAND OPERATIONS*
  One touch selection with pressing of twin key
- *SELECTABLE BAND MODE (MAIN/SUB)*
  One touch selection with pressing of band key
- *ILLUMINATED FRONT PANEL CONTROLS*
- *16-KEY DTMF MICROPHONE*
  With memory channel and frequency change up/down buttons.

ALINCO

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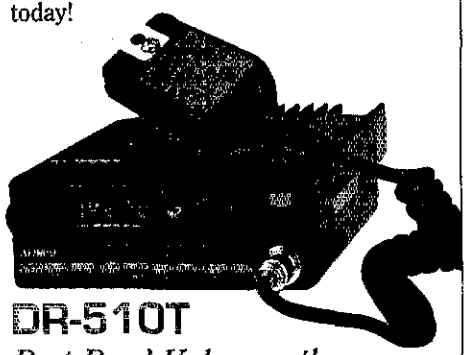
The Magnificent Six Gives You More Power



DR-570T

Set your sights for dual!

The Alinco DR-570T "Twin Bander" has dual LCD readout, volume, squelch and tuning controls. Double barrelled power with 45W on 2M and 35W on 70 cm, plus simultaneous receive on both bands or intermix with four modes of scan. The DR-570T will win the "battle" with its illuminated front function panel and LCD readout, readable in any lighting conditions. Don't let the "Tiny" DR-570T fool you! It's fast, and leaves the competition in the dust with many standard features you expect. Cross band repeat with the flick of a switch. Full duplex, 20 memory channels, call channels, 16-key DTMF Microphone, and subtones are just a few. "Reach" for the DR-570T today!



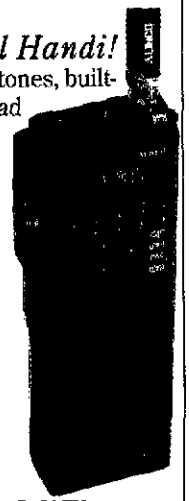
DR-510T

Best Dual Value on the Market!

The Alinco DR-510T has most of the outstanding features of it's sister the DR-570T, including 14 memory channels, cross band duplex and cross band repeat. The multi color LCD display, and simple tune control panel makes simplicity the key word. The DR-510T with 45/35 watts is the best, feature-packed dual bander on the Amateur market today. See the DR-510T along with the other Alinco "Magnificent" ones at your favorite dealer today!

DJ-500T

Power-Packed Dual Handi!

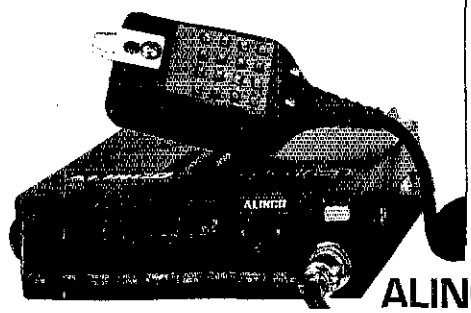


20 Memory channels, subtones, built-in DC to DC, 700 mah nicad battery, LCD readout with 6W on 2M and 5W on 70 cm (with optional battery) call channels, DTMF Touchtone, and direct keyboard entry, are just the few winning features of the Alinco DJ-500T Dual Band Handheld. Easy to use, and Value Priced at your Alinco Dealer.

DR-110T&R-410T

Tiny 2M Power From Alinco!

DR-110T, this 2M Alinco, enters the nineties a proven winner with the "reputation" of best value. The DR-110T packs a powerful 45W on 2M and sports all the features you expect in todays transceivers. Tuning is a snap with the multi-functioned easy-to-see keyboard, 14 memory channels, subtones, scan, multi- colored LCD readout, reverse, are a few of the many features of the DR110T. The mobile of the future — today! DR-410T available for 70 cm.



DJ-100T&DJ-200T

Best 2M Micro Value Anywhere!

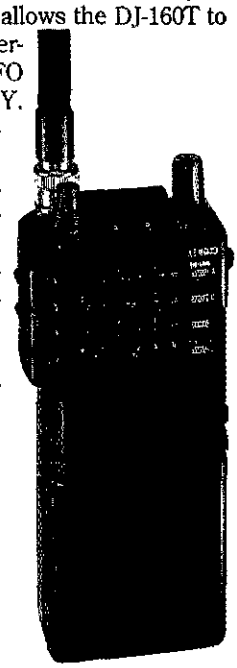


The Alinco DJ-100T is "Magnificent" for its tiny size, but stands up to the competition with power and capability. 10 memory channels store offsets and subtones. Has LCD readout with call channel and reverse at your fingertips. 500 mah battery with direct DC to DC is standard. 3W on standard battery, 6W on optional battery leaves the competition in the dust! DJ-200T for 220 MHz.

DJ-160T&DJ-460T

2M H/T is here! And wow!

"Bells & Whistles" is a tame word to use for the new DJ-160T, newest "Magnificent" one from Alinco. Keyboard entry is just one of four ways to enter a frequency in the extended receiver (137-173.995 Mhz) of the DJ-160T. You can store duplex/simplex pairs in any of 20 Memories, or Call Channel, with offsets, and any of 38 encoding subtones. Choose one of 3 scan modes, "Band" "Program" or "Memory" and one of five step ranges in VFO. Priority mode can be used in VFO, Memory or Call. "Dual Watch" allows the DJ-160T to scan 3 seconds alternately on CALL, VFO or one MEMORY. "Pager" is for group or single person alert. Other features include: Auto "Battery Save", Auto "Power Off", and 2-Memory Autodialer. Get 3-watts on standard 700 mah battery, or increased power from built-in DC to DC, or optional 12V battery. The Alinco DJ-160T, now the "Top Gun" with the competition today! DJ-460T for 70cm.



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shouldn't be hard to identify a GA HAM. I still don't have the number of ARRL members that are in the section but remember that ur club can make some bucks if u enroll or renew your membership thru them. Many who don't belong never will realize how much the League does for the hobby. My hearty congrats to the Georgia Tech Club for 50 years continuous membership in the ARRL as an affiliated club. If u are an ARRL member we have many appts. that ur eligible for. I am vy proud of this Ga section because of the volunteers that keep things going in many areas. This is ur section so won't u help to make it even better. Feb cud be a bad WX month so let's all BE PREPARED. God bless & 73. REMEMBER THE DALTON HAMFEST ON THE 24TH OF FEB. Traffic: KA4HHE 129, WB4DVZ 88, KC4BHX 87, N4UZ 57, WB4WQL 52, W4AET 42, WA4YYQ 29, N4MWR 13, K4JNL 12. (Oct.) WA4LLE 43.

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—BM: Dave, N4GMU. TC: Ed, WØRAO. ACC: Dick, WA4BIH. OOC: John, AB6I. SEC: Rudy, WA4PUP. STM: Colton, KB9LT. ASM: Bill, KB4LB. ASM: Digital Al, K4CY. SGL: John, KC4N. PIO: Petey, WA4POU. The club officers for NOFARS in 1990 are: Billy Williams, N4UF, Pres; Chris Kinzel, KK4QA, VP; Bob Bryner, WD4PFN, Sec; Bob Toerpe, KB4NTI, Tres; and Marla Nassau, N4UTV Activities Mgr. Congratulations to all and good luck to NOFARS for 1990! TARS has selected Rich Hernandez, KC4GKV as Pres; John Shaner, WB4BJG for VP; Jim Giles, K4VRT, Treas; Fred Brough, KB4IAJ, Sec; and Stan Ferguson, N4KGS, Editor. Best wishes to all! As your club selects your officers for 1990, please make sure a copy gets to me and I'll be pleased to announce all names and call signs. Our Section PIA's have been praised by Petey in recent report. W4DTV Bob Watson on the panhandle; Henry Grubbs, K4UTY in Taylor County; Fred Ritter, W4FI in Seminole County; Jim McCormack, KA4IAY in Jackson County; and Ralph Balsam, N4QIK in West Pasco County were all cited for their efforts in getting the word printed in local area newspapers and on the air. If your club has not appointed a PIA, be in touch with WA4PUO in Milton and Petey will see that you get the info. 73, Roy, N4ADI. Traffic: WD4IIO 966, KB9LT 496, N4SS 308, N4JAQ 282, WC4D 250, AA4FG 249, K4UBR 126, N4DY 120, WA4EYU 110, W4UEA 101, KC4FL 100, KI4CQ 77, N4QYS 75, W4KIX 68, NF4O 68, N2AOX 67, N4GMU 63, W1UKR 63, W4MGO 54, N4JHI 36, N4ADI 28, K4UTY 28, W4AT 26, WA8APQ 26, N4OZD 20, WA4PUP 17, W8IM 16, N4UF 13, WA4STZ 12, KI4BI 3.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—STM: K4ZK. SEC: W4SS. TC: KI4T. BM: WD4KBW. PIO: N4PBF. AAC: W4TAH. ACC: K4EUK. SGL: KC4N. PKT MGR: K4CY. The Suncoast Convention was held in November and as usual a pleasure to attend. There were many profitable meetings as well as Traffic Handlers Breakfast which provided an excellent facility and service - it was too bad that so few took advantage of the breakfast. Hope to see you at it next year. Thanks to K4EUK who was always around to provide help and service in the same manner that WA4NBE does for the Melbourne Hamfest - with guys like them it sure makes life easy. KB4XE reports that the Coral Springs Radio Operators served as parade marshalls for the annual Our Town Parade. Those assisting were W4NFJ, WB9DCM, N4CAZ, WD4GCM, KB4XE, WA4AZP, N4NEE and KE4PT. The mayor spoke on the net congratulating and thanking them on their civic interest. The Gator Chapter of the QCWA reports that Pelican Chapter will have a repeater on 145.29-600 soon. The guest speaker at the last meeting was former president W4STX who spoke on his DX-Pedition to the Cayman Islands. W4PCO gave a demonstration of very old telegraph keys. Also reported in the newsletter was that W4BQC had a QSO with W2AA in New England using fast speed cw. He is 93 years old and expects to reach 100. The Martin County ARA Common Emitter reports that discussions are underway as to whether to have a name change. The Florida Keys ARC bulletin stated that KA4TTS, N4KIW, KC4JCU and WB4MJE provided communications for a run/walk on Big Pine Key. The Everglades ARC Beam noted with regret the passing of K2AL. He was first licensed in 1922 and his first rig was spark gap. Newsletters received also included the Palmetto ARC Bug Juice, Manasota Repeater Assoc., South Brevard ARC Spark Southwest Florida Traffic Net and the Englewood ARS. WD4KBW reports that 82 bulletins were received and 102 sent in November by W4DL 41, WA4EIC 33, WT4F 52, K4IEK 20, WD4KBW 28 and WA9VND 10. N4PBF reported that Bob Case of the National Hurricane Center commended the 15 amateur radio operators for their unstinting and selfless assistance to him and his staff during the Hurricane Hugo Emergency. There were 15 operators who worked 115 hours at the NHC. WB4CKY stated that the Hollywood ARC observed its 20th anniversary this month. Anyone sending packet messages to WA4PFK please note that my packet address is now WA4PFK @ W7LUS. 73 de WA4PFK. Traffic: W3CUL 3355, W3VR 1302, WA9VND 507, WA4EIC 503, K4SCL 353, N4KFU 336, WA4PFK 334, KA4FZI 254, K4ZK 205, AA4BN 204, K4EUK 192, AA4HT 187, K4IA 180, KD4GR 165, AB4EA 164, KB6ECH 145, AA4CH 133, W4NFK 132, WA4RUE 128, KB4WBY 122, WB4WYG 119, WT4F 116, KB4KXV 115, K4FQU 103, W4DWN 100, N4MML 89, N4ET 74, KA4NXF 69, WD4KBW 64, W3TLV 63, KC4VK 61, WA4NBE 58, N4ORZ 56, KB4MON 49, K1EGN 44, KF4RL 41, KM4LP 40, AB4BC 39, K3KT 39, KB9BDL 36, WB4GCK 32, KB4AXG 28, K2OYG 24, K4JI 23, K4GMX 23, KA4YHS 21, WB8HYC 20, N4TVV 19, N4PKN 17, W4NSY 16, KA8GYF 16, KA4SIH 15, N4XGC 12, K4GVI 12, AA4WJ 11, N4OIA 11, N4ILN 10, W4UIO 9, NØABC 9, K9EHP 8, N4VLH 8, N4RHJ 8, KC4GHT 8, N4MFE 7, WA4PIL 6, W4MFD 5, KA4GDU 5, W1KAM 4, W3IJR 4, KB4HAY 3, N4PSV 2, AA4IF 1, KJ4VU 1.

PUERTO RICO: SM, Alberto L. Valldejuli, WP4CSG—Things are starting to get back to normal. However, it should be noted that we need to organize ourselves as soon as possible. Volunteers are needed to work during emergency situations. We had a hard time during Hugo looking for hams to assist in emergency communications for CD and other agencies. Please contact Dr. Gonzalez, our SEC (781-7037) or PRARL or me (766-5347/762-1715) to volunteer for ARES. Dr. Gonzalez is organizing ARES and we hope that we'll be fairly well off by next year's hurricane season. WE NEED YOU! PRARL will hold its first working convention in January 1990, and will elect its first group of officers. So far, the organizing group has excelled themselves in many ways. Congratulations. As an Affiliated Club, the PRARL is now enjoying all the benefits offered by the ARRL. Other groups should follow suit and take advantage of all the fine benefits of being an affiliated club. PRARL's address: PO Box 1917, Hato Rey, PR 00919. Again, our most heartfelt thanks to all of you who assisted during Hugo. Traffic: PRN Sessions 31; QND-190; QTC-7; QNI-140. Individual QNI'S: KP4DJ (NM) 31, NP4XM 16, WP4FMH 23, WP4FGM 9, KP4GC 7, KP4GG 4, WP4IWW 5, WP4HNF 4, KP4TIN 3, WP4IIV 5, K5HK/MM 5, VP2VI 30, KP4AR 1, PJ/PA3ENW 1, Great job, Willie (KP4DJ).

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—ASM: K7OMR. STM: W7EP. NMs: K7POF, K6LL. Verde Valley ARA had two interesting meetings in Oct. and Nov. Craig, N7GLT, representing Coconino ARC gave slide presentation of his Colo. River ride on Project RAFT with the students from USSR. NN7A, W7YS, and NN7D made presentation in Nov. on their DX-pedition to USSR and R9ZF operation. (Tnx, WI6S). Frank, N7EBT sent in FB reportings on VVARA's recent participation in SET and National Weather Service drill with Yavapai Co. Emerg. Services. The QCWA/SOWP luncheon honoring Barry Goldwater, K7UGA, was attended by over 110 members and guests. Unfortunately Barry had a hip replacement operation earlier in the week and could not be there. Director Fried Heyn, WA6WZO, presented an ARRL 60 year plaque to Bill Jackson, W6HDP, for delivery to Barry at a later date. For the nostalgia buffs who may visit the Phoenix area, there is a very interesting display of early electric and wireless equipment at Ed Sharpe's "Southwest Museum of Electricity and Communications." It is located at 2224 West Desert Cove, 205 Phoenix 85029 which is off 23rd Ave. two blocks east of the Holiday Inn at the intersection of the Freeway and Peroia Ave. Club Awards manager Ray Van Skiver, W7LQM will validate your QSL cards for ARRL VHS and WAS awards. Call 972-1322 or write 10411 Kelso Dr., Sun City, AZ 85351. Any ARRL member may use this service. Tnx, West Valley "Short Skip." The ARCA Spring Hamfest will not be held at the South Mtn Park this year. Instead, this big event, sponsored by the Scottsdale ARC, will be held at the Scottsdale Community College on Saturday, March 31 and will include speakers, working displays, ARRL forum and other activities. See you there! Bill, W9WFV's FB report on the Hurricane Hugo communications effort was forwarded to HQ for inclusion in a comprehensive article in QST. K7FDN, Holbrook, reports their club is looking for a new meeting place, and they plan a live demonstration of ham radio in the future for a NASA Space Shuttle mission for the local high school students. FB Tucson Rptr Assoc. New officers for 1990 are: KD6XH, Pres: KF7XD, VP: K7KYW, Sec'y; and K7OMR. Treas. Keep those cards and letter coming in!

NET	Abbrev	QNI	Traffic	SESS	Liaisons
Southwest Net					
Net	SWN	105	81	30	TWN
Arizona Cactus NO REPORT					
Net (VHF)					
Arizona Trf & ATEN Emerg Net	951	133	30	TWN	

Traffic: W7EP 138, WE7G 68, K7RLL 60, W7OIF 59, W7LVB 52, K7POF 28, N7ETP 17, W7KXE 15.

LOS ANGELES: SM, Phineas J. Icenbice, Jr. W6BF—WW7K Dave Morse is the LA Section Official Observer Coolnator, OOC and his phone is (818) 893-2817. His Granada Hills address is OK in the Call Book—W6AD, Ozzie stopped by the shack with his friend, W1YG, Parker is a collector of pre-WWII Amateur Radio equipment. I directed him to W6SPQ, Ralph and I think that they did some trading.—W6EL, Shel has 12 suggestions for Packet Cluster operators. A copy is available from the So. Cal. DX Packet Cluster System W6POS (10-89). KE6XI, Ken Mummery reports RFI from a "Walk & Don't Walk sign using a 7 KV, 10 kHz power supply. (Built by Indicator Conrol Corp., 3000 E. Las Hermanas St., Rancho Dominguez, CA 90221 (213) 603-8825). This interference can be found in the BC band and in many of the Amateur Bamds. The VISALIA DX Convention is scheduled for April 6-7-8, 1990. Most of the near-by hotels and motels are full so you better get busy and call your friends. South California DX Club TEX Myers, N6HAV, is predicting one of the greatest conventions ever this April. TL8DN, Margie Morris (also N6MMZ) attended the last Los Angeles Area Council of Amateur Radio Clubs, Inc. Margie has been serving for two and a half years as a missionary in Banqui, the capital of the Central African Republic. She has been on the 14,160 kHz ET DX Net many times in the past two years. Her father is W6YAR. John an active member of the Downey ARC. Traffic is terrific in LA WB6SAN (47), AJ6F 127, N6AHT 37, KC6BCC 21, KD6SK 12, KI6DO KB6JVA 16, N7NYK 76, KB6SPG 11, N6TFS 46, KD6ZD 13. 73 de W6BF, Phineas, HAPPY NEW YEAR & DX.

SAN DIEGO: SM, Arthur R. Smith, W6INI—SEC: W6INI. STM: N6GW. PIO: N6PKY. TC: N6JZE. QST - URGENT - Those of us who are living in "earthquake country" will be an extremely valuable communications asset when "The Big One" occurs on the Rose Canyon Fault. However, if you are not in tune with the current disaster plans for which ARES has responsibility, your Carevalue will be nil. San Diego County disaster plans involve ARES in the following Annexes: Annex D - Medical Multi-Casualty; Annex E - Public Health; Annex G - Care and Shelter; Annex M - Mental Health. Support of these Annexes involves providing preassigned operators to the Red Cross, designated shelters, hospitals, casualty collection points, first aid stations, and health centers throughout San Diego County. Plus requirements for internal communications within each of the 18 incorporated cities with three eight- hour shifts for a prolonged period of time add up to 500-600 operators. Familiarity with plans and procedures is vital. The point is we need you now so that you can gain experience and ECs can become acquainted with your capabilities. JOIN ARES. Call W6INI, 273-1120 for info.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA— My apologies to those who participated in 'quake traffic and have not been recognized in this column. Much as I'd like to pass the blame, the truth is I lost the paperwork. In any case, Many thanks to those of you who provided this valuable service, and also to those who stood by to go to the Bay Area if needed. Santa Barbara DXer Joan Ash, WD6BNH, travelled to JA-land last September to take in the big Sapporo Ham Fair and visit with some on the air friends. Joan was greeted at the Chitose (Sapporo) airport by a big Japanese flag and 'Hello Joan-san'

X SERIES

BASE/REPEATER ANTENNAS

X-500MA Dual-Band: 2m 3-5/8λ elements, 70cm 8-5/8λ elements ●Power rating: 200W ●Weight: 5lbs ●Length: 205in. ●Wind rating: 90MPH ●Connector: UHF

X-500A Dual-Band: 2m 3-5/8λ elements, 70cm 8-5/8λ elements ●Power rating: 200W ●Weight: 5lbs. ●Length: 205in. ●Wind rating: 90MPH. ●Connector: N

X-300A Dual-Band: 2m 2-5/8λ elements, 70cm 5-5/8λ elements ●Power rating: 200W ●Weight: 3.3lbs. ●Length: 114in. ●Wind rating: 112.5MPH. ●Connector: UHF

X-200A Dual-Band: 2m 2-5/8λ elements, 70cm 5-5/8λ elements ●Power rating: 200W ●Weight: 4lbs. ●Length: 88in. ●Wind rating: 90MPH. ●Connector: UHF

X-50A Dual-Band: 2m 3/4λ, 70cm 3-5/8λ elements ●Power rating: 200W ●Weight: 3lbs. ●Length: 67in. ●Wind rating: 135MPH. ●Connector: UHF

DIAMOND ANTENNA

F SERIES

F-22A 2m 2-7/8λ elements ●Power rating: 200W ●Weight: 5lbs. ●Length: 126in. ●Wind rating: 90MPH. ●Connector: UHF

F-23A 2m 3-5/8λ elements ●Power rating: 200W ●Weight: 8lbs. ●Length: 176in. ●Wind rating: 90MPH. ●Connector: UHF

NR SERIES

DUAL-BAND MOBILE ANTENNAS

NR-770HA 2m 1/2λ, 70cm 2-5/8λ elements ●Power rating: 200W ●Length: 59in.

NR-770RA 2m 1/2λ, 70cm 2-5/8λ elements ●Power rating: 200W ●Length: 59in.

NR-790A 2m 3/4λ, 70cm 3-5/8λ elements ●Power rating: 200W ●Length: 67in.

NR-770SA 2m 1/4λ, 70cm 1/2λ elements ●Power rating: 100W ●Length: 43in.

MX SERIES DUPLEXERS AND TRIPLEXERS



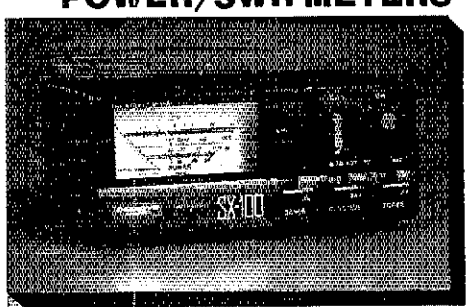
MX-72
Duplexer with UHF connectors for HF, 2m and 70cm bands
●Coaxial cable: RG58AU 35cm

MX-72H
Duplexer with UHF connectors for HF, 2m and 70cm bands
●Coaxial cable: 5D2VS 35cm

MX-72N
Duplexer with UHF connectors and N connector for HF, 2m and 70cm bands
●Coaxial cable: 5D2VS 35cm

MX-72D
Direct connection type Duplexer with UHF connectors for HF, 2m and 70cm bands
●Coaxial cable: None

SX SERIES WIDEBAND POWER/SWR METERS

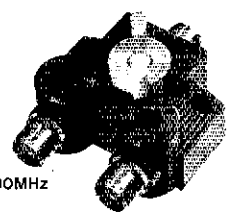


●Forward & Reflected power & SWR
●Selectable RMS or PEP switch
●3Power ranges:
5W, 20W, 200W
30W, 300W, 3KW (SX-100only)
●Power meas. accuracy: 5% (typ.)
●Insertion loss: 0.2dB Max.
●Wideband performance

FIVE MODELS TO CHOOSE FROM

Model	Frequency
SX-100	1.8-60MHz
SX-200	1.8-200MHz
SX-400	140-525MHz
SX-600	Dual-Band 1.8-160 & 140-525MHz
SX-1000	4-Band 1.8-160, 430-450, 800-930, 1240-1300MHz

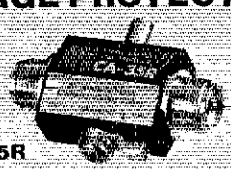
CX SERIES COAXIAL SWITCHES



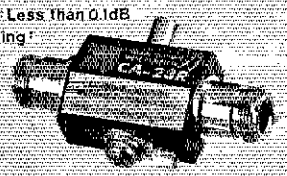
CX-210A
Wideband coaxial switch with UHF connectors
●Frequency range: DC-1000MHz
●Impedance: 50ohms
●Max. power rating: 1.5KW

CX-210N
Wideband coaxial switch with N connectors
●Frequency range: DC-3000MHz
●Impedance: 50ohms
●Max. power rating: 1.5KW

SURGE PROTECTORS

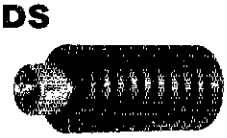


CA-35R
Surge protector with UHF connectors
●Frequency range: DC-500MHz
●Impedance: 50ohms
●Insertion loss: Less than 0.1dB
●Max. power rating: 400W (PEP)



CA-23R
Surge protector with N connectors
●Frequency range: DC-1500MHz
●Impedance: 50ohms
●Insertion loss: Less than 0.1dB
●Max. power rating: 200W (PEP)

DUMMY LOADS



DL-30A
●Frequency range: DC-500MHz
●Power rating: 15W (average), 100W (peak)
●Impedance: 50ohms
●Input connector: UHF male



DL-30N
●Frequency range: DC-500MHz
●Power rating: 15W (average), 100W (peak)
●Impedance: 50ohms
●Input connector: N male

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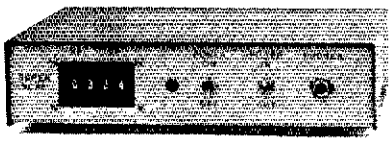

SuperSCAF is a versatile switched-capacitor filter for eliminating interference and noise on CW, SSB, RTTY, AMTOR, PACKET and other narrow band modes. Extremely steep filter skirts remove adjacent clutter and noise to enhance weak signal reception and greatly increase intelligibility and listening comfort.

SuperSCAF incorporates a switched-capacitor band-pass filter, an economical implementation of digital filter technology. Extreme sharpness, stability, accuracy and complete freedom from ringing characterize this design approach. Bandwidth is adjustable from a minimum of 30 Hz to a maximum of 3700 Hz, allowing optimum passband tailoring under widely varying conditions. Skirt slope is 150 dB per octave (about twice as steep as a good crystal filter), and stopband attenuation is at least 51 dB. SuperSCAF is connected via the receiver's speaker or headphone output and provides 1.5 Watts to drive a 3.2 to 8 Ohm speaker. SuperSCAF operates from 105 to 130 VAC.

SuperSCAF is available in kit form for $139.95 or assembled for $179.95. Please include $7.00 for shipping and handling. Order from AFtronics, Inc., PO Box 785, Longwood, FL 32752-0785. Florida resident should include state sales tax.

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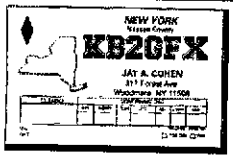

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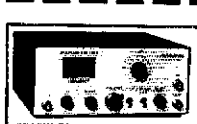

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banners. She received a royal welcome from hams wherever she went, and the reciprocal 7J8AAE call allowed her to make many new friends. A "VIP" at the Ham Fair, Joan participated in a promotion for the Fair, the opening ceremonies, and had her own booth. About 400 JA hams stopped by the booth to visit and sign the 6 by 9 foot Japanese flag. In all, we couldn't have had a better ambassador for "Peace and Friendship through Amateur Radio." Ray Benny, N6VR, reports that he now has a node of the Southern California DX Packet Cluster operating on 144.915 in Oxnard. Future plans include a tie in to WA6IET in Nipomo and a possible link to the Northern Cal cluster during major contests. For more information contact your local DX maven, or give Ray a call. The only test results to reach us this time are from the Estero ARC (ARRL) in Los Osos. To Novice: Rebecca T. True, Charles W. Nelson. To Tech: KC6BOJ, Randall L. True (unl.), Robert C. Heitzman (unl), To General: Christopher B. Johnson (from Tech., call not given). Examiners for the Estero VE team were not listed but congrats to those who upgraded and thanks to the examiners. That's all for this month. 73 de W2KVA/6

WEST GULF DIVISION

NORTH TEXAS: SM, Dan Dansby, W5URI—ASM's: W5GPO, K5MXQ, KG5SC, W5IWE, KF5BL. ACC: KA1CWM. STM: W5VMP. SEC: N6AJP. TC: K5SXK. OOC: WA5YKO. Be sure to send a Valentine to your one and only so you will be able to talk to us the rest of the year. Set aside 8-10 Jun 90 for the Arlington Hamcom. This one will be dedicated to Youth, "Our Untapped Resource." Planning is almost complete and Production is well underway to make this the best ever Hamcom. And don't forget No. TX Section Amateur of the Year Award will be presented at Hamcom '90. Youth programs are popping up all over the nation. A pilot program is underway at Rosemont Middle Sch. in Ft W. ISD You will see results at Hamcom, along with Boy Girl Scout Troops will be there. What has your club done for the kids recently? SKYWARN Schools are underway for the new "storm" season. Mike Mach, NWS in Ft W is the new instr. and will kick off the new year with a two Sat class in Ft W (Jan 27 & Feb 3). Room for 300 Hams at Ft W City Council Chambers, including tour of NWS Wx Facilities. Don's list of clubs in No TX is increasing by 2 or 3 a month, but we don't have all of them yet. If you know of any we might have missed or overlooked, drop Don a note. If they are not getting the Quarterly newsletter then we don't know they are out there. Help get your school "Dove Activated." For more info contact KO5I or me. Traffic: W5TOO 2740, K5UPN 1044, KF5BL 222, W9OYL 144, N5KCL 114, KD5RC 131, N5PGZ 91, WB5CPY 75, WA5MWD 68, N5NZH 56, KC5NG 41, WA5EZT 34, K5ZSB 29, AC5Z 27, KB5BNU 22, KB5ADE 14, W5VMP 7, N5PCI 7..

OKLAHOMA: SM, Joe Lynch, N6CL— This month it saddens me to report the loss of Ralph Rea, W5AA. Ralph became a Silent Key on December 6, after a long illness. He will be missed by his many friends in QCWA, and many hams throughout the state. Ralph related to your SM that one of his proudest activities as a ham was operating the special call-sign, W200AA, during the bicentennial celebration in 1988. It gave him an opportunity to be proud to be a ham and an American. Your SM will always remember his very strong moral character. At many of the QCWA Chapter 63 meetings he quite willingly delivered the invocation. He was an amateur for 60 years, having held the same call all of the time. He never complained about his fellow amateur's activities and he was always there to give a positive word. Several years ago the callbook rearranged the way they listed callsigns, thereby moving Ralph out of the number one position in the W5 call area. What a shame, for Ralph, you will always be number one in our book. In other news: The new EC for Garfield County is Dick Striker, N5HEL. The new EC for Oklahoma County is Jim Jones, K5PER. The New EC for Pottawatomie County is Jay Tingler, WZ5B. Pottawatomie and Seminole Counties have been brought into the Central Oklahoma Emergency Coordination District. Congratulations to Glen Bishop, WN5J, the new manager of the new Okc ham store. The monthly swap meets at String of Pearls Park in Okc should start again this month. Contact Ray Humphrey, WN5T for further info. That is not all the news but more than all the space for this month. 73, Joe, N6CL. Traffic: WA5EQW 688, N5IKN 156, K5CXP 87, WA5OUV 71, KF5RD 50, N5FEM 32, WA5ZOO 32, KV5X 27, WA5OGC 26, W5VOR 20, NQ5Y 8.

SOUTH TEXAS: SM, Arthur R. Ross, W5KR— STM: WD5GKH. SEC: K5DG. OOC: K5SBU. ACC: WB5YDD. BM: WA5WKY. PIA: WA5UZB. TC: NZ5U. SGL: K5KJN. ASM: all of above plus N5TC. DRN5 NM WB5YDD rprts 638 msgs in 60 Nov sessions: STX represented 98% by W5KLV, W5CTZ, WB5HZQ, KE5ZV, N5NAV, WV5X, KD5KQ, N5ILI, N5DFO, WB5YDD. EC KG5LN rprts Huntsville ARS VE team exam session had good results: W5IKB up-graded to Extra, N5OOJ and KB5IUJ went to Advanced, N5OPL went to General; nice going, gang! OBS W5KLV rprts 3 November bulletins given 30 readings on 7 nets. Central Texas Traffic NM N5NAV rprts 223 msgs in 62 Nov sessions; NTS liaison every session for 8 or more nets, including NTS. San Benito ARC Pres WA2VJL rprts club has established scholarship fund for one graduating High School Senior, starting with class of '90; award made possible by club members supporters and Coastal Banc (sic) Savings; Novice/Tech classes scheduled in Jan. CAND NM K5UPN rprts 852 msgs in 30 Nov sessions; DRN5 represented 100% by STX stns KD5KQ, KE5ZV, W5KLV, KD5CB, WB5YDD, N5NAV, N5ILI, K5UPN. AARC/OVER, bulletin of Austin ARC, rprts KB5KAX, KB5HZO, KB5CZN, KB5HTP and one unlicensed went to Technician; N5PLF went to General; 3 unlicensed, including 9-year-old daughter of K5GP, passed Novice exam; that's GREAT!! PIA NZ5J rprts Seguin Veteran's Day CROP Walk helped by N5KEI, K5JTA, NZ5J, W5MTO, WR5X, WD5DLN, K5IG, WA5YDN, W5FFG, KB5FUH and NCS W5TPI; N5OEO upgraded to Advanced; Seguin Lions 15, 20, and 40-mile bike-a-thon helped by K5TJA, WR5X, WD5DLN, WD5IQR, NZ5J, N5KT, N5OEO. KB5KMB, W5MTO, N5KEI, W5FFG, K5KXW and NC8 KB5FUH; AA5NY is new call of ex-WA5WZX. 7290 Traffic Net Secy NF5T rprts 287 msgs in 47 Nov sessions: 3313 ck-ins; NM KB5DVF. Beaumont ARC News (BARN) rprts latest club project is building "Handi-Finder" kits; whole club will soon be well-equipped fox-hunters. Texas Tfc NM K5UPN rprts 184 msgs in 30 Nov sessions. Univ of Texas ARC donated copy of ARRL "New World" to local video store for free rental. PIA N5FIX rprts NW ARS (NARS), Houston, 1990 officers: Pres KB5AEI, VP N5KPI, Secy N5MJB, Treas KB5BCL; NARS active in Houston HamCom with KF5OO, N5HF, W5BKK, KA5AKG and KF5ZL quite busy; N5LYG upgraded to General, one went to Technician. PIA KG5HQ rprts ECHO Society recorded 22 emergency phone patches in Sept, 28 in Oct on WB5MUI rptr; VE test sessions rprt KB5KV, N5POL, N5NBM. KG5UJ upgraded to Extra; N5MNK, N5NXS, N5HMS, N5MWD went to Advanced; N5PJH, KA0AYG, N5AYB, N5NVW, KB5KER, N5NTN, KB5ISX went to General; KB5KVT, KB5KDY, 6 unlicensed to Technician, one unlicensed to Novice; WOW!! PIA KA5EEQ, Brenham ARC, rprts club members KA5BLB, KA5EEQ, W5HI, KA5KPT, EC WB5FRQ gave multiple showings of ARRL "New World" at public library; efforts well rcvd; several invited BSA units attended; complete set of ARRL publications donated to library; full story in Brenham newspaper; "pop" SET exercise conducted with KA5KPT, KF5SP, N5GCU, KA5EEQ, KA5KCP, WB5PCO, WB5WEF, W5AUM, WB5MTA, KB5BBG, N5NMX. Traffic: WB5J 297, N5NAV 270, N5ILI 260, WB5YDD 239, WD5GKH 234, W5CTZ 98, NZ5J 57, W5BGE 22, W5KLV 16, N5KAO 11.

WEST TEXAS: SM, Milly Wise, W5OVH—The shorted circuit bulletin published by Jerome Doerrie, K5IS, announced that Larry Spence of Perryton recently passed the Novice test. Radio classes for the Perryton Area started Monday Jan 8 at 7 PM. The Tumbleweed Net will be on 146.82 MHz at 9 PM on Tuesdays. K5WPH the Sun City Club of El Paso recently elected new officers they are Jeanie, KA5WAC; Sec Albert, KB5GZZ; V-Pres Lonnie, KA5OSX; Treas Jim, N5FKW. The local oscillator of the Panhandle ARC told of activating the North Pole Net in an attempt to brighten the lives of unfortunate children in the Northwest Hospital and the High Plain Baptist Hosp. by letting them talk to Santa Claus via two meter satellite downlink. From the El Paso W5ES Bulletin at recent VE exams by ARRL VE Team Christos Matragoudakis upgraded to General; Robert Barker, K3TCN passed the Extra; Orly Unruh, N5NBO upgraded to advance; Fernando Briones, N5OVM got his general and Thomas Flynn upgraded to Tech—the beautiful sun carnival parade of El Paso on Thanksgiving day had communication help from members of K5WPH, W5ES, WTRA QCWA and many operators who were not members of any club. 33 hams were out helping. From the West Texas ARC bulletin, congrats to Mark Hilton, KB5FYV who qualified for DXCC with 117 countries confirmed. Mark did this within 367 days of getting his tech license. West Texas ARC officers are president Bob, N5KUC; Vice President Les N5KOA; Sec/Treas G.B. NG5R; Dir. John N5ETX. Dir D.H., WA5IBE. Dir. Jim, WU5N; and relay editor Otis, N5LEV. 73, Milly, W5OVH. Traffic: AE5I 247, WB5OXE 67, K5KK (packet) 24.

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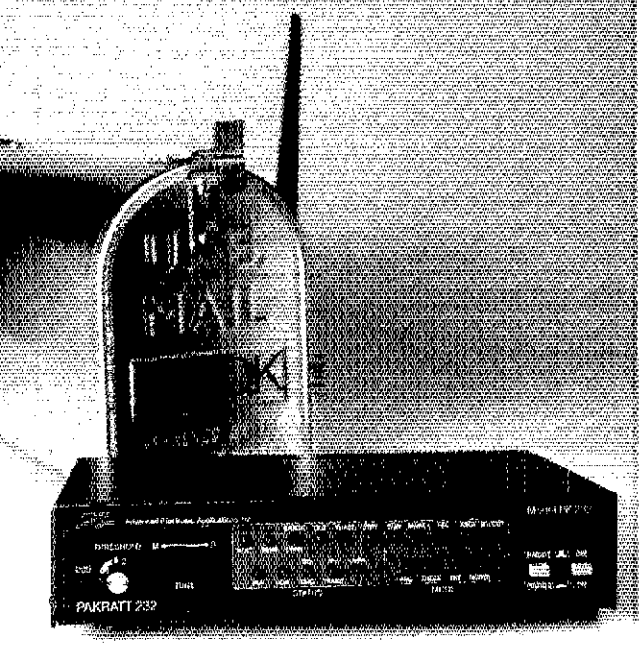

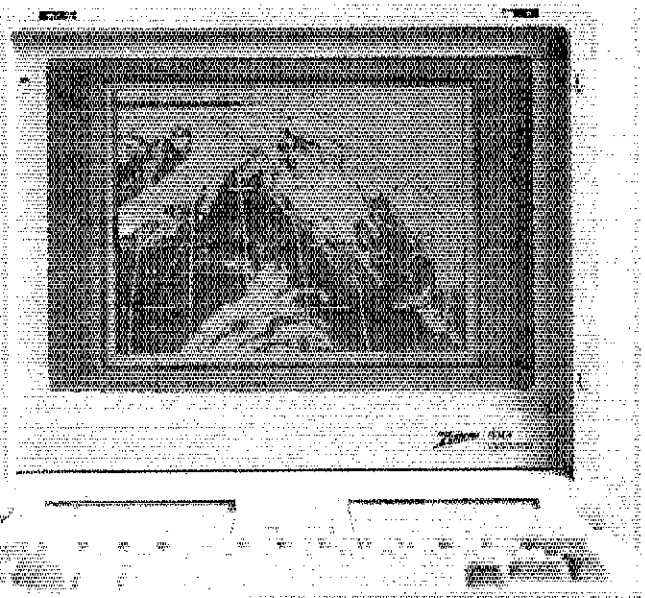

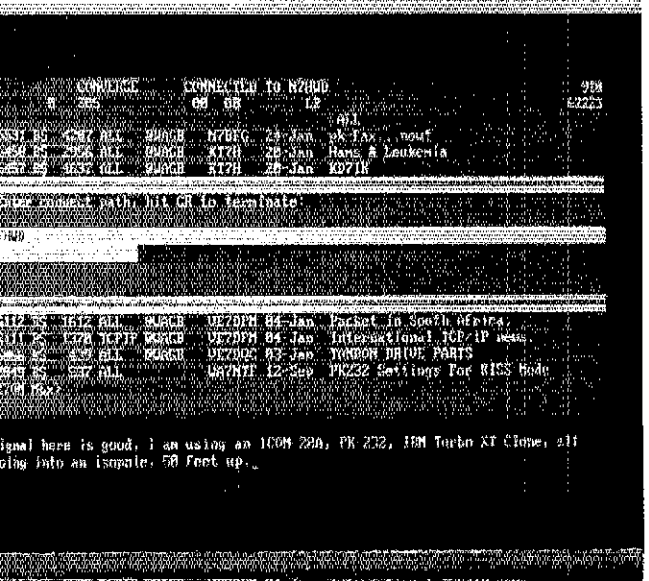

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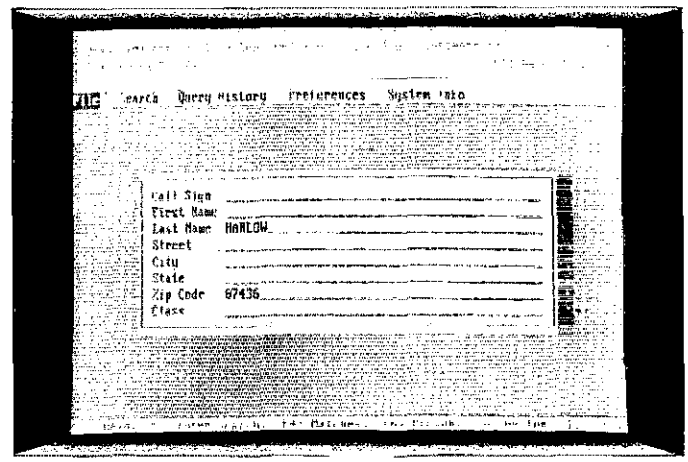

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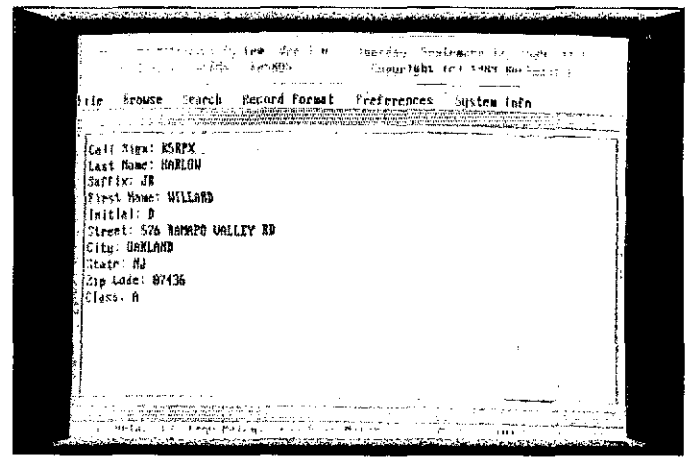

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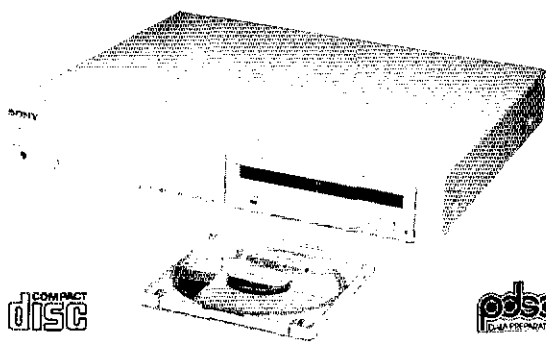

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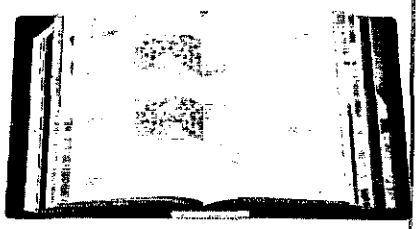

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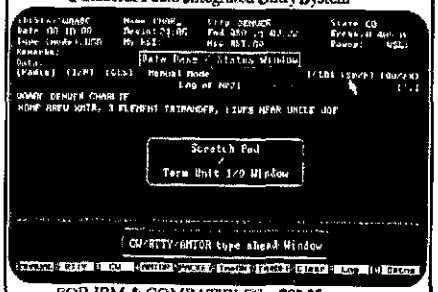

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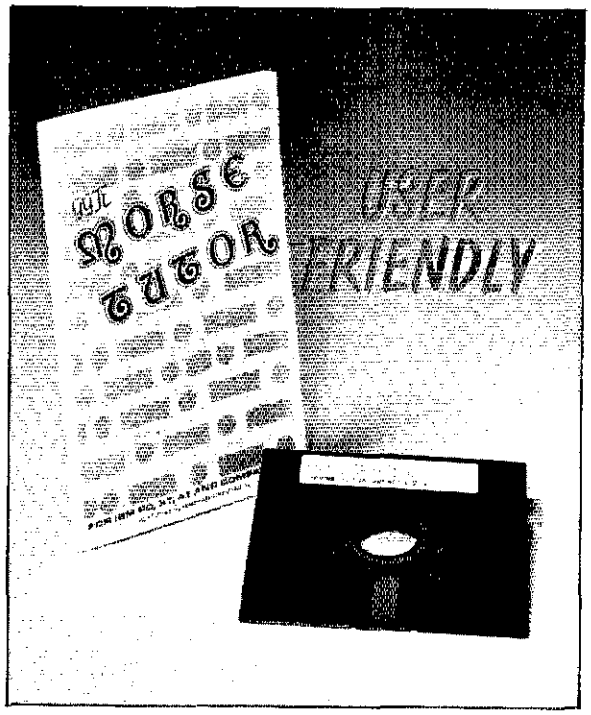

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Here's a fun way to learn Morse Code and practice for the exams. It's also a great way to keep your code skills sharp! Morse Tutor teaches all code characters in 11 lessons, using a "flash card" technique for each character which consists of letters, numbers, punctuation marks and special characters required on the code exam. You can set up each lesson to teach just the characters in that lesson, a random character drill using only the same characters just introduced or a random-word drill using all of the characters taught through that lesson. Characters can be displayed as they are sent or at the end of the lesson.

The final lesson is a random-QSO generator based on a huge pool of information that is contained on the disk. Two stations make a contact with several exchanges of information during each QSO—just like the real thing. The contacts are similar to those used on code exams. The names and callsigns of the stations match throughout the contact, and you can interrupt the lesson by hitting any key. You can start where you left off or quit any time you want.

Morse Tutor is easy to calibrate for different computer clock speeds. You select code speeds and character spacing separately, both in WPM so you can copy regular code or use the Farnsworth method. The program remembers your choice for these variables as well as lesson duration, tone frequency and display mode.

Morse Tutor is user friendly, and has easy-to-understand menu-driven functions. Excellent error trapping and accuracy in the code speed being sent make this software even more attractive. Pickup a copy of Morse Tutor, and in no time you'll be copying the code along with the experts.

Morse Tutor is available at many dealers or directly from ARRL HQ. The Price is $20.00 plus $2.50 for postage and handling ($3.50 for UPS).

THE AMERICAN RADIO RELAY LEAGUE, INC
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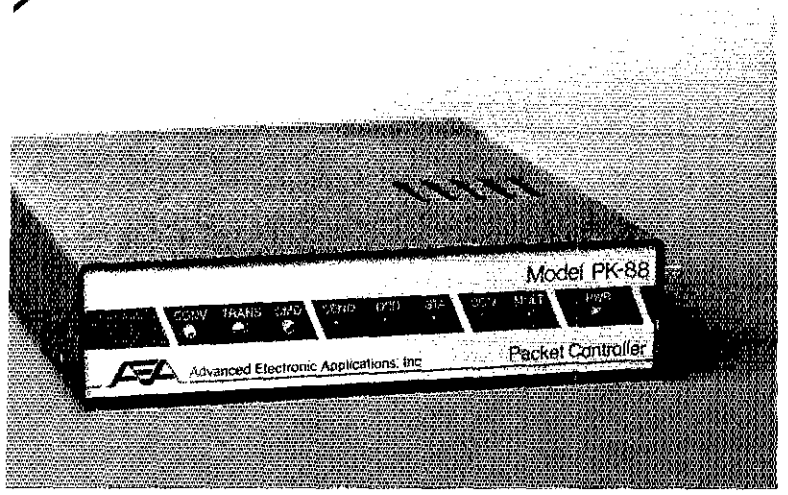
AEA's PK-88™ Packet Controller



Unique operating features with a proven hardware and software design make AEA's PK-88 your best choice in packet radio - now with MailDrop, an 8KBytes efficient personal Mailbox with selectable third-party traffic. The MailDrop uses a subset of the well-known WØRLI/WA7MBL packet BBS commands. When your PK-88 MailDrop is active, other stations can connect to your PK-88, leave messages for you or read messages from you. You can also store a single message or up to 15 separately numbered messages. Your MailDrop also accepts inbound mail forwarding from your local WØRLI/WA7MBL auto-forwarding packet BBSs.

The PK-88's internal KISS Mode is your direct interface to KA9Q's "NET" TCP/IP protocol suite - a single KISS command presets all packet parameters for TCP/IP operation. AEA's unique Host Mode provides the type of complete interface protocol preferred by many professional programmers for efficient control of the PK-88 by external programs and special applications. Your PK-88 also accepts special "NET/ROM" EPROMs provided by Software 2000, Inc., for Level Three node operation and networking.

In addition to all the features of a "standard" TNC, the PK-88 offers features not found in any other TNC:

- WHYNOT command - Shows reasons why some received packets are not displayed.
- AUDELAY command - Reduces spurious emissions in slow-switching radios.
- "Packet Dump Suppression" - Prevents dumping unsent packets on the radio channel when the link fails.
- Prioritized Acknowledgement (ACK) protocol improves performance on busy packet channels.
- CUSTOM command - Allows limited PK-88 customization for non-standard applications.
- Enhanced MBX command - Permits display of the data in I- and UI-frames, without packet headers and without retries and repeats.
- Enhanced MPROTO command - Suppresses display of non-ASCII packets from Level Three switches and network nodes.
- Unique MFILTER value $80 - Suppresses all graphics and control characters except TAB, CR and LF.
- Unique DFROM command - Permits selective digipeating ("Accept" or "Reject" digipeater operation by call signs).

Specifications:

- Processor: Zilog Z80. RAM: Battery backed, 32K Bytes. ROM: 32K Bytes
- Hardware HDLC: Zilog 8530 SCC

Modem:

- Modulator/Demodulator: AMD 7910 "World Chip"(tm), with differential AM detection and phase-continuous sinewave AFSK generator
- Modulator Output Level: Adjustable, 5 to 300 millivolts RMS
- Input Sensitivity: 5 millivolts RMS
- Input Range: 5 to 770 millivolts RMS
- External Modem Connector for use with external modem
- Hardware Watchdog Timer: One-minute time-out

Rear Panel Input/Output Connections:

- Radio Interface: Locking eight-pin; Receive Audio, Transmit Audio, PTT, Auxiliary Squelch, Ground
- Audio Input/Output: 3.5mm mini-plug
- External Modem: Five pins on DB-25; Transmit Data, Receive Data, Data Carrier Detect, Clock, Ground
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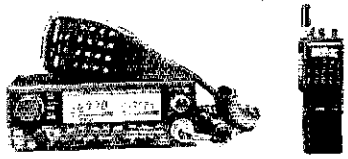

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TH75A, TH215A, TH25AT

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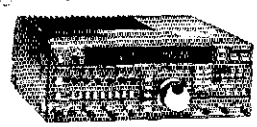

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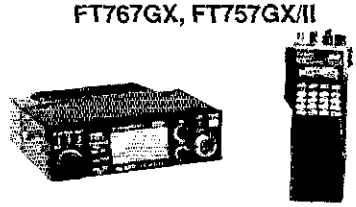

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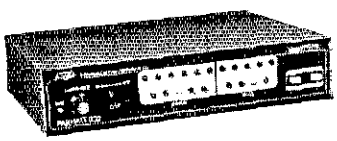

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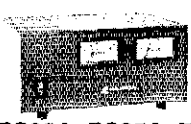

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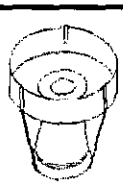

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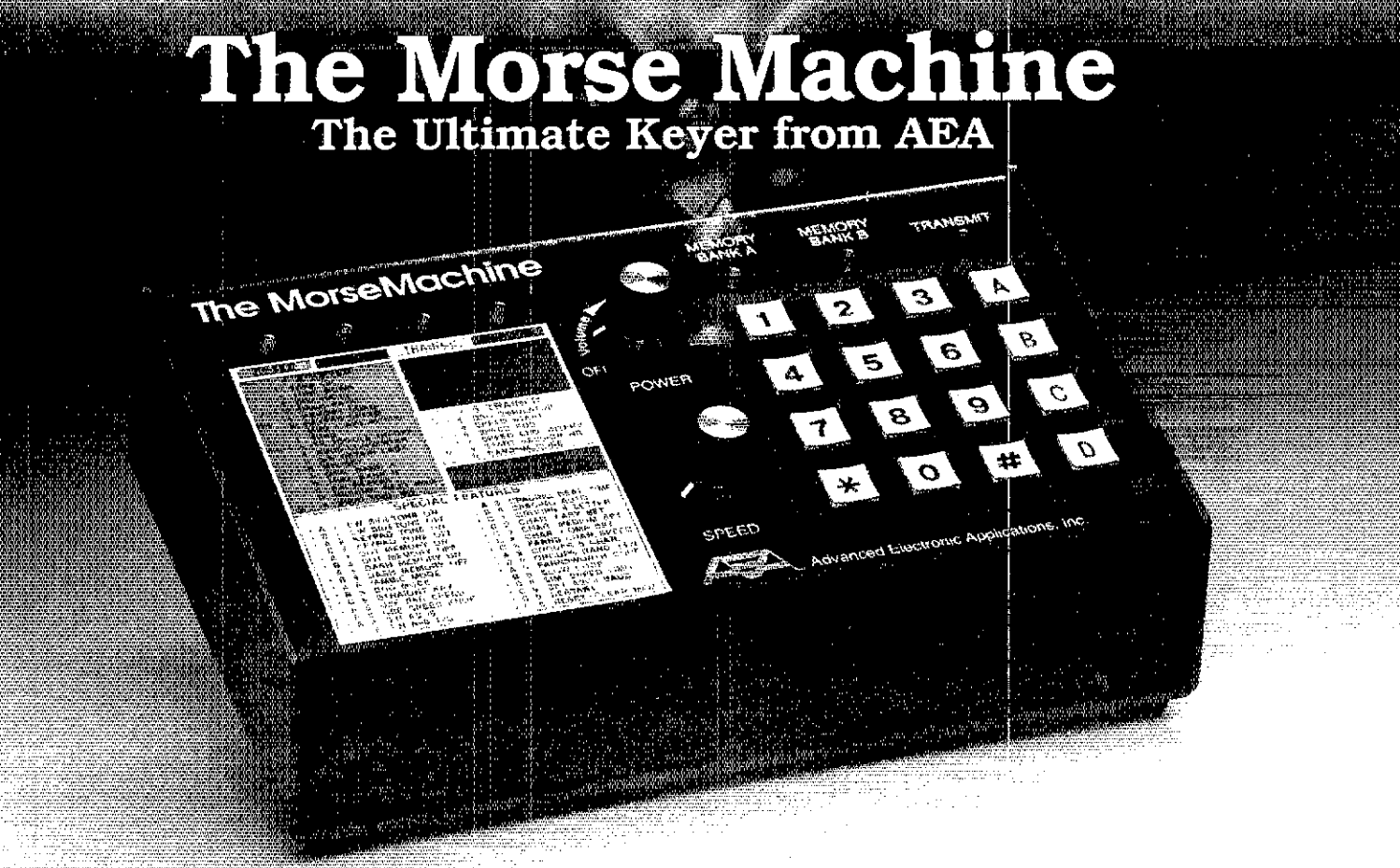

The Morse Machine has all the features you've been asking for in a high performance keyer like 2-99 WPM speed selection and over 8,000 characters of memory that can be stored in 20 memories. The 20 memories are soft partitioned so that your stored messages may be as short or long as you like. Memory can be expanded to hold up to 36,000 characters. Of course, all memory is backed up by an internal lithium battery so that once a message is loaded, it will stay there until you write over it.

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- A random word generator that randomly generates 4-letter words for a more realistic practice session.
- Dr. QSO (tm) QSO simulator based on our program for the Commodore 64 computer. You can call other stations, answer a CQ, or just sit back and listen to realistic QSOs very much like those you would hear on-the-air.

The Morse Machine is a full featured keyer for the serious contester, with automatic serial number insertion and incrementing in any memory message. You can use the front panel knob to adjust your sending speed or enter a precise speed with the keypad, toggling between the two at any time. Exchanges can be speeded up by having parts of your message sent at a higher speed. You can also add remote switches for 4 of the memories so that you can instantly send your responses or call CQ.

A computer can be interfaced to The Morse Machine through its RS- 232 compatible I/O. Any front panel function may be programmed by the computer. This makes loading memories as simple as typing them in from your keyboard. The Morse Machine can display your random code, or Dr. QSO practice sessions on the computer screen.

The Morse Machine can be programmed to be an automatic beacon. This can be used to automatically repeat a Morse (or RS- 232 ASCII) message at a programmed interval of 1 to 999 seconds.

See your AEA dealer today for a demonstration of The Morse Machine or contact:

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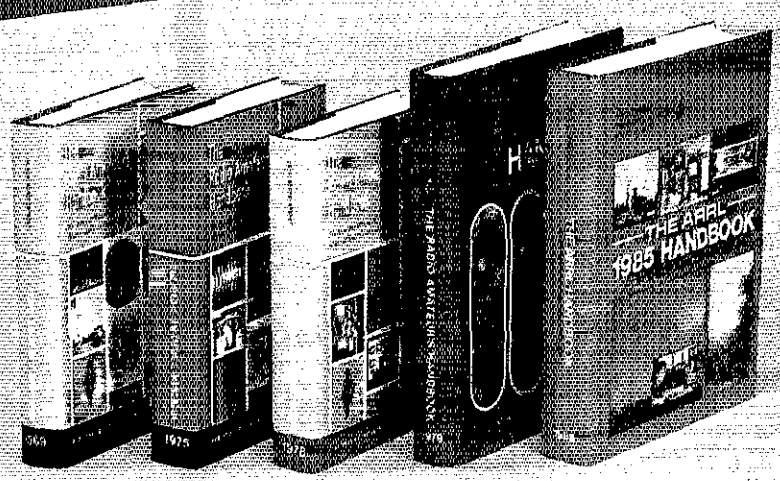

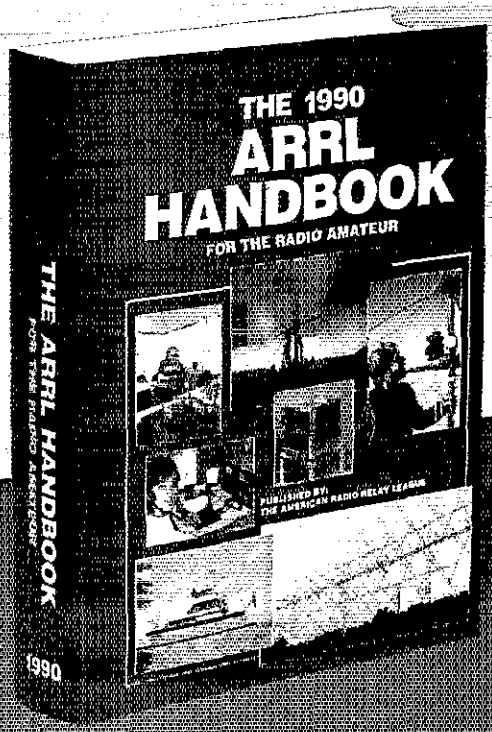

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If you bought one of the **Handbooks** pictured above, you're not alone. These represent over 485,000 of the 5.8 million copies of the **Handbook** purchased since 1926! ARRL's premier publication is successful because it is updated every year. The 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!**

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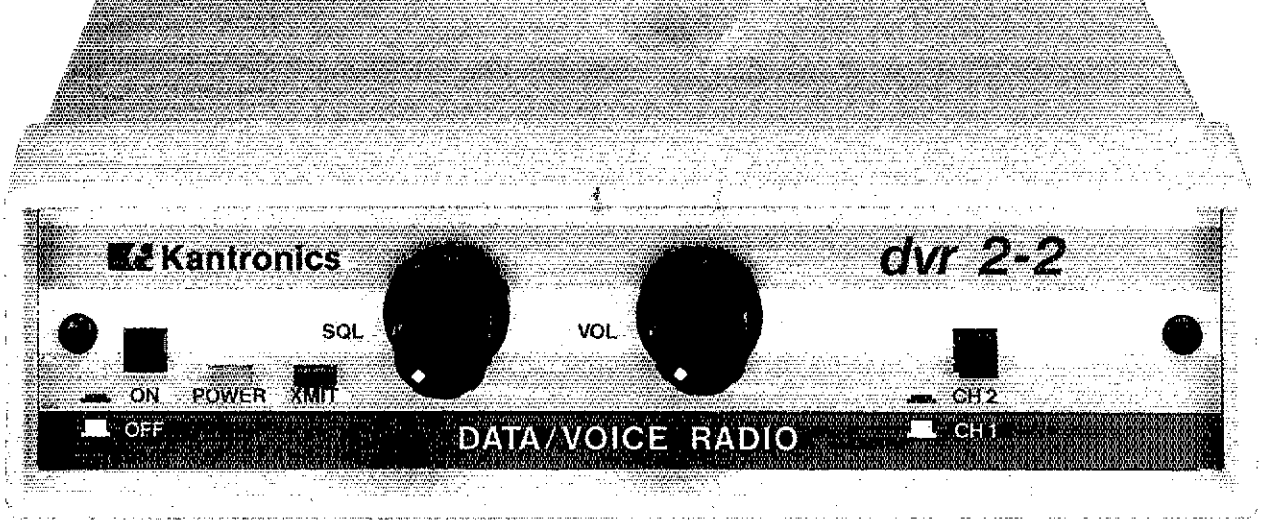
Here is a description of what is covered in the **Handbook**:

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



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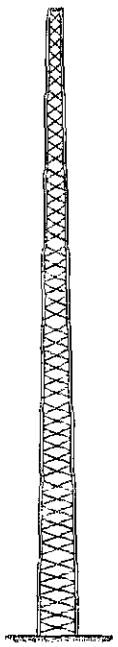

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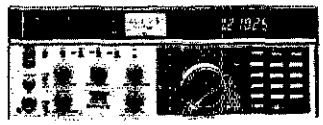

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Mobile Antennas	80 - 10 Meters

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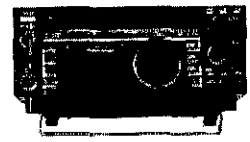

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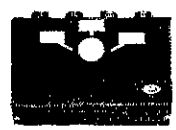

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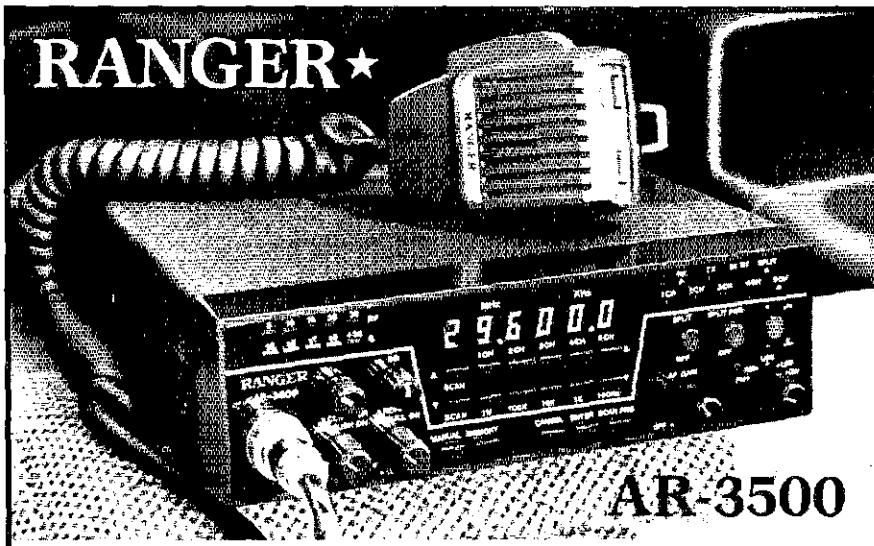

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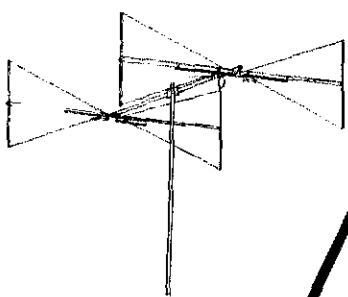

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- Add-on kit for 17 and 12 meters available now.
- 26 ft tall

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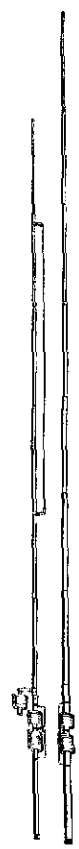

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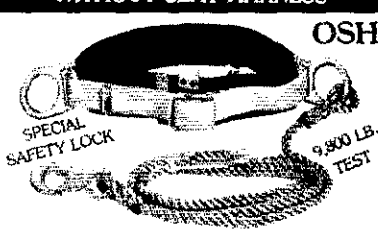

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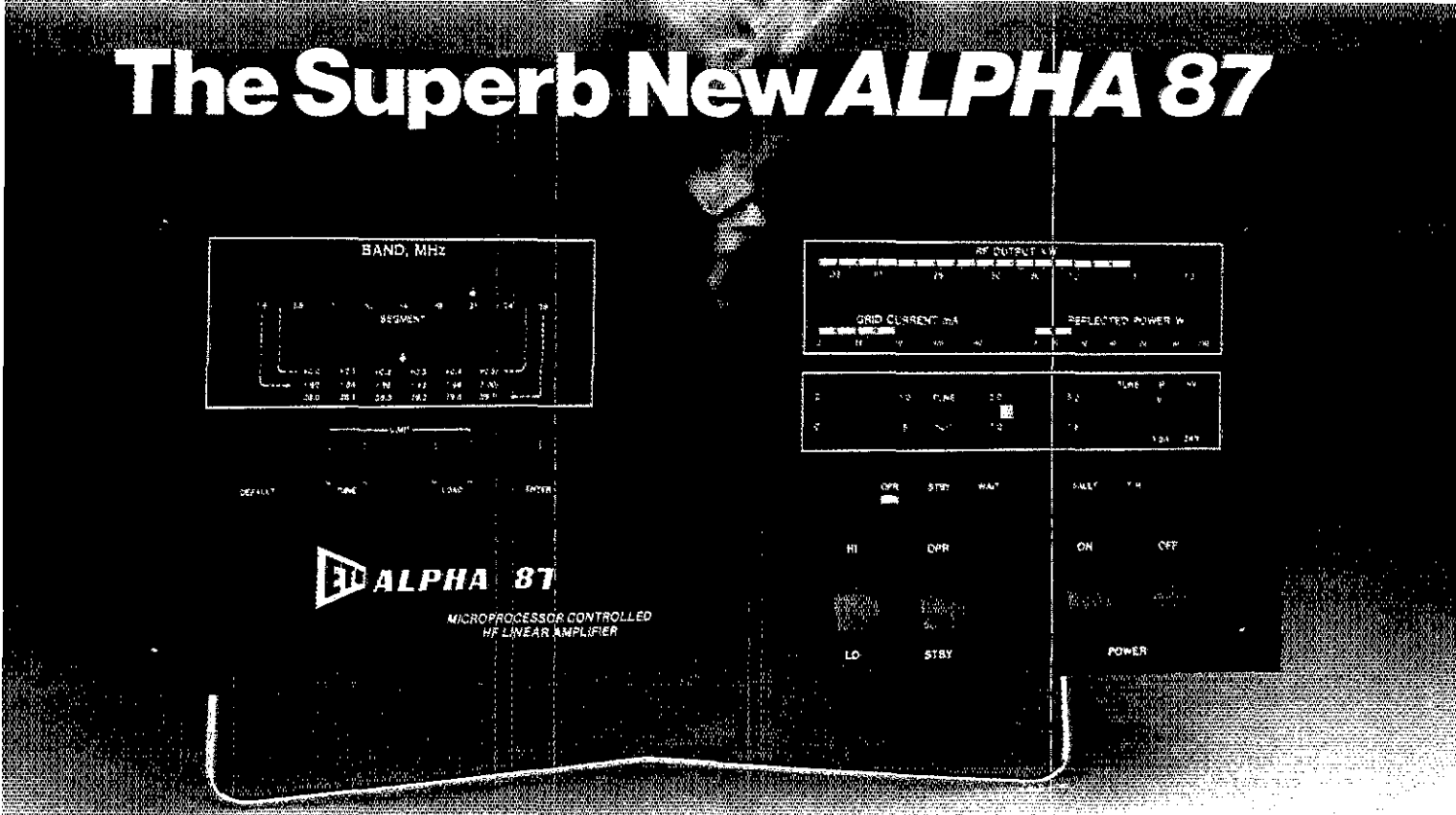

Reaffirms ETO's Traditional Commitment To SUPERIORITY

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ALPHA's "maximum legal power, continuous duty" specification often is paraphrased by imitators. But they replace our unequivocal "key down, no time limit" with restrictions in their fine print. ***ALPHA* power** has no equal.

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Imitation often is called the sincerest form of flattery, and since ETO introduced the first ALPHA twenty years ago we've been "flattered" by competitors layouts, no-tune-up arrangements, tank coils and T/R circuits. But an ALPHA isn't just bits and pieces - it's power, innovation, service and the smooth feel of superb quality. ALPHA POWER has many imitators ... but no equals.

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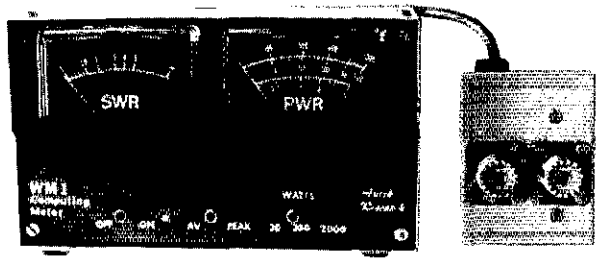

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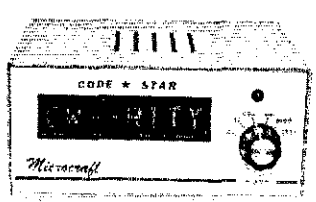

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Model	Sq. Ft.	Rotating TQ	Brake TQ	Sale
T2X	20	83	750	399.95
HAM IV	15	65	417	335.95
CD45 II	8.5	50	56	237.95

TQ-Torque in ft lbs

LARSEN

LMMM	mag. mt	17.95
LM150	2m coil & whip	25.95
NMOMM	mag. mt.	20.95
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KD4270	dual band duck	24.95
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RG8X	Mini	22 cts.
RG59/U	72 OHM	14 cts.
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N-Male for 8/U 8261		4.79
BNC(M)UHF(F) 2910		5.55
Low Loss eqv 9913		49 cts.

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CR2AP	2M perm. mt	41.00
CR2/4AM	dual band mag. mt	55.00
CR2/4AP	dual band perm mt	55.00

ROHN

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20AG	top sect. 9'	74.50
25G	10' sect.	68.00
25AG2	top. sect. 9'	85.50
45G	10' sect	161.00
45AG2	top sect. 9'	176.25
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AS45G	access shelf	70.00
TB-3	thrust bearing	71.00
M200	10' mast	18.00
SB25G	short base	32.70
SB45G	short base	70.20
EF2545G	gin pole AND MORE!	396.00

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5BTV	5 band trap vert	125.95
4BTV	4 band trap vert	95.95
G7-144	Fix stat. 2mt colinear	125.95
MO-1/MO-2	mobile masts	22.95
RM10/RM15	10m-15m resonator	12.95
RM10S/RM15S	super resonator	17.95
RM20/RM20S	std. & super resonator	16.95/22.95
RM30	30mt. std. resonator	17.95
RM40/RM40S	std. and super	18.95/26.95
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RM75S/RM80S	75 or 80 super	37.95
BM-1	bumper mt	16.95
SSM-2	stainless ball mt	18.95
SSM-3	spring	17.95
QD2	quick disconnect	15.95
5X2	2mt 5/8 mag. mt.	24.95
HDT	trunk mt. w/swivel ball AND MORE!	17.95

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PD8040	80-40 dipole kit	33.95
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432-30LBX	70cm satellite	
2M-13LBA	2 meter	
2M-16LBX	2 meter	

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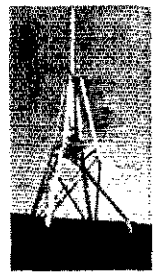
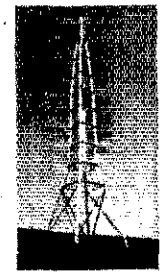


CR-18



CR-30



CR-45

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*Subject To Availability

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CR-45	14'9"	23 @ 90 MPH	39"	881	55	319.95*
CK-46	Thrust Bearing For CR-18, CR-30, and CR-45 Maximum Acceptable Mast Diameter 2⅜"					39.95*

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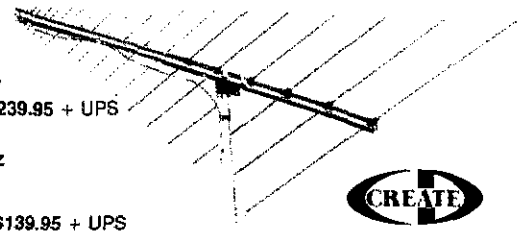

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747SRX	21.8	50	502	H.S.	416
1105 MSX	27.3	57	717		534
1105 MSAX	27.3	57	717	P.S.	599
1200 FXX	27.3	143	1290	H.S.	618
1300 MSAX	32.7	215	1792	P.S.	1,061
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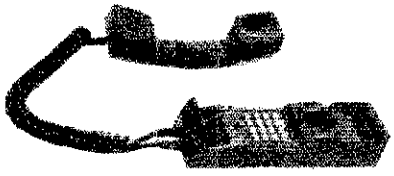

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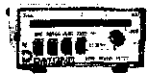

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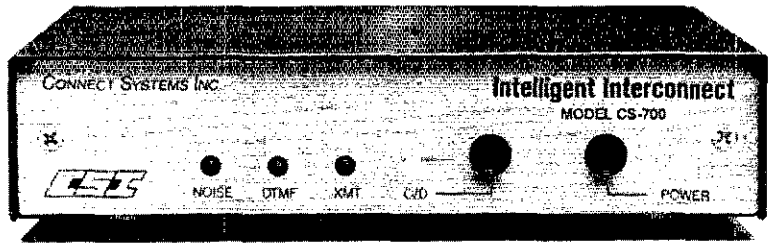

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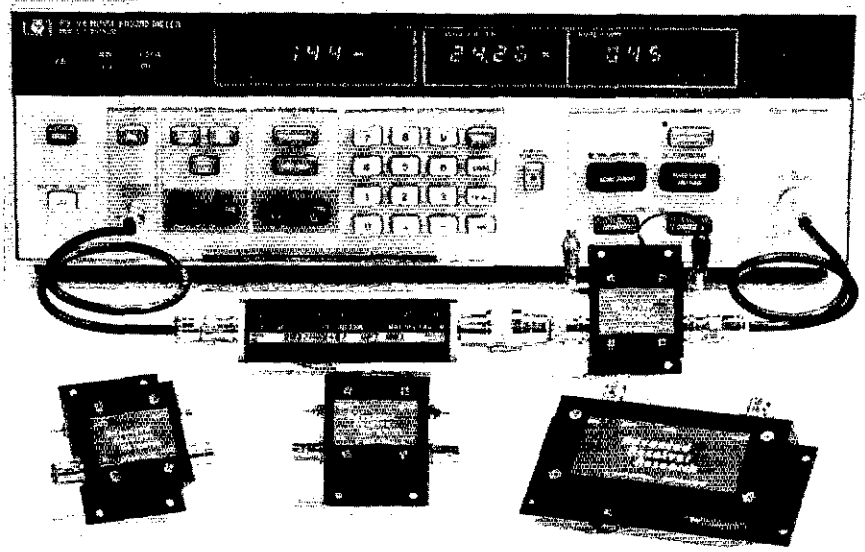

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P220VD	220-225	<1.8	15	0	DGFET	$29.95
P220VDA	220-225	<1.2	15	0	DGFET	$37.95
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P432VD	420-450	<1.8	15	−20	Bipolar	$32.95
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SP50VD	50-54	<1.4	15	0	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	$59.95
SP220VDA	220-225	<1.3	15	0	DGFET	$67.95
SP220VDG	220-225	<0.55	20	+12	GaAsFET	$109.95
SP432VD	420-450	<1.9	15	−20	Bipolar	$62.95
SP432VDA	420-450	<1.2	17	−20	Bipolar	$79.95
SP432VDG	420-450	<0.55	16	+12	GaAsFET	$109.95

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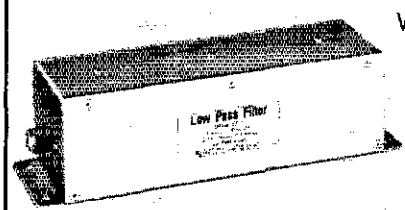

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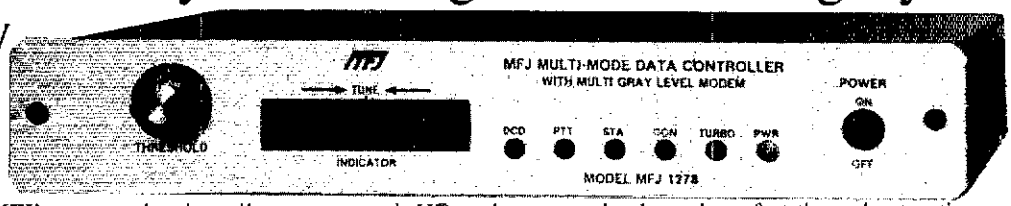

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New Easy Mail™ Personal Mailbox

You get MFJ's new Easy Mail™ Personal Mailbox with soft-partitioned memory so you and your ham buddies can leave messages 24 hours a day.

20 LED Precision Tuning Indicator

MFJ's unequaled tuning indicator makes it really easy to work HF packet.

And unlike others, you use it exactly the same for all modes -- not differently for each mode. Just tune your radio to center a single LED and *you're precisely tuned in to within 10 Hz* -- and it shows you which way to tune!

Multi-Gray Level FAX/SSTV Modem

You'll see tomorrow's news today when you copy outstanding FAX news photos with crisp, clear details.

MFJ-1278 is the *only* multi-mode with a built-in multi-gray level modem. It lets you transmit *and* receive high resolution multi-gray level FAX/SSTV pictures with an appropriate terminal program.

New MFJ-1278-*Turbo*

with *fast* 2400 baud modem

MFJ-1278-T

$359.95



The new MFJ-1278-*Turbo* gives you *fast* 2400 baud packet -- *twice* the baud rate of any other multi-mode. By communicating faster you'll reduce chances for error, lessen congestion and more efficiently utilize our ham frequencies. You'll also get 1200/300 baud for compatibility with older TNCs. The 2400 baud modem is also available separately. Order MFJ-2400, $79.95, for any MFJ and most other TNCs.

One FREE Upgrade!

When you buy your MFJ-1278 *today*, you don't have to miss new modes and features that come out *tommorow*.

Why? Because your MFJ-1278 comes with a coupon good for one ***free*** eprom upgrade exchange that'll add new features.

Plus More . . .

Plus you get . . . 32K RAM (not 16K), ***free*** AC power supply, Host mode that lets MFJ-1278 serve as a KISS interface or dumb modem, fast throughput anti-collision technology, independent transmit level for each radio port, random code generator, lithium battery backup, RS-232 *and* TTL serial ports, *standard* 850 Hz RTTY shift, socketed ICs, tune up command, peripheral I/O port, automatic serial numbering, programmable message memories, dual radio ports (*each* HF or VHF), CW key paddle jack, speaker jack that lets you monitor CW sidetone, transmit and receive audio and packet connect bell, ***new*** fully intergrated instruction manual with *Fast Start*™ instructions and more in a 9½ x 9½ x 1½ inch cabinet.

Get on the air instantly Just plug it all in

All you need is an MFJ-1278, your rig, computer and program.

With an MFJ Starter Pack you just plug it all in, wire up your mic connector, and you're on the air.

Order MFJ-1284 for IBM compatibles (includes Picture Passing); MFJ-1287 for Macintosh; MFJ-1282 (disk) for C-64/128; MFJ-1283 (tape) for VIC-20, $24.95 each.

No Matter What™ Guarantee

You get MFJ's one year No Matter What™ Guarantee.

That means we will repair or replace your MFJ multi-mode (at our option) *no matter what* happens to it for a year.

Others give you a *limited* warranty. What do you do when *they* say, "Sorry, your *limited* warranty doesn't cover *that*?"

Get 9 new ways of having fun

Don't settle for 3 year old technology.

Choose the only multi-mode that gives you the latest advances and all 9 modes.

Get 9 new ways of having fun *today!*

What the ham magazines say about the MFJ-1278:

QST Magazine: "***I was especially impressed*** *by the new '1278s DCD (data carrier detect) circuit performance. This function, vital to HF packet-radio operation, performs admirable . . . . Refinements such as this go a long way toward improving the viability of HF packet-radio operation with a multimode!*"

"***FAX reception is so good*** *that it is irresistible to tune around for interesting FAX transmissions. The current '1278 provides good copy on all seven supported FAX formats . . . . I most enjoyed copying news-photo transmissions. Some of these were outstanding, with crisp, clean reproduction and a surprising amount of detail.*" **September, 1989.**

CQ Magazine: "***I found the '1278 did an excellent*** *job (copying CW), even with bad operators. I've checked lot of CW 'copiers' in my time, and certainly this unit was as good or better than most.*"

"***I switched the terminal mode to HF packet*** *. . . . I was very impressed, because with the tuning indicator I immediately received (good) packet copy . . . I (tried) a connect with an east coast station. Before I knew it I had a QSO going and even handled break-in stations anxious to log New Mexico.*" **May, 1989.**

73 Magazine: "***If you think I enjoyed using*** *(the MFJ-1278) you are right. It was easy and fun to use . . . Overall, I found the MFJ-1278 to be . . . a good multi-mode controller at a reasonable price. You won't be disappointed.*" **April, 1989.**

Worldradio Magazine: "***Bottom line: Excellent value*** *for the money. Solid performer. Easy to use.* ***Easiest*** *of the top three to get on line . . . .*" **September, 1989.**

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MFJ, Bencher and Curtis team up to bring you America's most popular keyer in a compact package for smooth easy CW



MFJ-422B **$129.95**

The best of all CW world's -- a deluxe MFJ Keyer using a Curtis 8044ABM chip in a compact package that fits right on the Bencher iambic paddle!

This MFJ Keyer is small in size but big in features. you get iambic keying, adjustable weight and tone and front panel volume and speed controls (8-50 WPM), dot-dash memories, speaker, sidetone and push button selection of automatic or semi-automatic/ tune modes. It's also totally RF proof and has ultra-reliable solid state outputs that key both tube and solid state rigs. Use 9 volt battery or 110 VAC with MFJ-1305, $12.95.

The keyer mounts on a Bencher paddle to form a small (4-1/8 x 2-5/8 x 5½ inches) attractive combination that is a pleasure to look at and use.

The Bencher paddle has adjustable gold plated silver contacts, lucite paddles, chrome plated brass and a heavy steel base with non-skid feet.

You can buy just the keyer assembly, MFJ-422BX, for only $79.95 to mount on **your** Bencher paddle.

Deluxe 300 W Tuner



MFJ-949D **$149.95**

MFJ-949D is the world's most popular 300 watt PEP tuner. It covers 1.8-30 MHz, gives you a new peak and average reading Cross-Needle SWR/Wattmeter, built-in dummy load, 6 position antenna switch and 4:1 balun -- in a compact 10 x 3 x 7 inch cabinet. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

Antenna Bridge

MFJ-204B **$79.95**



Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge.

No other equipment needed -- take it to your antenna site. Determine if your antenna is too long or too short, measure its resonate frequency and antenna resistance to 500 ohms. It's the easiest, most convenient way to determine antenna performance. Built in resistance bridge, null meter, tunable oscillator-driven (1.8-30 MHz). Use 9 V battery or 110 VAC with AC adapter, $12.95.

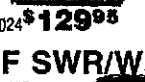
Super Active Antenna

"World Radio TV Handbook" says MFJ-1024 is a "first rate easy-to-operate active antenna ... quiet ... excellent dynamic range ... good gain ... very low noise ... broad frequency coverage ... excellent choice."

Mount it outdoors away from electrical noise for maximum signal, minimum noise. Covers 50 KHz to 30 MHz.



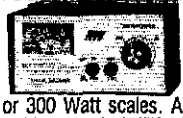
Receives strong, clear signals from all over the world. 20 dB attenuator, gain control, ON LED. Swtich two receivers and aux. or active antenna. 6x3x5 in. Remote unit has 54 inch whip, 50 ft. coax and connector. 3x2x4 in. Use 12 VDC or 110 VAC with MFJ-1312, $12.95.



MFJ-1024 **$129.95**

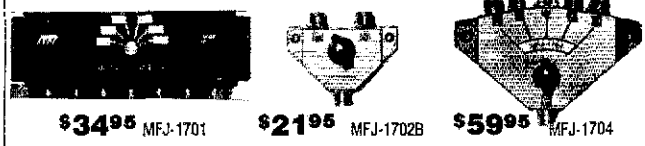
VHF SWR/Wattmeter

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. 4½x2¼x3 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. 10x3x1½ 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 lightening/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. 6¼x4¼x1¼ in.

"Dry" Dummy Loads for HF/VHF/UHF



MFJ-260B **$28.95** MFJ-262 **$69.95** MFJ-264 **$109.95**

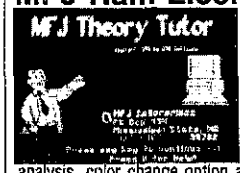
MFJ has a full line of dummy loads to suit your needs. Use a dummy load for tuning to reduce needless (and illegal) QRM and save your finals.

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. 2½x2½x7 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-**Novice**; 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 Speaker Mics

MFJ-284 or MFJ-286 **$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, Santec. 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 4½x1x2; MFJ-107B 2¼x1x2 in.

Cross-Needle SWR/Wattmeter

MFJ-815B **$69.95**



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



MFJ-557 **$24.95**

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. 8½x2¼x3¾ in.

AC Volt Monitor

MFJ-850 **$19.95**



Prevent damage to rig, computer or other gear. Monitor AC line voltage for potentially damaging power surge or brown out conditions. Expanded 95-135 volt 2-color scale. Plugs into any AC outlet. 2% accuracy. 2¼x2¼x1½ in.

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MFJ TUNERS

Here is the finest 3 KW Tuner money can buy with roller inductor, dummy load, *new* peak reading meter, antenna switch, balun plus more ... $349.95

The MFJ-989C is not for everyone. **However,** if you do make the investment you get the finest 3 KW PEP tuner money can buy - one that will give you a lifetime of use, one that takes the fear out of high power operation and one that lets you get your SWR down to absolute minimum.

The MFJ-989C is a compact 3 KW PEP roller inductor tuner with a new **peak** reading Cross-Needle SWR/Watt-meter. The roller inductor lets you get your SWR down to absolute minimum.

With **three continuously** variable components - two massive 6 KV capacitors and a high inductance roller inductor - you get precise control over SWR **and** the widest matching range possible from 1.8-30 MHz.



MFJ-989C **$349.95**

You get a **new** lighted **peak** and average reading Cross-Needle SWR/Wattmeter with a **new** more accurate directional coupler.

You get a giant two core balun wound with teflon wire for balanced lines and a 6-position antenna switch with extra heavy switch contacts.

Its compact 10¾x4½x15 inch cabinet fits right into your station.

You get a 50 ohm 300 watt dummy load for tuning your exciter, a tilt stand for easy viewing and a 3-digit turns counter plus a spinner knob for exact inductance control. Add $10 s/h.

2-knob *Differential-T*™ Tuner



MFJ-986 **$269.95** The **new** MFJ-986 Differential-T™ 2-knob Tuner uses a differential capacitor to make tuning foolproof and easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only **one** best setting. Covers 1.8-30 MHz.

The roller inductor lets you tune your SWR down to absolute minimum. 3-digits turns counter lets you quickly return to your favorite frequency.

You get MFJ's **new** peak and average reading Cross-Needle SWR/Wattmeter with a **new** directional coupler for more accurate readings over a wider frequency range. It reads forward/reflected power in 200/50 and 2000/500 watt ranges. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

A **new** current balun for balanced lines reduces feedline radiation and forces equal currents into antenna halves that are not perfectly balanced for a more concentrated, stronger signal. Add $10 s/h.

MFJ's *Fastest Selling* Tuner



MFJ-941D **$109.95** **The MFJ-941D is MFJ's fastest selling 300 watt PEP antenna tuner. Why? Because it has more features than tuners costing much more and it matches everything continuously from 1.8-30 MHz.**

It matches dipoles, vees, verticals, mobile whips, random wires, banlanced and coax lines.

SWR/Wattmeter reads foward/reflected power in 30 and 300 watt ranges. Antenna switch selects 2 coax lines, direct or through tuner, random wire, balanced line or tuner bypass. Efficient airwound inductor gives lower losses and more watts out. Has 4:1 balun. 1000 V capacitors. 10x3x7 inches.

MFJ's *Random Wire* Tuner

MFJ-16010 **$39.95**



You can operate all bands anywhere with any transceiver when you let the MFJ-16010 turn any random wire into a transmitting antenna. Great for apartment, motel, camping operation. Install a wire anywhere! Tunes 1.8-30 MHz. 200 watts PEP. Ultra small 2x3x4 in.

MFJ's *Deluxe* 300 Watt Tuner



MFJ-949D **$149.95** **The** MFJ-949D gives you lower SWR than **any** tuner that uses two tapped inductors. Why? Because you get two **continuously** variable capacitors that give you infinitely more positions than the **limited** number on switched coils.

This gives you the precise control you need to get your SWR down to a minimum. After all, isn't that why you need a tuner? Covers 1.8-30 MHz.

You get MFJ's **new** lighted 2 color **peak** and average reading Cross-Needle SWR/Wattmeter, dummy load, antenna switch, and 4:1 balun - all in a compact 10x3x7 inch cabinet. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

*With MFJ's **deluxe** 300 watt PEP tuner you get* an MFJ tuner that has earned a reputation for being able to match just about anything - one that is highly perfected and has years of **proven** reliability.

MFJ's *Mobile* Tuner

MFJ-945C **$89.95**



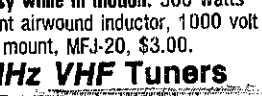
Don't leave home without this **mobile** tuner! Have an uninterrupted trip as the MFJ-945C **extends your antenna bandwidth** and eliminates the need to stop, go out and adjust your mobile whip.

You can **operate anywhere in a band and get low SWR.** You'll get maximum power out of your solid state or tube rig and it'll run cooler and last longer.

Small 8x2x6 inches uses little room. **SWR/ Wattmeter and convenient placement of controls make tuning fast and easy while in motion.** 300 watts PEP output, efficient airwound inductor, 1000 volt capacitors. Mobile mount, MFJ-20, $3.00.

144/220 MHz VHF Tuners

MFJ-921 **$69.95**



MFJ's new VHF tuners cover both 2 Meters and the 220 MHz bands. They handle 300 watts PEP and match a wide range of impedances for coax fed antennas. SWR/Wattmeter. 8x2½x3 in. **MFJ-920, $49.95.** No meter. 4½x2½x3 inches.

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MFJ's *Artificial* RF Ground

$79.95 MFJ-931



You can create an artificial RF ground and eliminate RF "bites", feedback, TVI and RFI when you let the MFJ-931 resonate a random length of wire and turn it into a tuned counterpoise. The MFJ-931 also lets you electrically **place a far away RF ground directly at your rig** -- no matter how far away it is -- by tuning out the reactance of your ground connection wire.

Barefoot/1.5 KW Linear Tuner



MFJ-962C **$229.95** For a **few** extra dollars, the MFJ-962C lets you use your barefoot rig now and have the capacity to add a 1.5 KW PEP linear amplifier later. Covers 1.8-30 MHz.

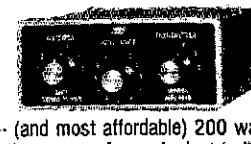
You get two husky **continuously** variable capacitors for maximum power and minimum SWR. And lots of inductance gives you a wide matching range.

You get MFJ's **new** peak and average reading Cross-Needle SWR/Wattmeter with a **new** directional coupler for more accurate readings over a wider frequency range. It reads forward/reflected power in 200/50 and 2000/500 watt ranges. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

Has 6-position antenna switch and a teflon wound balun with ceramic feedthru insulators for balanced lines. 10¾x4½x14 7/8 inches. Add $10.00 s/h.

MFJ's *smallest* Versa Tuner

MFJ-901B **$59.95**



The MFJ-901B is our smallest -- 5x2x6 inches -- (and most affordable) 200 watt PEP tuner --when both space **and** your budget is limited. Good for matching solid state rigs to linears.

It matches whips, dipoles, vees, random wires, verticals, beams, balanced and coax lines from 1.8-30 MHz. Efficient airwound inductor, 4:1 balun.

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The 1990 Callbook Supplement will be published June 1, 1990, with thousands of new licenses, address changes, and call sign changes received over the preceding six months. This single Supplement will update both the North American and International Callbooks.

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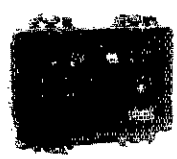

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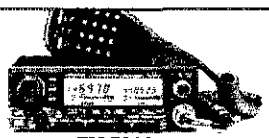

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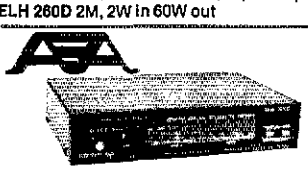

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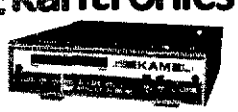

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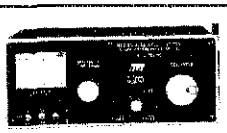

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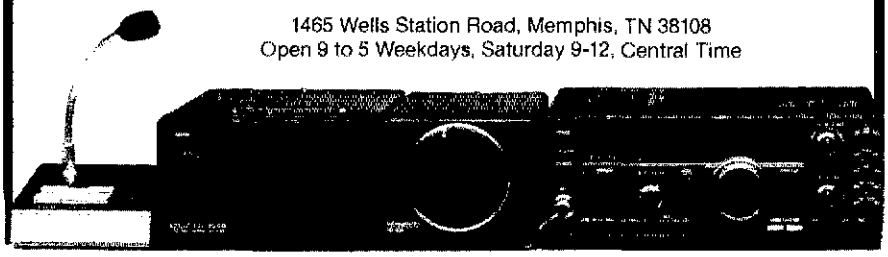

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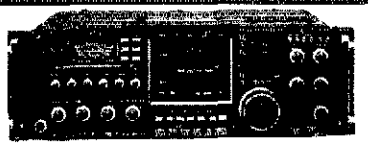

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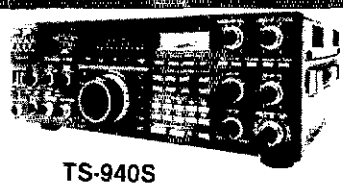

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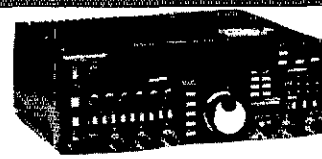

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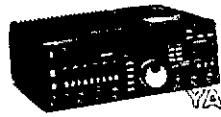

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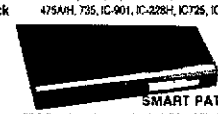

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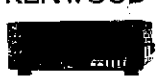

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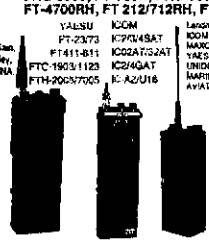

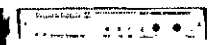

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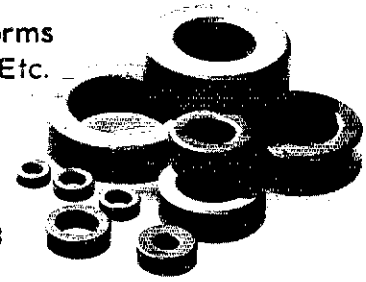

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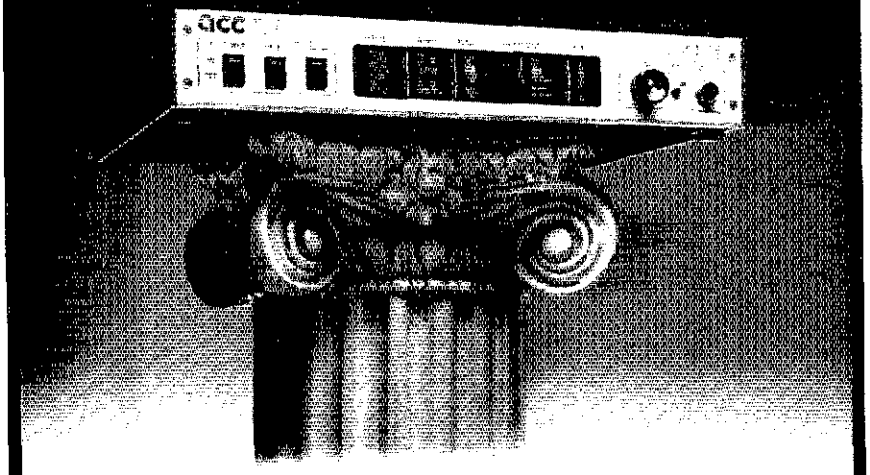

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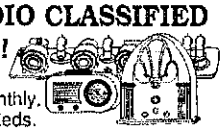

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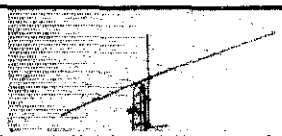

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Same as above except, 35 amp constant, 37 amp surge, adjustable from 10 to 15 volts

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Fully regulated 50 amp, adjustable voltage 11-15VDC, dual metering, short circuit protection, multiple binding posts (4)

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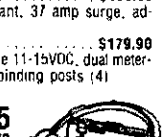

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same features as 49SA except uses 'AA' nicad batteries and comes with battery charger

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100 Ch 11 band weather, Ch lockout, priority, auto search, delay, track turning, programmable, built-in nicad rechargable battery pack, AC/DC adapter & carry case



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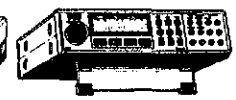
BC560XLT . $94.90
16 Ch 10 band mobile, 2 digit LED, delay, priority, programmable, ch lockout, direct ch access, weather search, squelch, review, track tuning, w/mobile mounting bracket



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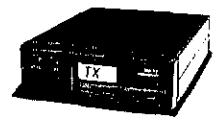
Regency



INF10 . . . $104.90
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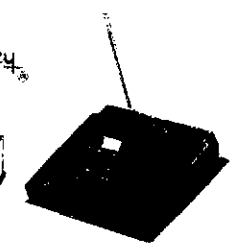

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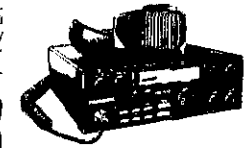

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HR2510 ..... **$239.90**
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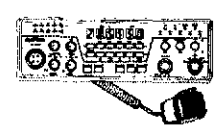

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CAT# NCB-C
D SIZE $4.50 each
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0-30 MINUTE AUTO-SHUTOFF TIMER
Sanbyo Seiko Mfg.# TMDF30MYB6
120 Vac 60 hz. 10 amp contacts, UL listed. Turn shaft to turn on lights or other electrical devices. Ball rings and circuit breaks after specified amount of time. Ideal for any device that needs to shut off automatically. 2.95" X 1.8" X 2.54" behind face plate. 1/4" half-round shaft.
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Solder loop terminals.
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Black plastic pushbutton.
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335 ohm coil.
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ALL PLUG DIRECTLY INTO 120 VAC OUTLET
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Mod Products International# A19H-HO-1D01
Primary: 600 ohm
Secondary: 600/900 ohm
4.17" X 0.67" X 0.65" high.
6 p.c. pins on 0.62" centers.
Primary Inductance: 300 mH min., at 1kHz, 1 volt.
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R-390A, R-390, R-392 parts SASE. TS-352 military-spec multimeter: $19.50 postpaid. K8SJ, Baytronics, Box 591, Sandusky, OH 44870.

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WORLD Ham Net Directory $11.95; Basic Guide to VHF/UHF Ham Radio $8.95; book catalog $1, free w/order. Tiare, P.O.B. 493, Lake Geneva, WI 53147.

COLOR SSTV For The Atari ST by John Langner, WB2OSZ, See Dec. 89 "73" Magazine. Kit with software, #168/169 KIT, $124.95. Assembled board with software, #168/169 ASY, $149.95. Add $4.50 s/h. Visa/ MC accepted. A & A Engineering, 2521 W. La Palma #K, Anaheim, CA 92801, 714-952-2114.

WANTED: Rockwell emblem or late model Collins round emblem S-Line and KWM-2A for my personal station. All replies answered. Jerry Brouwer, AB8U, 3041 Rising Springs Court, Bellbrook, OH 45305.

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FREQUENCY COUNTER, Heathkit, Type 2420, price $300 cash/with antenna. Mint condition. Bought new less than year ago. N4IKG.

WANTED: 55G1 Preselector For Collins 51S1 Receiver. Carter Elliott, WD4AYS, 1460 Pinedale Road, Charlottesville, VA 22901, 804-979-7383.

HRO-50T1 excellent, ABCDE coils, speaker, FM & calibrator $450. AA6S, 209-732-7163.

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WANTED: Drake R-7A receiver and accessories. Alan, N4LUS, 301-229-7069 evenings.

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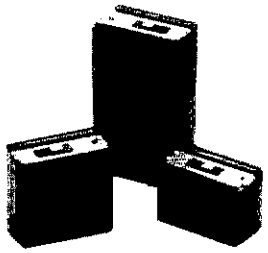

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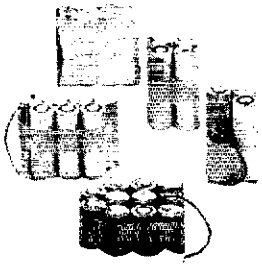

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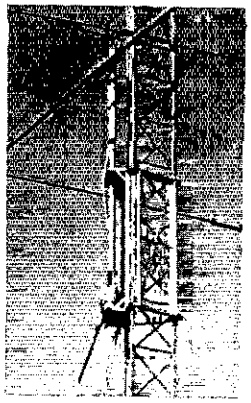

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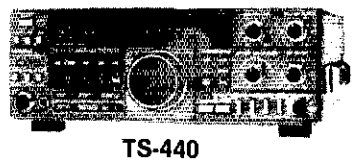

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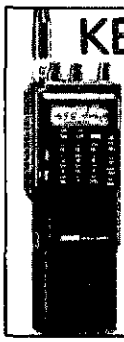

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Bermuda Contest 1990

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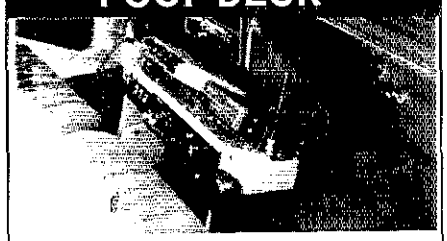

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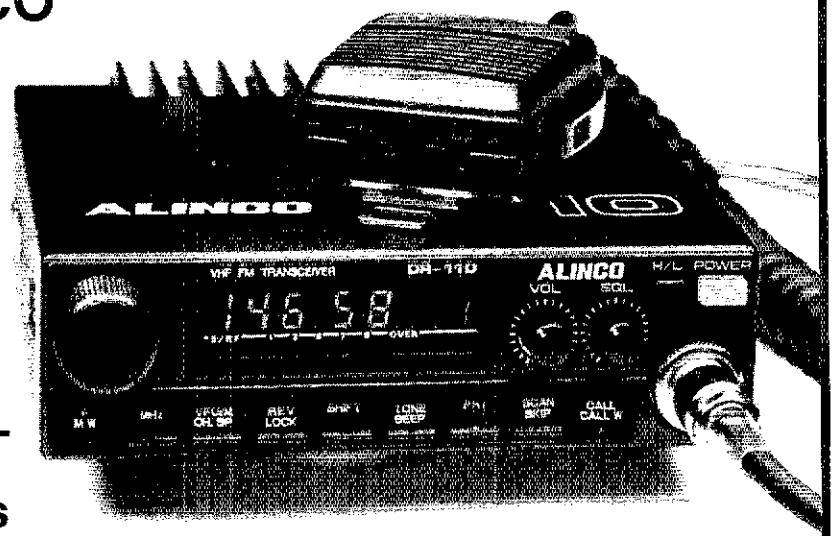

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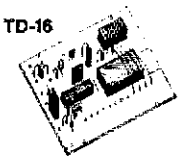

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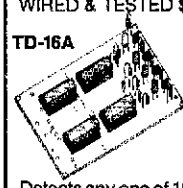

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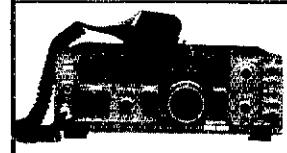

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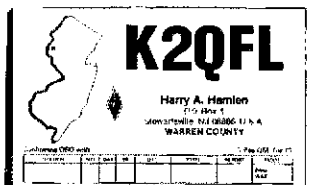

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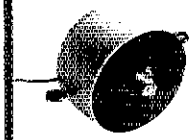

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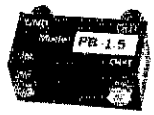

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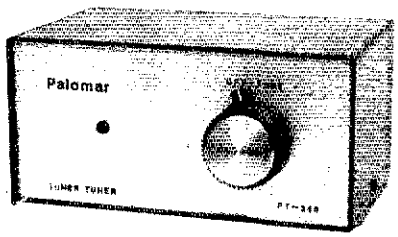

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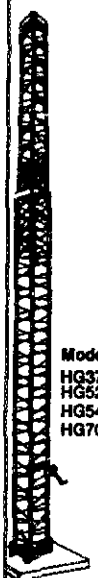
ANTENNA/TOWER SALE!



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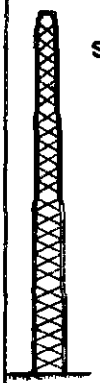
CRANKUP SALE!

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
HG37SS	37 ft	9 sq ft	$CALL
HG52SS	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.!



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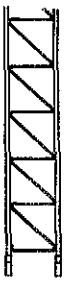
FREIGHT PREPAID

- 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*
HBX40	40 ft	10 sq ft	228	$449
HBX48	48 ft	10 sq ft	303	$589
HBX56	56 ft	10 sq ft	385	$699
HDBX40	40 ft	18 sq ft	281	$569
HDBX48	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'	1369	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, Thrustbearings 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'	50'	10 sq ft	999
TX438	22'	38'	18 sq ft	919
TX455	22'	55'	18 sq ft	1385
TX472	23'	72'	18 sq ft	2279
HDX565	22'	55'	30 sq ft	2079
HDX572	23'	72'	30 sq ft	3559

Note-US Towers Shipped Freight Collect From Visalia, CA Factory

**Note-towers rated at 50 mph to EIA specifications*

RG-213U

$.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!

RG-8X

$.22/ft $209/1000 ft.

- RG8X—95% Bare Copper Shield • Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

9086 $.45/ft $439/1000 ft.

- Same Specs as Belden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

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½" Alum. w/poly Jacket.....$.79/ft.
½" LDF4-50 Andrew Heliax®.....$1.99/ft.
⅞" LDF5-50 Andrew Heliax®.....$4.99/ft.
select connectors below

Heliax® is a Registered Trademark of the Andrew Corp.

Coaxial Cable Loss Characteristics (50/75Ω ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	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
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HELIAX® CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Heliax®	$29	$29	$29	$29
⅞" Heliax®	$55	$55	$55	$55

Amphenol Silver PL259.....$1.50
UG21B N Male.....$3.50
9086/9913 N Male Connector.....$4.95

ANTENNA WIRE & ACCESSORIES

Stranded Copper 14ga.....$.10/ft.
¼ mile 18ga copper-clad steel wire.....$30
Dog bone end insulator.....$.79 ea.

VAN GORDEN

1:1 Balun.....$15 Center Insulator.....$8
Dipole Kits.....D60 $31.95/D40 $28.95
Short Dipole Kits.....SD60 $35.95/SD40 $33.95
All-band Dipole w/ladder line.....$29.95
G5RV all band antenna.....$49.95

ALPHA DELTA

DX-A 160-80-40 Sloper.....$49

CUSHCRAFT

A3 3-el Tribander.....
A4S 4-el Tribander Beam w/S.S. Hdwre.....
A743 & A744, 30/40 mtr KIT for the A3 & A4.
R4 20-10 mtr Vertical.....
AP8 80-10 mtr Vertical.....
AV5 80-10 mtr Vertical.....
D40 40 mtr Dipole.....
40-2CD 2-el 40 mtr Beam.....
A50-5 5-el 6 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.....
424B 24-el 432 MHz Beam.....
ARX2B 2 mtr Vertical.....

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Discoverer 2-el 40-mtr Beam.....
Discoverer 3-el Conversion Kit.....
EXPLORER-14 SUPER-SPECIAL.....
QK710 30/40 mtr. Add-On-Kit.....
V2S 2-mtr Base Vertical.....
V4S 440MHz Base Vertical.....
TH5MK2S Broad Band 5-el Triband Beam.
TH7DXS 7-el Triband Beam.....
TH3JRS 3-el Triband Beam.....
205BAS 5-el 20-mtr Beam.....
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.....
2BDQ 80/40 mtr Trap Dipole.....
5BDQ 80-10 mtr Trap Dipole.....
BN86 80-10 mtr KW Balun W/Coax Seal...

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6BTV 80-10 mtr Vert $149 5BTV 80-10 mtr Vert $129
4BTV 40-10 mtr Vert $99 G7-144 2-mtr Base $129
G6-144B 2-mtr Base $89

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts In Stock!

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HF6VX 80-10m Vertical $159.95 Delivered
- Full Legal Power
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HF2V 80-40m Vertical $149.95 Delivered
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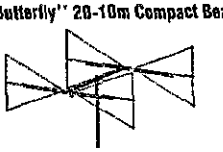
- Automatic Band Switching

Accessories:
RMK II Roof Mtg. Kit.....$59.95
STR II Stub-Tuned Radials.....$39.95
TBR160 160m Coil Kit.....$99.95
30m Add-on Kit.....$39.95
17/12m Add-on Kit.....$39.95



FREE UPS on ACCESSORIES when purchased with antenna

HF5B "Butterfly" 20-10m Compact Beam $259.95



- Unique Design Reduces Size
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- Element Length 12.5 Feet

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KT34A 4-el Broad Band Triband Beam.....$419
KT34XA 6-el Broad Band Triband Beam.....$619

ROTORS

Alliance HD73 (10.7 sq. ft. rating).....$129.95
Alliance U110 (3 sq. ft. rating).....$49
Telex CD 4511 (8.5 sq. ft. rating).....$Call
Telex HAM 4 (15 sq. ft. rating).....$Call
Telex Tailtwister (20 sq. ft. rating).....$Call
Telex HDR300 Heavy Duty (25 sq. ft. rating).$Call

ROTOR CABLE

Standard 8 cond cables $.25/ft. (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.45/ft (vinyl jacket 2-#16 & 6-#18 ga)



ROHN GUYED TOWER SECTIONS
10 FT. STACKED SECTIONS

20G.....$54.50 45G.....$153.50
25G.....$65.50 55G.....$197.50

ALL ACCESSORIES IN STOCK—CALL

ROHN FOLDOVER TOWERS

Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	CALL FOR PRICES
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 (3990 lb rating)	$.15/ft
1/4 EHS Guywire (6850 lb rating)	$.18/ft
5/16 EHS Guywire (11,200 lb rating)	$.29/ft
5/32 7 x 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	$.45
1/4 CCM Cable Clamp (1/4" Cable)	$.55
1/4 TH Thimble (fits all sizes)	$.45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2 x 9EE (1/2" x 9" Eye to Eye Turnbuckle)	$9.95
1/2 x 9EJ (1/2" x 9" Eye & Jaw Turnbuckle)	$10.95
1/2 x 12EE (1/2" x 12" Eye & Eye Turnbuckle)	$12.95
1/2 x 12EJ (1/2" x 12" Eye & Jaw Turnbuckle)	$13.95
5/8 x 12EJ (5/8" x 12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$19.95
500 B Guy Insulator (5/32" or 3/16" Cable)	$1.99
502 Guy Insulator (1/4" Cable)	$3.49
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.32/ft
HPTG4000 Guy Cable (4000 lb rating)	$.52/ft
HPTG6700 Guy Cable (6700 lb rating)	$.72/ft
9901LD Cable End (for 2100/4000 cable)	$9.95
9902LD Cable End (for 6700 cable)	$11.95
Socketfast Potting Compound (does 6-8 ends)	$16.95

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Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$29	$49	$69	$89
.18 in Wall	$49	$89	$129	$149
.25 in Wall	$59	$129	$189	$249

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- Dual Frequency Receive
- Digital AF Filter • 100 Memories

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- 200 Watts Output
- All Amateur Bands
- Dual Receive
- DDS-Direct Digital Synthesis

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IC-765 NEW HF TRANSCEIVER

- Built-in Automatic Antenna Tuner and Power Supply
- *99 Memories • 100 W Output*
- 160-10M/General Coverage Receiver
- Band Stacking Registers

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VHF/UHF TWIN BANDER

- 45W on 2M/35W on 70cm
- Receive on both Bands at Same Time
- *Extended Receiver Range*
- More Features for the Money Than Anyone Else

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TS-140S AFFORDABLE DX-ing!

- HF Transceiver With General Coverage Receiver
- All HF Amateur Bands
- 100 W Output
- Compact, Lots of Features

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FT-736R VHF-UHF BASE STATION

- SSB, CW, FM on 2 Meters and 70 cm
- Optional 50 MHz, 220 MHz or 1.2 GHz
- 25 Watts Output on 2 Meters, 220 and 70 cm
- 10 Watts Output on 6 Meters and 1.2 GHz • 100 Memories

ICOM IC-725

NEW ULTRA-COMPACT HF TRANSCEIVER

NEW!



- USB/LSB/CW, AM Receive Optional Module for AM Transmit and FM TX/RX
- 160-10M Operation • 100 W Output
- Receive 30 kHz to 33 MHz
- 26 Memories with Band Stacking Registers

AMERITRON



AL-80A AMPLIFIER

- Full Kilowatt Output
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TS-140, Affordable HF
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TM-231, 2 Meter Mobile
TM-731, Dualband, FM
TM-701, 25W, 2M/440 MHz
TH-75, 2M/70cm HT

CALL NOW

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COMPACT DUAL BAND FM HANDHELD (2M/70CM)

21 Memories for Each Band
Dual VFO's for Each Band
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Built-in CTCSS
Built-in 10-Memory DTMF Autodialer

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COMPACT DUAL BAND, FM

- 140-150 MHz; 440-450 MHz
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• RS20A	$89	• RS50A	$199
• RS20M	$109	• RS 50M	$219
• VS20M	$124	• RM50M	$259
• RS35A	$139	• VS50M	$232

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HR-2600 10 Meter Mobile

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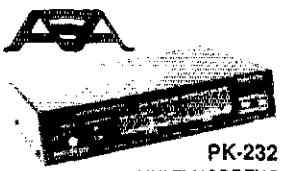

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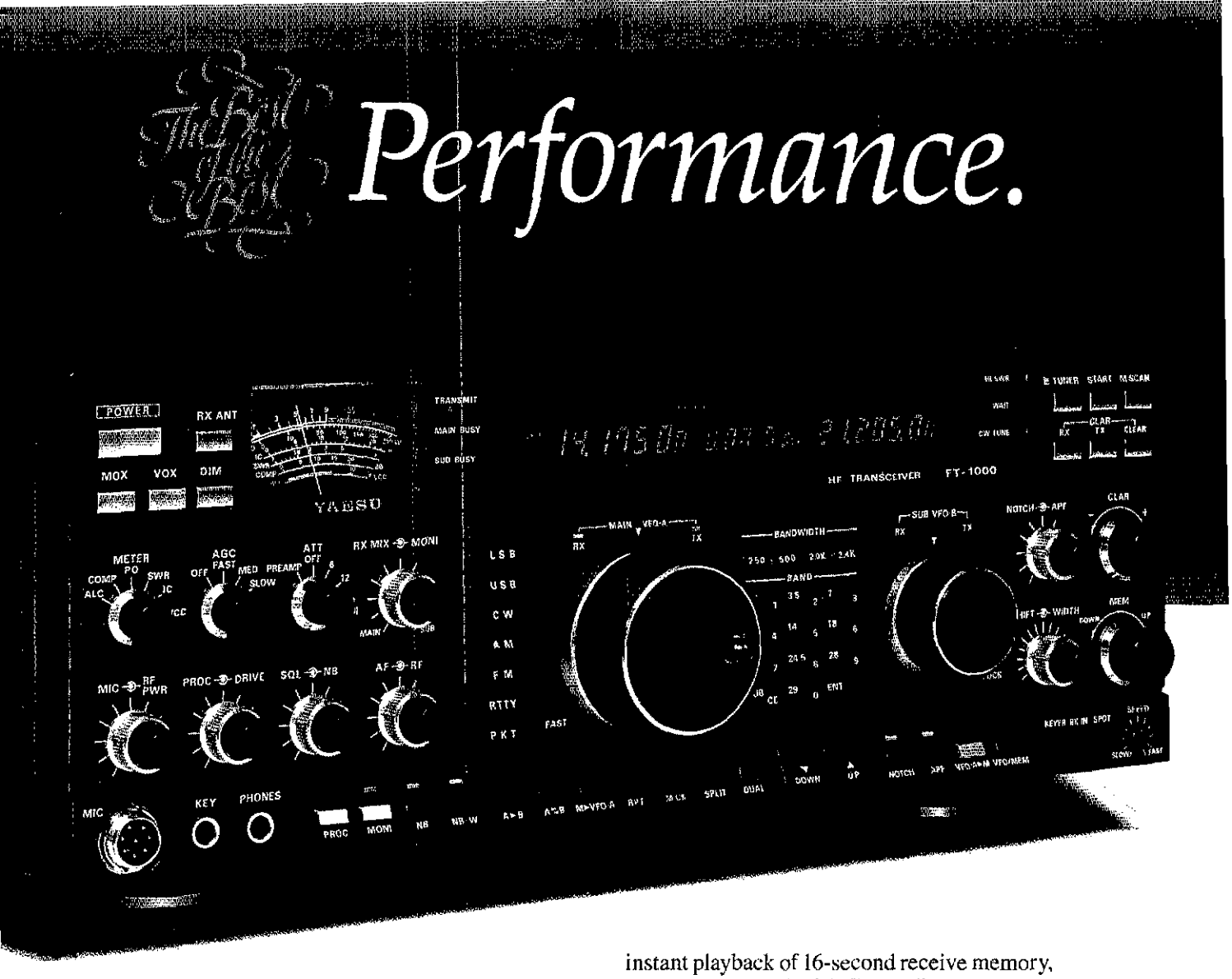
Performance.



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.

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• **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.

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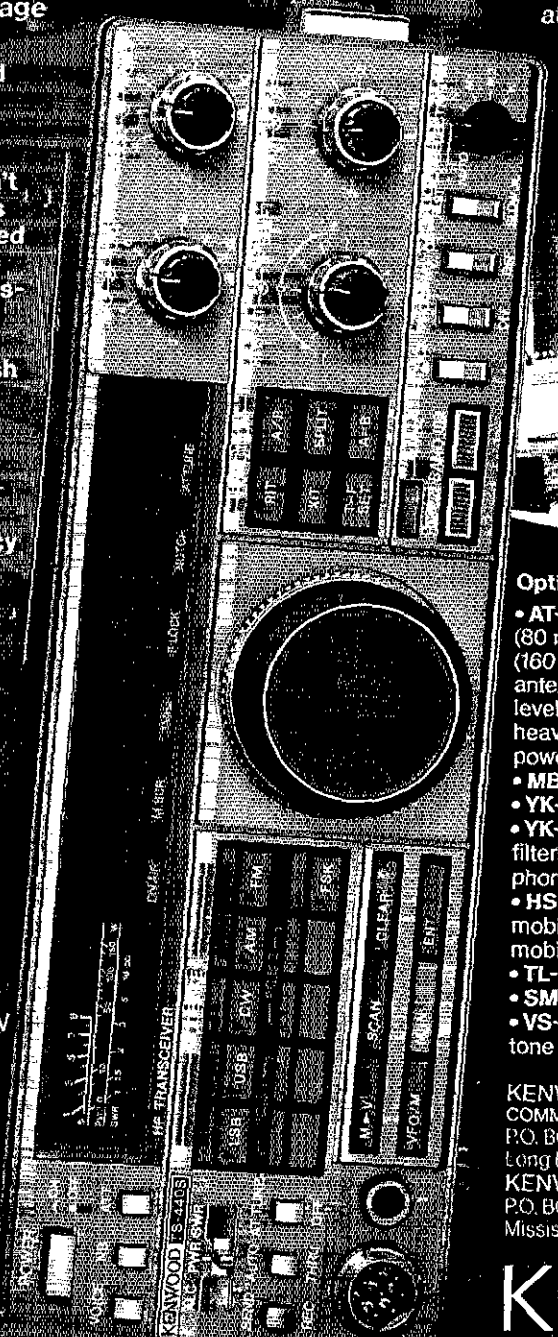
TS-440S

Compact high performance HF transceiver with general coverage receiver

Portable reliable performance and ease of use makes the TS-440S your obvious "low bands" choice. It is "Every Ham's" rig to go – ham shack, portable or mobile. But don't let the small size fool you – there's lots of "big rig" performance packed into this package. Built-in antenna tuner option. Continuous duty transmitter. Super DynaMix™ front end. Five filter functions. The TS-440S is at your service wherever you wish to operate.

- **Covers all Amateur bands** General coverage receiver tunes from 100 kHz–30 MHz. Easily modified for HF MARS operation.
- **Direct keyboard entry of frequency**
- **All modes built-in** USB, LSB, CW, AM, FM, and AFSK. Mode selection is verified in Morse Code.
- **VS-1 voice synthesizer (optional)**
- **Built-in automatic antenna tuner (optional).** Covers 80–10 meters.
- **5 IF filter functions**
- **Superior receiver dynamic range** Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range. (500 Hz bandwidth on 20 m.)
- **100% duty cycle transmitter** Super efficient cooling permits continuous key-down for periods exceeding one hour. RF input power is rated at 200 W PEP on SSB. 200 W DC on CW, AFSK, FM, and 110 W DC AM. (The PS-50 power supply is needed for continuous duty.)
- **Computer interface port**
- **Adjustable dial torque**
- **100 memory channels** Frequency and mode may be stored in 10 groups of 10 channels each. Split frequencies may be stored in 10 channels for repeater operation.
- **TU-8 CTCSS unit (optional)**



- **MC-43S UP/DOWN mic. included**
- **Superb interference reduction** IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and opt. filters fight QRM.
- **Dual SSB IF filtering** A built-in SSB filter is standard. When an optional SSB filter (YK-88S or YK-88SN) is installed, dual filtering is provided.
- **VOX, full or semi break-in CW**
- **AMTOR compatible**



Optional accessories:

• **AT-440** internal auto. antenna tuner (80 m – 10 m) • **AT-250** external auto. tuner (160 m – 10 m) • **AT-130** compact mobile antenna tuner (160 m – 10 m) • **IF-232C/IC-10** level translator and modem IC kit • **PS-50** heavy duty power supply • **PS-430** DC power supply • **SP-430** external speaker • **MB-430** mobile mounting bracket • **YK-88C/88CN** 500 HZ/270 Hz CW filters • **YK-88S-88SN** 2.4 kHz/1.8 kHz SSB filters • **MC-60A/80/85** desk microphones • **MC-55** (8P) mobile microphone • **HS-4/5/6/7** headphones • **SP-41/50B** mobile speakers • **MA-5/VP-1 HF** 5 band mobile helical antenna and bumper mount • **TL-922A** 2 kw PEP linear amplifier • **SM-220** station monitor (no pan display) • **VS-1** voice synthesizer • **TU-8** CTCSS tone unit • **PG-2C** extra DC cable.

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