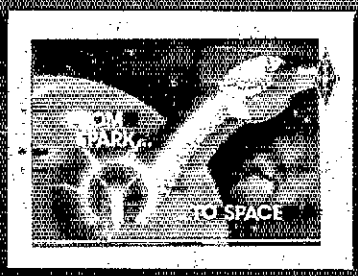
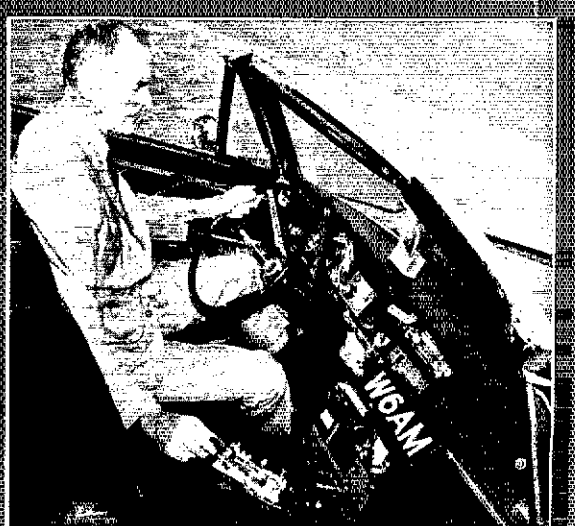
QST

devoted entirely to Amateur Radio



FIELD DAY
THROUGH THE YEARS



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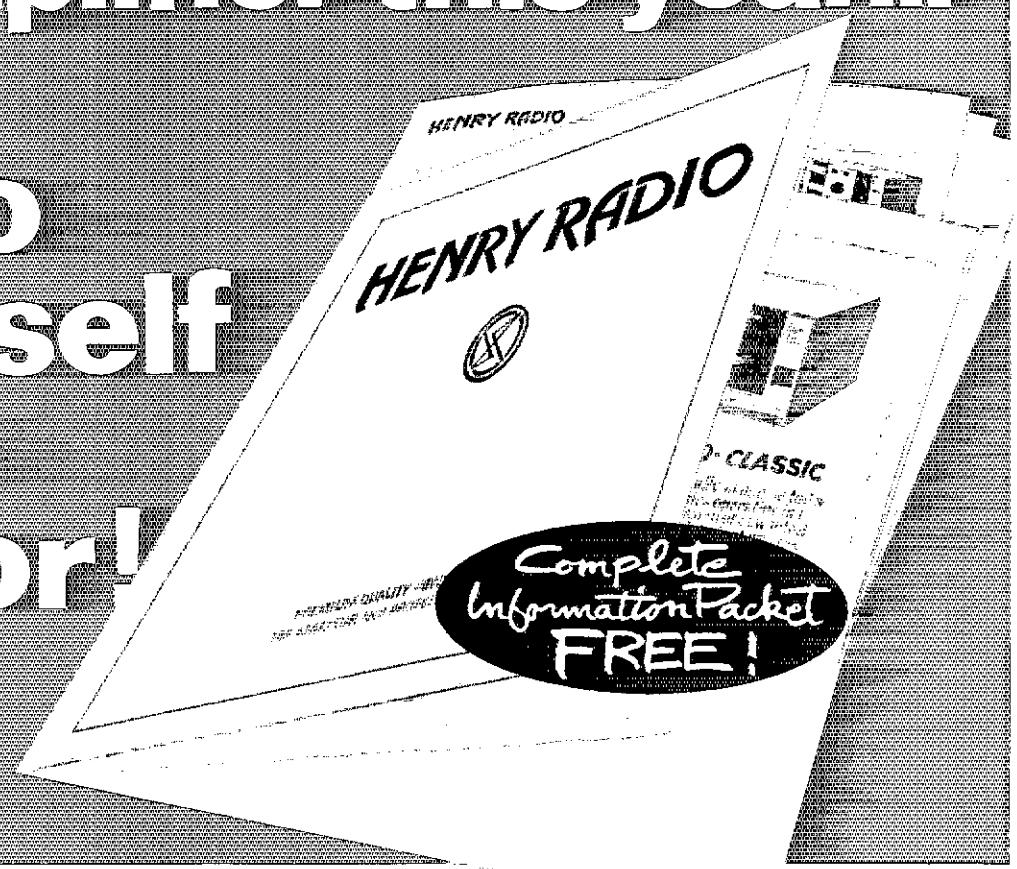
If you plan to buy an amplifier this year...

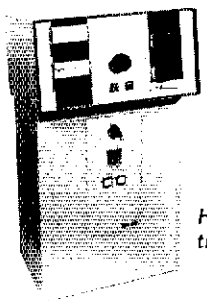
do yourself a favor!



You wouldn't buy a car from a dealer who offers only one model. . .so why buy an amplifier that way?

Henry Radio offers the widest choice of amplifiers in the world. We design and produce amplifiers to fit different needs and different budgets. We feel we offer the best equipment and there are a lot of amateurs who obviously agree. That's why we've sold over 40,000 amplifiers during the last 25 years. If you plan to buy an amplifier, do yourself a big favor. . .call, write, FAX, or come in. But make sure you have our new information packet in your hands before you make a decision. You owe it to yourself. Read it through, compare the specs, compare prices, compare VALUE.

And, of course, when you buy from Henry Radio you're buying factory direct.



Our present HF amplifier line includes the following models:

2KD STANDARD	Single 3-500Z Desk SSB Amp	**3K CLASSIC MKII**	Domestic Console
2KD CLASSIC	Desk Model Linear Amplifier	**3K CLASSIC MKII**	Export Console
2K CLASSIC	Console Amplifier	**3K CLASSIC RF**	RF Deck only
2K CLASSIC X	Domestic Console	**5K CLASSIC**	Export Console
2K CLASSIC X	Export Console	**5K CLASSIC RF**	RF Deck only
2K CLASSIC X RF	RF Deck only	**3K PREMIER**	Console Amp. with 160 meters
3KD CLASSIC	Single 3CX1200A7 Desk Amp	**3KD PREMIER**	Desk Amp. with 160 meters

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KENWOOD

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All New!

Stacked in Your Favor!

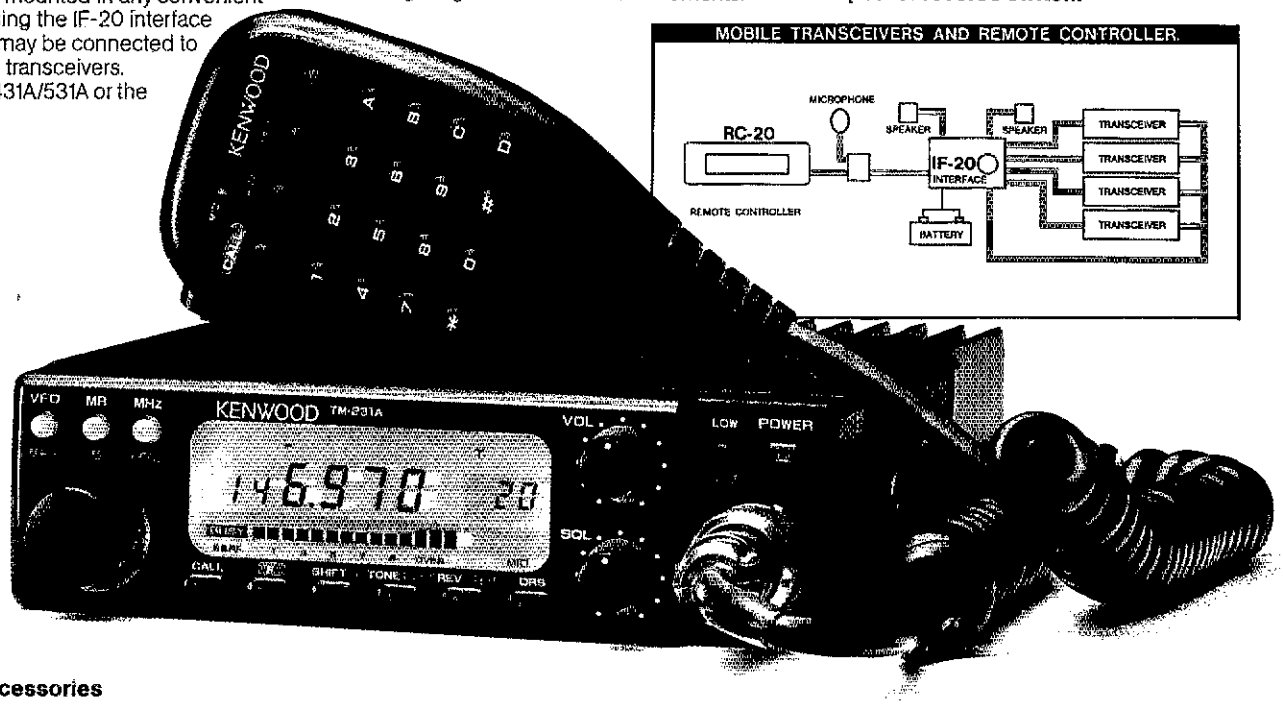
TM-231A/431A/531A

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.** 20 memory channels allow storage of frequency, repeater offset, CTCSS frequency, frequency step, Tone On/Off status, CTCSS and REV.
- **High performance—high power! 50W (TM-231A), 35W (TM-431A) with a 3 position power switch (high, medium, low).**
- **Optional full-function remote controller (RC-20).** A full-function remote controller using the Kenwood bus line, model RC-20, may be easily connected to the TM-231A/431A/531A and 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 DTMF mic. supplied.** Controls are provided on the microphone for CALL (Call Channel), VFO, MR (Memory Call or to change the memory channel) and a programmable function key. The programmable key can be used to control one of the following on the radio: MHz, T. ALT. TONE, REV, DRS, LOW or MONITOR.
- **Easy-to-operate illuminated keys.** A functionally designed control panel with backlit keys increases the convenience and ease of operation during night-time use.
- **Auto repeater offset on 144 and 220 MHz.**
- **Built-in digital VFO.**
  - **a) Selection of the frequency step (5, 10, 15, 20, 12.5, 25kHz)**
    *TM-531A: 10, 20, 12.5 25kHz
  - **b) Programmable VFO**

  The user friendly programmable VFO allows the operator to select and program variable tuning ranges in 1 MHz band increments.
- **Programmable call channel function.** The call channel key allows instant recall of your most commonly used frequency data.
- **Selectable CTCSS tone built-in.**
- **Tone alert system—for true "quiet monitoring"!** When activated this function will cause a distinct beeper tone to be emitted from the transceiver for approximately 10 seconds to signal the presence of an incoming signal.
- **Easy-to-operate multi-mode scanning.** Band scan, Program band scan, Memory scan plus programmable memory channel lock-out, with time operated or carrier operated stop.
- **Priority alert.**
- **DRS (Digital recording system).** The optional DRU-1 can store received and transmitted messages for up to 32 seconds, allowing the operator to quickly check or return any call using the tone alert system.
- **Automatic lock tuning function (TM-531A).**
- **Repeater reverse switch.**



Optional Accessories

- **RC-20** Full-function remote controller
- **RC-10** Multi-function remote controller
- **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** Desk-top 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 • **PS-50** Heavy-duty 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

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

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Mississauga, Ontario, Canada L4T 4C2

ICOM

IC-2400 UHF/VHF Mobile
IC-2500 UHF/

NOW YOU DON'T HAVE TO DOUBLE UP!

10 watts on 1.2GHz. Both units include selectable low power for working local stations.

Stack today's rapidly expanding VHF/UHF action in your favor with the most advanced design yet easy-to-operate FM dual banders on the road: ICOM's IC-2400 2-meter/440MHz or IC-2500 440MHz/1.2 GHz.

Their overlapping band ranges are great for present use and future expansions, and their wide array of impressive features make your auto a double-mobile winner!

WIDEBAND COVERAGE.

The IC-2400's range of 138-174MHz RX/140-150MHz TX and 440-450MHz RX/TX includes NOAA weather reception plus liberal overlap for MARS/CAP operation. The innovative IC-2500 receives and transmits 440-450MHz and 1240-1300MHz.

HIGH POWER RADIOS!

The IC-2400 delivers 45 watts output on two-meters, 35 watts on 440MHz. The IC-2500 features 35 watts on 440MHz

FULL DUPLEX OPERATION.

Both transceivers transmit on one band while simultaneously receiving on another. Both radios feature independent offsets for each band. It's like having two separate radios in one! Perfect for true telephone-style auto-patching with a modern crossband repeater!

SIMULTANEOUS DUAL BAND RECEPTION.

Monitor both bands on the internal speaker or add external speakers. Each band features separate volume and squelch controls.

40 MEMORIES.

Twenty per band. Store frequencies, PL tones and TX offsets for super-convenient mobiling!

PROGRAMMABLE BAND AND MEMORY SCANNING.

You set the limits and select/lockout preferred memories. ICOM's IC-2400 and IC-2500 monitor the action. A sheer VHF/UHF delight!

Additional features include: **Priority Watch.** Monitor one channel's activity while operating on another frequency. **Two Call Channels.** One on each band for quick, single access to your favorite repeater. A **Repeater Input Monitor Switch** for rapid checks of TX offset and evaluation of direct range. Plus, an **Optional Beeper** silently monitors any selected frequency or repeater for calls with your preselected CTCSS subaudible tone.

Double your bands with ICOM's new IC-2400 or IC-2500 mobiles!

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OUR COVER

To many, Field Day *is* ham radio. This month's cover shows: *QST*'s July 1952 FD cover cartoon; Steve Mesko, WB7Y, preparing a tower for FD '89; Byron Goodman, W1JPE, now W1DX, operating FD in '37; Don Wallace, W6AM/6 (SK), operating CW mobile during FD '67; the W6YL team preparing a balloon-supported skywire for FD '88; and the W6DIS/6 18-watt, 3690-kc rig that won FD in '34 with 58 QSOs. Field Day results begin on page 72.

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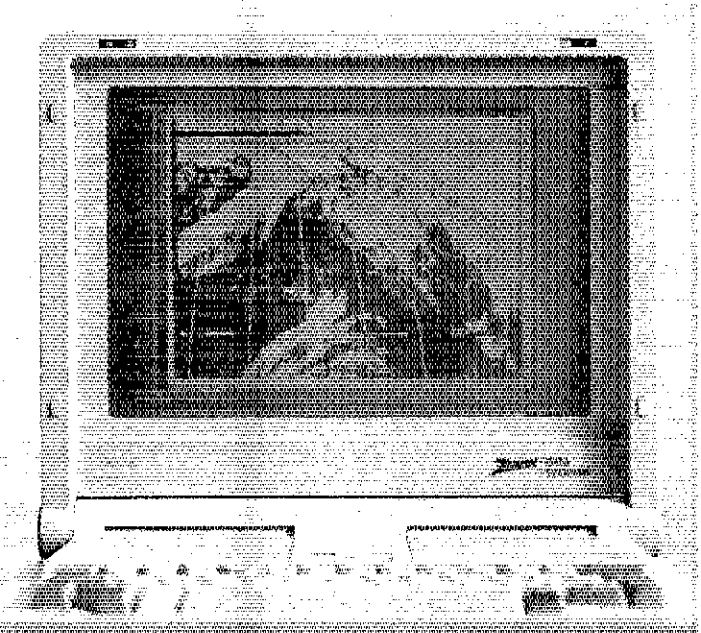
AEA's NEW PK-232MBX With PakMail™



Now AEA's popular PK-232MBX multi-mode data controller has all of the features you've been asking for...PakMail™ mailbox with third-party traffic, seven-character AMTOR sel-call, TDM (Time Division Multiplexing) Rx for SWL and priority acknowledgment features. Compatible with almost every computer or data terminal, you can enjoy the full spectrum of digital communications with the PK-232MBX.

All Operational Modes. The PK-232MBX includes all of the **recognized** data modes available today... AMTOR, ASCII, Baudot, CW, FAX Tx and Rx, NAVTEX marine and packet.

Modem Superiority. An eight-pole chebyshev bandpass filter limiter-discriminator modem enhances the signal-to-noise ratio at the detector and virtually eliminates interference from adjacent signals. This system is superior to PLL modem technology which was designed for minimal noise interference.

PakMail.™ PakMail™ mailbox with third-party traffic is now a standard feature. Leave and retrieve packet messages around the clock. The PakMail™ plug-in board/update is compatible with all PK-232's. Contact factory for details. The upgrade also includes TDM (Time Division Multiplexing) decoding and seven-character AMTOR sel-call. Priority acknowledgment is also included to reduce packet collisions.

FAX Transmission. The **first** multi-mode TNC to transmit FAX, the PK-232/MBX supports the widest range of printers using the optional RS-232/printer cable.

Host Mode. Only AEA provides a fully functional Host Mode which enables programs to control the TNC more efficiently. Programs include PC-Pakratt with FAX for IBM PC and compatible computers, COM-Pakratt with FAX for the Commodore 64 and 128, and now MacRATT with FAX for the Macintosh.

Two Radio Ports. Independent radio connection ports allow interchangeable HF or VHF operation, selectable from the front panel for convenience.

Signal Anaylsis. The PK-232MBX internal software has the exclusive SIAM™ (Signal Identification and Aquisition Mode) feature which lets you tune an unidentified signal. The PK-232MBX can automatically determine the signal's mode, baud rate or speed and configuration.

You Deserve the Original. AEA was the first to produce a multi-mode TNC, and it still remains the standard by which all other TNC's are compared. Don't settle for less.

Advanced Electronic Applications, Inc.
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206-775-7373

R5 10, 12, 15, 17, 20 METERS

Communicate From the Tight Spots

R5 is the antenna designed for space age living, on small city lots, apartments, condominiums or for travel in motor homes. If you have limited space, or galaxies of space, R5 will give the most performance from your transceiver.

R5 electrical halfwave, only 16′ 4″ tall design allows the antenna to be mounted virtually anywhere, without compromising performance. It easily handles 1800 watts of power with a solid state matching network giving full band coverage of 10-12-15-17-20 meters.

Easy set-up makes this antenna ideal for portable or fixed installations. It performs without a rotator, or tower. A simple support mast and 50 ohm cable is your connection to ham friends around the world.

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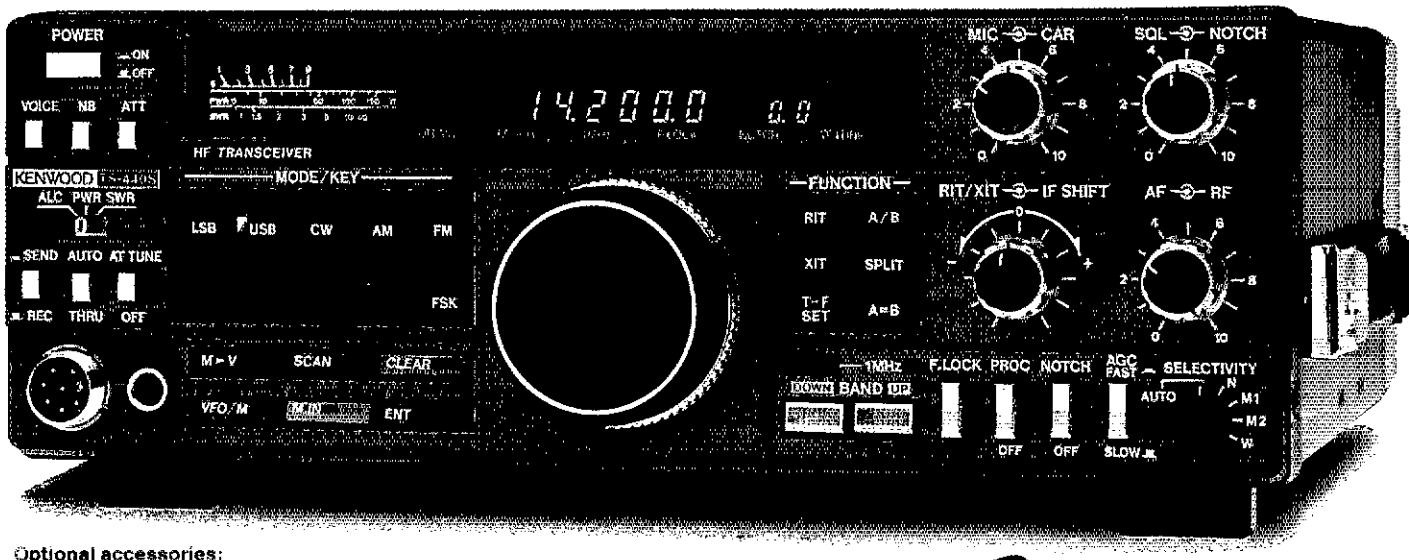
All New Compact HF

"DX-citing!"

TS-440S Compact high performance HF transceiver with general coverage receiver

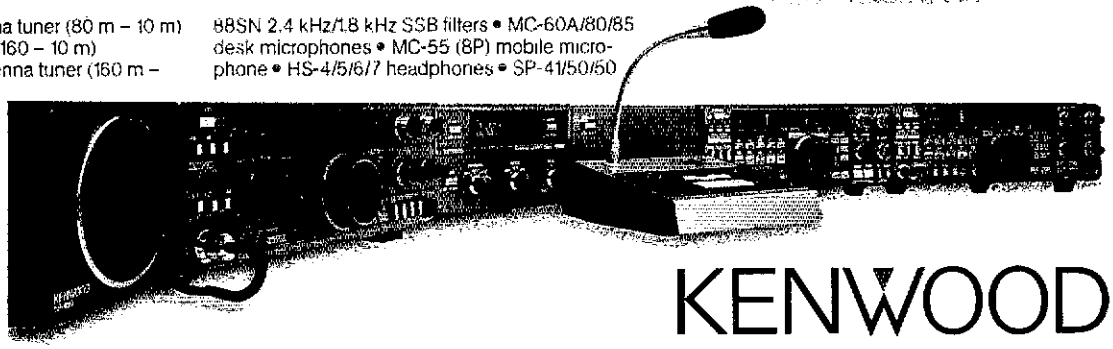
Kenwood's advanced digital know-how brings Amateurs world-wide "big-rig" performance in a compact package. We call it "Digital DX-citement"—that special feeling you get every time you turn the power on!

- **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)**
- **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.)
- **Built-in automatic antenna tuner (optional).** Covers 80–10 meters.
- **5 IF filter functions**
- **VOX, full or semi break-in CW**
- **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.
- **AMTOR compatible**
- **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)**
- **Superb interference reduction**
  IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and optional filters fight QRM.
- **MC-43S UP/DOWN mic. included**
- **Computer interface port**



Optional accessories:

- AT-440 internal auto. antenna tuner (80 m – 10 m)
- AT-250 external auto. tuner (160 – 10 m)
- AT-130 compact mobile antenna tuner (160 m – 10 m)
- IF-232C/IC-10 level translator and modem IC kit
- PS-50 heavy duty power supply
- PS-430/PS-3D 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-41/50/50 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.



Kenwood takes you from HF to OSCAR!

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P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

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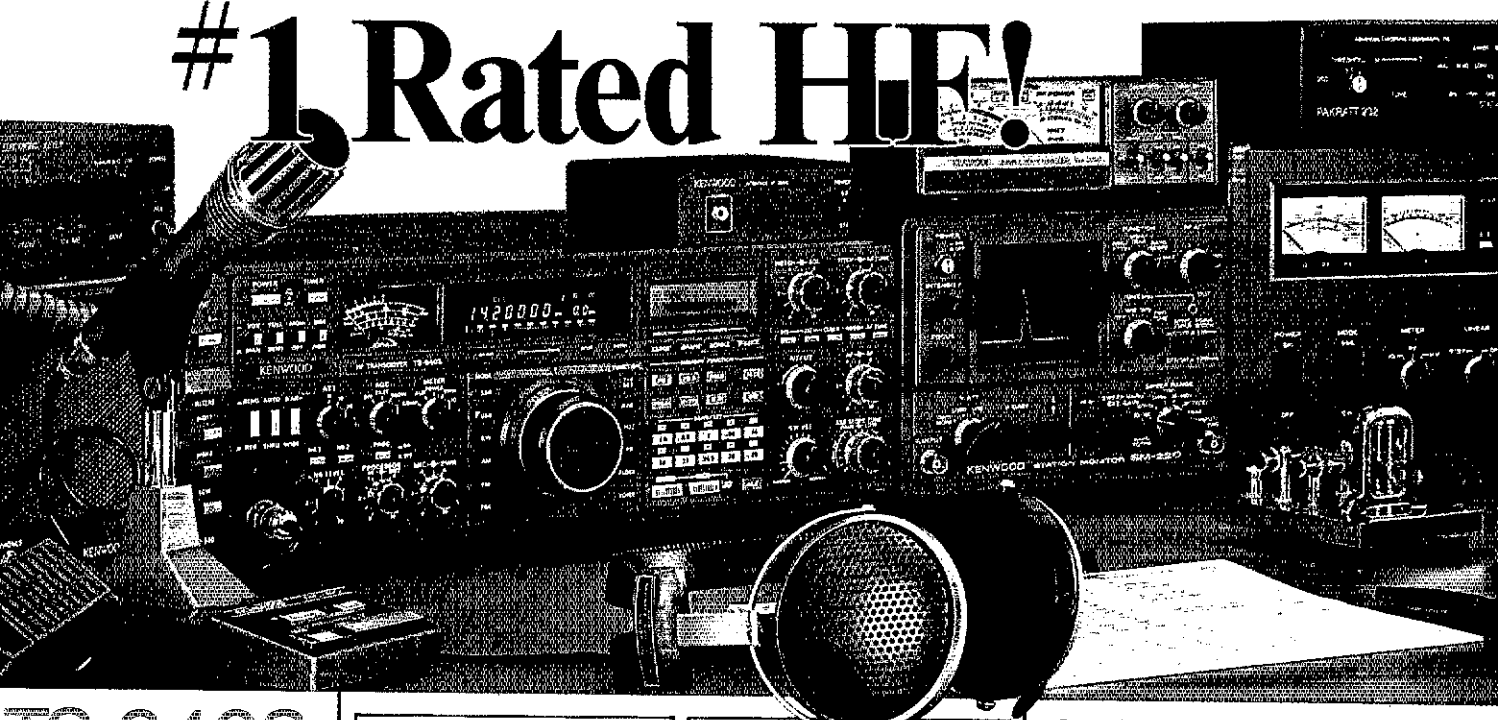
DX-cellence!

#1 Rated HF!

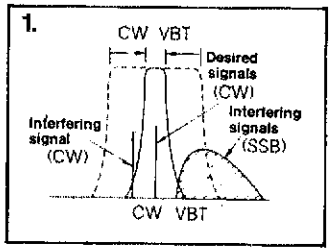


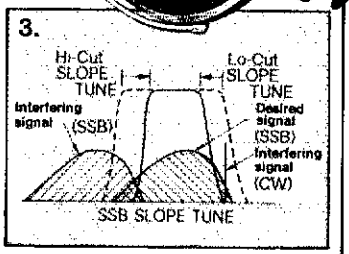
TS-940S

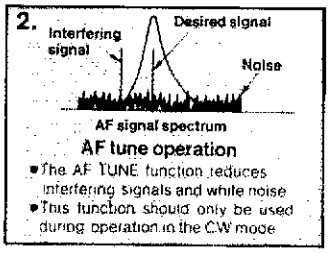
Competition class HF transceiver

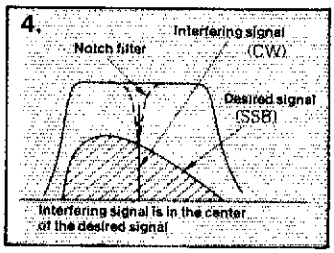
TS-940S—the standard of performance by which all other transceivers are judged. Pushing the state-of-the-art in HF transceiver design and construction, no one has been able to match the TS-940S in performance, value and reliability. The product reviews glow with superlatives, and the field-proven performance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

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









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

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

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

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

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

Optional accessories:
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-43S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL-922A linear amplifier • SM-220 station monitor • BS-8 pan display • IF-232C/IF-10B computer interface.

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

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Reports Invited: The ARRL Board of Directors (see list at left) determines the policies of ARRL. The 15 divisions of the League are further arranged into 69 administrative "sections," each headed by an elected Section Manager. Your SM welcomes reports of club and individual activity. ARRL Field Organization appointments are available covering a wide range of Amateur Radio volunteer interests. Whatever your license class, your SM has an appointment available. Check with your SM (below) for further information.

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"It Seems to Us . . ."

License Fees

Not for the first time, radio amateurs in the United States face the possibility of having to pay a fee when applying to the FCC for a new license, or for any change in their existing license.

Most members we've talked to since the issue resurfaced are not flatly opposed to a license fee. They simply want a fee system that doesn't discourage people from entering Amateur Radio or from upgrading, and that doesn't exceed the actual cost of administration. They also want the government to provide needed services in return; they're tired of listening to the broken record that goes, "We know that's what the rules say, but we don't have the wherewithal to enforce the rules."

Unfortunately, the measures being discussed in Congress have some very undesirable features, and none of the desirable ones. On Capitol Hill, a fee schedule for amateur licenses is not seen as a way of funding increased services to licensees. It is simply viewed as one of the many tiny thimbles with which the ocean of red ink in the federal budget is to be bailed out. Amateur license fees are simply a way to raise an estimated $3 million to help offset the couple of hundred *billion* dollars of annual deficit.

At this writing, the House has under consideration H.R. 3299, the Omnibus Budget Reconciliation Act of 1989. Under Section 4701(a) of H.R. 3299, any time a Form 610, 610-A, or 610-B was submitted to the FCC it would cost $30.00. Special Temporary Authority requests, modifications, and extensions would cost $30.00. Waiver requests would cost $105.00. The Senate Budget Committee has a similar measure under consideration, but the Senate price tag is $35.00.

With license terms of ten years, either the House or the Senate version would come to less than a penny a day. It's difficult for a longtime, dedicated radio amateur to argue that a ham ticket isn't worth at least that much to him. But the proposed fee schedule is much more insidious than that. To begin with, $30.00 or $35.00 is a lot of money for someone to fork over at the point of entry. Last month, *QST* carried a story about 65 new hams in a Bardstown, Kentucky, middle school where the total investment in the school radio station came to less than $1,500. Would the parents and the school system be as enthusiastic about the program if another $2,000 in license fees was added to the up-front cost? Now, let's say that each student wants to upgrade the following year; that's another $2,000. And that's just one upgrading step; progressing all the way to Extra could cost each and every licensee $150.00—and that doesn't even include the reimbursement for the Volunteer Examiner program, which operates *at no cost to the government*. Taking several people in the same family and turning them into enthusiastic radio amateurs could drain hundreds of dollars out of their family treasury before they even got on the air.

License modifications include changes of station location. It doesn't take a rocket scientist to figure out what will happen if the government charges people for the privilege of updating the government's records of where they live: the records will quickly become as useless as an old telephone directory.

A reciprocal permit is only valid for one year at most, and many applicants come from countries with foreign-exchange restrictions. Instead of being vehicles for international good will, a $30.00 or $35.00 fee will turn reciprocal permits into something only well-heeled visitors can afford.

On the Hill, we've pointed out that $3 million is a phony figure. It assumes that there will be just as many applications, at $30.00 or $35.00 each, as there are when the applications are free. It assumes that processing the fees will not increase the cost of processing applications. Even if it weren't a phony figure, what is the cost to the country when we discourage young people and retirees from entering a corps of technically qualified, service-oriented volunteers, and from upgrading their skills once they enter? How can the government that uses Amateur Radio communications in emergencies such as Hurricane Hugo justify imposing a fee on the very people who provide that service—and who are barred from accepting remuneration? Doesn't this really amount to a new tax, imposed on volunteers?

These are questions that deserve to be answered before Congress instructs the FCC to charge fees of its amateur licensees. Unfortunately, as we went to press it seemed unlikely that this would occur on the House side. Our best hope was that Senator Carl Levin of Michigan was working on an amendment to reduce or eliminate amateur license fees, and that such an amendment would be adopted by the Senate and would prevail when the Senate and House versions of the bill went to a joint Conference Committee for reconciliation. The time frame for all this to happen probably will have passed by the time you read these lines, but if you've been copying W1AW bulletins you'll know how it turned out.

Of course, there's always a possibility that Congress will have moved more slowly than predicted. There may still be time to write your Senators and ask that they support the Levin Amateur Radio Amendment to the Budget Reconciliation Bill, and to write your Congressman urging support for the amendment in the Conference Committee. Warm up your receiver!—*David Sumner, K1ZZ.*

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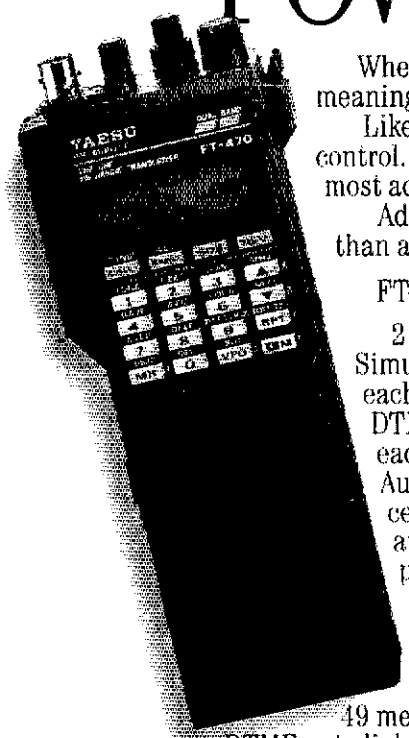

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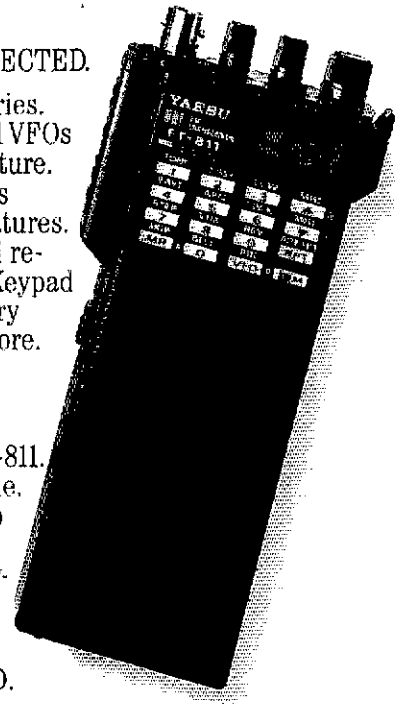

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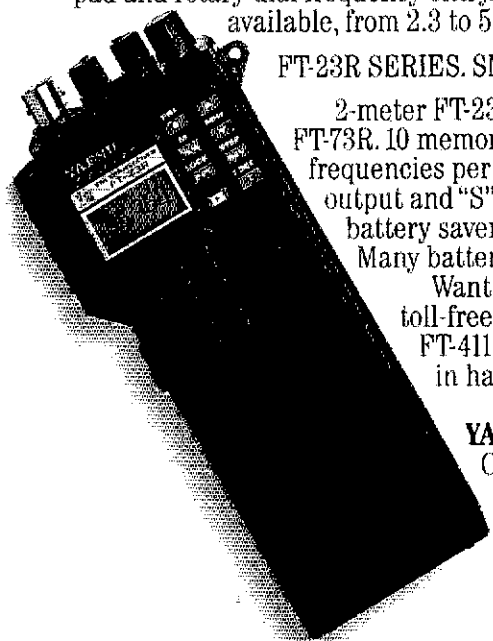

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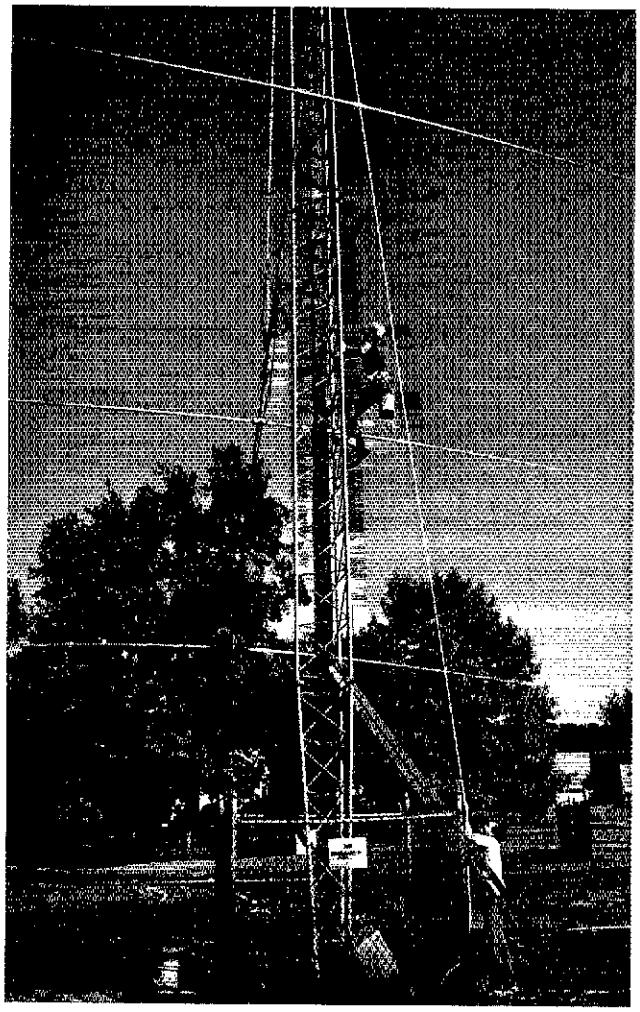
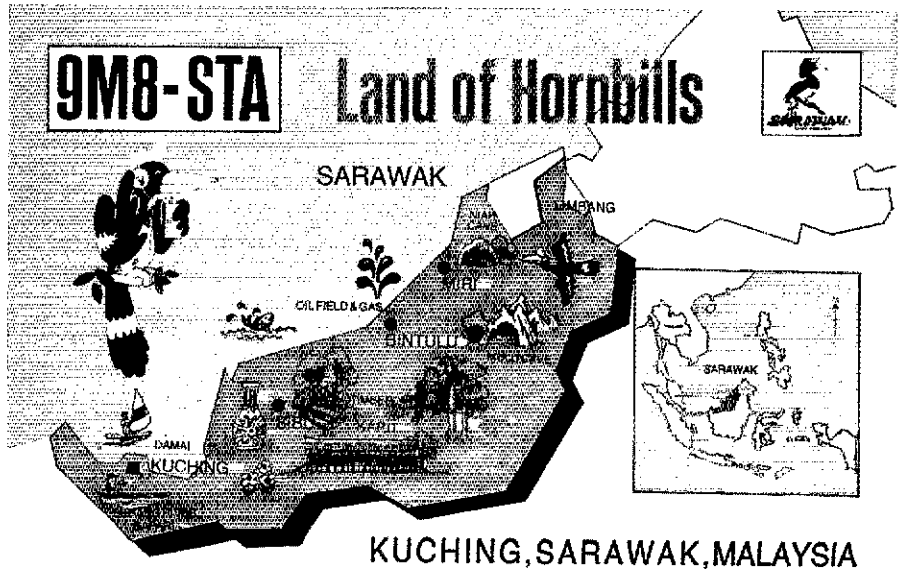
UP FRONT in QST

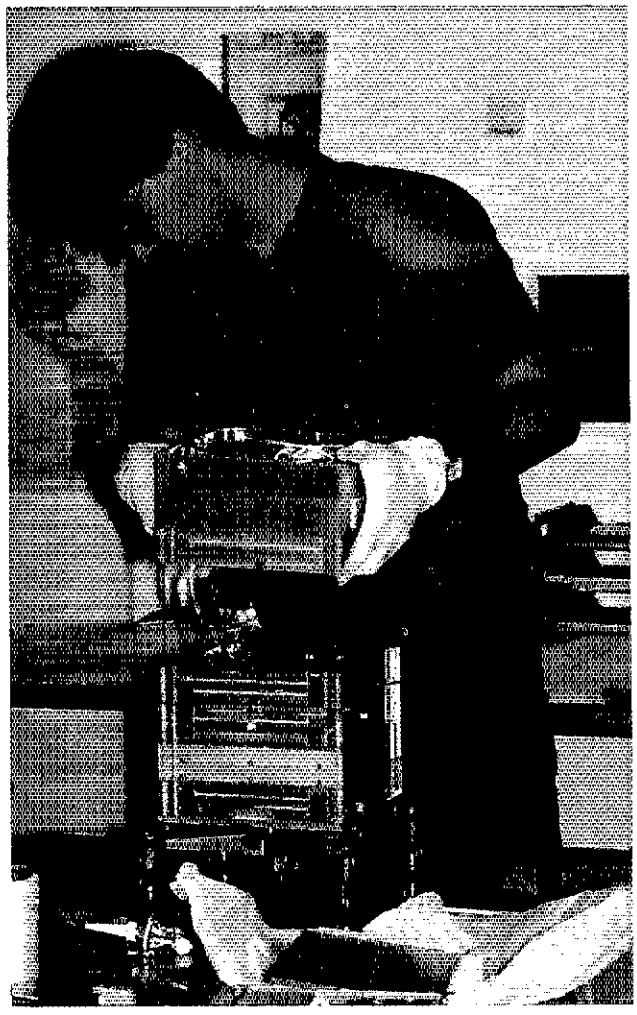


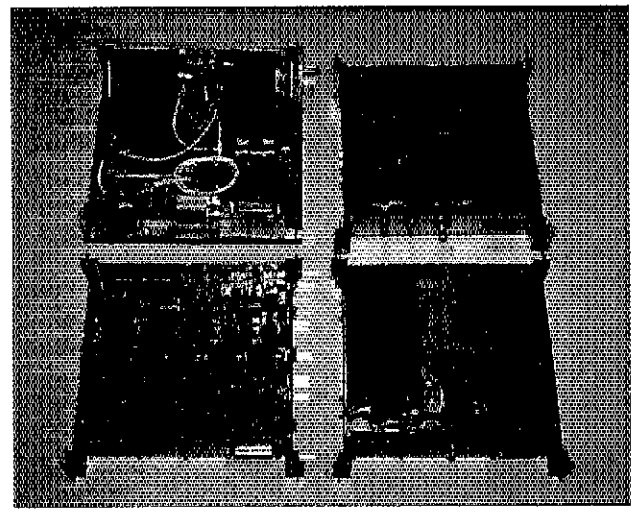
Hoist away!: Jeff Bauer, WA1MBK (on the tower), and Mark Wilson, AA2Z, install the first of many new antennas on the 120-foot tower at W1AW. Plans call for fixed 3-element Yagis on 10, 12, 15, 17 and 20 meters, 2-element Yagis on 30 and 40 meters for bulletin and code-practice transmissions, as well as rotatable antennas for two-way contacts. Bill Myers, K1GQ, custom designed the 3-element Yagis especially for W1AW use. They have a wide impedance bandwidth to be able to cover W1AW's widely spaced CW and phone bulletin frequencies. Cushcraft manufactured the custom antennas and donated them to the League. We'll show you more of W1AW's new skyhooks in upcoming issues of *QST*. Be sure to give W1AW a listen, as the transmissions will be emanating from the improved facilities by the time you're reading this.

Worked 'em all: George De Grenier's face shows determination—the kind of determination it takes to confirm more countries on the *DXCC Countries List* than anyone else. W1GKK hasn't missed a country in 43 years! The skill and Yankee perseverance required for this feat is described by Rick Booth, KM1G, in this month's *QST* Profile. *(KM1G photo)*

Land of Hornbills: Here's the QSL from the August operation of 9M8STA, the first special-event station from Kuching, Sarawak, Malaysia. A group of 13 amateurs made 3039 contacts in 48 hours, with 600 of those being on 6 meters. Read more more about the operation in the article by IARU Region III Director D. D. Devan, 9M2DD, in this month's IARU News.







Stacking up nicely: AMSAT volunteer Jeff Zerr assembles the Weber State College Microsat. The design of the Microsats allows each subsystem to be built in its own modular box. In the photograph at right, the individual modules are (clockwise from upper left) the transmitter module, battery/power module, AMSAT Argentina (LUSAT) module, and LUSAT receive module. (The CPU module isn't shown.) Read more about the impending launch and these new OSCARs' packet-radio capabilities in this month's Amateur Satellite Communication column. *(N4HY photos)*

Want a Place in Up Front?

Have a news item of an interesting twist concerning Amateur Radio, with a good color photograph? It just may be the ticket for a future edition of Up Front. Here are some hints to improve your chances of getting that item in print.

1) Be sure the item is of interest to most hams.

2) Amateur-Radio-in-action shots are preferred over staged stand-up awards presentations; ie, we'd prefer to have a photograph of a ham doing what he got the award for, rather than a shot of the ham receiving the award.

3) Photographs must be in color. Transparencies reproduce best, and print enlargements should be at least 4 × 6 inches. No Polaroids®, please.

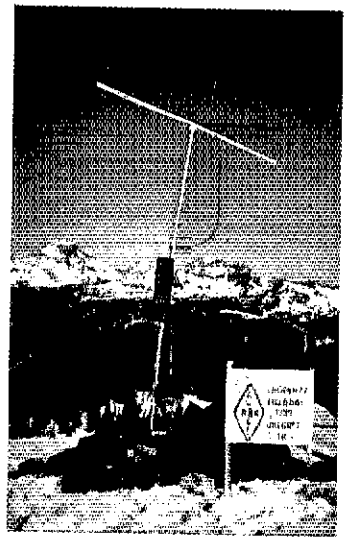
4) Include all pertinent information and identify everyone in the photograph. Don't forget to include a photo credit.

5) Send all material to ARRL, Up Front Editor, 225 Main St, Newington, CT 06111.

Simplex to duplex: The "arch of sabers" is performed with hand-helds as Dave Rhodes, N1EYO, weds Kimberly Wood, KA1TYI. The best man was KA1OXO, and the mother and father of the bride, K1TFW and K1TFX. Forming the arch are WS5V, KA1ROE and XYLs of KA1KAO and KA1ROE—with even more hams in attendance at the ceremony! All the amateurs are members of the Aroostook (ME) Amateur Radio Association. *(KA1KAO photo)*

Field Day 1989

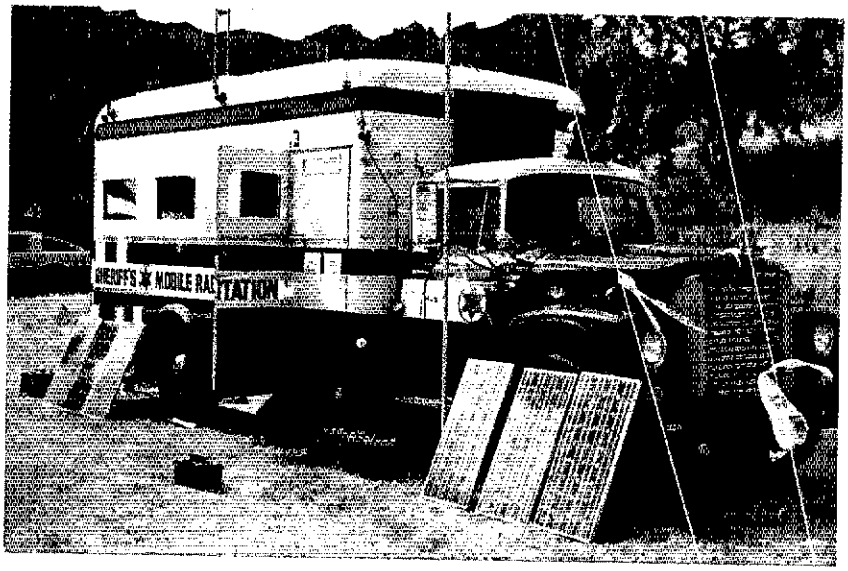
The crew at KH6JJX picked a great spot for Field Day—Sand Island State Park, Oahu, Hawaii.



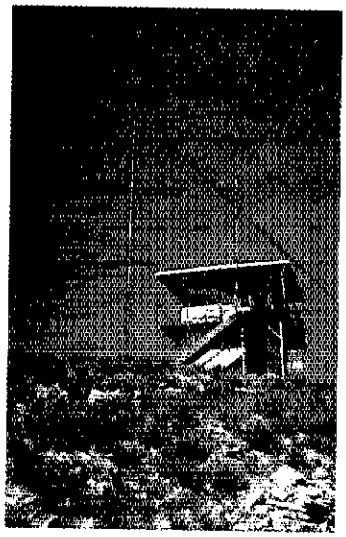
Jeff Damm, WA7MLH, ran solar-powered 2-meter FM and 40-meter CW on Mt Tumalo in central Oregon.

Boy Scout Troop 298 operated CW at the Texins Amateur Radio Club station, K5OJI, at Erwin Park in McKinney, Texas. *(N3BAO photo)*

George Hart, W1NJM, pecks away to generate CW at the Newington Amateur Radio League, W1OKY, setup. *(AA2Z photo)*



The gang at NW6A, the Los Angeles County Disaster Communications Service, used the Sheriff's Mobile Radio Station for housing their HF CW and 2-meter multimode stations at the Circle X Ranch in the Santa Monica Mountains National Recreation area.



The KK7A site was atop 7650-foot House Mountain about 30 miles east of Boise, Idaho. *(KK7A photo)*

League Lines

It's Official: The ARRL has gone to court to challenge the FCC's 220 MHz reallocation decision. A petition was filed September 28 requesting that the US Court of Appeals for the DC District review the decision which the ARRL believes to be arbitrary, capricious, an abuse of discretion and not in accordance with the law. More information will appear in next month's Happenings column.

Effective immediately, ***the League will now accept 10-MHz contacts for the following awards:*** WAS (basic, CW, RTTY, packet and QRP; but no single-band or 5-Band WAS); DXCC (CW and digital QSOs for mixed, CW and RTTY awards, but no 5-Band DXCC). IARU officials at the Region 2 Conference in Orlando adopted the change, which now allows awards credits on 10 MHz. The policy now conforms with 10-MHz award credit rules in Regions 1 and 3.

10-MHz users are reminded to avoid causing interference to stations operating in the Fixed Service. The conference attendees noted the special need to maintain the highest operating standards in the period prior to the 1992 World Administrative Radio Conference.

Many of the first reports from the affected areas by ***Hurricane Hugo*** were from Amateur Radio stations. At press time, the story of the hurricane disaster was still unfolding, and *QST* will have more information on amateur activities as it becomes available.

The Field Services Department is most interested in gathering the stories of groups and individuals who participated in Hurricane Hugo Communications effort for compilation in a future *QST* article. Please send your articles and photos to Rick Palm, K1CE, at HQ.

Attention repeater owners/trustees: It's now time to submit your repeater changes and updates to your frequency coordinator for inclusion in the 1990-91 issue of *The ARRL Repeater Directory*. Mark your changes on the forms provided in the back of the 1989-90 *Repeater Directory*. Repeater updates should be submitted directly to the coordinator for your area; however, packet and beacon changes may be sent directly to *Repeater Directory* Editor Jay Mabey, NUØX, at ARRL HQ.

The ARRL/VEC has reached another landmark. On September 27, 1989, the ARRL/VEC processed examination session number 10,000. The session was conducted by the Grand Rapids (MI) Amateur Radio Association. More than 121,000 candidates have been served by the ARRL/VEC.

It's time again for one of the most popular ARRL operating events—***ARRL November Sweepstakes!*** CW Sweepstakes will be held November 4-5 and Phone Sweepstakes will be held November 18-19. For forms, send an SASE with 45 cents postage to ARRL HQ. The Sweepstakes announcement can be found on page 83 of October *QST*.

Following several days of test transmissions, W1AW began operating on its regular schedule from the renovated station on September 28. As announced in July *QST*, CW operation has been moved to 14,047.5 kHz on 20 meters and 7,047.5 kHz on 40 meters. Voice transmissions will be sent at 0245 and 0545 UTC. A complete W1AW operating schedule can be found on page 80.

Here's a job opening at HQ that doesn't come along very often: ***Chief Operator and W1AW Station Manager.*** Technical and computer skills as well as background in management are required. Starting salary range: $26,000-28,000. Send resumes to Membership Communications Services Manager John Lindholm, W1XX, at ARRL HQ.

One of the benefits of ARRL membership is the availability of low-cost equipment insurance to members. The cost is $1.25 per $100 of replacement cost value plus a $5 administrative fee. Send a SASE to ARRL HQ for an application.

White Water Portable

They made the contact that counted, in spite of poor propagation.

By Michael Dale
4707 East Kings Ave
Phoenix, AZ 85032

When Kevin Swesey, KA7GQX, asked if he could paddle along on a trip we had planned over the Memorial Day weekend, I said, "Why not?" My partner, Kim Swesey (his brother), and I planned an eight-man, four-canoe trip down the rugged Verde River in central Arizona. Two nights and three days of excitement for our crew and a world of entertainment supplied by KA7GQX making contacts sounded like fun.

Paddling canoes in class two and class three white water is a lot of fun, especially in Arizona where you'll see cacti in bloom, eagles' nests located on sheer cliffs and beautiful cottonwood trees along virgin fishing waters. Gliding down river rapids in a canoe is not the most stable place to operate a radio, so we agreed on limiting operations to riverbank resting spots.

For our radio equipment, we used a 10-meter AR-3500 Ranger with a dipole. For local contacts we brought along a hand-held and a home-brew, four-element cubical quad, as we would need maximum gain to get out of deep canyons and sheer cliffs.

Our power supply was a marine battery rated at 60 Ah tied down under the back seat of the canoe. That seat was assigned to the lightest crew member. Operating one hour each morning, one hour at noon and starting in again at 5:00 PM until band closing, we estimated that the battery would last the whole trip. All of our radio gear, along with cameras, personal effects and other necessary equipment was stowed in waterproof bags and tied to the canoes in the event we capsized.

We arrived at Childs, Arizona (our launch site), on Friday evening to camp overnight. Our families came along to cook, watch the launch and drive vehicles back over the switchback trail to Phoenix. Kevin tried out the AR-3500 in early evening but was unable to make a contact. Solar flares were disrupting the band, and we all hoped that conditions would improve the next day.

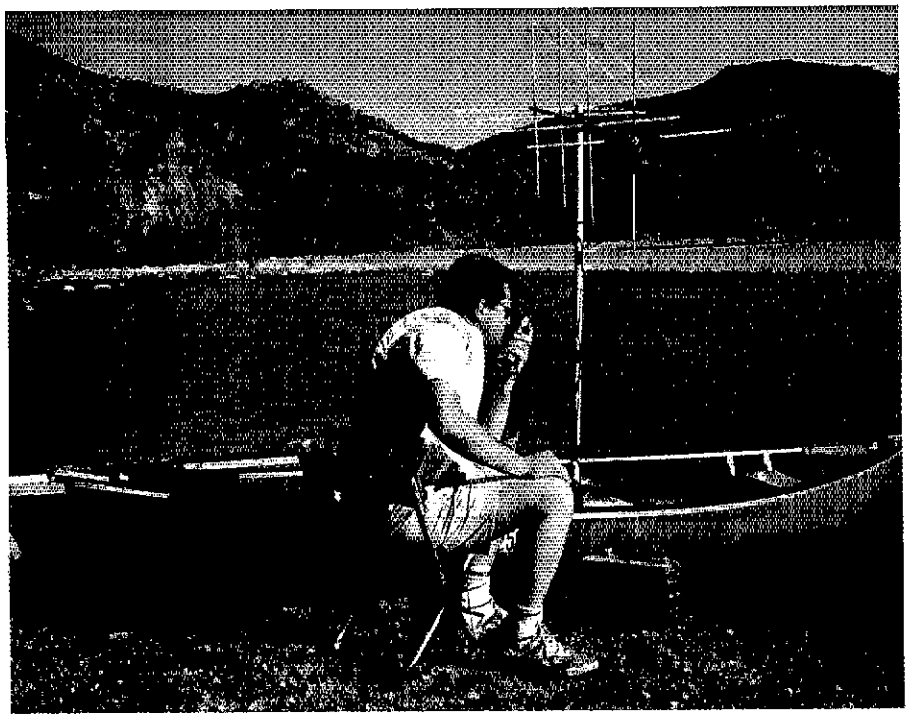
The morning light danced across my eyelids as I stirred from a deep slumber. Raising up on one elbow, I looked out at the four canoes that would embark us on waters of adventure. The slow awakening of our campers escalated as breakfast began to perk along with the coffee. While the canoeists were being teased with the tantalizing odors of all that good food, they were busy loading equipment. Our radioman was excused from this activity, as he tried once again to make some contacts, but the band was still dead.

Now it was time to hit the water and start paddling. The first rapids were only 200 yards downstream. Everyone that wasn't in a canoe rushed ahead to watch the crews shoot through the narrow opening that was fortified on each side with huge boulders.

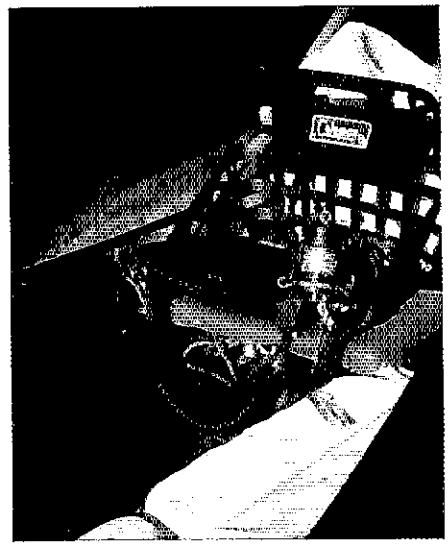
The first canoe made it through as though they had done this a hundred times. The second canoe, where Kevin and all the radio gear was riding made it through with flying colors, but then bashed against the rock-bordered bank and swamped. The third and fourth canoes also swamped. We soon discovered, that vital to our success on this trip, were our state-of-the-art canoes and waterproof bags. The ultralight canoes and transport bags made it possible to carry the added weight of the radio and battery over rough water and keep it bone dry in spite of frequent swamping.

There was only one place to make our first stop, and that was where sheer cliffs rise several hundred feet and the river makes a sharp right turn. We landed here for a

Kevin Swesey, KA7GQX, makes contacts on 10 meters at a remote site on the Verde River in central Arizona. *(photos by author)*



Even with the 2-meter cubical quad, it was difficult to get a signal out of the deep canyon and surrounding mountains.



The marine battery was stored under the aft seat of the canoe. Other equipment included a 10-meter transceiver and a dipole.

breather and discovered an eagle's nest perched on an overlooking jutting rock high on the cliff. In our excitement to take pictures of the fledgling eagles with their parents flying overhead, we completely forgot about the noon schedule to transmit.

After making our first campsite, unloading the canoes and equipment only took a few minutes. Kevin found a couple of trees, spread out the dipole antenna and started scanning the band. For the next 30 minutes we heard nothing but static and background noise. Kevin also tried the 2-meter handheld, but even with the quad plugged in, he wasn't making any contacts.

In the early stages of planning this trip, Kevin started passing the word along to his fellow operators to tune in on this adventure. Now we wondered how many were actually listening. The solar flares kept it a secret, so we shut down until our next stop.

On the second day we paddled down a fast stream of rapids with plenty of action and thrills. The high winds we were encountering presented us with special concerns. Our support crew was due to pick us up at Horseshoe Dam on the third day, but because of the wind we were beginning to doubt that we could make it that far. It became increasingly important to make contact with someone who could relay a message for the support crew to change the pick-up point further upstream to Sheep Bridge.

We stopped more frequently than planned so Kevin could try to raise someone, but no one could hear him. We finally made our second campsite, and Kevin dug out the 10-meter rig again. He called CQ for a solid hour. Making radio contact took on a desperation, but it was either that, or we would all have a long, long hike from Sheep Bridge after a punishing three days on the river. More importantly, we didn't want to worry the support crew by not being at the designated pick-up point on time.

At the last minute, Kevin decided to give it one more try and heard some Australian stations on the band. Then it happened! We heard KA7 GOLF QUEBEC X-RAY, WHAT SAY MATEY? CAN YOU HEAR ME? Kevin gave him a fast response, and we had our first contact. Kevin explained our situation to Dick Webb, VK3AHT, who offered his help from Melbourne, Australia. We could only hope that he was successful in getting a message to Phoenix.

Our day-long battle with the fierce winds had taken its toll. We nibbled on our supper and called it a day. I'm sure each man's last thoughts that night was of what lay ahead of us the next day, soothed only by the dim hope that our support crew would be at Sheep Bridge...and that somehow our Australian contact would work the miracle to save us from another grueling day against the wind.

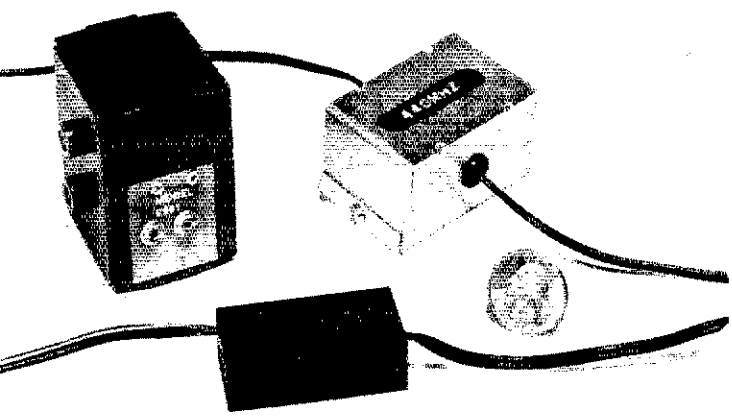
At dawn on the third day out, our entire crew was showing wear and tear from the demons of Mother Nature. Sunglasses, hats and suncreen were all necessary equipment. Our long-sleeved shirts, kept wet for cooling purposes, seemed to bake under the unrelenting sun. One of the crew suffered painfully sunburned ears because his hat did not have a brim. Although the wind had died down during the night, it was beginning to pick up again, and we knew we were in for another day of fighting the elements.

At the noon stop, Kevin tried again to make contact with anyone on 2 or 10 meters, but to no avail. We gave up and pushed on against the wind...always against the wind. The only thing that kept us going was looking for the bridge. Around every turn we expected to see it, only to find more river and another turn. Finally, one of the oarsmen in the lead canoe bellowed out, "I smell barbecue!" Take my word for it, the paddling speed picked up considerably. Just around the next turn we spotted our support crew cheering us to shore.

It was late afternoon, and the wind had helped time our arrival just right. We had not kept the support crew waiting long. Nothing had ever looked better than those people resting against the vehicles, framed by the smoke of a campfire cooking up big, juicy hamburgers—and plenty of them, along with lots of cold drinks. After greetings and handshakes, we asked how contact had been made.

VK3AHT from Australia had made contact with David Oustayan, KC6BFM, in Inglewood, California. KC6BFM then made a collect call to Phoenix to our crew chief's wife, informing her of the new pick-up destination and time. I am never surprised, but always gratified to know that an amateur has handled a critical relay message. Both of these operators responded in a professional and timely manner to rescue us from our dilemma. We were all very grateful and let them know with QSL cards just how much it meant to us.

Speaking of QSL cards—we had a quantity of them printed specifically for this trip that were never used, so if you'd like to have one, just let us know. You can't take credit for a contact, but it will sure serve as a reminder to make careful plans before going canoeing in remote areas—such as taking along a transceiver. As for the sun, the wind, and the solar flares, well, you know what they say about the best laid plans of mice and men...gosh, we sure did have fun.



An Adapter for Powering Hand-Held Rigs from 12-V Sources

Still using NiCd batteries for all your hand-held-radio work? A lead-acid power source is much more versatile—when used in conjunction with this adapter.

By Mitchell Lee, KB6FPW

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Santa Clara, CA 95052

The title photo: Three versions of the adapter described in this article are pictured. One, for powering a Ten-Tec 2591 2-meter hand-held rig, is built into a spare-battery case; one for general-purpose use is constructed in a home-brew PC-board box; and one for operation of a 440-MHz FM hand-held radio fits inside a commercial aluminum enclosure.

Anyone who owns a hand-held radio knows the frustration of NiCd batteries. NiCds seem to always go dead just as you access the autopatch to report a roadside emergency to the highway patrol! After arriving at home, you face a 15-hour wait for the pack to recharge or—if you've spent the extra dollars for the convenience—a shorter wait for the fast charger to do its thing.

Have you ever wanted to take your hand-held rig on a camping trip, or on a weekend drive, only to remember (too late) that your battery is half discharged? Wouldn't it be nice to top off the charge before leaving? But we've all been warned about the damage caused by recharging a half-used NiCd battery: the cells develop *memory*, and won't hold a full charge.

The result of situations like these is that nearly everyone with a hand-held rig owns two or more battery packs for each radio. These battery packs are rotated with each charge/discharge cycle. Because a period of inactivity can do serious damage to the cells, the best treatment for NiCds is to use them regularly.

Although NiCds are indispensable for most casual operation, lead-acid batteries are perfect hand-held-rig power sources for extended emergency, fixed, or mobile operation. A fully charged lead-acid battery is almost always available in the car. For extended emergency operation, such as at a fire station or a hospital, a so-called maintenance-free car battery serves well. Such a battery can be float charged indefinitely without requiring electrolyte-level maintenance, and, when an emergency arises, the battery can power not only hand-held transceivers, but also higher-powered mobile rigs or "brick" amplifiers. For these reasons, many emergency operating positions are equipped with such batteries.

For portable operation, 12-V, gelled-electrolyte cells are available in a variety of sizes ranging from 1 Ah (equivalent to a very large NiCd battery) to 40 Ah (about the same as a small car battery). Batteries with capacities of up to 2.5 Ah can be comfortably attached to a belt, and those capable of storing as much as 12 Ah can be considered backpack portable. Larger-size gelled-electrolyte batteries are also transportable, to the extent that most people can carry one 100 yards or so from the car to a campsite. Small gelled-electrolyte batteries (1 to 2.5 Ah) are especially attractive in pedestrian-portable applications, because they are virtually infinite energy sources for hand-held rigs.

One big disadvantage of NiCds is their relatively flat voltage-v-discharge characteristic: The voltage doesn't sag until the bitter end, when the output drops dramatically and without warning, suddenly rendering a NiCd-powered radio completely inoperable. In contrast, the output voltage of lead-acid batteries drops gradually throughout the discharge cycle, and the state of charge is easily determined from the cell voltage (see the sidebar, "Terminal Voltage Reveals State of Charge").

Unfortunately, lead-acid batteries don't fit in standard battery cases; a 12-V, 1-Ah gelled-electrolyte battery is bigger than most hand-held rigs. Smaller-capacity cells are difficult to manufacture, and there is no small-size lead-acid equivalent to the tiny NiCds used in typical battery packs. Also, cell voltage differs between NiCds and lead-acid batteries. Therefore, batteries of the two types cannot be directly interchanged. For these reasons, gelled-electrolyte batteries have not found their way into hand-held-rig battery cases.

Groups of three and six cells (6 and 12 V) are the most common configurations for both liquid- and gelled-electrolyte batteries. In most cases, hams need 12-V batteries, as few hand-held rigs operate on 6 V or less. Because of the bulk of the battery, it is external to the radio. Many hand-held rigs don't operate directly from 12 V, either; some means of dropping the voltage to the level required by the hand-held rig is necessary. For this purpose, a one-chip, adjustable voltage regulator can be used.

NPN Voltage Regulators

The operating voltages of hand-held radios vary from model to model, and from manufacturer to manufacturer. There are several adjustable-regulator ICs on the market (such as the LM317 and LM350) that meet the voltage and current demands of the average hand-held rig, but few can tolerate the electrical requirements of lead-acid batteries.

The voltage of a lead-acid battery fluctuates over a 30% range, depending on whether the battery is being charged or discharged, and on the state of charge. The regulator must maintain regulation while

Terminal Voltage Reveals State of Charge

Lead-acid batteries have a built-in charge indicator: their open-circuit (unloaded) voltage! The graph (Fig A) relates open-circuit, at-rest battery voltage to the charge percentage remaining in the battery. (For a battery to be considered *at rest*, it must have been unloaded for at least 24 hours.) To determine the amount of charge left in your battery, simply measure the terminal voltage (a 3½ digit DMM is recommended) and check it against Fig A.

Various factors affect the discharge curve. If the battery is under load, the voltage for any given percentage capacity will be less than that shown. This difference ranges from 200 mV for light loading (100 mA drain from a 1-Ah battery), to 1 V for a heavy load (1 A from a 1-Ah battery).

The curve is relative, because the actual battery capacity is dependent on the discharge schedule. High discharge rates at a high duty cycle reduce the effective ampere-hour capacity of the battery. For instance, although a particular battery might be rated for 2.5 Ah at a 0.2-A discharge rate, the capacity might drop to 1.5 Ah at higher discharge rates. A measurement that indicates 30% remaining capacity is valid, but 30% of what? That depends on how you intend to discharge the remaining 30% of the battery's capacity.

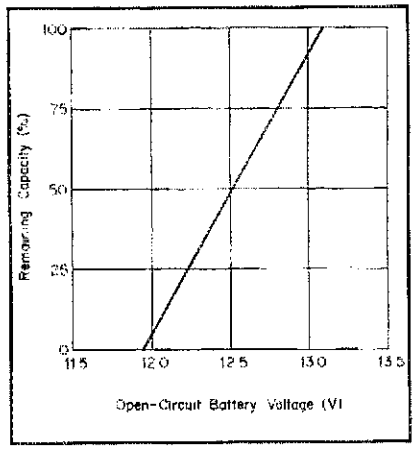


Fig A

Open-circuit voltage is directly affected by the specific gravity of the battery's electrolyte, which in turn varies with battery type. Signaling batteries designed for standby service typically have lower electrolyte specific gravities than deep-discharge batteries, resulting in slightly lower output voltages for the signaling types. For exact output voltage figures for your battery, check the manufacturer's specification sheet.—*KB6FPW*

handling the minimum and maximum input voltages. Also, charging systems (especially those in vehicles) can produce voltage spikes. In use, the regulator could be connected to the battery backwards, or the wrong voltage might be inadvertently connected to the input terminals. The regulator must not only survive these conditions, but also protect the load from destruction.

Fig 1 shows a regulator based on a conventional NPN device, the LM317T. The output voltage is set to 10.8 V using 1% resistors, and can be used in place of a nine-cell NiCd battery. Although the regulator is short-circuit-proof, and automatically shuts down if it overheats, it cannot stand inverted source polarity or high-voltage transients such as a load-dump condition (a slow, high-voltage transient produced by the charging system [see the sidebar, "A Voltage-Regulator Vocabulary Primer"]). These conditions could destroy the regulator—and possibly the load—if no external protection is provided.

To protect the regulator and the load, several components are added to the input. The blocking diode isolates the regulator from negative inputs, such as a backwards-connected battery. Without this diode, a negative input would be coupled directly through the internal substrate diode to the output. Under such conditions, it would be a race to see whether the 3-A fuse, regulator or hand-held rig would blow up first!

To catch load dumps and fast transients, a low-resistance inductor, a 27-V Zener diode and an electrolytic capacitor are added. In combination, these components limit and absorb overvoltage conditions at the input. As is necessary for any circuit connected to a lead-acid battery, a fuse is placed in line near the battery to protect against catastrophic malfunctions. This seems like a lot of work for a simple adapter!

A less obvious drawback is the resultant dropout voltage: If the load draws 0.5 A, the regulator needs at least a 1.7-V input-to-output differential to maintain output-voltage regulation. Add to this the drops in the 1N4004 (0.8 V), choke (0.5 V), and wiring (0.1 V), and the input must be 13.9 V or greater to maintain a 10.8-V output. That's equivalent to a 12-V lead-acid battery under charge (in a vehicle with the

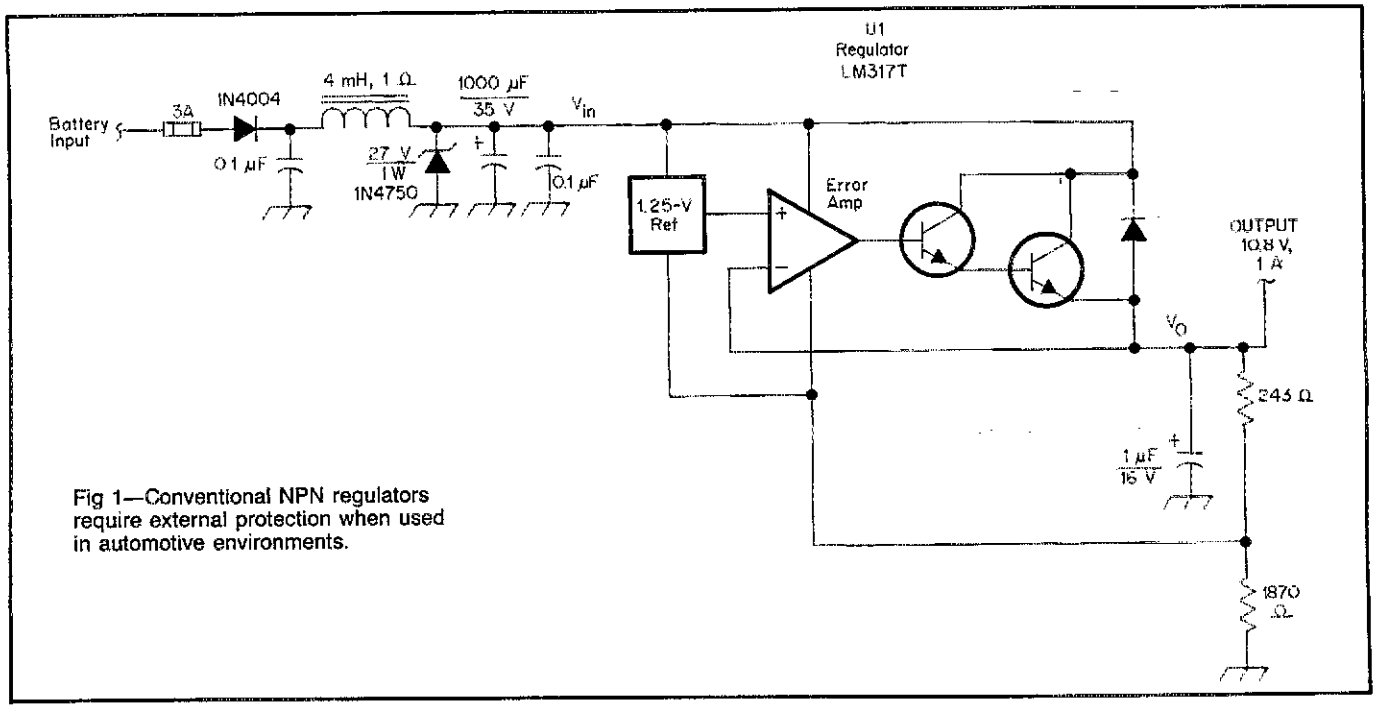


Fig 1—Conventional NPN regulators require external protection when used in automotive environments.

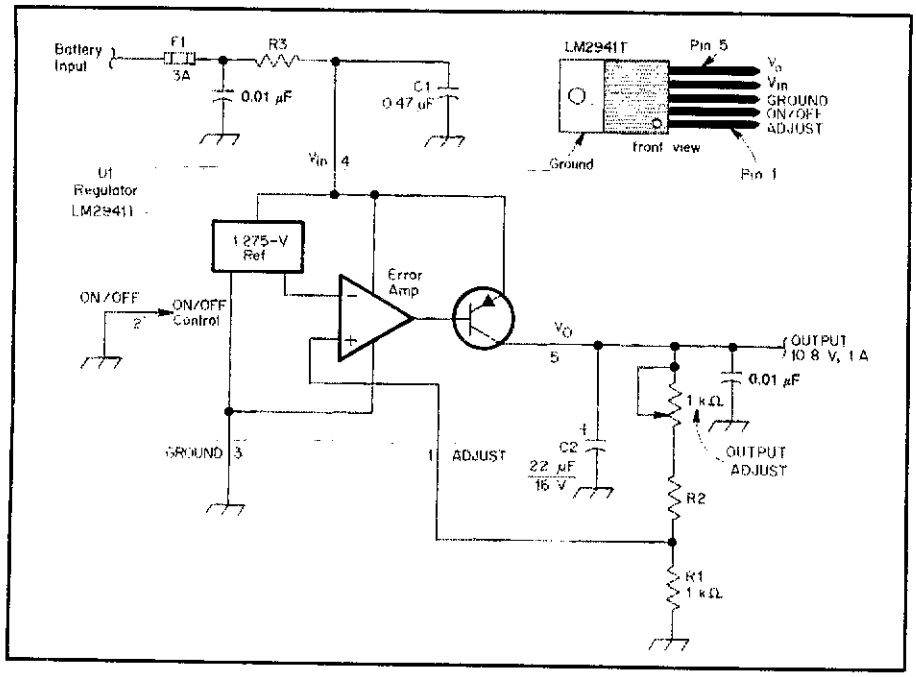


Fig 2—Schematic of the regulator. The output voltage is set by R1 and R2. R3 (2 W, wirewound) is optional, but provides RF filtering and, in the case of lower output voltages (high input-to-output voltage differentials, in which the regulator must dissipate considerable unwanted energy), R3 helps by dissipating some power. The 1-kΩ trimmer in series with R2 is also optional; if included, it allows fine-output-voltage-adjustment capability. Place C1 and C2 as close to the IC as possible, and keep lead lengths to a minimum. Do not bypass R1 or R2; instability may result. Also, if you alter the value of C2, do *not* decrease it below 22 μF—again, instability could be a problem.

C1—0.47 μF, 100 V, polyester film.
C2—22 μF, 16 V, tantalum.
F1—3-A in-line fuse; RS no. 270-1276.
R1, R2—1% metal-film resistors; available from Circuit Specialists and Digi-Key®. See text and Table 1.
R3—See text and Table 1. Digi-Key "5% wire-wound rectangular resistors," Circuit Specialists nos. PW2 and PW5, RS no. 271-130 acceptable.
U1—National Semiconductor LM2941T; Jameco®, Circuit Specialists.

Suppliers:

Digi-Key Corporation, 701 Brooks Ave S, PO Box 677, Thief River Falls, MN 56701-0677, tel 800-344-4539.

Jameco Electronics, 1355 Shoreway Rd, Belmont, CA 94002, tel 415-592-8097.

Circuit Specialists, Inc, PO Box 3047, Scottsdale, AZ 85257, tel 800-528-1417.

A Voltage-Regulator Vocabulary Primer

As in any specialized field, a number of terms unique to voltage regulators have evolved. A few of the more common terms are explained here.

• *Dropout Voltage:* By definition, the input-voltage differential at which the circuit ceases to regulate against further reduction in input voltage. Technically speaking, dropout voltage is the difference between the input and the output of a regulator when the output voltage has dropped by 100 mV from the nominal value. This nominal output voltage is usually measured when the input-output differential is 5 V.

The dropout voltage of an NPN regulator is related to both saturation voltage and base-emitter drops in the Darlington pass device. PNP dropout voltage is dependent only on saturation voltage, making it at least 1 V better than that of NPN regulators.

• *Load Dump:* The easiest way to define this term is with a description of a load-dump condition. Modern cars are powered by three-phase alternators. The output of such alternators is converted from ac to dc by means of a three-phase diode bridge, and the power output is regulated by varying the current flowing in a rotating field winding. More field current makes for more power delivered to the load; less current makes for less power. Because a lead-acid battery is connected to the output of the alternator, the system voltage is held essentially constant.

Alternator field windings have an inductance on the order of 1 H, preventing fast changes in field current. If there is a rapid change in load current, the battery momentarily acts as a reservoir to either absorb or supply the changing load demand. Long-term demands are met by the action of the alternator's regulator. The division of fast and slow regulation between the battery and alternator works until the battery connections deteriorate. A significant resistance appearing in series with the battery impairs its ability to moderate rapid changes in loading.

The worst-case scenario is when the battery is nearly dead, the alternator is delivering maximum current to charge it, and a battery connection fails—such as when hitting a bump knocks an important cable loose. This is a load-dump condition: The load current drops, and—for a few hundred milliseconds—the alternator has enough field current to develop as much as 60 V across the remaining loads. This doesn't happen very often, but every electronic device in a modern automobile is designed to survive load dump.

A load-dump transient is slow, with a 1- or 2-ms time constant on its rising edge and 50- to 200-ms time constant on its falling edge. Much faster transients exist as a result of inductances in series with the battery. Although the battery can absorb fast changes, series inductance contributed by wiring increases the effective battery impedance at high frequencies. These transients are handled in the 12-V adapter (see Fig 2) by C1 and the 60-V capability of the LM2941T.

• *PNP Regulator:* Low-dropout regulators are sometimes referred to simply as PNP regulators, because the pass devices in such regulators are PNP transistors. As a consequence, the contrasting term *NPN regulator* has been coined to describe conventional regulators that exhibit higher dropout voltages.—*KB6FPW*

engine running).

For a more realistic input voltage—let's say 11.8 V for a lightly loaded battery near the end of its discharge cycle—the regulator could provide an output of 8.7 V, roughly equivalent to a seven-cell NiCd battery. The circuit in Fig 1 just won't work for hand-held rigs that use eight- or nine-cell batteries. If the lead-acid battery is under heavy load (simultaneously powering an HF rig, VHF rig and/or brick), its output will drop below 11 V at the end of the discharge cycle, and the regulator will barely work in the place of a six-cell battery.

PNP Regulation

Another regulator topology, one based on a series-PNP pass device, overcomes the voltage-drop and delicacy problems associated with NPN regulators. This type of regulator, shown in Fig 2, was developed for automotive applications. Such circuits are called low-dropout regulators, because the dropout point is simply the saturation voltage of the PNP pass device. For the device shown, the new LM2941T, that requirement is only 270 mV at a load current of 0.5 A.

A second advantage of PNP over NPN regulators is that no extra headroom is required to operate the error amplifier and reference, because these subcircuits are powered from the full input voltage—not

Table 1

Values for R2 based on the type and number of cells to be replaced. R1 is 1 kΩ, 1% tolerance, metal film, ½ W.

Number of Cells		*Total Voltage*	*R2 (without trimmer)*	*R2 (with trimmer)*	*R3*
NiCd (1.25 V ea)	*LeClanche (1.5 V ea)*				
5	4	6.0	3.74 kΩ	3.3 kΩ	2.2 Ω
6		7.2	4.64 kΩ	4.3 kΩ	1 Ω
	5	7.5	4.87 kΩ	4.3 kΩ	1 Ω
7		8.4	5.62 kΩ	5.1 kΩ	0.47 Ω
	6	9.0	6.04 kΩ	5.6 kΩ	0.33 Ω
8		9.6	6.49 kΩ	6.2 kΩ	0.22 Ω
9		10.8	7.5 kΩ	6.8 kΩ	0.1 Ω

the input/output differential.

The PNP base-emitter junction has a relatively high reverse-breakdown voltage and has no internal input-to-output diode, which allows it to stave off negative input voltages with ease. Note that the emitter turns into a reverse-biased diode with negative inputs, effectively isolating the load. The error-amplifier and reference circuits have similar structures connected to V_{in} so that they, too, are isolated from battery-reversal conditions. There is no need to use a series blocking diode with this regulator.

Better still, PNP pass devices can withstand 60-V transients, obviating the need for an external, power-hungry transient-suppression network. The PNP regulator is designed to survive the rigors of an automotive environment where transients, reverse-polarity inputs and marginal input voltages are commonplace. A summary of NPN and PNP regulator characteristics is shown in the sidebar, "NPN and PNP Regulators: A Comparison of Characteristics."

The LM2941 provides several configuration options, depending on your requirements. Table 1 shows appropriate values for R2 as a function of the number of NiCds that are being replaced (R2 values for 1.5-V [LeClanche] cells are also shown). For easiest fine adjustment, add a 1-kΩ trimmer potentiometer in series with R2 and adjust it for the exact output voltage you need. If you don't like making adjustments, use 1%-tolerance resistors for R1 and R2.

Construction

The adapter circuit can be built inside a small aluminum box, using the box itself as a heat sink for the regulator. The regulator's mounting tab is at ground potential, so no insulating washers are necessary (LM317-type regulators require them). For good thermal contact, use thermally conductive grease between the mounting tab and the box. Also, make sure that the aluminum is free of paint and anodizing before mounting the device.

A small (1- × 1-inch) copper-clad PC board can be located adjacent to the pins of the regulator and held in place with glue, or a screw and nut. The components external to the regulator can be mounted on this board. If the aluminum box is used to carry ground currents from the battery to the load, make sure that there is a solid connection between the PC board and the box. Solder pin 3 (ground) to the PC board as well.

The LM2941 can deliver at least 1 A—plenty for most hand-held radios. Under short-circuit conditions, the output is in excess of 1.6 A.

After saying all of those bad things about external protection circuitry, I included a resistor (R3) in series with the input of the regulator. The purpose of this resistor is different than that of the resistive choke shown in Fig 1. R3 (Fig 2) is optional, but it can provide two major performance enhancements: First, it dissipates some power (this is helpful for the lower-output-voltage applications), and second, because R3 is a wire-wound resistor, it has inductance that helps filter RF noise from the regulator input.

Two- or five-watt, wire-wound resistors typically resonate above the HF region, providing a very effective, low-Q RF choke. At 144 MHz, a 0.1-Ω wire-wound resistor has about a 50-Ω impedance. Additional RF filtering is provided by 0.01-μF bypass capacitors at the points where the input and output leads enter and leave the box. Although the bypass capacitors and inductive power resistor are optional, they should be given serious consideration if the adapter is going to be used in the vicinity of high-power amplifiers.

C1 and C2 stabilize the regulator and enhance its transient-immunity and regulation characteristics. These capacitors should be located very close to the regulator IC, preferably within ½ inch. Solder them directly to the regulator pins if possible, cutting the capacitor leads to minimum length. C1 should be a small polyester-film

NPN and PNP Regulators: A Comparison of Characteristics

Table A is a comparison of the features found in typical NPN and PNP voltage regulators. The LM317 and LM2941 are used as examples. An explanation of these features is included below.

- *Short-circuit current limiting:* All modern, monolithic voltage regulators include current-sensing circuits to monitor output current and to limit it to a safe (nondestructive) value. When the current limit is reached, the output voltage is no longer regulated. The limit current is usually 150% or more of rated output current.
- *Thermal shutdown:* Excessive power dissipation is a leading cause of destruction of ICs, so many power ICs incorporate thermal-shutdown circuits to protect the devices in the event of excessive heat. This is standard issue for voltage regulators. If a regulator is momentarily shorted, the short-circuit current limit will protect it from destruction. If the short persists, the device will heat up and the thermal-shutdown circuit will trip, further protecting the device.
- *Overvoltage shutdown:* To guard against high-voltage, safe-operating-area (SOA) failures in a regulator's pass device, an overvoltage circuit senses the input voltage and shuts the regulator off at between 26 and 36 V.
- *Reverse-battery protection:* In portable and automotive equipment, there is a remote chance that someday, someone will replace a battery backwards. To guard against the destruction of the regulator and its load in such a case, a blocking diode must be included in series with the power lead. In the case of a PNP regulator, the emitter of the pass device provides reverse-battery protection, obviating the need for an external diode.—*KB6FPW*

Table A

NPN/PNP Regulator Feature Comparison

Characteristic	*NPN (LM317T)*	*PNP (LM2941T)*
Short-circuit current limit	Yes	Yes
Thermal shutdown	Yes	Yes
Overvoltage shutdown	No	Yes
Reverse-battery protection	No	Yes
Dropout at:		
50 mA	1.6 V	60 mV
500 mA	1.8 V	270 mV
1 A	2.0 V	500 mV
Maximum input voltage	40 V	60 V

(Mylar® is suitable) unit, and tantalum is best for C2.

One final note concerning construction techniques: Think about the consequences of high G forces, such as when the adapter is dropped on concrete. Don't leave any components flopping around at the ends of long leads, and don't allow heavy parts such as R3 to stress other, more fragile components.

Operation

The LM2941 uses the internal circuit topology shown in Fig 2. The error amplifier senses the voltage at the **ADJUST** pin and increases drive to the PNP pass device until the adjust voltage (as derived from the output by the divider) matches the internal (1.275-V) reference. The LM2941T exhibits excellent temperature stability (40 parts in 10^6 per °C) and the device has an overvoltage monitor that turns off the regulator when the input potential exceeds a preset limit (30 V).

A feature not used in this application is the LM2941T's **ON/OFF** switch. Pin 2 is a TTL-compatible control line that can be used, by a microprocessor or another device, to turn the regulator on and off. As shown, the regulator is hard-wired in the **ON** position (pin 2 is grounded). If pin 2 is pulled above 1.275 V, the regulator will turn off. It's possible to have a computer turn a rig on and off by means of this line, for use in a packet-radio station, for example.

Setup

Before connecting the adapter to a power source, double-check all your wiring. Don't connect a load yet. If everything looks okay, connect a voltmeter to the output and apply power to the input. If the output isn't about what you expected, check the wiring again, and check resistor values. In particular, make sure that R1 and R2 aren't transposed, and that the regulator pins are correctly connected. If you installed a 1-kΩ trimmer in series with R2, it will give an adjustment range of approximately ±0.5 V, and can be used to set the output once the circuit is working.

Try connecting a 10- or 20-Ω power resistor (a no. 93 desk-lamp bulb or no. 1157 automotive lamp are good substitutes) to the output while watching for changes in the output voltage. The output should change less than 50 mV from no load to full load. You may want to leave the dummy load connected for a few minutes to make sure the adapter doesn't overheat. If it does, the output voltage will fall, but it will recover once the regulator cools down. In extreme applications, such as sustained 1-A load, 14.4 V input, low output voltage (4.5 to 6 V), and very hot operating environment, you may want to add a small heat sink to the regulator.

If you want to see the regulator's protection features in action, try shorting the output, or connect the battery backwards. Monitor the output current for the short-circuit test, and the load voltage for the reversed-input test. The regulator will recover from both faults, although it may take a moment to do so if the device's thermal-shutdown threshold is reached during the short-circuit test.

Once you have convinced yourself that the circuit is working properly—and that it's foolproof—it is ready for use with your hand-held rig.

Interconnections

Use a connector at both the input and output of the adapter. At the battery end, any of several different available connectors will work fine. Two-conductor quick-change connectors (Radio Shack® 270-026 or 270-025) work well in this service and, if the adapter is being used only in an automotive environment, a cigarette-lighter adapter (Radio Shack 274-331 [unfused] or 274-335 [fused]) is a good choice. For versatility, banana plugs can't be beat; because of the risk of short circuits, though, they're not recommended for direct connection to a car battery.

Above all else, make sure you include an in-line fuse at or near the connection to the battery. A fuse provides safety in the event of pinched wires, in-the-dark blundering, and catastrophic failure of the adapter.

Connections at the radio end of the adapter will vary according to the requirements of the hand-held rig. Some use 2.5- or 3.5-mm audio connectors, and others use barrel connectors. It is also possible to build the adapter into an empty battery case.

One important precaution: *Do not* connect the adapter output across the NiCds normally used with your hand-held rig! Similarly, do not connect the adapter to the rig's charger input (separate charger- and supply-input connectors are often provided on battery cases and radios). Most hand-held rigs switch NiCds out of the circuit when power is applied to an external-supply input. Consult your rig's manual for appropriate voltages and connections. Also, be sure to observe the polarity of the rig's power connector—there is no standard.

Some rigs are not designed for connection to external power sources. My Ten-Tec 2591 2-meter hand-held radio is one such rig; for it, I purchased an empty battery case and assembled the entire regulator inside the empty case (see the title photo). In that adapter, the LM2941T's heat sink/mounting tab is attached directly to the **GROUND** connector for heat sinking.

Summary

The adapter described here is handy not only for mobile, portable and emergency communications, but also for powering incompatible hand-held radios from one 12-V battery. You may want to install an adapter permanently in your car to reduce some of the wiring clutter associated with taking a hand-held radio along for a ride.

Mitchell Lee, Extra Class ham and former applications engineer for National Semiconductor in Santa Clara, California, earned a BSEE from California Polytechnic State University in 1988. He has also attended Central Manchester College (Manchester, England), Fresno City College and California State University, Fresno.

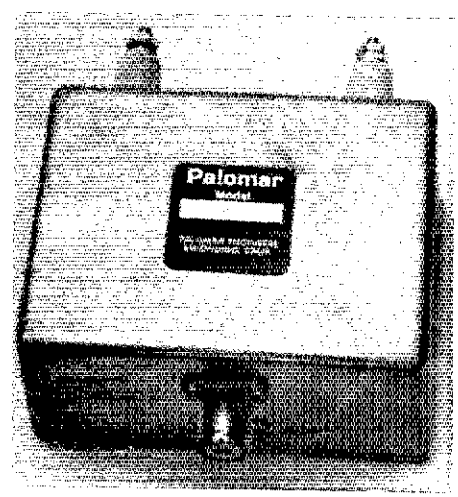
Mitchell's operating interests include Field Day and AM on the 2, 6, 10, 40 and 160-meter bands, and CW on 30 meters. He also maintains a beacon, MEL, on the 1750-meter band. Mitchell's other interests include photography, writing, motorcycles, fourth-season mountaineering and industrial music. He plays violoncello in a local symphony orchestra. Mitchell was formerly VK4CFL, and his father, Ed, is KB6JQK.

New Products

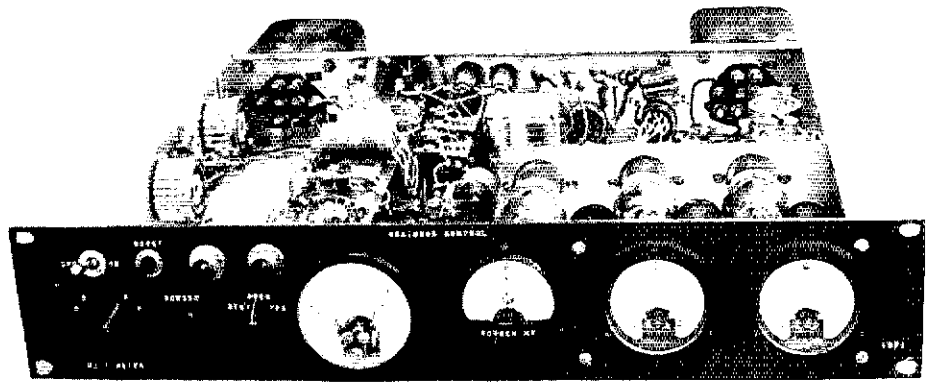
PALOMAR ENGINEERS 2-kW BALUNS

☐ Palomar Engineers has introduced a line of baluns for the 2- through 30-MHz range. Dubbed the MB series, these baluns are rated for 2 kW CW and 6 kW PEP, have 50-Ω inputs, and are available with female-UHF (Teflon®-dielectric) or N input jacks. Output connectors are conical standoff insulators, and available output impedances are 50, 75, 100, 150, 200, 300, 450 and 600 Ω.

The MB series baluns are housed in epoxy-filled, cast-aluminum enclosures, and are weatherproof. Price range: $100 to $165. For more information, contact Palomar Engineers, PO Box 455, Escondido, CA 92025, tel 619-747-3343.—*Rus Healy, NJ2L*



Protecting Power Tetrodes



Lengthen tube life by using these foolproof control-circuit ideas.

By Mark Mandelkern, KN5S
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Las Cruces, NM 88005

Despite the popularity of the latest cathode-driven, power-triode amplifier circuits, many builders still prefer to use tetrodes. Tetrodes are not only less expensive at flea markets than the newer triodes, but they require much less drive. In a grid-driven circuit, fewer band-switch decks are required for wide-frequency-coverage operation, because a passive input circuit eliminates the need for switching tuned input circuits. The low drive requirement is especially useful at VHF; high gain and the avoidance of tuned input circuits can more than compensate for the control- and screen-grid bias supplies required by tetrodes.[1]

Properly used, tetrodes are very rugged. I used one 4CX1000A in a 1.8- to 54-MHz amplifier for 17 years with no drop in power output. I removed that tube from service last year only to test a new (flea-market-purchased) tube, and to begin a tube-rotation schedule. Tube rotation can help avoid failure of the ceramic-metal seals in these tubes. The old tube will get its turn again next year.

Tetrodes *require* adequate protection circuits; they are easily destroyed—in an instant—if run beyond their grid and screen ratings. My old tube lasted so long only because it was protected by the circuits in the control panel that I'll describe in this article. I designed this circuit for my 4CX1000A amplifier, but the circuit ideas can be used with any tetrode. To modify my design, you'll need some knowledge of the amplifier circuitry and access to the manufacturer's data for the tube you're using.

I built my amplifier in three sections: RF deck, control and metering circuits, and high-voltage (HV) supply. I built the control circuit separately so I could build additional RF decks for the VHF and UHF bands—without duplicating all the protection and metering circuits. The control panel can be connected to several amplifiers at the same time, but only one of the amplifiers can transmit at any time.

Similarly, one HV supply can be used to power several amplifiers: I've done this without trouble for 18 years, although one of the two connected amplifiers in my setup is usually not powered. When both are powered, grid-bias-standby switching keeps the unused amplifier cut off.

A partial schematic of my amplifier, including the control and metering circuits, is shown in Fig 1. Although the RF deck and control circuit are separate, the combined circuit is shown here so that you can more easily adapt the ideas to your amplifiers. Most of the parts required to build this circuit are available from the supplies listed in Table 1.

Never tune a tetrode amplifier for maximum output!

The word that best describes this control circuit is *foolproof*. Even holding in the **RESET** button will not enable the amplifier; the circuit resets *only* after the button is released, and *only* if the fault has been corrected. You'll hear one control relay pull in when you push in the **RESET** button, and another when you let it go. I used mechanical relays—rather than solid-state circuits—for switching. In my experience, relays provide the most reliable protection for tubes, and are more immune to RFI.

The most crucial factor in tetrode operation is providing a stable and current-limited screen-voltage supply. Through the years, I've tried a number of different methods for doing this. Shunt regulation, I've found, is the best and easiest-to-implement method. Positive screen current is limited by regulator current, and negative screen current merely increases the current in the regulator.

Grid- and screen-current overload protection is provided by sensitive (low-current-actuated) relays. The specifications for the relays used in this circuit are relatively noncritical. I used a 1-mA-actuated relay at K1 and a 4-mA-actuated relay at K2. The suppliers listed in Table 1 carry inexpensive relays that are suitable for use in this circuit.

Although some tetrodes are designed for either class C or class AB_1 operation, others—such as the 4CX1000A—are designed only for class AB_1 operation (wherein no grid current flows). The 4CX1000A is constructed with an extremely fine grid structure, allowing for high gain; but by the same token, this tube is a candidate for an early grave if run beyond its grid-dissipation rating. In this circuit, grid-current control is obtained via ALC; the basic circuit is described in a previous article.[2] The ALC circuit is included in Fig 1, because I've had several requests for specific information on connecting this circuit to existing amplifiers.

The main reason for using ALC is that a class AB_1 tetrode amplifier cannot be driven into grid current without producing splatter. Therefore, ALC is one of the best ways to maintain maximum, clean output

[1]Notes appear on p 25.

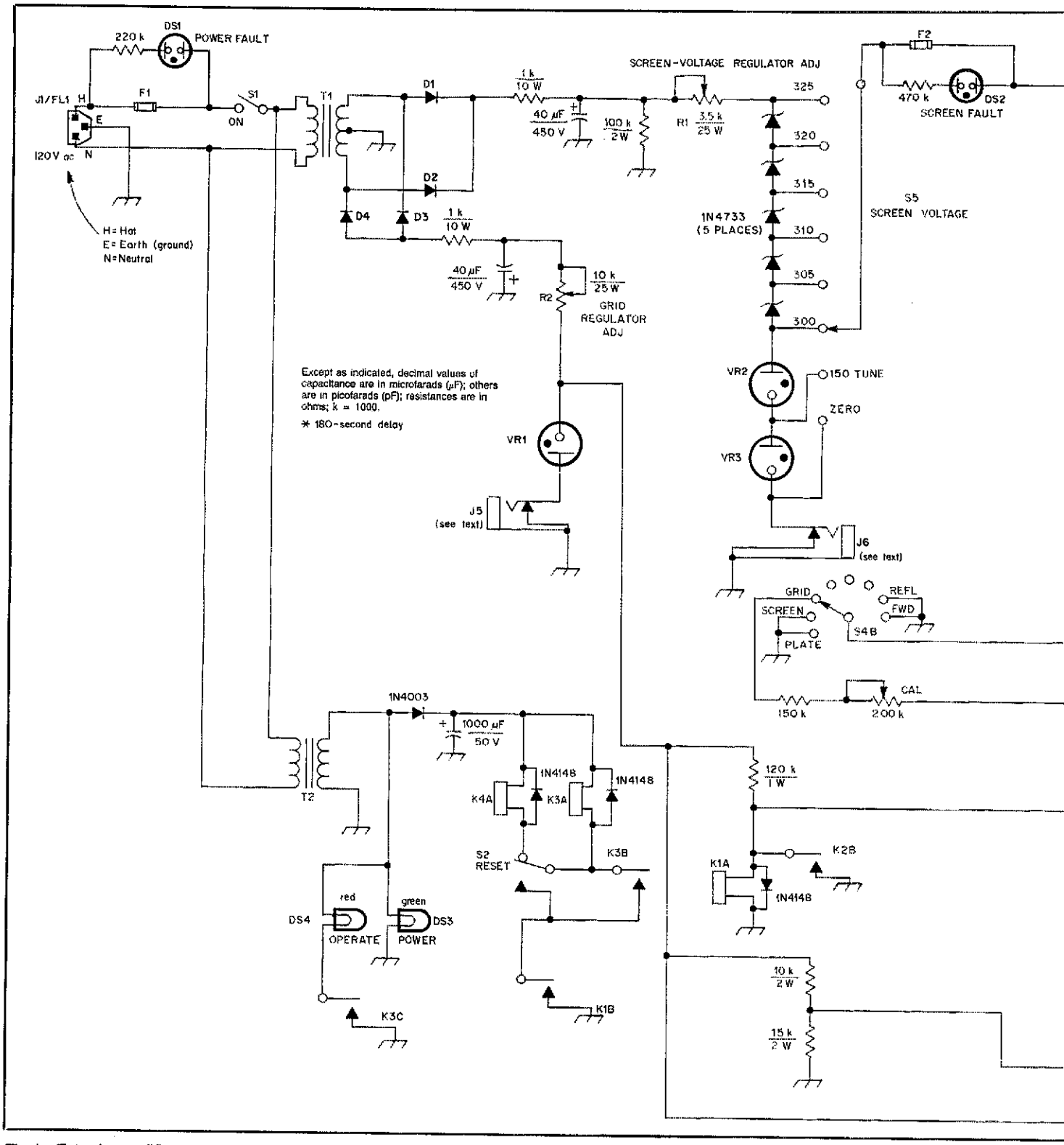


Fig 1—Tetrode-amplifier control and protection circuit, including connections to a companion amplifier. The ALC circuit shown in the shaded box is one that I described previously in *QST*. See text.

Parts List

D1-D4—Each consists of three 1N4007s in series.
D5-D9—1N4733.
DS1-DS2—120-V neon indicator built into fuse holder.
DS3-DS4—12-V lamp.
F1—4-A, slow-blow fuse.
F2—1/8-A, fast-blow fuse.
J1—6-A CEE-22 connector with built-in line filter (BC).
J2, J3—Phono jack.
J5, J6—Phone jack, shorting.
K1—1-mA-actuated, 10-kΩ-coil SPST relay.
K2—4-mA-actuated, 750-Ω-coil SPST relay.
K3, K4—12-V-dc-actuated DPST relay.
M1—0-1 mA, contact-making ammeter; see text.
S2—SPDT push-button, momentary-contact switch.
S3—DP3T rotary switch, right-hand-position momentary contact (BC no. RO-4).
S4—Double-pole, 8-position rotary switch.
T1—120-V primary; 800-V, 150-mA center-tapped secondary.†
T2—120-V primary; 12-V, 2-A secondary.
VR1, VR2, VR3—Voltage regulator (VR150/0D3 tube, available from Fair Radio [see Table 1]).†

†Component values may differ for amplifiers using tubes other than the 4CX1000A.

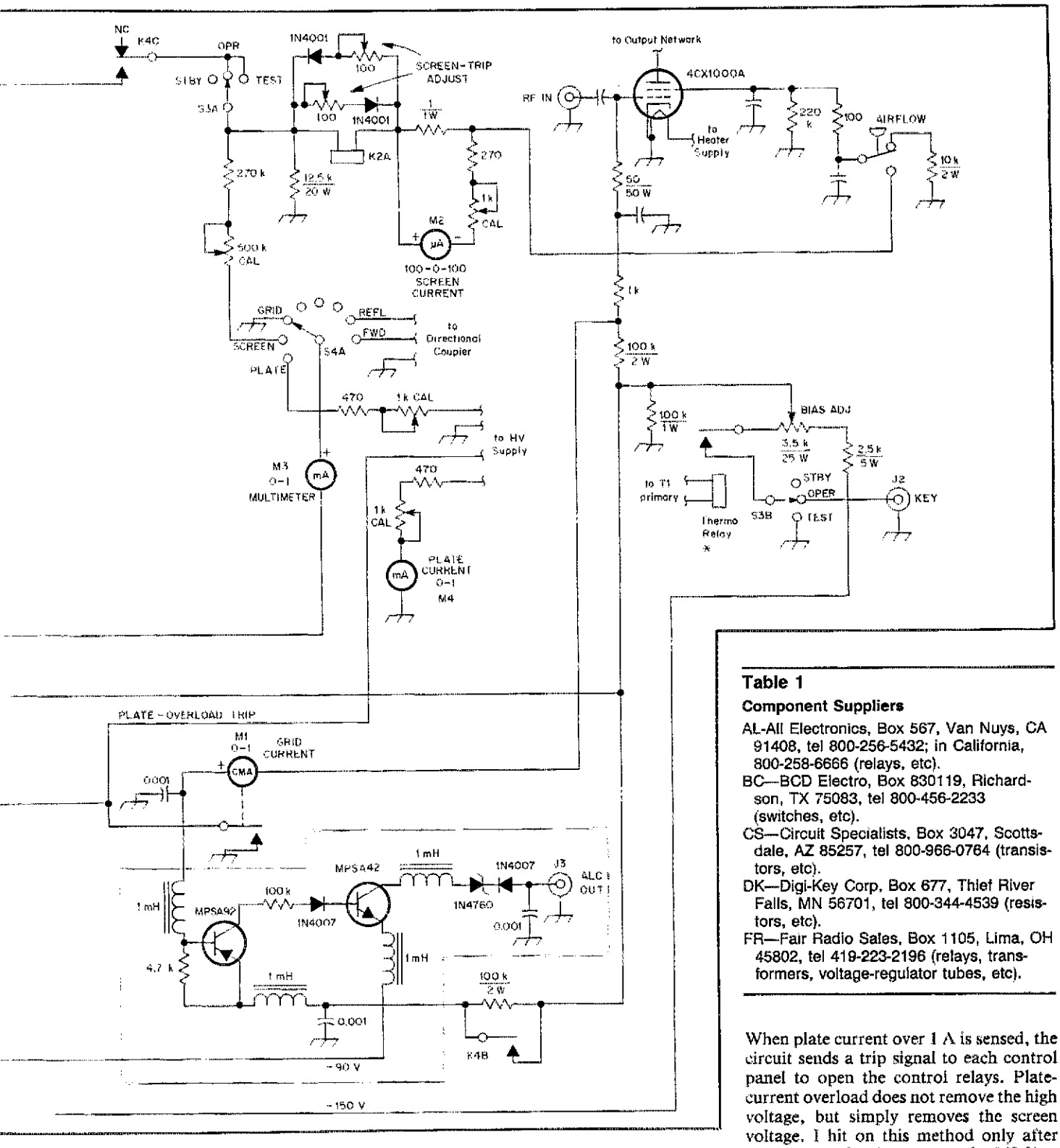


Table 1

Component Suppliers

AL-All Electronics, Box 567, Van Nuys, CA 91408, tel 800-256-5432; in California, 800-258-6666 (relays, etc).

BC—BCD Electro, Box 830119, Richardson, TX 75083, tel 800-456-2233 (switches, etc).

CS—Circuit Specialists, Box 3047, Scottsdale, AZ 85257, tel 800-966-0764 (transistors, etc).

DK—Digi-Key Corp, Box 677, Thief River Falls, MN 56701, tel 800-344-4539 (resistors, etc).

FR—Fair Radio Sales, Box 1105, Lima, OH 45802, tel 419-223-2196 (relays, transformers, voltage-regulator tubes, etc).

power. I believe the main reason that people believe that tetrodes, in general, produce poor-quality signals is that most tetrode amplifiers don't provide a positive method of preventing overdrive. In my amplifier-control circuit, back-up grid-current-overload protection is provided by a 1-mA meter relay. (A meter relay, also known as a contact-making or -breaking meter, is simply a meter with a set of contacts that open or close at a specific meter-deflection level.) I built this amplifier several years before developing the ALC circuit, and now the meter relay isn't really necessary. If you can't find an inexpensive meter relay, you can use an ordinary meter in its place. Just be sure that your ALC is connected and working if you do this!

Plate-current-overload protection is provided by a relay in the HV supply. When plate current over 1 A is sensed, the circuit sends a trip signal to each control panel to open the control relays. Plate-current overload does not remove the high voltage, but simply removes the screen voltage. I hit on this method only after many years of trying to open the 240-V ac primary circuit under overload conditions. All I have to show for my efforts is an interesting collection of relays with welded contacts! This screen-voltage-removal method protects only the tube, however. The HV supply itself is protected from shorts and arcing by a fast-acting fuse. The fuse itself would not protect the tube from moderate plate-circuit-overload conditions, but it is *absolutely necessary* for safety.

Loss of grid bias causes both the screen

and plate circuits to trip out. However, the primary line of defense against grid-bias failure is simple and automatic: The grid-bias supply powers the main control relay, K1. No grid-bias voltage, no go!

Metering

The control circuit provides dedicated metering of grid, screen and plate current. The screen-current meter is a zero-center type, because positive and negative screen-current conditions can occur during normal tetrode operation.[3] A fourth meter is switched to measure grid, screen or plate voltage, or forward or reflected power (the forward- and reflected-power signals are provided by a directional coupler in the antenna line).

The expense of precision resistors is avoided by using simple, shunt-multiplier meter-calibration circuits using miniature trimmer potentiometers. For the multimeter, I used a meter with scale markings from 0 to 6, so I adjusted the metering circuits to give full-scale readings as follows: grid, 300 V; screen, 600 V; plate, 6 kV; forward power, 2 kW; and reflected power, 200 W.

To allow compensation for minor differences between tubes, S5 is used to select screen voltages between 300 and 325, in 5-V steps. Although the 4CX1000A's data sheet specifies a typical screen voltage of 325, I get 1.5 kW output—and better linearity—with only 300 V on the screen.

To permit tune-up at decreased plate dissipation, the **TUNE** position puts 150 V on the screen. Although the **SCREEN VOLTAGE** switch's **TUNE** position is handy during tune up and for touch-up antenna tuning, the amplifier is not linear when the grid bias is set for linearity at 300- to 325-V screen operation. Therefore, S5's **TUNE** position can't be used as a means for quick power reduction during SSB operation.

Circuit Operation

When you turn on primary ac with S1, grid-bias voltage pulls in relay K1. When the **RESET** button (S2) is pushed, relay K3 pulls in; when S2 is released, relay K4 pulls in. If excessive grid current is sensed, the contacts associated with meter relay M1 close, causing K1 to drop out. This opens K3's latching circuit, causing K3 and K4 to drop out. In the event of excessive screen current, relay K2 pulls in and causes K1, K3 and K4 to drop out.

If the tube draws excessive plate current, the plate-overload relay causes the RF-deck control relays to open. When this happens, screen-grid voltage is removed from the tube. To limit grid current in this condition (to prevent tube damage if the exciter is still transmitting), a grid-bias resistor is inserted into the circuit by K4B.

This reset system has another advantage: Because it requires pushing the **RESET** button on initial startup, this control circuit protects its associated amplifier from momentary power-line interruptions by releasing control relays K3 and K4 at the occurrence of such an interruption. This saves the amplifier from unpleasant jolts when primary power returns.

Does the control circuit ever trip out the amplifier? Only when I switch to the wrong antenna, or forget to retune after changing bands, or such foolishness. Just for laughs, I sometimes turn on the screen voltage *before* enabling the plate voltage! (This is a well-known, *big* no-no with tetrodes!) This produces screams from visiting hams, but can't hurt a tube in an amplifier that's controlled by this circuit.

For tetrodes, screen current is the best indicator of resonance and loading conditions.[4] Don't try to tune for a plate-current dip. Resonate tetrodes by tuning for maximum screen current. In a stable, grid-driven tetrode amplifier, resonance and peak output are indicated by a peak in screen current. Adjust the loading until this screen-current peak is the value that yields maximum output. After you find the settings for maximum output, increase the loading so that the output at resonance is 5 to 10% less than the maximum available. (That last step produces a narrower signal!)

As I mentioned earlier, I suspect that some of the bad press that tetrodes have received is simply due to overdrive and improper tuning. Dave Meacham, W6EMD, said it best in a *QST* article:[5] "Never tune a tetrode amplifier for maximum output."

Adjustments

All the control-circuit adjustments are done on the test bench, without the RF deck connected, and without high voltage applied. Because the 4CX1000A's screen grid usually runs more negative than positive, separate screen-overload-adjustment trimmers, with isolating diodes, are provided across K2A.

Set the control-grid-bias-regulator current to 38 mA (in standby), via R2, with a milliammeter attached at J5. Set the screen-regulator current to 10 mA with the control relays engaged. To do this, attach a milliammeter at J6 and adjust R1. This rather low setting provides protection for the screen. The tubes I've used never run positive screen current under normal conditions, but when the amplifier load is accidentally removed, the screen current tends to soar out of control and drives the tube into a runaway condition, resulting in quick tube destruction. With this circuit, when the screen current rises above 10 mA, the screen voltage drops rapidly.

Summary

How are the results, you ask? This control circuit and its companion 1.8- to 54-MHz amplifier have twice helped me win the SSB ARRL Sweepstakes (New Mexico Section). Using this amplifier, I once won the Rocky Mountain Division in an ARRL SSB DX contest (in the all-band category). Using this amplifier on 6 meters in 1987, I set the current Rocky Mountain Division record in the ARRL June VHF QSO Party (with help from the 2-meter rig). I operate mostly on 6 meters, and conditions for catching a new country or grid square on six might be right for only 30 seconds—maybe a whole minute if you're lucky! For this reason, 100% reliability is required. This control circuit has maintained that performance level for the last 18 years.

Notes

[1]In this article, I'll refer to the control grid and the screen grid of a tetrode as the grid and the screen, respectively, in keeping with common usage of these terms. In the same vein, I'll use *plate* in lieu of *anode*.

[2]M. Mandelkern, "ALC for Class AB_1 Amplifiers," *QST*, Jul 1986, pp 38-39, 47.

[3]D. Meacham, "Understanding Tetrode Screen Current," *QST*, Jul 1961, pp 26-29.

[4]See note 3.

[5]See note 3.

New Products

MICROSYSTEMS SOFTWARE HANDYCODE AR

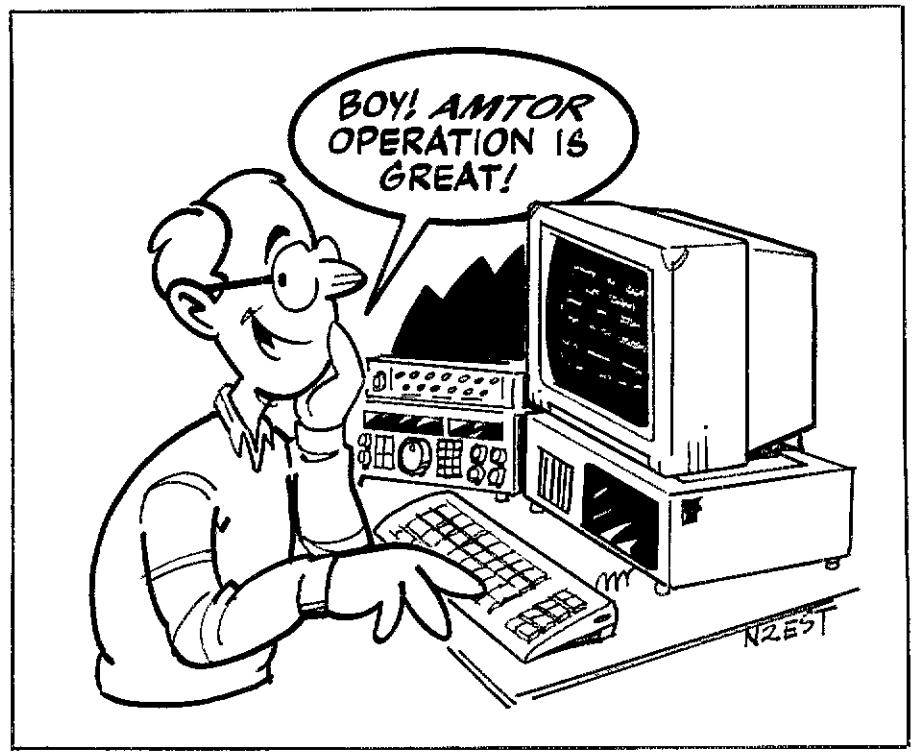
☐ Microsystems Software, Inc, has introduced a unique software package for IBM® PC and compatible computers. HandyCODE AR provides (among others) the reverse function of countless other programs: It translates Morse code input into keystrokes, for the purpose of commanding a computer by means of CW. The program uses nonstandard Morse characters to provide user-definable functions and macros. A code-practice utility and on-line help information are included.

User-selectable parameters include code speed (from 1 to 99 WPM), iambic operation and letter/word spacing. Applications of HandyCODE AR include CW bulletin boards and computer operation by handicapped individuals. HandyCODE AR, which comes with a parallel-port connector, is available for $149 from Microsystems Software, Inc, 600 Worcester Rd, Suite B2, Framingham, MA 01701, tel 508-626-8511. Microsystems Software accepts Visa® and MasterCard®, and HandyCODE AR has a 30-day money-back guarantee and a one-year warranty. —*Rus Healy, NJ2L*

An AMTOR Operating Primer

Haven't you tried AMTOR yet? Here are some guidelines to help you get started using a mode that provides impressive communications performance.

By Donald W. Huff, W6JL
12842 Luiseño
Poway, CA 92064



With the greater availability of microprocessor-based controllers in recent years, AMTOR has moved from the realm of experimentation,[1-6] to the point where AMTOR operation sometimes fills the "operator's agreement" sub-bands on 20, 15, and 10 meters on busy weekends. Based on my observations made during my AMTOR operations over the past three years, many newcomers are joining the AMTOR ranks daily. In the few years since its introduction to our hobby, a lot of radio amateurs have discovered that AMTOR is an enjoyable, nearly error-free HF communications mode.

What is AMTOR?

AMTOR is an acronym for *Am*ateur *T*eleprinting *O*ver *R*adio. AMTOR has its roots in merchant-marine MF/HF communications, where it is called SITOR (*Si*mplex *T*eleprinting *O*ver *R*adio). CCIR Recommendation 476-3 defines the standards for TOR operations that have been adopted for amateur use.[7]

AMTOR uses frequency-shift keying (FSK) or audio-frequency-shift keying (AFSK) transmission on the MF/HF bands. The FSK signal is generated directly (by keying the transmitter's carrier oscillator) or indirectly (by feeding audio-frequency-shifted tones to an SSB transmitter's audio input). If AFSK is used, the tones employed are 2125 and 2295 Hz (called the *high tones*), or 1275 and 1445 Hz (the *low tones*). These tone pairs provide a conventional frequency shift of 170 Hz. Some multimode controllers, however, use a 200-Hz tone shift (the same as used on packet radio) on RTTY as well as AMTOR. The 30-Hz difference seems to be of little consequence in practical operation.

If your rig offers FSK, use it. FSK eliminates the need to set an audio level to the transmitter mike jack, and in some transceivers, the FSK position allows you to use the CW IF filter (of course, your transceiver has to be equipped with such a filter). By using the narrower CW IF filter, you can eliminate a lot of QRM.

The AMTOR Code

AMTOR (and SITOR) use a special method of encoding alphanumeric characters, different from either Baudot or ASCII codes. AMTOR uses a 7-bit code that is capable of representing the 26 uppercase letters of the alphabet, the digits 0-9, punctuation marks and several special characters and control codes—a total of 38 different combinations.

In Table 1, the Baudot, ASCII and AMTOR codes are shown. Note that the AMTOR code uses 7 bits to represent what requires only 5 bits in the Baudot code. Why the additional two bits? These two bits are used to create a code for each character such that there is a constant ratio of three marks to four spaces for every possible character. Thus, the AMTOR code is called a *constant ratio* code. The two bits are used for parity checking and increase error-detection capability. If an error occurs, there will no longer be the correct 3-to-4 ratio of marks to spaces. The communications processor at the receiving end checks for the correct ratio, so error-detection to a high degree of accuracy is achieved. Of course, it is *possible* for several bits to be corrupted in such a way as to result in another valid character, but that is much less likely to happen when using the AMTOR code. The price paid for this feature is, of course, the two additional bits of overhead per character compared to using Baudot code. With the data rates useful for MF/HF communication, and the availability of inexpensive microprocessor-based error detection, these penalties are small indeed.

AMTOR Modes

Within the general description of AMTOR, there are four basic modes of operation: *Sel*ective *F*orward *E*rror *C*orrection (SELFEC); *A*utomatic *R*etransmission upon re*Q*uest (ARQ); ARQ monitor (listen-only) and *F*orwarded *E*rror *C*orrection (FEC).[8] Of these, ARQ and FEC are

[1]Notes appear on p 28.

Table 1

Baudot (Murray, ITA2), ASCII and AMTOR (CCIR Rec. 476) Codes

Baudot† Bit No. 43210	ASCII†† Bit No. 6543210	AMTOR†† Bit No. 6543210	LTRS	FIGS
00011	1000001	1000111	A	-
11001	1000010	1110010	B	?
01110	1000011	0011101	C	:
01001	1000100	1010011	D	
00001	1000101	1010110	E	3
01101	1000110	0011011	F	
11010	1000111	0110101	G	
10100	1001000	1101001	H	
00110	1001001	1001101	I	8
01011	1001010	0010111	J	BELL
01111	1001011	0011110	K	(
10010	1001100	1100101	L	)
11100	1001101	0111001	M	.
01100	1001110	1011001	N	,
11000	1111001	1110001	O	9
10110	1010000	0101101	P	0
10111	1010001	0101110	Q	1
01010	1010010	1010101	R	4
00101	1010011	1001011	S	'
10000	1010100	1110100	T	5
00111	1010101	1001110	U	7
11110	1010110	0111100	V	=
10011	1010111	0100111	W	2
11101	1011000	0111010	X	/
10101	1011001	0101011	Y	6
10001	1011010	1100011	Z	+
01000	0001101	1111000	Carriage return.	
00010	0001010	1101100	Line feed	
11111	-	1011010	Letter shift	
11011	-	0110110	Figure shift	
00100	0100000	1011100	Space	
00000	0000000	1101010	Blank	
-	-	1100110	Signal repetition (RQ)	
-	-	0110011	Idle signal β	
-	-	0001111	Idle signal α	
-	-	1100101	Control 1	
-	-	1101010	Control 2	
-	-	1001101	Control 3	

†Bits are numbered 0 (least significant) through 4 (most significant).

††Bits are numbered 0 (least significant) through 6 (most significant).

Note: The bit data in the ASCII column is incomplete and does not correlate to the characters shown in the FIGS column. A detailed explanation of these codes (and others) is given in the Digital Communications Chapter of *The 1989 ARRL Handbook*, pp 19-10 to 19-21.

used most often by radio amateurs.

SELFEC

This mode, also known as selective mode B, is quite similar to FEC. The difference between the two is that SELFEC contains an address that allows non-addressee stations to reject it.

ARQ

The fully linked mode in which most AMTOR QSOs take place is ARQ. The transmitters and receivers of the stations at both ends of the QSO are linked or synchronized, alternatively sending and acknowledging three-character blocks of text sent by the transmitting station. There can be only two stations transmitting and receiving on a circuit; no roundtable QSOs are possible in ARQ.

The direction of information flow can be reversed by either station at any time. If a temporary loss of signal occurs and signal flow is disrupted for any reason, the link will automatically reestablish itself and retransmit the unacknowledged data. (No operator intervention is required.) Under these conditions, the operators at either end of the link see only a reduction in data-flow rate from the sending station to the receiving station. The front-panel LED displays on most communications processors can reveal the link direction and provide you with other signal information. (Experienced operators can tell a lot about the signal just by listening to it.)

ARQ Monitor (Mode L)

This mode allows any number of stations to listen in on a pair of ARQ-linked stations in QSO. And, if both signals are readable, listening stations can copy both sides of the conversation.

FEC

Sometimes called Mode B or Bc, FEC is a nonlinked mode used mostly for calling CQ, round tables, nets, or when ARQ mode is impossible for some reason. The transmitter is keyed continuously, and text is sent (using FSK or AFSK), in much the same manner as conventional ASCII or Baudot RTTY.

When transmitting in the FEC mode, each character is sent twice, separated by four additional characters. This provides a second chance for the receiving station to correctly decode the same character—a form of time-diversity reception. For short words, idle character codes are used, as required, to fill in spaces at the beginning and end of each group of letters (word). For example, *QTH* would actually be sent as:

Q<idle>T<idle>HQ<idle>T<idle>H

Thus, there are four characters between every once-repeated character. Consequently, using AMTOR's FEC mode (although not absolutely error-free), results in a much lower error rate—for the same path conditions—than Baudot or ASCII. That's because of the duplicate transmission of each character. My on-the-air experience using FEC under poor communications conditions confirms this.

A more-detailed technical explanation of all of these AMTOR modes is contained in the material already cited, and elsewhere.[9,10,11]

Some Operating Hints

AMTOR's usefulness and enjoyability for ragchewing can be maximized by using operating practices that make QSOs more fun and efficient. Here are some suggestions.

- When just starting out on AMTOR, avoid signal inversion. By convention, AMTOR operation uses *lower sideband* on MF and all HF amateur bands. (This results in the mark signal being the higher emitted frequency). Otherwise, your transmitted signals will be inverted and other stations will not be able to decode your FEC or ARQ transmission unless they realize what's happening and switch sidebands. If you are using FSK, check with another AMTOR or RTTY station to verify correct FSK sense. Many communications processors offer jumper-selectable FSK sense.
- Always *listen* before transmitting on any frequency. You may be able to hear only one of the two stations in an ARQ QSO, so careful listening is needed to verify that a frequency is clear.
- Keep CQs short, and *always* allow some idle signal (for phasing at the receiving end). A 20-second idle, followed by two or three single lines of three CQs, followed by your call sign and SELCAL should be

sufficient. An idle signal alone is a great attention-getter for anyone looking for an AMTOR QSO, so the actual CQ and identification of call sign and SELCAL can be brief.

• A SELCAL is never a replacement for a call sign. The SELCAL is used only by the AMTOR communications processor in Master mode to initiate an ARQ link. Hence, the SELCAL is never used to call a station in FEC, for example.

• Avoid overdriving the audio stages in your transceiver if you're using AFSK. I've heard many AMTOR signals that have multiple tone pairs, the result of overdriving the transmitter's audio stages. Run the audio level up to the point at which ALC action just begins, then reduce the audio level until there is no ALC indication. Of course, speech processors and VOX should be turned off.

• Use fast AGC (manual gain control with weak signals). Slow AGC may add an unacceptable delay to the transmit-to-receive recovery time.

• Remember, in ARQ, there is no need to repeat your name, QTH, etc. (For some, this may be a hard-to-break RTTY habit!) Once is enough! There's no need to ask "How copy?" or "Do you copy?" or "How print?". (Poor conditions may slow down the link data flow, and errors do appear if you try to communicate through a *terrible* path.)

• Avoid using large message buffers that contain descriptions of everything in the shack from power supplies to antenna tuners. It's better to discuss equipment as appropriate in the QSO. Also, avoid the excessive use of line feeds; they'll make text scroll off the screen at the receiving end. Some stations (like mine) have no way of recovering text that has scrolled off the screen, so the received information is lost.

• Always monitor the received signal aurally. This helps you to determine band conditions and decide whether or not you need to use a narrower filter and passband tuning to eliminate QRM before the link gets too far behind. Often (using IF shift carefully), I have been able to completely null out the received mark or space tones while still maintaining good link flow. Most good AMTOR communications processors provide automatic threshold correction that enables single-tone (mark or space) reception, if necessary. I've observed that even some veteran AMTOR operators are not aware of the threshold-correction capability of their communications processors, and it's not mentioned in some communications-processor equipment manuals.

• There is little need to use high power on ARQ, but if you want to run that amplifier, you'll need to verify that no hot RF switching is taking place.[12] However, I have rarely found any real need to use an external RF power amplifier, even with weak signals and fluttery QSB.

Low power does it! Forty watts to a tribander will get you plenty of DX on ARQ, especially with current good conditions on 10 and 15 meters. This is certainly one of the big pluses of AMTOR operation.

• A computer is *not required* for AMTOR operation (or for packet radio or RTTY for that matter). Any dumb terminal with an RS-232-C interface will work fine and can reduce the software learning-curve time for the newcomer. Many newcomers to AMTOR that I've met on the air have their biggest problems trying to understand the cryptic command syntax of some terminal-emulation software. I have tried AMTOR operation both ways—with a computer and with a dumb terminal. After three years of AMTOR operation, the simple dumb-terminal arrangement seems hard to beat for straightforward AMTOR rag-chewing.

• Help newcomers. Most of us were lost for a while when we first got on the air with AMTOR. Every week I run into someone who is experiencing problems because their transmitted RF is crashing their computer; they're unaware they're sending inverted tones, or any number of other reasons. Once we get a link going, it's a great reward to see their amazement and enthusiasm at how well the system works, and the ease with which a QSO can proceed even under poor conditions.

• Don't touch that dial! Once the link is established, use *only RIT* to correct for any drift by either station. This eliminates the need for stations in QSO to chase each other up and down the band.

• Use the operator's agreement when operating AMTOR. On 80 meters, look for AMTOR signals from 3.550 to 3.650 MHz; on 40, 20, 15, 10, check frequencies from 70 to 80 kHz above the bottom of each band. Also, look for Novices operating between 28.115 to 28.150 MHz.

Summary

I hope the information I've provided here offers you some additional insight on how to use AMTOR. If you haven't tried AMTOR yet, you're missing out on a really enjoyable ham radio communications mode. Don't wait any longer—see you on AMTOR!

Notes

[1]J. Martinez, "AMTOR, an improved radioteletype system using a microprocessor," *Radio Communications*, Aug 1979, pp 714-718.

[2]J. Martinez, "AMTOR, the easy way," *Radio Communication*, Jun/Jul 1980, pp 610-615.

[3]J. Martinez, "AMTOR, an Improved Error-Free RTTY System," *QST*, Jun 1981, pp 25-27.

[4]P. Newland, "An Introduction to AMTOR," *QST*, Jul 1983, pp 11-13.

[5]W. Meyen, "Operating With AMTOR," Technical Correspondence, *QST*, Jul 1983, pp 40-41.

[6]P. Newland, "Report on the Unattended Use of the Teleprinter Code," *QEX*, Mar 1985, pp 8-9.

[7]International Telecommunication Union (ITU) Report CCIR 476-3 (1978), "Direct-Printing Telegraph Equipment in the Maritime Mobile Service," is available as a reprint from ARRL HQ as part of the proceedings of The Third Computer Networking Conference. See also, *ARRL Amateur Radio Computer Networking Conferences 1-4*, (Newington: ARRL, 1985), pp 3.125-3.124.

[8]P. Newland, "Algorithms and Methods for SITOR/AMTOR Systems," *QEX*, Jul 1988, pp 9-12.

[9]P. Newland, "A User's Guide to AMTOR Operation," *QST*, Oct 1985, pp 31-34.

[10]P. Anderson, "Introduction to and the Operation of AMTOR," available from Kantronics, Inc, 1202 E 23rd St, Lawrence, KS 66046, tel 913-842-7745.

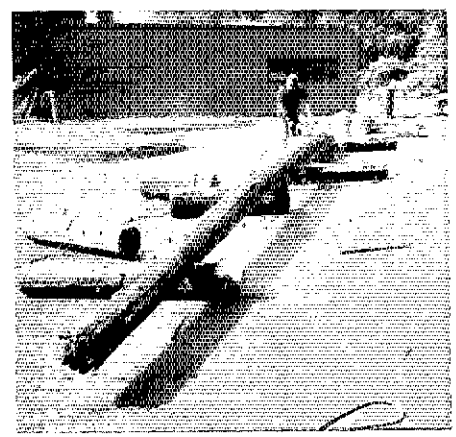
[11]B. Hale, ed, *The 1989 ARRL Handbook* (Newington: ARRL), p 19-13 to 19-14.

[12]Hot switching occurs when a signal is applied to switching contacts before the switch is transferred. Hot switching damages contact points and may cause the contact points to fuse. Ideally, switch transfer should occur *first*; then the signal is applied to the switch. This is known as *cold* switching. With transceiver and RF power amplifier TR switching, the TR relays should close *before* RF is applied to the relay contacts and open *after* RF is removed from the relay contacts.

Don Huff was first licensed as KN6KDE in 1955, just after his 15th birthday. His involvement in Amateur Radio led him to study electronic engineering at California Polytechnic State College where he minored in Communication Theory. Don has BSEE and MSEE degrees and has been employed by Hewlett-Packard for the past 23 years. He works as a development engineer and Engineering Project Manager in research and development.

Don's main interests in ham radio are CW (fixed and mobile), ragchewing, antenna design and construction and operating AMTOR. Don also holds a Second Class Radiotelegraph Operator's license. QST

Strays



The four 65-foot red cedar poles that supported the famous W1AW Rhombic were taken down in August. The poles came from the West Coast and were transported through the Panama Canal. Installation took place in 1937 by a volunteer crew from the Hartford Electric Light Co. The poles had been the victims of noticeable dry rot. Here, a tree service employee cuts one of the antenna supports into sections before it's transported off the HQ site.

Some Power-Supply Design Hints

RF suppression in regulated supplies can be significant. This article shows how it is done.

By Doug DeMaw, W1FB
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The textbooks do not cover some of the day-to-day questions that amateurs have about regulated dc power-supply design. For example, how can we keep unwanted RF energy out of a power supply? Also, how might we use a negative voltage regulator to obtain positive output from a power supply?

These are common questions, and the answers are straightforward. Application notes and technical books that deal with power supplies seldom provide answers to questions of this kind because the writers assume the reader is an engineer. Let's explore the practical aspects of these questions.

Getting Rid of Stray RF Energy

The more complex the regulated power supply, the greater the opportunity for circuit malfunction when RF currents get into the system. To help keep RF out of the supply, it becomes necessary to filter the ac input line to the power supply by means of a brute-force filter. The output port of the power supply needs to be filtered also, because RF energy can enter the circuit via that route. Some internal RFI suppression measures, such as installing bypass capacitors and ferrite beads at key spots in the power supply, are required in stubborn cases.

What about the less complex regulated supply? Normally we will not experience malfunctions if a moderate amount of RF energy enters the circuit, provided it does not overwhelm the regulator. The usual 0.1-μF bypass capacitors at the input and output of the regulator IC offer ample protection against RF currents. But another

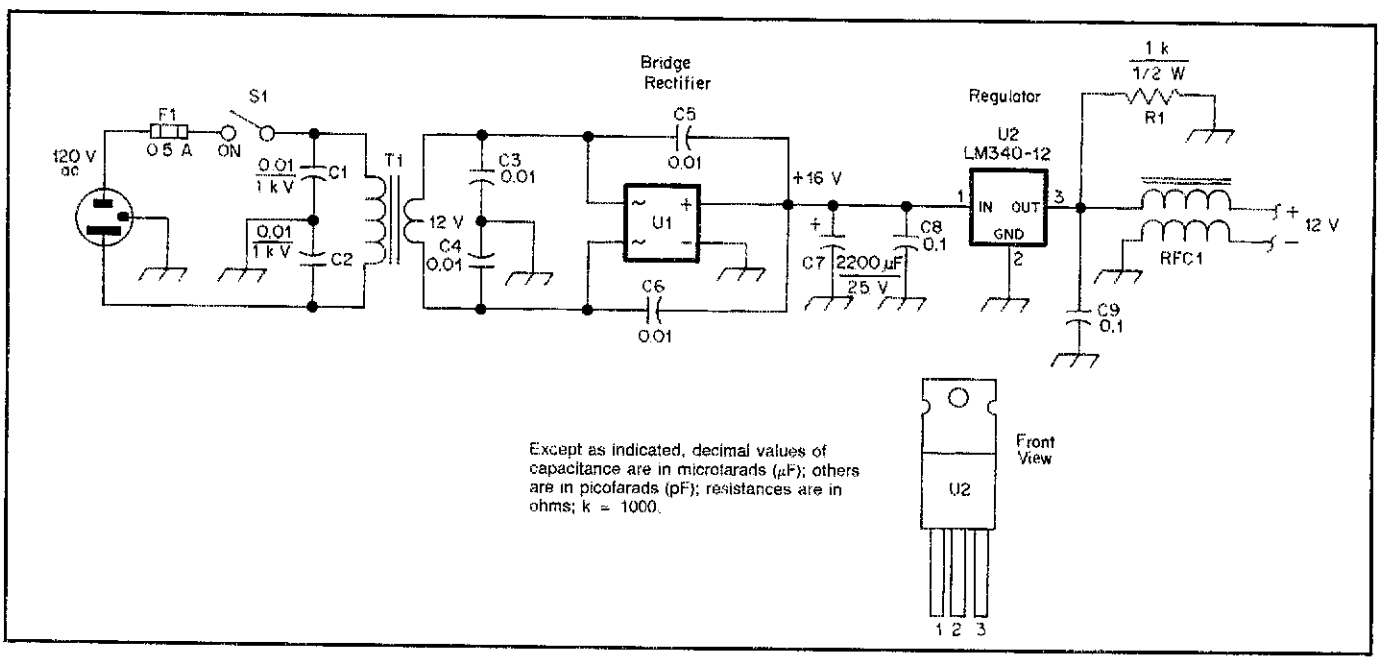


Fig 1—Schematic diagram of the 12-V, 300-mA regulated power supply.

C1-C6, C8, C9—Disc ceramic.
C7—Electrolytic, 2200 μF, 25 V.
F1—0.5-A fuse.
R1—1-kΩ, ½-W carbon composition.
RFC1—Dual RF choke. Use 6½ bifilar turns of no. 26 enam wire on an Amidon BLN-43-202 binocular core.
S1—SPST toggle.
T1—12-V, 500-mA or greater transformer.
U1—In-line bridge rectifier, 2-A, 50-PRV or greater.
U2—12-V, 1-A three-terminal regulator IC.

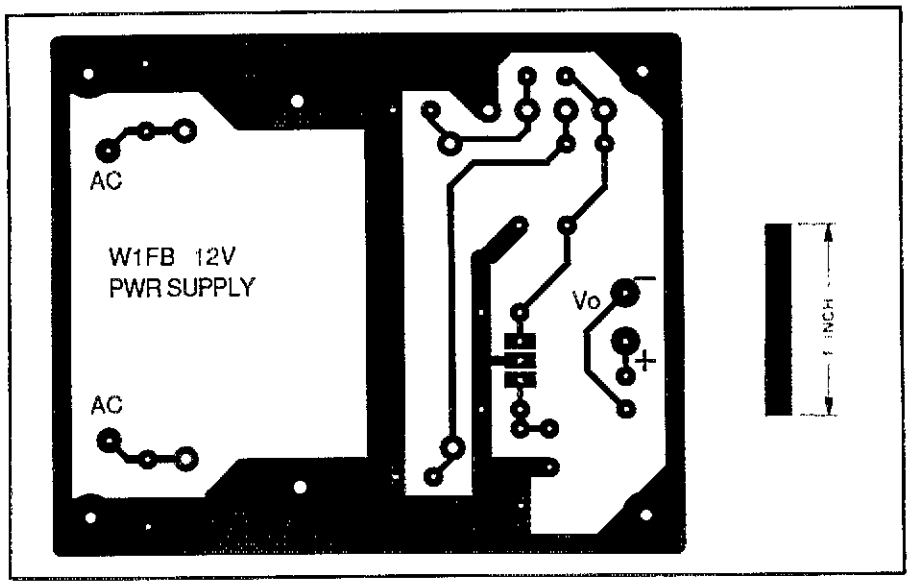


Fig 2—Circuit-board etching pattern for the 12-V power supply, shown full size from the etched side of the board.

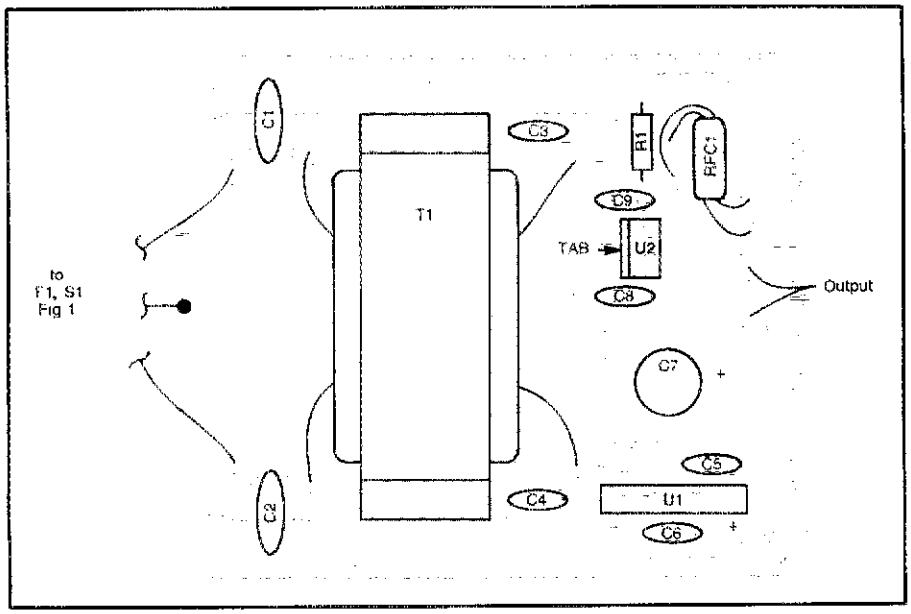


Fig 3—Parts-placement guide for the 12-V power-supply PC board. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern. Component outlines are not necessarily representative of the shapes of the actual parts used.

situation can occur, whereby RF energy gets into the power supply and affects the equipment powered by the supply.

A notable example is a direct-conversion (D-C) receiver that is seriously afflicted with hum in the upper part of the HF spectrum. The malady is known as *common-mode hum*. You have probably experienced common-mode hum if you have used an HW-7, HW-8 or a homemade D-C receiver with an ac-operated dc power supply. RF energy from the receiver local oscillator enters the power supply and passes into the rectifier circuit. The RF energy becomes hum-modulated (120 Hz) in the diodes and is reradiated into the receiver front end (via the antenna) at the operating frequency.

Some simple RF-proofing measures can be applied to any 12-V power supply. Fig 1 shows the circuit of a low-current 12-V regulated supply I built for use with QRP gear and some of my lab test equipment. C1 and C2 are used as RF bypass capacitors at the ac input to T1. Each diode in bridge rectifier U1 is bypassed with a 0.01-μF capacitor (C3, C4, C5 and C6). These capacitors can also be placed in parallel with separate rectifier diodes if you use them. The capacitors bypass the RF energy around the diodes and help prevent hum modulation of any RF current that may be present in that part of the circuit.

Attention must be paid to the power-supply output lines as well. RFC1 of Fig 1 blocks the passage of RF and keeps it out of the power-supply circuit. I use a bifilar choke wound on a small ferrite binocular core. C9 aids the RF filtering by serving as a bypass capacitor. J1 and J2 are bypassed by means of a 0.1-μF capacitor at each jack. This increases the effectiveness of RFC1. Wes Hayward, W7ZOI, tipped me off to the implementation of RFC1 many years ago. The bifilar-wound choke will work equally well on a ferrite toroid core (850 μ_e suitable). I have not experienced common-mode hum while using this circuit with a number of D-C receivers, even while listening to the 10-meter band.

I have not observed any voltage variations while using the power supply in Fig 1, even when strong RF fields were present at my work bench. A final step can be taken to ensure RF immunity of the power supply: Connect an earth ground to the negative bus of the circuit, or to the cabinet if the negative bus is common to it.

Building the Supply

I used a PC board to contain the components for the circuit in Fig 1. The maximum current that can be drawn from this supply is 300 mA. You can use a larger transformer by mounting it outboard from the PC board. Do not exceed the current capability of the regulator, U2, which is rated for a maximum output current of 1A. A heftier regulator along with a suitable heat sink can be used in place of the LM340. Better still, use the LM340-12 with a current-pass transistor. A circuit example is shown in Fig 4.

The rectifier diodes must have ample current ratings for any increase you plan for this circuit. Similarly, RFC1 needs to be wound with wire large enough to pass the output current without causing a voltage drop. Increased wire diameter requires a larger core for RFC1.

The PC board for my power supply measures 2-3/4 × 3-1/8 inches. Drilled and plated boards are available by mail.[1] You can use point-to-point wiring if you do not want to build your circuit on a PC board. Layout is not critical. A scale etching template is provided in Fig 2, and a parts-placement guide is shown in Fig 3.

You will observe that a 12-V power transformer is used with the circuit in Fig 1. Don't despair, because the output voltage from the bridge rectifier is 1.41 times the ac input voltage, minus the voltage drop across the forward diodes

[1]Notes appear on page 40.

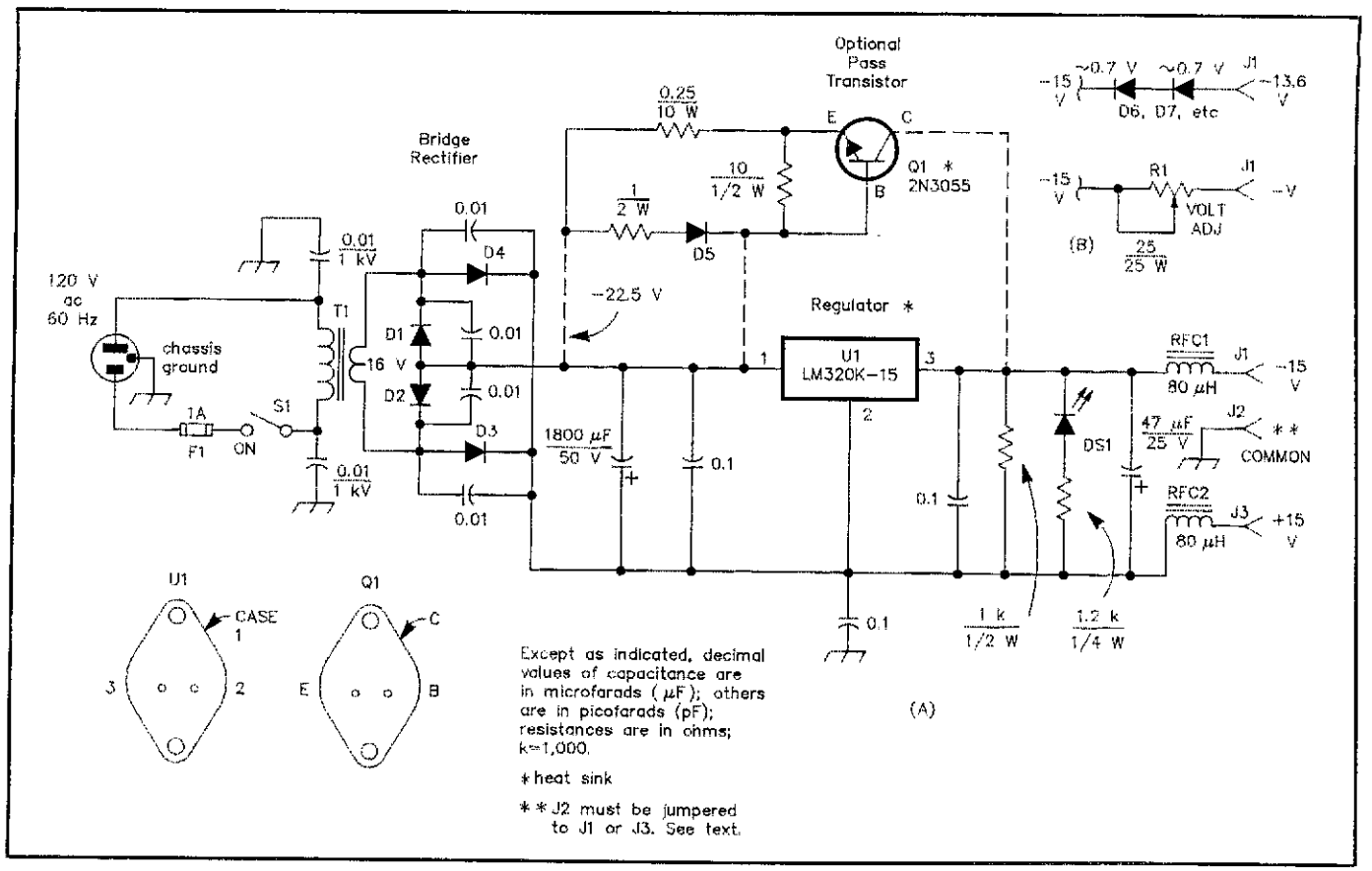


Fig 4—Schematic diagram of the 15-V regulated power supply. Capacitors are disc ceramic except those with polarity marked, which are electrolytic. Resistors are carbon composition.

D1-D4, incl—6-A, 100-PRV rectifier diode.
D5—1-A, 50-PRV rectifier diode.
D6, D7—See text.
DS1—Red LED.
F1—1-A fuse.
J1, J2, J3—Binding post. One black, one white and one red.
Q1—See text.
R1—See text.
RFC1, RFC2—RF choke. Use 25 turns of no. 20 enam wire on an Amidon Assoc B-72-1011 ferrite bobbin. An FT-50-43 toroid core can be used in place of the bobbin.
S1—SPST toggle.
T1—16-V, 2.5-A or greater transformer.
U1—Negative 15-V, 1-A regulator IC, LM320K.

(0.7 V). This results in approximately 16 V dc at the input to regulator U2. This is an acceptable approach for low-current supplies. I do not recommend it for supplies that deliver 1 A or greater. It is better, in that event, to use a 16- or 18-V transformer for T1.

Using Negative Regulators

We frequently see bargain-priced negative regulators as surplus, but have no need for a negative supply. I recently came into possession of a small box filled with unused −15-V, 1-A regulator ICs—for free! I decided to build a power supply around one of them, and the circuit is presented in Fig 4. It can be used as a positive or negative 15-V regulated supply. Note: You cannot use this supply to simultaneously deliver ± 15 V to a load.

T1 is a 2.5-A, 16-V transformer I bought from a surplus dealer. Therefore, I can add a current-pass transistor (Q1) to increase the power supply output-current rating over that available from the U1 regulator. The dashed lines show the required circuitry for employing the pass transistor.

The Fig 4 circuit illustrates how the negative and positive lines of the supply can be floated above the chassis ground in order to extract positive *or* negative output from the circuit. J2 is common to the power-supply chassis. When a positive output voltage is required, you can ground the negative terminal (J1) by joining it to J2. Then take the output voltage from J3 and J2. Bridge J3 and J2 if you desire a negative output voltage and take the output voltage from J1 and J2.

Inset B of Fig 4 shows methods for lowering the power-supply output voltage, if desired. Each diode you place in series between RFC1 and J1 will lower the output voltage by approximately 0.7 V. (Be sure to measure the output voltage accurately before applying it to a given circuit.) D6 and D7 (plus any additional diodes) must be capable of passing the current taken by the load. I suggest that you use a diode-amperage rating of at least three times the load current. The series diodes can be mounted on a heat sink for additional protection against overheating.

Fig 4B also shows a series resistance (R1) in the output voltage lead. This method is somewhat crude, and it is useful only when the load draws a constant current. Variations in current will cause fluctuation of the output voltage amplitude. A high-wattage rheostat can be used for R1. It should have no more maximum resistance than is needed to provide the desired voltage drop.

The 15-V power supply employs RF energy suppression in the same manner as the circuit in Fig 1. An internal view of the 15-V power supply is provided in Fig 5.

Closing Comments

The Fig 5 power supply is housed in a new surplus case I obtained from N8HLE/1. The case is 8-1/4 inches deep, 3-1/4 inches wide and 2-7/8 inches high, is made from 1/8-inch-thick black anodized aluminum and has a natural-finish, perforated-aluminum cover. The front panel is slotted for a bar-graph indicator

(continued on page 40)

Conducted By James W. Healy, NJ2L
Assistant Technical Editor

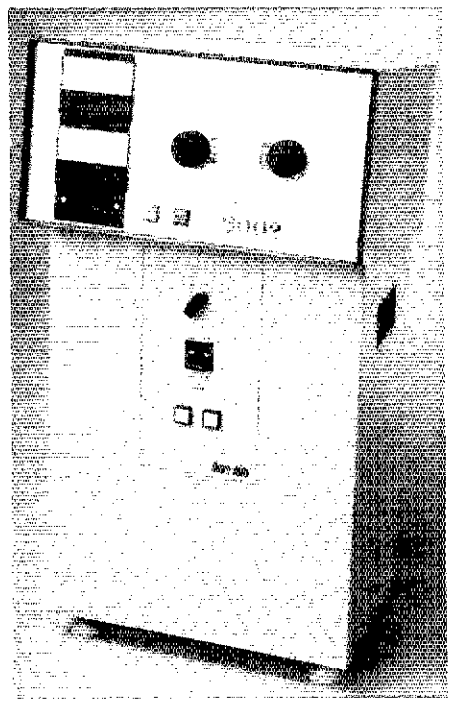
Henry Radio Tempo 3002A 2-Meter Linear Amplifier

Reviewed by Mark J. Wilson, AA2Z

There are times during 2-meter operation when legal-limit power is a big help. You don't need (nor should you want) to use high power to work through the local FM repeater or AMSAT-OSCAR 13. But if you hang around the bottom 300 kilohertz of the band, and if DX is your game, having 1500 watts of solid RF on tap can help you work those elusive tropo, aurora, scatter and moonbounce contacts.

For years, Henry Radio has offered VHF enthusiasts an alternative to bending their own sheet metal. Many a VHF DX contact has been made using power by Henry, and the 3002A carries on this tradition.

The 3002A uses a single EIMAC 8877 triode. Featuring a self-contained power supply, metering and control circuitry and an antenna relay, the 3002A is about as challenging to use as a typical HF amplifier. So much for the myths about the difficulty of serious 2-meter operation.



Construction

The 3002A looks similar to the floor-model Henry HF amplifiers. Standing almost three feet tall and tipping the scales at close to 200 pounds, the 3002A makes an impressive package. The power supply and control circuitry are housed in the base, and the RF deck is mounted on top.

The 8877 and associated RF circuitry are built in a solid aluminum case that fits inside the main enclosure. The output circuit uses a pair of striplines with the tube in the center, reminiscent of the classic W6PO 2-meter amplifier design that many hams have duplicated. Tuning and loading are handled by a pair of capacitors, with a thick sheet of Teflon® dielectric material between the two plates of each capacitor.

The blower, which pressurizes the RF deck, is mounted inside the power supply. After cooling air passes over the tube's base, a chimney forces the air to travel through the tube's anode-cooling fins. Hot air exits through a screened hole in the cabinet top. Blower noise is moderate.

In these days of microprocessor control and fancy displays, the 3002A's front panel is relatively Spartan. Two meters dominate the left side of the RF deck: One reads anode current (0-1 A), the other is switchable between grid current (0-100 mA) and high voltage (0-10 kV). There is, of course, no band switch. The two large knobs with counter dials are for **INPUT TUNE** and **OUTPUT TUNE**. The **PA LOAD** control is located on the rear panel, which is not a problem because it's a set-and-forget adjustment. (You need only use this control when you switch antennas.) Push-button switches below the meters are for switching between standby and operate, and for switching the multimeter between grid current and high voltage. A pair of indicator lamps show **POWER** and **STAND BY**. The **STAND BY** light glows when the 3002A's two-minute warm-up period is over (the 8877 must be warmed up before use). The **POWER** lamp glows when ac power is applied, the warm-up period is over and the amplifier is switched to operate.

On the front of the base is the **POWER ON/OFF** circuit breaker that serves as the main power switch. The **SSB/CW** switch does not affect class of operation; it simply switches between two taps on the high-voltage transformer. **CW** (suggested for tune-up, CW, FM, RTTY and AM operation) provides about 2500 V with no load. **SSB** raises the high voltage to about 3500.

In addition to the **PA LOAD** control, the rear of the RF deck has a BNC connector for **RF INPUT**, an N connector for **RF OUTPUT** and a phono jack for **RELAY CONTROL**. A large air filter occupies much of the rear of the base. A 1.5-A fuse that protects the cathode circuit is also accessible from the rear panel.

Hookup and Operation

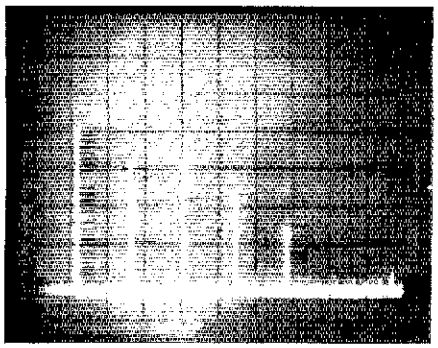
Because of its weight, the 3002A must be shipped by truck. The review unit was packed in a sturdy cardboard carton, mounted on a wooden platform, and it survived the cross-country journey with just one small dent in its RF-deck cabinet.

Henry ships the amplifier with tube and power transformer installed, and ready for operation. You must supply your own ac power plug. I had no trouble installing a standard 20-A, 240-V plug to match the outlet in my shack. Primary taps on the transformer allow 200, 220 or 240-V operation. From the factory, the 3002A is ready for 220-V use. Operation from 120 V is not possible (and is not desirable for any amplifier in this power class).

Included accessories are the operator's

Table 1
Henry 3002A 2-Meter Amplifier, Serial no. 60-162

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: Available for 100 to 200 MHz; 144 to 148 MHz standard. Tunable over ±5% of center frequency.	144 to 148 MHz.
Driving power required: 40 to 60 W typical.	50 W for 1500 W output.
Maximum power output: 1500 W continuous.	As specified.
Spurious emissions: Reduced in accordance with requirements for application by means of external output filter	Complies with current FCC specifications. See Fig 1.
Keying: Ground to transmit.	
Primary power requirements: Primary taps for 200, 220 and 240 V ac, 30 A maximum.	
Color: Light gray.	
Size (HWD): 32.75 × 15 × 16.5 inches.	
Weight: 190 lb (shipping weight).	



(A)

(B)

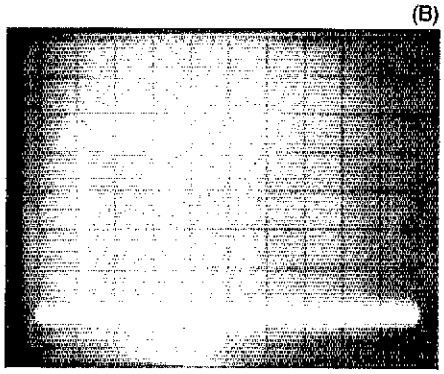


Fig 1—Worst-case spectral display of the Henry 3002A. Horizontal divisions are each 100 MHz; vertical divisions are each 10 dB. Output power is approximately 800 W at 144.2 MHz. The fundamental has been reduced by approximately 28 dB by means of notch cavities to prevent spectrum-analyzer overload. Photo A shows the 3002A operating without its external output filter; photo B shows the output with the filter in place. With the filter installed, all harmonics and spurious emissions are at least 60 dB below peak fundamental output. With the output filter, the Henry 3002A complies with current FCC specifications for spectral purity.

manual, RF-input cable, relay-control cable, spline wrench (for the dials), a box of 1.5-A fuses and an output filter. That's right, an output filter. Henry can supply the 3002A for any frequency between 100 and 200 MHz for many uses other than ham DXing, and they supply an appropriate filter for the intended use. Note that you must connect the filter between the 3002A's **RF OUTPUT** connector and your antenna to suppress the 3002A's harmonics to a legal level. See Fig 1.

Hooking up the 3002A was a breeze. (The hard part was wrestling it into my shack. . .) As suggested in the instruction manual, I first drove the amplifier with 10 watts from my transverter. This allowed me to familiarize myself with tuning and loading the amp at reduced power—and at reduced risk of damaging the 3002A. Initial tune-up yielded almost 400 watts output—Henry rates amplifier gain at 15 dB!

Operation was smooth and trouble free, so I added an RF Concepts solid-state amplifier in line between the transverter and amplifier input. This time, I had no trouble slamming my Bird wattmeter needle against the peg (the 1-kW element was installed). Off to the telephone to borrow a higher-power Bird element! The 3002A easily tunes up to 1500 W output with about 50 W drive, and operation at that power level is well within the safe anode- and grid-current ratings for the 8877.

It's hard to describe the difference that legal-limit power makes during 2-meter weak-signal operation. I normally run about 400 W output, and the difference on aurora, meteor scatter and marginal tropo contacts is tremendous. The extra 6 dB or so in signal strength made the difference in being just another signal on the band and being able to attract a lot of callers during the many auroral events we've had recently.

The 3002A's biggest test came during the September VHF QSO Party at W1XX/3. Although the 3002A does not exactly lend itself to mountaintop-portable operation, we dragged it along anyway because we thought that it would be worth the trouble. The amplifier ran flawlessly for the entire contest period, and the end result was 672 2-meter contacts in 87 grid squares—with flat band conditions! In 1988, operating from the same site with similar antennas and 500 W, we worked 88 grids with the help of two aurora sessions and a little tropo enhancement. Our 2-meter op, Clarke Greene, K1JX, attributes the difference to running high power and being able to attract very weak stations at the edge of the normal tropo range.

I really enjoyed using the 3002A. It's a solid performer, and it does what all good amplifiers should: Make lots of watts with a minimum of hassle.

Price class: 3002A (including power supply, 8877, vacuum antenna-changeover relay), $2395; RF deck only (including 8877, but less power supply and relay), $1595. Manufacturer: Henry Radio, 2050 S Bundy Dr, Los Angeles, CA 90025, tel 213-820-1234.

AUTEK WM1 SWR/WATTMETER

Reviewed by Kirk Kleinschmidt, NT0Z

Before acquiring the Autek WM1 SWR/wattmeter, I found myself in a predicament many hams probably face: I needed an easy way to measure the PEP output of my transceiver and amplifier—without spending a lot of money, and without using more than one metering device. To make matters even more challenging, my "ultimate" power meter has to perform well from 5 to 1500 watts! The Autek WM1 does the job; it saved me the trouble of building two wattmeters: one for QRP, and one for medium- and high-power operation.

Description

The WM1 is an RF-power and SWR-computing meter that operates from 1.5 to 30 MHz with a usable power-measurement range of 0.5 to 2000 W. The unit measures PEP or average power in three ranges: 0 to 20 W, 0 to 200 W and 0 to 2 kW. SWR is indicated on a separate meter, eliminating the need to switch back and forth between forward- and reflected-power readings.

The WM1's RF-sensing head is attached to the main meter unit via a 4-foot cable, allowing the head to be installed in any convenient location. In my setup, the WM1 sits on a shelf above my operating table, and the sensing head is fastened directly to my amplifier's **RF OUTPUT** connector. This arrangement eliminates a couple of short runs of coaxial cable, and keeps the coax from dragging the meter around (I call this the *tail wagging the dog* syndrome).

Autek regards the schematic diagram for the WM1 as proprietary. Other than a circuit diagram for the sensing head (a typical toroid-and-diode directional-coupler design), the rest of the meter, in-

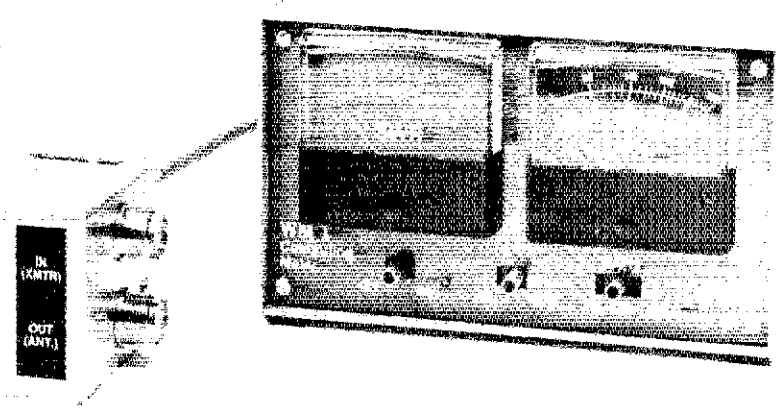


Table 2
Autek WM1 SWR/Wattmeter

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Accuracy: ±5% of full-scale (FS) reading, ±10% of FS reading below 20% of FS.	As specified.
Power source: 9 to 18 V dc (battery or ac-to-dc adapter [supplied]) at 15 mA.	As specified.
Insertion VSWR: Less than 1.1:1.	As specified.
Low-power threshold for SWR-computation circuit: 0.5 W.	As specified.
Color: Gray.	
Weight: Approx 1 lb.	
Size (HWD): 3½ × 6½ × 2¾ inches.	

cluding peak detectors, voltage regulator and divider network (the computing part) is presented only in block-diagram form.

The sensing head and main unit appear to be well-made. All of the components in the main enclosure are mounted on a small, high-quality circuit board. Access for calibration adjustments is provided through a large slot in the back of the enclosure.

Using the WM1

Setting up the WM1 is not difficult. Simply plug in the ac-to-dc supply (supplied) and connect the sensing head in series with your 50-Ω antenna cable (just before your antenna tuner, if you use one). The WM1 may be powered from a 9- or 12-V battery, in lieu of the supplied ac-to-dc adapter, making the meter suitable for portable operation.

To use the WM1, first select the appropriate power range. For greatest accuracy, use the lowest practical range. Then, choose between average and PEP power measurement. When reading average power, the meter behaves like any other conventional wattmeter. A slight delay in the readings is caused by the meter's inability to quickly follow short RF-power peaks. The WM1's PEP mode eliminates this delay, and allows you to get an accurate picture of your station's RF-power peaks on SSB, CW or any other mode. To facilitate PEP measurement, peak RF values are sensed electronically, captured, and then displayed on the meter. The meter-deflection amplifier has a fast attack time and a slow delay time. This way, the WM1 can measure and display RF-power peaks lasting only a few milliseconds. Regardless of the power-measuring mode, the WM1 calculates SWR automatically, and requires no adjustments or calibration.

Using the WM1 makes me wonder how I managed to get along without it! I especially like the PEP mode. It's quite useful, whether I need an accurate way to keep my PEP output at less than 5 or 10 W (for QRP work), or need to know the PEP output of my kilowatt amplifier. Power readings are consistent among the three ranges.

If you're concerned about the WM1's metering accuracy (manufacturer-rated as typically within 5% of full scale), don't be. Unless you're performing critical tests, knowing whether your transceiver is putting out 100 W or 93 W is of little real value. The beauty of the WM1 is its ability to accurately track over a wide range of power levels, displaying PEP-output and SWR readings without requiring any adjustments.

Beating the WM1's price-versus-performance ratio is difficult. Autek has packed a lot of performance into the WM1, considering the unit's price tag.

Price: WM1 (including shipping and handling, plug-in ac-to-dc supply, instruction manual and one-year warranty), $109. Manufacturer: Autek Research, Box 302, Odessa, FL 33556, tel 813-920-5810. (Autek sells only factory-direct.)

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.

Advanced Radio Devices model 230A MF/HF linear amplifier, s/n 0126 (see Product Review, May 1989 *QST*). Minimum bid: $3500.

Heath® SB-1400 MF/HF transceiver, s/n 8K020058, including SBA-1400-4 heavy-duty power supply/speaker and SBA-1400-2 hand-held microphone (see Product Review, October 1989 *QST*). Sold as a package only. Minimum bid: $772.

Amp International (formerly Amp Supply) model LK-550 MF/HF linear amplifier (based on three 3-500Z tubes), s/n 2052. Minimum bid: $865.*

Sealed bids must be submitted by mail and must be postmarked on or before November 27, 1989. 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 Kathy McGrath, Product Bids, ARRL, 225 Main St, Newington, CT 06111.

*Editor's Note: The Amp International LK-550 amplifier was purchased for Product Review, but Amp International went out of business during the review period. A review of this amplifier has not appeared, and will not appear, in *QST*. The amplifier is in good working order and has had only light use. As far as we know, there is no factory or other warranty support available for this amplifier. Several Amateur Radio dealers and repair facilities provide amplifier servicing, however.

Because of the unusual circumstances under which this amplifier is being sold, an additional discount from the original purchase price is reflected in the minimum bid for this item. QST

New Products

AEA MACRATT DATA-CONTROLLER SOFTWARE FOR MACINTOSH COMPUTERS

☐ Advanced Electronic Applications (AEA) has announced the availability of their Apple® Macintosh® data-controller software, called MacRATT. MacRATT, which has FAX capability, works with (and supports all modes of) AEA's PK-232, PK-88 and PK-87 data controllers.

MacRATT's features include program operation via the computer's mouse; direct FAX-image printing (without changing cables); ten user-definable macros; and compatibility with MultiFinder™ and Macintosh models 512K, 512E, Plus, SE and Mac II.

Price: $59.95. Available through AEA dealers. Manufacturer: AEA, PO Box C-2160, Lynwood, WA 98036, tel 206-775-7373.—*Rus Healy, NJ2L*

Hints and Kinks

Conducted By David Newkirk, AK7M
Assistant Technical Editor

PUTTING THE MINI-MISER'S DREAM RECEIVER ON 7 AND 10 MHz

☐ Here's how to modify Doug DeMaw's Mini-Miser's Dream (MMD) receiver[1,2] for 40- or 30-meter coverage with a 4.0-MHz intermediate frequency (IF). The modifications involve four main changes: (1) Reworking the crystal filter to a half lattice[3] and moving the MMD's IF amplifier and beat-frequency oscillator (BFO) to 4.0 MHz; (2) reworking the receiver's variable-frequency oscillator (VFO) and its π output filter to cover the 40- or 30-meter bands; (3) adding a 10-MHz input circuit in the 30-meter version; and (4) adding a two-pole, doubly terminated band-pass filter in the MMD mixer's 50-ohm input line. So far, I've modified two MMDs: one for 40 and another for 30 meters.

Crystal-Filter, IF-Amplifier and BFO Modifications

I graded a batch of surplus, 4.0-MHz, HC33/U-holder crystals by frequency with the test oscillator described by Hayward[4] and selected three crystals for each receiver: two differing by about 210 Hz (suitable for a half-lattice filter), and a third (for the BFO) about 250 Hz lower than the average frequency of the first two crystals. The measured crystal frequencies for one receiver were 3999.283, 3999.071 and 3998.988 MHz, respectively; for the other receiver, 3999.291, 3999.079 and 3998.895 MHz. (Remember, the filter crystals function in the series-resonant mode. In the MMD's BFO—and in Hayward's test oscillator—the crystal functions in the parallel-resonant mode. The actual IF is higher than the measured oscillation frequency—slightly higher than 4.0 MHz.) I installed the second filter crystal in place of C3 (the original circuit's filter phasing capacitor), and rewound the MMD's bifilar crystal-filter inductor, L1, with 8 bifilar turns of no. 28 enameled wire. A 10-kΩ resistor installed across RFC1 provides a defined resistive termination for the filter. The measured 6-dB bandwidth of the half-lattice filter is 400 Hz; this gives good single-signal selectivity.

I also modified T2, the MMD's IF-amplifier output transformer, rewinding its primary with 10 center-tapped turns of no. 26 enameled wire to give greater leeway in adjusting T2's tuning trimmer. (As for 3.3 MHz, T2's secondary consists of 3 turns of no. 26 enameled wire).

Aside from installing a 4.0-MHz BFO crystal, the MMD BFO modification involves replacing the BFO's 100-pF fixed capacitor (in series with Y2, the BFO crystal) with a 15- to 150-pF, ceramic-dielectric variable capacitor to allow BFO-frequency adjustment.

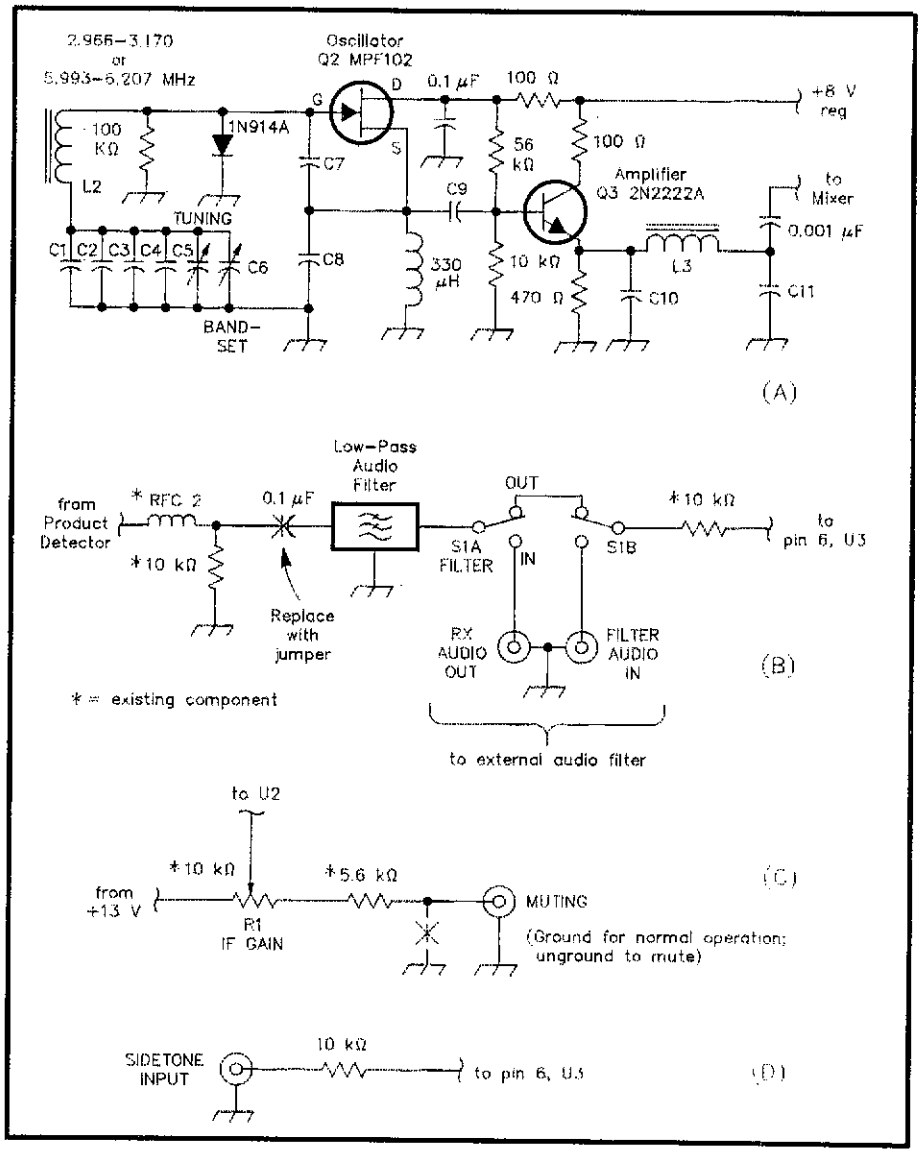


Fig 1—Herb Ley modified the Mini-Miser's Dream VFO for 40- or 30-meter operation as shown at A. The VFO tunes from 2.966 to 3.170 MHz for 40 m and 5.993 to 6.207 MHz for 30 m. B shows Herb's added audio-filter switching, and C and D show muting and sidetone-input modifications not described in the text. All numbered capacitors are NP0 (C0G) ceramic.

C1, C2—100 pF.
C3—Not used at 40 m; 47 pF at 30 m.
C4—Not used at 40 m; 4.7 pF at 30 m.
C5, C6—30 pF.
C7, C8—940 pF (2 × 470 pF in parallel) at 40 m; 470 pF at 30 m.
C9—47 pF.
C10, C11—100 pF at 40 m; 47 pF at 30 m.
L2—18.1 μH (62 turns of no. 28 enam wire on a T-68-6 toroidal core) at 40 m; 5.12 μH (33 turns of no. 24 enam wire on a T-68-6 core) at 30 m. To allow for variation in capacitor values, wind this inductor with 10% more turns than necessary and remove turns, one at a time, until you achieve the desired tuning range.
L3—13.6 μH (17 turns of no. 26 enam wire on an FT-50-61 toroidal core) at 40 m; 6.8 μH (12 turns of no. 26 enam wire on an FT-50-61 toroidal core) at 30 m.

Reworking the VFO and Its π Output Filter

After studying the articles by Hayward

[1]D. DeMaw, "The Mini-Miser's Dream Receiver," *QST*, Sep 1976, pp 20-23. Also see Feedback, *QST*, Nov 1976, p 22.
[2]Circuit boards and kits for this receiver are available from Circuit Board Specialists, PO Box 951, Pueblo, CO 81002, tel 719-542-4525.
[3]For more on crystal filters, including a description of the half-lattice configuration, see *The 1989 ARRL Handbook*, pp 12-26 to 12-28.—*AK7M*
[4]W. Hayward, "A Unified Approach to the Design of Crystal Ladder Filters," *QST*, May 1982, pp 21-27. Also see Feedback, *QST*, Jul 1987, p 41.

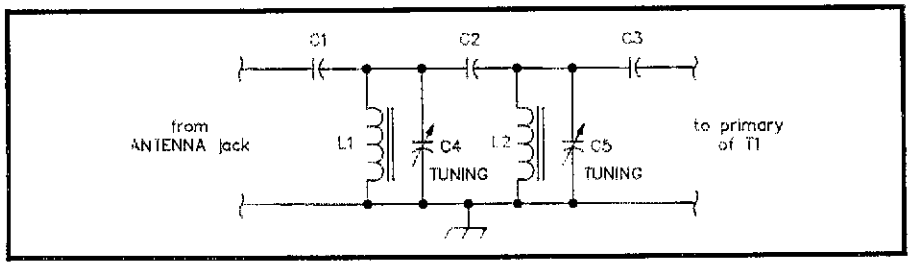


Fig 2—Herb Ley added this doubly tuned filter between the antenna and mixer in his modified Mini-Miser's Dream receivers for improved spurious-signal rejection.
C1, C3—40 pF at 40 m; 24 pF at 30 m.
C2—4.6 pF at 40 m; 2.6 pF at 30 m.
C4, C5—Nominal values: 188 pF at 40 m; 159 pF at 30 m.
L1, L2—2.16 μH (19 turns of no. 22 enam wire on a T-50-2 toroidal core) at 40 m; 1.34 μH (18 turns of no. 22 enam wire on a T-50-2 core) at 30 m.

and Lawson,[5] and Lewallen,[6] I measured the frequency drift of a prototype oscillator containing various combinations of polystyrene and NP0 ceramic capacitors, and T-68-2 and T-68-6 toroidal inductors. The results confirmed Lewallen's observations of the better stability of NP0 capacitors and T-68-6 inductors. I also followed Lewallen's recommendation (attributed to Hayward) to anneal the toroids in boiling water for a few minutes after winding and coating the coils with Q-dope.

The modified MMD's VFO must tune from 3.0-3.17 MHz to cover 40 meters, or 6.0-6.2 MHz to cover 30 meters. Corresponding changes must be made in the VFO output filter. Fig 1 shows a schematic of the modified MMD VFO. For greater frequency stability than that possible with polystyrene capacitors, I used NP0 ceramic capacitors for all fixed capacitors in the VFO tuned circuit. Each of two MMD VFOs modified in this way drift approximately 80 Hz during the first 15 minutes after turn-on.

Using a toroidal inductor instead of the original slug-tuned MMD VFO inductor, L2, makes room for a 30-pF, air-dielectric variable capacitor (a Hammarlund APC-30 in my MMDs) on the right rear side of the VFO enclosure. This bandset control, the shaft of which projects near C3, allows me to set the VFO range to cover 100-kHz band segments and does away with the need to do tedious cut-and-try experimentation with the inductance of L2. I chose a tuning range of 100 kHz as a compromise between reasonable bandspread, the MMD's selectivity and the suboptimal quality of my receiver's vernier drive.

New Mixer-Input Transformer for the 30-Meter Version

For 30 meters, the secondary winding of T1 consists of 17 center-tapped turns of no. 24 enameled wire on a T-50-6 toroidal, powdered-iron core. The primary is 3 turns of no. 24 enameled wire over the secondary winding. This modification was described by Collins.[7]

Input Band-Pass Filters

I calculated component values for the antenna-line band-pass filters from the formulas in *Solid-State Design for the Radio Amateur*[8] using a computer program and K values (from Amidon's data sheets) that differ slightly from those used in *Solid-State Design*. Fig 2 shows the filter circuit. The most difficult component to find for either filter is the coupling capacitor, C12. Radio Shack® currently stocks an assortment of low-capacitance disc-ceramic capacitors (RS no. 272-806); this assortment may contain capacitors close to the values you need. Short pieces of RG-174 coax can also serve as this capacitor, as discussed in *Solid-State Design*. Still another alternative is to use low-capacitance trimmer capacitors adjusted to the necessary value by measurement or estimation. To align these filters quickly, tune in a signal at the center of the MMD's tuning range and adjust C1 and C2 for maximum output. A more refined method involves adjusting C1 for maximum response on a signal 25% from one end of the band, and C2 on a signal 25% from the other end of the band.

Comments and Conclusions

The Mini-Miser's Dream lacks audio filtering. I mounted the input band-pass filter on the receiver's rear wall in the spot formerly occupied by the original receiver's 20-meter converter, and mounted an active, low-pass audio filter[9] on the right wall of the enclosure. (I chose not to use the 20-meter converter originally presented with the receiver because its MOSFET mixer is susceptible to intermodulation distortion; instead, I use an external converter with a low-gain RF stage, doubly balanced diode mixer and post-mixer amplifier. If you prefer to use the inboard 20-meter converter, you can mount it on the receiver's rear wall.) Next, I rewired the old 40/20-M switch to select, when needed, an external band-pass active audio filter.[10] These filters, which are switched into the audio output line of the receiver, may overload when the receiver gain is increased enough to drive low-sensitivity, hi-fi headphones; they work very well with 8-Ω phones. (The filters are too noisy to be inserted between the MMD's diode product detector and audio amplifier without low-noise AF preamplification between the product detector and the filter.)

I am very pleased with my modified MMDs. Their basic design is good, and their stability, sensitivity and selectivity are excellent when they have been modified as I've described. The input and active audio filters provide a major improvement in MMD performance. Either receiver can be used on other bands with an external converter having "good" IMD characteristics. I have several spare sets of crystals and other components for these modifications. Send an SASE with your inquiry or comments if you want a reply!—*Herb Ley, N3CDR, c/o Herbert L. Ley Assoc, Inc, PO Box 2047, Rockville, MD 20852*

FEEDBACK: KENWOOD TRANSCEIVERS *CAN* KEY COMMERCIAL LINEAR AMPLIFIERS

☐ In "An Improved Circuit for Interconnecting the SB-200 Amplifier and Solid-State Transceivers," (*QST*, May 1989, pp 48-49) Richard Jaeger, K4IQJ, mentions that he interpreted our reference to the low-current capability of the TS-940's amplifier-keying circuitry as meaning "low voltage." We feel that many of your readers might misinterpret Mr. Jaeger's statement. All Kenwood transceivers are capable of interfacing with any commercially manufactured linear amplifier without the need of an external keying circuit. Our reference to "low current" means just that, and was included so that home builders would not try and use an old Dow-Key-type relay. Our linear amplifier, the TL-922A, uses a relay voltage quite similar to the Heathkit® linears, and does not require any special keying circuit!

Please reassure your readers that the use of such relay switching circuits is not required in the TS-940S or any other Kenwood transceiver when connecting any commercially available linear amplifier. This includes amplifiers manufactured by Heathkit, Alpha/ETO, Henry, Ameritron, Kenwood, ICOM, Yaesu, Drake, ARD, AMP Supply, etc.—*Craig L. Martin, KR6T, Customer Service Manager, Kenwood USA Corporation, PO Box 22745, Long Beach, CA 90801-5745*

SPEAKER SWITCHING AVOIDS RFI PROBLEM

☐ My Heil SS-2 sound system suffered RF interference when I operated my linear am-

[5]W. Hayward and J. Lawson, "A Progressive Communications Receiver," *QST*, Nov 1981, pp 11-21. Also see Feedback, *QST*, Jan 1982, p 47; Apr 1982, p 54; and Oct 1982, p 41. This receiver also appears on pp 30-8 to 30-15 of *The 1989 ARRL Handbook*.
[6]R. Lewallen, "An Optimized QRP Transceiver," *QST*, Aug 1984, pp 14-19. Also see Feedback, *QST*, Nov 1981, p 53.
[7]G. Collins, "Getting Started on VHF: A Tunable I-F for VHF Converters," *QST*, May 1982, pp 32-34.
[8]W. Hayward and D. DeMaw, *Solid State Design for the Radio Amateur*, 2nd printing (Newington: ARRL, 1986), pp 237-241.
[9]See Note 5.
[10]D. DeMaw, "Understanding and Using Audio Filters," *QST*, Apr 1983, pp 45-48.

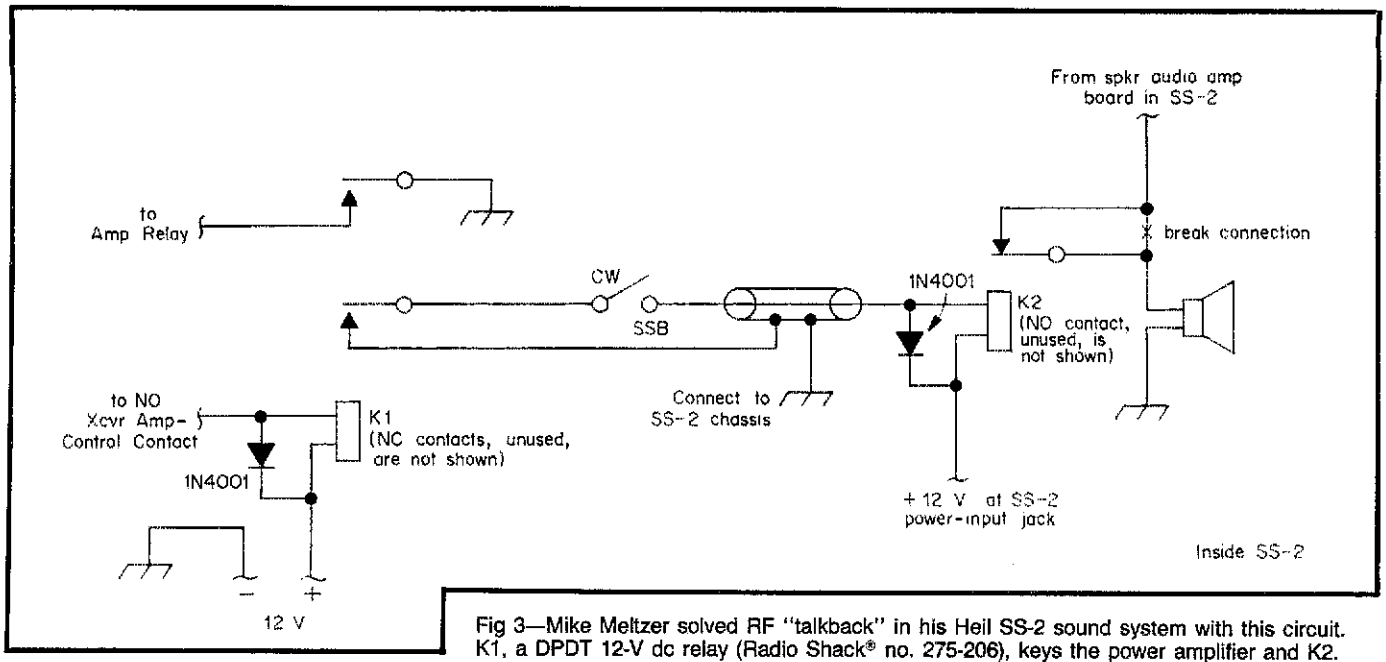


Fig 3—Mike Meltzer solved RF "talkback" in his Heil SS-2 sound system with this circuit. K1, a DPDT 12-V dc relay (Radio Shack® no. 275-206), keys the power amplifier and K2. K2, a SPDT 12-V dc relay (RS no. 275-248) mounted inside the SS-2, disconnects the SS-2's speaker in transmit. S1 disables the speaker-cutoff relay for CW operation. The diodes clamp the transients that occur when K1 and K2 are switched off. See text.

plifier. Installing bypass capacitors and ferrite rings and beads, and grounding the SS-2's chassis, did not help. Unable to cure the illness, I decided to work on its symptom.

Most MF/HF transceivers include a relay or transistor switch that's intended to control an external power amplifier. I used this feature to key an *outboard* DPDT relay, which, in turn, keys the amplifier and actuates a second relay mounted inside my SS-2. The inboard SS-2 relay disconnects the SS-2 speaker in transmit. No speaker connection, no RFI! (Fig 3 shows the circuit.) Not wanting to drill holes in my SS-2, I rewired the external speaker lines in the SS-2's DIN jack to carry the drive for the speaker-disabling relay (K2).

I have modified five Heil SS-2 systems as described here for myself and my friends, and we are all very happy with the results. One system can be modified in two to three hours; the parts necessary for the modification cost under $10.—*Mike Meltzer, K2SDD, 121 Clearview Rd, Dewitt, NY 13214*

18-MHz COMPONENT VALUES FOR THE *HANDBOOK* VXO CW TRANSMITTER

☐ Yes, the *1989 ARRL Handbook*'s 6-watt, VXO-controlled CW transmitter[11] works well at 18 MHz. Here are component values necessary for using the rig on this band; the component designators listed are those shown in Fig 48 of the *Handbook* write-up:

C1—VXO tuning capacitor; 50 pF.

C2—Limits the VXO tuning range to ensure that the crystal, and not L1 and C1, controls the oscillator frequency. I omitted this capacitor in the version I tested; if you try this and your crystal loses control, use 10 pF.

C3, C4—VXO feedback capacitors; 39 pF, silver mica or NP0 ceramic.

C6—Interstage coupling capacitor; 39 pF, silver mica or NP0 ceramic.

C17, C18—Output filter capacitors; 190 pF, silver mica (10 pF in parallel with 180 pF).

L1—VXO inductor; 28 turns of no. 26 enameled wire on a T-37-6 toroidal, powdered-iron core (measured inductance, 2.5 μH). Space the turns on this coil, and those on L3-L5, to allow a 30° gap between the beginning and end of the each winding.

L3, L5—Output filter inductor; 16 turns of no. 24 enameled wire on a T-37-6 core (measured inductance, 0.85 μH).

L4—Output filter inductor; 20 turns of no. 24 enameled wire on a T-37-6 core (measured inductance, 1.28 μH).

Y1—Parallel-resonant fundamental crystal, 20- or 32-pF load capacitance. An 18.07-MHz crystal borrowed from Zack Lau's QRP Three-Bander (see pp 25-30 of October 1989 *QST*) provided a VXO swing of 10.8 kHz with 39 pF at C3 and C4.

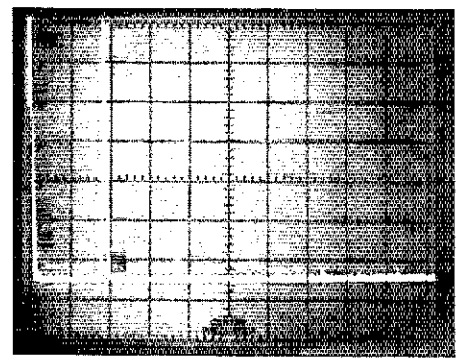


Fig 4—Spectral display of the *ARRL Handbook* 6-W VXO transmitter operating at 18.09 MHz. Each horizontal division represents 10 MHz; each vertical division represents 10 dB. The spike at far left (the spectrum analyzer's first-local-oscillator signal) serves as a convenient "0 MHz" reference. This spectrogram was taken with the VXO transmitter producing 6.2 W of RF energy. All harmonics and spurious emissions are at least 57 dB below peak fundamental output. Modified for 18 MHz as described in the text, the 6-W VXO transmitter complies with current FCC specifications for spectral purity.

Powered with a 12.0-V dc supply, my version of the VXO transmitter draws 1.26 A dc while producing 6.2 W output at 18.09 MHz. Fig 4 shows the transmitter's output spectrum under these conditions.—*AK7M*

[11]B. Hale, ed, *The ARRL Handbook for the Radio Amateur*, 1989 ed, (Newington, ARRL, 1988), "A VXO-Controlled CW Transmitter for 3.5 to 21 MHz," pp 30-43 to 30-45.

Technical Correspondence

Conducted By Paul K. Pagel, N1FB
Associate Technical Editor

STABLE HEXFET RF POWER AMPLIFIERS

In a recent article,[1] Doug DeMaw described RF power amplifiers using the IRF511 HEXFET®. DeMaw encountered two major problems with the circuits. First, stability was very difficult to obtain. Second, he could obtain reasonable output power only when using a 24-V power supply. Our experience with HEXFET amplifiers is much more optimistic than that reported by DeMaw. Stability is ensured if low resistance, noninductive terminations are used. Useful output power is available from amplifiers operating from 12-V power supplies if a higher device quiescent current is used.

Stability

Fig 1A shows a simple amplifier resembling that used by DeMaw. Our circuit is simpler, but offers the same salient features. Most RF power amplifiers operate in class AB or C. The amplifier of Fig 1A is a class-A circuit. Class-A operation is chosen because the circuit is more easily modeled with available software tools. The circuit of Fig 1B—a small-signal equivalent of the amplifier of Fig 1A—is used for stability analysis.

RF data is rarely available for general-purpose power FETs. However, large-signal SPICE models are now available for many FETs.[2] We created a SPICE file and performed an ac analysis to extract the scattering parameters for the IRF511. The 4.31-V gate bias used in the circuit of Fig 1A sets the bias current to 0.5 A.

The other unknown in the circuit of Fig 1A is the ferrite bead. Most radio amateurs use such beads, but rarely take the time to carefully model them. We placed an Amidon FB-43-101 bead, a common part, on a small wire loop at the end of a piece of coaxial cable. The bead was then characterized using an HP8753B network analyzer. In the 5- to 50-MHz frequency spectrum, we discovered that the bead looks like a 320-nH inductance in parallel with a 28-ohm resistor.

The FET scattering parameters and the bead model were used in a small-signal, two-port-amplifier analysis of the circuit of Fig 1B. For this analysis, we used a program called SuperStar.[3] Table 1 shows the SuperStar circuit file and Table 2 contains the tabular output data. Circuit gain is high at low frequencies, but decreases as we move through the 5- to 50-MHz range. The Rollett stability factor, K, is especially significant: A value greater than 1 indicates unconditional stability; a value less than 1 warns of potential oscillation. The data shows that the amplifier is unconditionally stable at frequencies over 15 MHz, but is potentially unstable at lower frequencies.

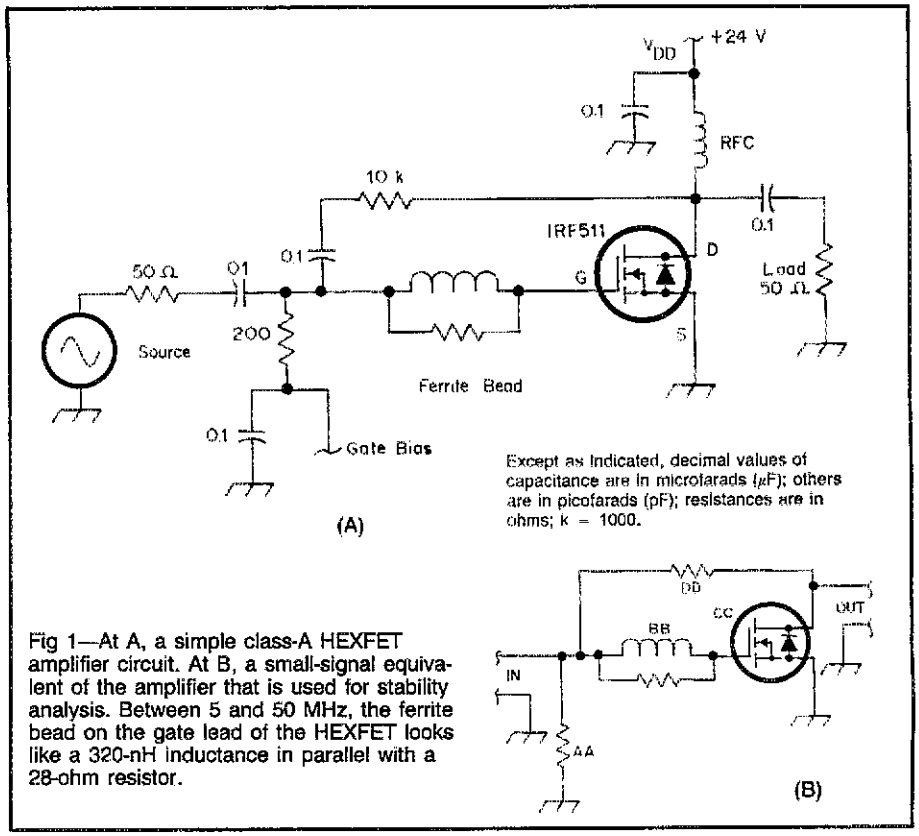


Fig 1—At A, a simple class-A HEXFET amplifier circuit. At B, a small-signal equivalent of the amplifier that is used for stability analysis. Between 5 and 50 MHz, the ferrite bead on the gate lead of the HEXFET looks like a 320-nH inductance in parallel with a 28-ohm resistor.

Table 1
HEX511.CKT Circuit-Parameter Input to SuperStar

```
CIRCUIT
RES AA PA 200
PRL BB SE 28 320 'FERRITE BEAD
TWO CC SP 50 'IRF511.SPI
RES DD SE 10000
PAR CC DD
CAX AA CC
OUTPUT
DSP AA SK 50
FREQ
SWP 5 50 10
```

Although an analysis indicating potential instability is useful, it is incomplete. What we really want to know is what we can do to stabilize the amplifier. The solution is partially shown in Fig 2. This is an input-plane stability-circle plot. It shows, in Smith Chart form, the impedances presented to the amplifier input that cause instability. The 5-MHz stability plot shows that the IRF511 amplifier is potentially unstable when the input is terminated with an inductive reactance. Impedances inside the stability circle are the unstable ones. The circuit is stable when loaded with capacitance.

Recall that the ferrite bead is modeled as a lossy inductance. Fig 2 shows that the bead is too inductive in this application. Replacing the bead with a 10-ohm resistor resulted in an unconditionally stable amplifier. K is greater than unity at all frequencies. The ferrite bead, a component that we always assume to be a *stabilizing* influence, can actually be the *source of major instability*. The beads

[1] D. DeMaw, "Power-FET Switches as RF Amplifiers," *QST*, Apr 1989, pp 30-33. Also, see Feedback, *QST*, May 1989, p 51.
[2] SPICE is a general-purpose, nonlinear circuit analysis program originated at the University of California, Berkley. The version used by the authors is PSPICE from MicroSim Corp, 23175 La Cadena Dr, Laguna Hills, CA 92653, tel 714-830-3855.

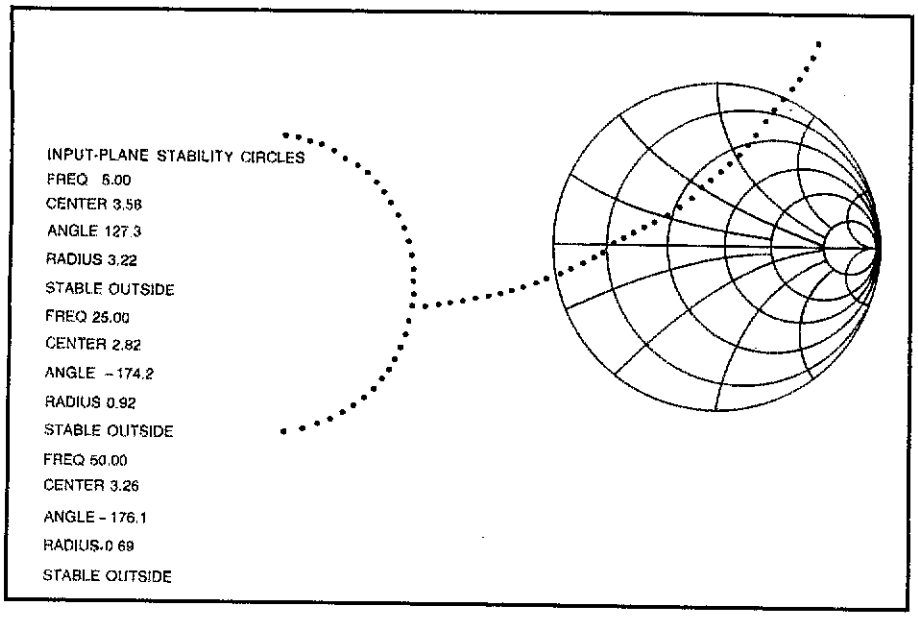


Fig 2—An input-plane stability-circle plot. It shows, in Smith Chart form, the impedances presented to the amplifier input that cause instability (see text).

Table 2
Screen Dump of HEX511.CKT Run Under SuperStar

	= = = SuperStar	= = = Mon Apr 24 07:52:47 1989			
FREQ(MHz)	S11 dB< ANG	S21 dB< ANG	S12 dB	S22 dB< ANG	K
5.00000	-2.9098< -173.54	24.073<103.75	-32.077	-1.5859< -150.42	0.2290955
10.00000	-4.6441< 162-66	15.691< 83.280	-32.927	-1.2958< -168.52	0.6125636
15.00000	-6.3850< 158.86	12.888< 82.314	-33.792	-1.3748< -171.29	1.176323
20.00000	-7.5986< 158.07	9.8696< 81.919	-34.317	-1.4337< -173.60	1.959576
25.00000	-8.4068< 158.17	6.0710< 80.051	-34.631	-1.4646< -175.69	3.293028
30.00000	-8.9930< 160.10	5.0852< 80.854	-34.827	-1.4776< -175.97	3.878258
35.00000	-9.4077< 161.91	4.1724< 81.480	-34.958	-1.4868< -176.20	4.449523
40.00000	-9.7070< 163.47	3.2223< 81.850	-35.048	-1.4934< -176.41	5.073209
45.00000	-9.9276< 164.79	2.2036< 81.970	-35.113	-1.4980< -176.62	5.791251
50.00000	-10.093< 165.88	1.0850< 81.829	-35.161	-1.5011< -176.82	6.658419

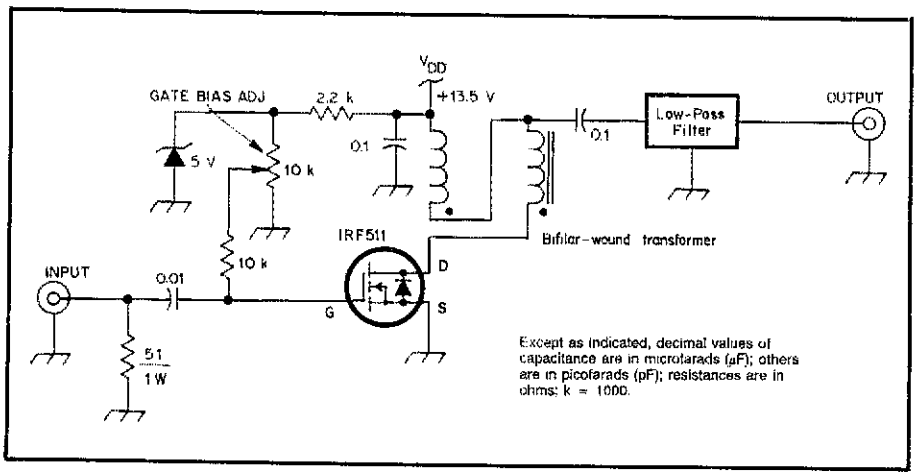


Fig 3—This amplifier circuit has been used in several portable 75- and 40-m SSB transceivers, and is capable of an output of 8 W CW or SSB PEP up through 14 MHz, with a 13.5-V supply.

are certainly useful components, but they should not be used with casual abandon.

Practical Results

The esoteric analysis presented was done to satisfy our curiosity. This occurred after we had built numerous successful power amplifiers with the IRF511. A class-A analysis is a useful guideline, even when it differs from the class-AB circuits we might build.

Fig 3 presents an amplifier typical of those we have built. The IRF511 is driven from a 50-ohm source, is stabilized with a 50-ohm input resistance, and has a drain load of about 12 ohms. There's a 2:1 turns-ratio transformer at the output, followed by a low-pass filter. This amplifier has been used in several portable 75- and 40-m SSB transceivers, and is capable of an output of 8 W CW or PEP on SSB up through 14 MHz, even when a 13.5-V supply is used. This amount of output power is only available, however, if a quiescent bias current of about 100 mA is used for the IRF511. No ferrite beads are used. A similar amplifier with a 50-ohm output termination functions well as a 1-W output SSB driver when biased to only 25 mA.

Fig 4 shows a higher-power amplifier for CW applications. This amplifier employs a larger, more robust FET, the IRF530. It's still a cheap part, costing less than $3 new in mail-order catalogs. A 2:1 turns-ratio step-down transformer provides a low-impedance driver input circuit. An LCC T network is used for output-circuit matching. Both the input and output networks are much like those used with a bipolar amplifier of similar output-power capability.

The amplifier shown in Fig 4 uses a bias scheme introduced in an earlier design.[4] Part of the bias is derived from RF drive. When RF drive is removed, the drain current drops to very low levels. The internally generated noise also drops, making this circuit especially useful for QSK CW.

The IRF530 amplifier is capable of relatively high power from a 24- to 28-V power supply. We have measured an RF output power as high as 50 W at 14 MHz with a drive power of 1.5 W. Similar output power is available on 80 m when the amplifier is driven with nothing more than a crystal oscillator.[5] Lower, but useful, output power is available from this circuit with a 12-V power supply.

[3]SuperStar is available for $595 from Circuit Busters, Inc, 1750 Mountain Glen, Stone Mountain, GA 30087, tel 404-923-9999.
[4]W. Hayward, "A VMOS FET Transmitter for 10-Meter CW," *QST*, May 1979, pp 27-30.
[5]R. Culter, "80 M Radio Transmitter uses Power MOSFETs," *EDN*, Nov 28, 1985, p 280.

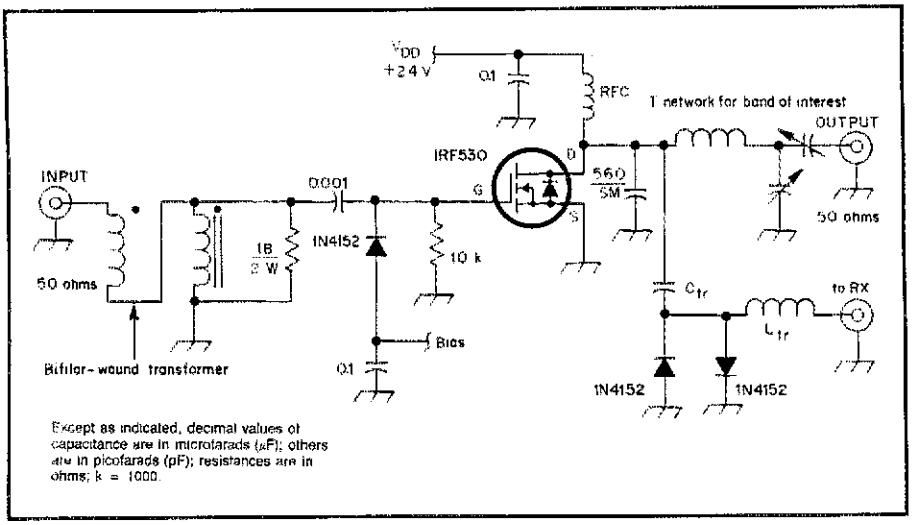


Fig 4—A high-power amplifier for CW applications. Using a 24- to 28-V power supply, RF output power as high as 50 W at 14 MHz can be obtained with a drive power of 1.5 W.

There's a TR circuit in the amplifier shown in Fig 4. The reactance of L_{tr} and C_{tr} is each about 500 ohms. We measured a receiver path-insertion loss of less than 1 dB for this circuit. The power available at the receiver antenna terminal is around −10 dBm, low enough to avoid receiver damage. Receiver IMD measurements suggest an input intercept of over +10 dBm for this circuit. This is strong enough for most amateur applications.

Our experience with medium-power amplifiers using inexpensive FETs is very encouraging. They are generally easier to use and tame than bipolar transistors at similar power levels. Stability is ensured by a low-impedance gate-drive design without excess inductance in series with the gate. Amplifier performance is improved when higher-voltage power supplies are used, but practical results are still possible with 12-V power supplies.—*Wes Hayward, W7ZOI, 7700 SW Danielle Ave, Beaverton, OR 97005, and Jeff Damm, WA7MLH, 18025 NW Bronson Rd 01, Portland, OR 97223*

Feedback

☐ Please refer to *QST*, Sep 1989, Technical Correspondence, "C64 Memory Transplant," p 40, Table 1. An error appears in line 4. The last digit in that line should be 4 as shown here.

```
4 GET #2, A$ : PRINT A$; :A$ = A$ +
  CHR$(Ø : IF ASC (A$) < > 13 THEN 4
```

(tnx Don Goshay, W6MMU)

☐ J L Manufacturing reports that our New Products announcement of their Vise-Brake (p 71, Sept 1989 *QST*) was in error: We listed an incorrect toll-free telephone number. You can reach J L Manufacturing at 408 Hawk St, Bldg D, PO Box 561203, Rockledge, FL 32956-1203, tel 800-780-3877 or 407-631-3877.—*Rus Healy, NJ2L*

☐ In the parts list of Fig 1 of "A 1.25- to 25-V, 2.5-A Regulated Power Supply," *QST*, Sep 1989, Q1 is identified as an NPN transistor. It is a PNP transistor. *(Tnx W5XW)*

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.

Some Power-Supply Design Hints

(continued from page 31)

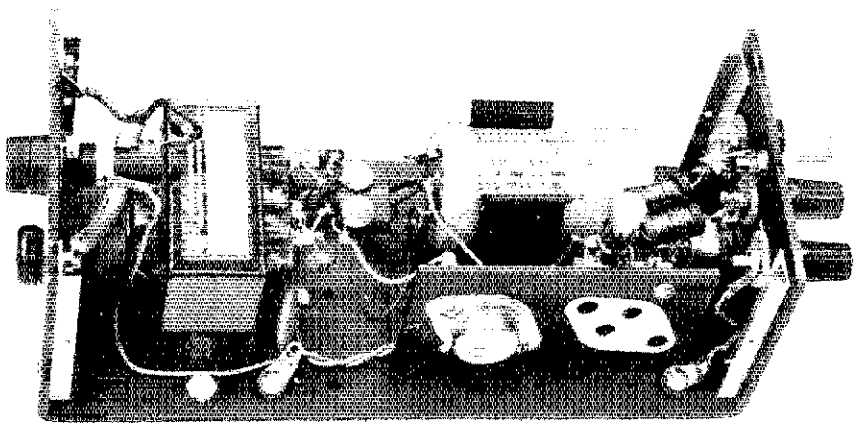


Fig 5—A view of the interior of the 15-V power supply. The regulator IC is mounted on the vertical heat sink bracket. Point-to-point wiring is used in place of PC-board construction.

and there is an internal **L** bracket drilled for two TO-204 cases. There is also an internal clamp that can be used to hold an electrolytic capacitor. These items can be removed easily by simply drilling out the rivets that hold them to the main chassis. N8HLE has a few hundred of these boxes at a reasonable cost, should you want one or more.[2] They are excellent for all manner of home projects.

I hope this article has given you some helpful hints you can use for solving your power-supply problems. It is important to use a large enough regulator heat sink to permit the IC to operate cool or warm, but never hot! When in doubt, use a larger heat sink than you think is necessary.

Notes

[1]FAR Circuits (N9ATW), 18N640 Field Ct, Dundee, IL 60118, tel 312-426-2431. Price at this writing $6.50 postpaid to US addresses.

[2]South River Electronics, 320 S River Rd, Tolland, CT 06084; $3.50 ea, plus shipping.

The Importance of Being There

A modest station and nearly a half-century of uninterrupted hamming have made W1GKK the all-time DXCC leader. With uncommon persistence he has accomplished a feat that few hams, if any, can ever hope to match.

By Rick Booth, KM1G
232 Washington St
Norwood, MA 02062

George De Grenier poses with the latest version of his "Top Gun" station. Check out George's DXCC awards. Have you ever seen so many endorsement stickers? *(photo KM1G)*

It takes 310 confirmed DXCC countries to be on the League's Century Club Honor Roll. George De Grenier, W1GKK, not only made it—in the Honor Roll's rarified air, a world of aces, he is the *ace* of aces, *capo di tutti capo*, Top Gun. His confirmed country total is a staggering 372.

Say *what*? No, that's not a misprint. Three-seven-two, mixed phone and CW, that's his total, confirmed by the ARRL's DXCC desk. Not 372 worked, mind you, not birds in the bush. We're talking in his *hand*, confirmed. As in on the wall. *He hasn't missed a single country since the bands were reopened to hams after WW II.* George De Grenier is a patient, consistent DXer.

Don't get discouraged. He didn't get them overnight. George has been in Amateur Radio since the 1930s, and into DX almost as long. But the total count isn't the sole surprise waiting in George's story. Of his 372, every single one is on 20 meters. Only in the last couple of years has he launched himself on a second career, hunting new countries on 75 meters. He's not too shabby there, either, despite having almost the simplest of stations. George doesn't have the biggest signal on the band. He's not a *big* gun. Just the *top* one.

I got my first clue to his achievement's magnitude from the road by George's house. The place is glued on a Berkshire slope in the shadow of Mount Greylock in Massachusetts, a long putt from Vermont and an easy chip from New York. The driveway fell away so steeply, the peak of his three-story, tar-shingled place in North Adams was level with my eyes, a house undistinguished from thousands in mill-worn New England hamlets. No skywalking tower set it apart from its cheek-by-jowl neighbors. No six-over-six, either. George was never into big arrays. He could never afford them. Not then, 50 years ago when he started, and not now. What he *is* into, what's put him at the very top of a very special heap, is *being there*.

"That's the secret," he told me from an easy chair in his incredibly simple shack. "If they're there, and you're not, you're not going to get them." So simple. Yet so true. I felt like the pilgrim who struggled to a mountain sage, only to learn a truth so obvious one wonders at its elusiveness.

And struggle I had, east on the Mohawk Trail, cross-compartments through the Berkshires, grey sky straight overhead, tree-laden slopes all around. Just finding North Adams was work. Told about my trip, George allowed, "Those mountains to my south really do a job on my signal."

To get to the summit, you need steel. A little aluminum doesn't hurt, either, and some wood, and handy hands, all within George's lifelong reach. He looked at the QSL cards ringing his shack, two rows near the ceiling like molding. I'd been reading them, my ham glands salivating.

"Oh, I only put them up there if they're dupes, if I've got others in the drawer there. Only took me 50 years and six towers. Four of them wood. This"—he pointed upward—"is my first store-bought antenna."

I'd seen the four-element Cushcraft from the road. I'd had to look for it, a monobander, nearly invisible against the grey mountains behind.

I saw his QSL files, too. Amazing. Thumbing through, I happened to hit the JYs, Jordan. Nothing special, really, not to an Honor Roller. But a country most hams wouldn't turn down. Some of the cards sported photographs, and a familar face arrested my eyes. I yanked it from the group. On it was a single proper noun, hand-written: Hussein. That's King Hussein, ruler of the history-laden Mesopotamian country, and holder of the famous call sign JY1.

Amazing hobby, this, where relative paupers talk to princes. George's parents emigrated from Canada, looking for mill work and a better life. George and Mary wed, were in the early stages of what would be five children (none of them hams, alas), when his mother's health began to fail. "There was a mortgage on this place, so she asked me to take it over, keep it in the family. I've been here ever since."

That was the only move 1GKK ever made, and it was long, long before the legend was even thought of. Things were a little different in those days: "We all went to Catholic schools. French in the morning, English in the afternoon. And double the homework. The nuns saw to that." George can still *parler Francais*, but he said it never helped him capture QSLs, not even the

Terrible Ts, those elusive French-speaking Africans. Every one of whom George eventually got, of course.

There were a lot of rigs over the years, most of them home-brew, with the occasional kit and the odd Viking Ranger thrown in. George built his own antennas, too—he had an edge.

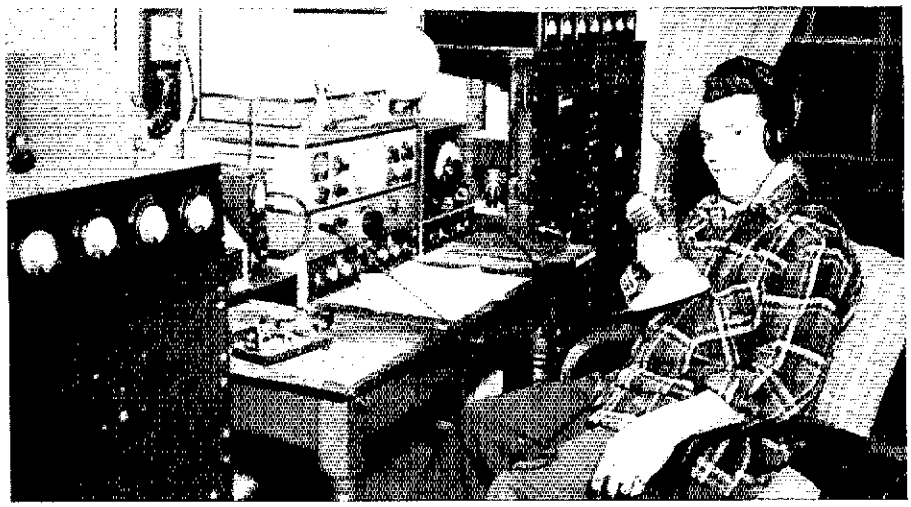
"I worked for years in a metal fabricating place. It's gone now, closed up. But they always had this aluminum tubing around, and I could weld and everything. So, I always built my antennas. Towers, too. Always one band, 20. I wanted DX, and that's where the DX was. On 20."

Not a few DX legends have been borne on the forebearance of employers, or by the self-employed, and W1GKK was no exception.

"I never missed work, no. But I knew the game pretty well. If I knew something was going to happen during the day, I'd plan it right. I'd set up a job, and then while the job was going I'd be back here, calling the DX. Then I'd go back to work." Lucky for the legend, George didn't spend a lot of time on the graveyard shift. At least, not on the company clock. On microphone and key, there was midnight oil aplenty. On the band, he nearly always got his man. Or woman, as the case might be. Other than persistence, he can't say why.

Getting them, as any DXing veteran knows, is one thing. Confirming them is quite another. George freely admits it may be the harder part of the art. "Longest I ever waited? Seven years. That was for Tibet, AC4NC. You can't get it now. It's on the Deleted Countries list."[1] George pointed to it, on a brand-new, golden DXCC Countries List from the League. I

De Grenier's signal has been emanating from this house, located in the Berkshire Mountains of western Massachusetts, since at least 1945—an era that saw the end of WW II and the birth of ARRL's DXCC program. The 4-element Cushcraft Yagi is George's first store-bought antenna.



Here's what De Grenier and his station looked like in the early '50s. Back then, George was persistently working many of the countries that are now on the deleted list, the ones most of us will never work.

was almost afraid to ask. How many did he have from the deleted list, the ones you not only don't have, but can't ever hope to get?

"Oh, I've got all of 'em," he said. Matter-of-fact. Doesn't everybody?

Not surprisingly given a half-century ham career, George tends to think of his life in terms of periods. There were the early days, before the war and DXCC. Then postwar, then the period when he ran the W1 QSL Bureau, a job he only surrendered in the 1960s. That might explain some of his successful QSL work. But it *was* work. It didn't keep him away from the rig, though. The shack wasn't on the second floor then, just off the living room, not with five kids. It was in the attic, and there was a room for card sorting up there. "I'd tune the rig on the frequency where I knew a new DX would be, then turn the receiver gain way up and come out here to sort. Then when he came on, I'd run in and nab him."

There were darker times, too, as in the 60s when DXing scandals so disgusted him he left the air. "I wasn't alone. Lots of guys, good guys, left, too." The scandals toughened DXCC confirmation requirements.

He never intended to return to the air, but one of his four sons, though not a ham, rescued W1GKK. He sold a stamp collection, and bought his father a new transceiver—the radio he uses today, a Kenwood TS-830S, with an outboard VFO. The Kenwood drives a Heathkit SB-220 amplifier ("Bought it for a song, and it runs great"). That's all George ever runs. He has but two antennas, the Cushcraft and, lately, his 75-m coax-fed inverted vee. A Kenwood MC-60 mike, an old black homebrew keyer, a Barker & Williamson coax switch. That's it.

He doesn't get any more DX bulletins, either, though he used to. In fact, George used to be up on whatever was on the band, if not by the printed word, then by simply being QRV, being *there*. His biggest moment was in the 80s, when the manager for his 370th contact—KP2A, Desecheo—presented the precious card in the presence of the League's top brass, in Newington. No sooner was the deed done than George's mailman brought another missive, one most DXers would consider every bit as precious as any QSL: congratulations from no less than a then-living legend, Don Wallace W6AM.

Lofty company, that. George followed my eyes across his station, and up to the framed DXCC certificate. It's pretty startling to see a "370" endorsement sticker, and I guess my face showed it. George smiled.

"Don Search (ARRL DXCC Manager) has to have those stickers printed in batches of 50," George remarked. "He asked me what I thought he should do with the other 49."

It was the closest George came to humor. He is a serious man, and not especially sociable. He's turned down invitations to be guest of honor at DX gatherings. It's understandable. He isn't as young as he used to be. He quit smoking a dozen years ago, but emphysema is a nagging worry. At age 73, a *lot* of things are a nagging worry. But DX isn't one of them, at least not like it used to be. After all, how many of us, asked our country total by someone who knows we count them, can offer the W1GKK answer:

"All of them."

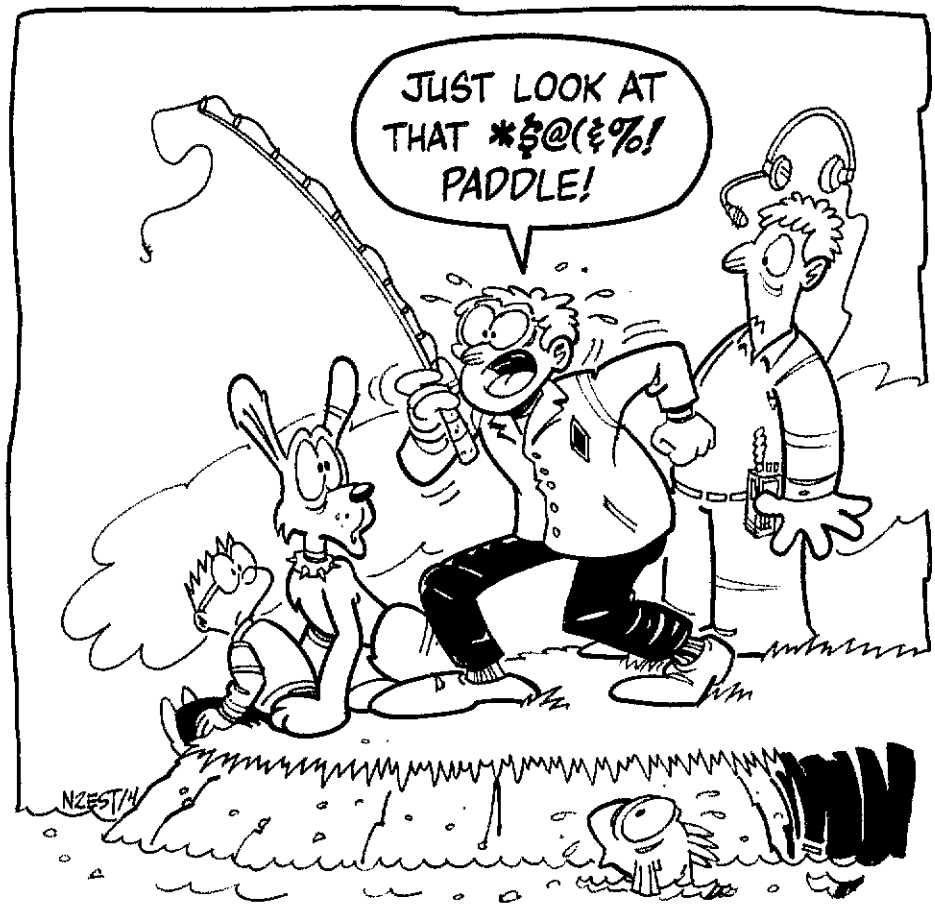
Notes

[1]At the time of this writing, the number of current DXCC countries totals 321. Countries on the Deleted List total 51. A country is deleted when, through changes in government or other rules interpretations, it no longer meets the conditions necessary to remain an active, current country. So today's DXers, who may not have been on the air in the '50s and '60s, have no chance of working all possible DXCC countries. DXCC's Don Search, W3AZD, says up to 400 hams have worked all of the current DXCC countries, although he knows of no other ham who is in a position to "work 'em all."

Herb

By Ken Stuart, W3VVN

ARRL Technical Advisor
48 Johnson Road
Pasadena, MD 21122



I was there, that afternoon, when they took Herb away.

It was sort of cold that day; a stiff breeze was blowing and clouds filled the sky. I stood in the shelter of a tree across the street from Herb's house. I watched as the white van drove up. Two men got out and went inside. It hadn't taken them long to get there; I had placed the call only about an hour earlier. A little later, Herb and the men came out and walked toward the van. I caught a few strands of their conversation as they crossed the lawn: "Wow! You guys could really set up a great mobile station in that thing—amplifiers on all bands, even!" It was obvious to me that the drivers had followed my suggestion as to what to say to him—about visiting their all-band packet station—since Herb was cooperating fully and was even eager to go with them.

After the van pulled away, I felt sort of like a traitor, having signed the papers for his hospitalization. But I knew it was for the best. Things just couldn't be allowed to keep going the way they had been. I knew they'd take good care of him, but the rest of the guys in the club and I would really miss him.

Once the van was out of sight, I turned and started the long walk home. With each step, memories poured forth—about how Herb had grown increasingly preoccupied about what was supposed to be just a hobby. For him, ham radio became an obsession. It occupied his every waking hour. Worse yet, I realized that *I* was the Elmer who had started him along the path which now led to the Babbling Brook Home for the Nervous!

It started about three years ago, when Herb had been present in a group of CBers assembled at the local library to hear my talk on ham radio. I seem to recall that he was the most enthusiastic participant, hanging on my every word and asking endless questions after the talk was finished. Sure enough, he appeared at the next meeting of our club, the Fraternity of Amateur Radio Communicators and Experimenters, paid the required dues, and was voted into membership. After that, he never missed a meeting and participated in all the club activities. He even stayed the full two days for field day. As time went on, his operating skills improved, and he quickly claimed WAS, DXCC and many other certificates. We began to notice, however, that his lifestyle was changing. His eyes were frequently red from late-night QSOs and DXing, and his clothes, once neat and clean, were often coffee stained and smelled of tobacco smoke. Herb's conversations became less coherent, and we suspected that he was using something stronger than coffee to keep him going on his late-night stints.

Anyway, a few months ago, some of us guys happened to be talking when Jim, our club's ARES officer, mentioned Herb. It seems that he and Herb were helping to provide communications for a canoe race down at the lake. They were at the finish line waiting for the first of the contestants to come around the bend, when the battery in Jim's HT gave out. While he was rummaging around in the trunk of his car for another battery pack, the first canoeist came into sight. Herb immediately grabbed an unattended fishing rod (rather than his HT), stuck the reel up to his mouth, pushed the line release lever and yelled into the reel: "Here they come! The red boat with the white stripe is in the lead. Just look at that *$@(&% paddle!" Jim grabbed his HT and quietly moved to the other side of a nearby hill, out of Herb's sight, where he finished reporting the race.

Right about now, we decided that Herb needed a little diversion to break him out of the rut he was in. Possibly some sort of social activity. A girl, perhaps. We compared notes and came up with a vict...er, uh, date for him.

The chosen Fair Flower of Womanhood was perfect for the task at hand. Delores was a year or two younger than Herb, and the words "ham radio" were not in her vocabulary. She had also seen him once or twice at the supermarket, so it wasn't exactly a blind date. The affair would be a buffet and dance held at the local social hall. Just to make sure that everything went okay, Jim and I found dates for ourselves and went along.

Aahhh...there was magic in the air! The hall was nicely decorated, the music delightful and romantic, and Herb actually seemed to be coming out of his shell. He even talked about nonham things. Things were looking good between Herb and Delores, too. He was complimenting her on her dress and hair; she was telling him that he had a nice tie. It looked as if the evening was going to be a success, and Jim and I were congratulating each other.

That's when it all blew apart.

The two of them were out on the dance floor. Her eyes were closed as she floated

on his arms. As I watched Herb, his eyes suddenly turned glassy, and I knew that mentally, he was no longer with us. I think he had a sudden inspiration about the link between his TNC and computer, a problem he had been discussing with me a day or two before, because he suddenly let go of Delores, looked over at me, and shouted, "I know what the problem is—the baud rate's all wrong! Yeah, the baud rate's no good!" Delores slapped him, whirled and walked out of the hall—and out of Herb's life. But Herb hardly noticed.

While walking along, I thought about the events of that very morning when I had dropped by Herb's shack to see the new linear amplifier he had built. He greeted me at the door and guided me through the vast array of electronic gear littering the floor. We had to step gingerly over runs of coax and cables, old logs, textbooks, and an uncountable number of magazines, until we finally came to his equipment table. On the table itself and, stacked floor to ceiling nearby, were racks and shelves full of surplus equipment and stuff he had built himself. Everything seemed to be connected together. The cooling fans, humming transformers and clacking relays were so loud we had to raise our voices to be heard. "Looks great, don't it?" he said.

"Yeah, Herb," I replied. "I don't think I've seen this much stuff in one shack since I saw pictures of an old '20s spark station."

"Hey," he said, "I've got one of those old rotary spark gaps over in the corner, somewhere. Wanna fire it up?"

I declined.

Anyway, he went on and explained that the stuff in the rack to the left of the table was his DX machine, something he had invented himself, something that was responsible for his phenomenal success as a DXer. Looking over the apparatus, I saw a surplus BC-375-E transmitter, a couple of tube-type CB radios, an impossible tangle of wires and coax, and two tubs from old washing machines. "The washing machine tubs make cavity resonators for fifteen and ten meters," he explained. "They're a special design I thought of myself. I tune 'em by turning vanes screwed to the agitators. Oh yeah, don't get too close to those bare wires going up to the ceiling. They tie into the 3000-V plate supply over on the far wall." Herb tried to explain how the system worked, but it was beyond me—something about how he could get DX on the higher-frequency HF bands at any time day or night by using the DX machine to create his own ionization layers in the ionosphere.

It was time. I knew what I had to do. I slipped out while Herb was QRZing a G3 station and made the phone call.

Well, time went by and occasionally we got word on Herb's progress. It seems that with the break from ham radio, he was responding to treatment and was almost back to normal. He still talked to the doctors about DXing and packet and so on, but now it was in a quiet, controlled manner. In fact, the hospital suggested that we might try exposing Herb to a bit of radio activity—to see how he reacted— sort of like a little outside therapy. We discussed it at the next club meeting, and decided we would let him ride shotgun at the upcoming fox hunt. Arrangements were made with the hospital. He would be released the next day. Charlie volunteered to let Herb ride with him.

The hospital even used shock therapy a time or two, but strangely enough...the equipment seemed to have no effect

On that fateful morning, Charlie showed up at the hospital parking lot and picked up Herb about a half-hour before the hunt was scheduled to begin. Charlie had brought his direction-finding antenna, which consisted of a garbage can lid with a duckie antenna mounted on the inside, sort of like a radar dish. You hold it by the handle and swing it around until you get the best peak, or better still, the best null when it is pointed exactly away from the transmitting station. While they sat in the car waiting for the fox hunt to start, Charlie explained to Herb how to operate the antenna by swinging it for the null and checking it against the compass. Every once in a while, one of the attendants would walk by and cast them a curious glance, wondering why they were still parked.

Suddenly the rig in the car burst into action. The fox was transmitting! With a yell, Herb threw open the door, jumped from the car, jerked out the garbage can lid antenna, held it at arm's length and swung it around and around. Suddenly he stopped sharply and shouted in at Charlie, "Over there! the fox is over thataway! It sounds like he's only a few miles away! Let's go!" They grabbed poor Herb before he could get back into the car. Didn't even let Charlie explain what was happening.

By the time everything got straightened out, it was too late. Herb's mind had snapped. He regressed into a ham-radio fantasy world. Treatment became more rigorous. The hospital even used shock therapy a time or two, but strangely enough, after a couple of treatments the equipment seemed to have no effect. It was almost as though it wasn't working. The staff also mentioned that they occasionally heard noises, like clicks and beeps, coming from the shock therapy room late at night. But when they would open the door, no one was there.

One strange thing puzzling the club during this time was that we began to get a lot of QSLs from the bureau addressed to Herb, in care of the club. We figured that the bureau must be really running behind, since he had been away from any radio equipment for several months. And yet the packages of QSLs were still coming in droves.

Well, summer ended and autumn came and went. We heard less and less about Herb, except that he was making progress. The Winterfest™ committee was burning the midnight oil trying to get everything prepared for the upcoming event. We were over at Joe's house, going over the details for the umpteenth time, when there was a knock at the door.

Yep, it was Herb. He had just been released a couple of days ago. We invited him in, sat him down and listened as he filled us in on the last few months. He told us that one of the doctors had talked to him at length about his ham-radio condition. For him, it was an addiction, just like alcohol. As long as he renounced ham radio completely he would be okay. But the doctor warned him that if he got even a little bit involved, a relapse was certain. The hospitalization would be longer the next time. Herb had already cleaned everything out of his shack. Much of the stuff had been junked, but the good stuff was donated to the club to help get new hams on the air. With that, he handed me a cardboard box he had brought with him. With a tear in his eye, he explained, "Al, you helped me get started in ham radio, and with everything that's happened, you've stood by me. I want you to have this. It's a miniaturized version of my DX machine. Thanks for everything." With that, he got up and walked out, leaving us speechless.

Well, that's about all there is to the story. Herb moved to another state, got a real estate license, and picked up his life where he had left off. We still get Christmas cards from him, and we visit him when any of us are in his neighborhood, but we strictly avoid discussing ham radio. I guess that everything worked out for the best, but I still miss him and his enthusiasm.

Oh, yeah. I got around to hooking up the DX machine he gave me—followed the instructions he left in the box. I can't believe how well it works—twenty-meter DX at one o'clock in the morning. Several of us got together and tried to figure out what made it tick, but to no avail. It seems that some of the main parts of the gadget are not ham gear at all, but have some kind of medical electronics company stickers on them.

I wonder where Herb got that stuff... QST

Enjoy a Vacation Abroad with an ITHE Host

An International Travel Host Exchange (ITHE) participant can make a foreign vacation a very memorable experience—or maybe you could host a DX visitor.

By Donald P. Jordan, W8KUZ
2623 N Eighth St,
Terre Haute, IN 47804

My XYL and I had been saving for a vacation trip to England. We had been devouring all of the travel literature and had decided upon most of the places we wanted to see and things we wanted to do. We ran across some bargain round-trip airline tickets to London, and quickly decided that we would never get a better deal. I had written to the ARRL a few weeks before and received their latest International Travel Host Exchange (ITHE) list.[1] There were three British hams on the list who lived in or near London, which was where we wanted to spend most of our time.

I wrote to all three operators, with a bit of apprehension, and carefully explained our background, our length of stay, and the arrival and departure times and dates from Heathrow Airport. Admittedly, I felt a bit awkward about imposing upon a family that we had never met, so I emphasized that we did not need to be chaperoned, as we are independent souls who like to strike out on our own and really needed just a place to lay our heads at night.

Eleven days after the letters were mailed, we received a letter postmarked from England. I was so excited to receive such a prompt reply, I dismissed any thought of looking for the letter opener. I tore it open. My heart sank as the brief note explained that their family would be "gone on holiday" and would not be able to host us on those dates.

Four more days passed, and another letter from England arrived. I was trying not to get to hopeful; it was a very pleasant lengthy letter which was profusely apologetic about the fact that their house was going through some remodeling, and they didn't have the space to host us this time. They did ask us to look them up while we were there. We were getting discouraged. The cost of a hotel room for ten days was definitely not in our budget. Our hopes were pinned on the last family, and we didn't know if we would hear from them.

Author Don Jordan, W8KUZ (l), and ITHE Host Roger Brown, G3LQP, inspect the boom before attaching the elements. *(Photo by Clare Jordan)*

Two days later it arrived. The size of the letter was about the size of a thank you note commonly found in most stationery stores. It occurred to me that it doesn't take much paper to say no. It said yes! It was a very short note saying call him from Heathrow Airport, and he would give us directions. It was simply signed, "Roger, G3LQP."

Clare, my XYL, and I had many lively discussions for the next few days as we made the final plans and often talked about our host. His letter didn't say if he was married. Maybe he was a widower. Was he a confirmed bachelor, divorced, retired, self-employed? Is he a person of means, of middle class, or does he barely manage to scrape out a meager existence? Our imaginations worked overtime. Maybe he leads a life of crime. Would it be safe to be with him?

Arrival in England

Departure day swiftly came. After a seven-hour flight from Chicago, we landed at 10:00 AM local time. As far as our bodies

[1]For more information about the International Host Exchange Program, write the American Radio Relay League, Dept ITHE, 225 Main St, Newington, CT 06111.

were concerned it was 5:00 AM, and we hadn't slept all that well on the plane; we were too excited to feel tired.

After getting our baggage and clearing customs, we made our way to a telephone. I fished Roger's telephone number out of one pocket and found some British coins in another. It took me a while to figure out what coins to put into the phone. Finally, I took a deep breath and dialed the number. I had no idea if Roger would be home. On the second ring his voice came through the twisted pair with this wonderful British accent, "Hello, this is Roger Brown."

It was the beginning of a wonderful ten days that we will remember for the rest of our lives. As luck would have it, we were the same age, he was married, all four of us got along together extraordinarily well, plus Roger and I shared a life long love of chasing DX; in fact, he's on the DXCC Honor Roll. During our first day it didn't take long to learn that Roger had a crank-up tower that he had recently installed. The old tower had been blown down by a storm the year before, and he managed to salvage the driven element, which he had put back on top of the tower. He also showed me a new triband beam that had never been put together. I suggested to Roger that I would like to put it together for him and mount it on top of the tower. The look in his eyes was unmistakably "visions of sugar plums dancing in his head." He indicated that he would have a day off later in the week from British Telcom and, weather permitting, we could work on it then. I assured him that would be fine, and gave him a shopping list of items we would need to complete the job.

For the next four days, Clare and I would get up early in the morning and head into London to take in those sights we had planned to see. We got back late each night, once at 2:00 AM, with smiles on our faces, a song in our hearts and feet that wouldn't speak to us.

The day before Roger's day off, he began feeling pangs of guilt for using my vacation time to work on his beam. I assured him that I was ready for a break in taking in the sights, and Clare was eager to do some shopping on her own. Roger was grateful for my assurance.

A Housewarming Gift for a DXer

The big day arrived, and we were as excited as a couple of kids with a new toy. Roger and I headed for the garden (backyard) and started spreading out the necessary tools and all of the pieces to the antenna. The hardware glistened in the sunlight like a new car.

The slow process began of measuring the distances between traps and element lengths. I had to learn the metric system, as the dimensions were not in feet and inches. After checking measurements three and four times, we would tighten the pressure clamps at the appropriate places. I enjoyed teaching Roger the art of putting a beam together, and it was obvious he was delighted to learn how to do it.

By the time we reached the point of attaching the elements to the boom, Roger had learned the meaning of "Murphy's Law" and had an unbridled admiration of my patience to deal with the unexpected problems along the way. I have always been amazed that when you do an antenna project, anything that can go wrong will go wrong.

We got the elements attached to the boom, balun installed and coax attached. It was dark. In this part of Europe the sun goes down at about 4:00 PM in December. We reluctantly accepted that it was too dangerous to put the antenna up in the dark, as the working area was very tight and we needed to clearly see what we were doing. Roger didn't have to go to work until late in the afternoon the next day, so we decided we would put it up in the morning. I was dying to know how well it would work. Would the SWR measurements be within acceptable ranges? Did I measure everything correctly in my attempt to learn metric measurements? Would the front to back ratio be what the manufacturer said it would be?

By the time dawn broke the next day, we were at the base of the tower. I had never worked with a crank-up and tilt-over tower before. We dropped the tower down from the side of the house, and the winch worked like a precision Swiss watch. We took off his driven element, removed the weather worn coax and installed the new beam and new coax.

After threading the new coax through the guides on the tower, we slowly winched the tower back up and attached the bracket to hold it firmly to the side of the house. It was far smoother than working with gin poles, pulleys and ropes.

It took a few minutes as we took turns cranking the winch to raise the tower with the new beam to 50 feet. After feeding the coax into the shack, we stood back in the yard to admire our work. The elements stood out from the boom like the wings of a giant eagle. As we stood there in awe of this majestic creation, it suddenly occurred to me that Roger's thoughts were on cracking DX pileups. I was anxious to know how well the antenna worked also.

Testing the Beam

It didn't take us long to decide that it was time to see if it worked as well as it looked; we entered the shack, put the PL-259 on and plugged it into the transceiver. It was music to our ears as signals on 20 meters came pounding through. So far, so good. I quickly checked the SWR at 100 kHz intervals on 10, 15 and 20 meters. I breathed a sigh of relief as I saw Roger's eyes fill with excitement.

He was poised like a race horse at the starting gates of the Kentucky Derby. I turned the rig over to him, and he quickly nailed a station to run a test with the beam. The station reported that as he turned the beam to the side, his signal dropped off sharply, and off the back of the beam it came up some, but when he rotated it to the front, his signal came up strong. Roger didn't have to say a word. The smile on his face told it all.

We had one final task to complete: install a low-pass filter. Roger had a lifelong problem of RFI, which at one time had caused some real social problems with his neighbors. It hadn't been helped any when the storm blew his tower down and his beam went through the neighbor's roof!

The new tower, when fully raised, put his beam about 40 feet from any television antenna. The low-pass filter would give a little extra added insurance. With the filter installed, we turned the amplifier on, and Roger loaded it to the legal limit. I went to the living room and turned on the television and his stereo. As he transmitted, I checked the TV channels and tuned his radio through the broadcast frequencies. We repeated the procedures on all three bands. I hadn't realized how worried Roger was about this problem until I pronounced it "clean as a whistle." I thought he was going to jump through the ceiling!

We were satisfied that the testing was complete and the results were a smashing success. Roger proudly declared that it was time to celebrate. We did the perfectly British thing to do—had a cup of tea.

An International Experience

In our remaining days, Clare and I would again get up early and take the 30-minute train ride into London. We returned each night and had long visits with our hosts until the wee hours of the morning. As we got to know each other during our ten day visit, it was amazing how closely our life experiences paralleled each other. It was incredible how many things we had in common. We developed a rare closeness only experienced by people who know each other for a lifetime. Departure day came all too quickly. We boarded the plane, and in seven hours we touched down in Chicago; our lives had been enriched far beyond our expectations. We were tired, happy to be safely home, but saddened to have to leave some dear friends behind. Ham radio is truly an international experience, and the ITHE program is a marvelous extension.

Amateurs Celebrate "We the People"

Thousands of hams and SWLs celebrated the Bicentennial of the US Constitution in a special way—a ham radio way. Were you among them?

By Eileen Sapko
Awards Manager, ARRL

Judging by the number of applications, the "We the People" Worked All States Award is a smashing success. To date, more than 3500 "We the People" WAS awards have been issued. Approximately 150 of these were for shortwave listeners who received a special "Heard All States" endorsement. One-time awards such as "We the People" and the ARRL Golden Jubilee of DXCC have proven to be very popular.

The "We the People" WAS award commemorates the Bicentennial of the US constitution, and is offered for working all 50 states during the period from September 17, 1987, through December 31, 1988. Applications can be submitted until December 31, 1989.

Other than accommodating SWLs, the only other endorsement offered is the very challenging "200" sticker for working all states with special "200" club call signs. A total of 310 hams have qualified to date, including three SWLs and three DX stations: I8ACB, IK8DOI, and OA4OS. See the complete list of stations who qualified for the "200" endorsement.

SOAPBOX

I want to thank you so much for the opportunity to work "We the People" WAS...Many people have really joined to create a wonderful new spirit among amateurs...would you believe a DX pile-up for the state of Minnesota from other countries working "We the People?"...also it was nice not to have to wait for the QSL cards (NØK). I know there are many who did it much faster, but few with more pride. I work with all indoor antennas...in my condo... (K16VC). A great award idea (WBØCIW). It was fun, indeed challenging, and we enjoyed pursuing even the "rare ones" like Delaware and Wyoming...I hear the award is even more attractive than the one *QST* displayed (K4TWJ). This was fun!!! (W4NIM)....went nuts getting Maine (W3FDU). At this time I would like to congratulate you and the League for the new award program...these new activities spark renewed interest for the hams around the world (HC2CG). At one stage I seriously doubted whether or not I would be able to complete the award...I had worked all but Delaware, DC and North Carolina..it would be a crime to be on the air without a decent antenna so I put the Yagi up again and completed the award within the week...I shall be very proud of this award...ARRL is to be congratulated for introducing this award without the need for QSL cards (VS6CT). Here we are again having spent a most enjoyable week DXing from Macau and I am very proud to have achieved the "We the People" award (XX9CT). Enclosed is my application for the "We the People" WAS award...accomplished using QRP power, output level of 5 watts, feeding inverted vees on the low bands, and a 2-element home-brew Yagi at 35 feet, which I use on 20/15/10 meters with the help of an antenna tuner...it has required much listening to work these stations (WA1IDP). Thanks for including shortwave listeners in one of your awards programs. We really do appreciate it (KUSØBK). The anniversary of the US constitution will have a very special meaning for me, forever...thank you (NS3X).

WORKED ALL STATES WITH "200" CLUB CALL SIGNS

KC1BS
WB1DWR
W1FHP
KC1HI
KB1KA
KQ1N
WA1NQV
NG1O
W1XX
NJ1Y

KA2AJT
N2ATF
KK2B
W2BLV
WB2CJL
N2CVR
K2CYX
NJ2D
WB2DIN
W2FG
N2FJQ
K2FL
W2FXA
W2HAZ
KD2IM
AC2P
W2PKM
WB2QJY
WA2S
KA2SPH
KA2TFM
K2TQC
WA2UNP
K2VV
WB2YQH
WA2YYR

KD3AL
KD3AO
N3BGA
KV3D
N3EHD
KA3ENQ
W3GH
K3HBP
W3HCW
W3IVG
WA3JRL
AJ3K
KZ3K
ND3L
KC3LM
KC3M

NB3N
KU3R
KA3ROX
K3SLJ
KC3TG
K3TUA
WA3VWA
KC3WJ
K3YBJ
NN3Z

WD4AFY
WD4AHZ
WD4BBE
WA4BIM
N4BJZ
KJ4BK
WB4BMM
WD4DBJ
AA4DO
W4DYL
KJ4EW
AA4FC
K4FK
W4FLW
WA4FWH
KZ4G
WD4HRO
WD4IIO
K4JYS
K4KGU
KF4L
WD4LJY
N4LZL
N4MAD
KA4MBF
W4MLA
N4MM
N4MXN
WB4NXG
N4NWT
W4PSN
N4PXV
KS4S
K4SE
W4WAW
KJ4WP
WA4WTG
KB4WUK
WA4ZVK

W5ADH
W5AFK
NU5B

WD5CBL
AA5CI
N5CND
N5DZQ
AE5E
W5EIJ
KD5F
KG5FX
K5GE
AE5H
N5HBQ
N5HSF
WZ5I
W5KFN
N5KMR
W5KUY
W5KUZ
W5KWA
KB5NI
WA5NRT
K5OVC
KE5PGE
KE5PO
WA5QGH
KE5RK
W5RKK
WB5VFL
WB5VUH
KD5XH
NM5Y
KF5YZ
WZ5Z

WT6A
N6AHU
WB6AKF
N6AVU
AA6BB/7
KJ6BI
N6BOI
KI6BU
N6CFQ
K6CID
W6CN
W6DDB
KB6DSX
KF6E
WD6EKR
WE6F
WA6HIB
K6ICS
K6ILM
K6IR
K6JAD

KA6JDH
W6JEP
W6KON
WA6LFN
W6LS
KT6M
KA6MBF
KG6MY
N6NXV
N6PVV
KD6PY
WA6PZK
WY6Q
AE6T
W6TKV
KA6V
KI6WY
NQ6X
WA6YEO

WG7A
K7ABV
WA7AHF
KM7B
WE7B
KF7BR
N7BSA
N7BXX
W7CSW
WE7D
NI7E
K7EHI
N7FYU
W7GUR
N7GVV
N7HKU
N7JB
WA7JUO
KB7KU
NW7O
KE7PB
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KE7UL
W7ULC
KE7UM
KT7V
KE7X
KK7Y
W7YOF

WA8AEG
W8AH
WA8ANP
K8AQM

N8BEE
K8BL
W8BZP
W8CBA
KE8CC
K8CHN
W8CNL
WB8FBJ
W8FO
N8FQZ
KA8IAF
W8IEC
WD8IFH
W8KST
K8LJG
K8LP
WG8N
KE8NK
W8OBI
WD8REC
WD8RXP
KB8S
WI8S
WA8SWM
NG8T
W8URM
WB8WHJ
W8WOJ
K8WOQ
WA8ZDL
W8ZRL
WB8ZRL

NS9B
KC9BD
KC9CU
KA9EFT
N9EWS
N9FXQ
N9FWM
N9FWW
KA9HFA
WB9I
WD9INF
W9JZ
NT9L
NW9L
W9MYG
WB9NOV
WA9OHU
KA9OTD
KA9PHA
WA9PSV

WB9QPA
W9RCJ
KI9T
K9VER
K9WRH
WA9WSJ
W9WYN
NT9Y
W9ZGP
W9ZTL

NØABE
KEØAH
KØBUR
NØDLS
NØELA
WDØEMY
NØFBA
WØGAX
KØGT
WAØGUD
KEØHN
NØHVL
WKØI
KAØIAR
WØIZ
WØLEO
WØMLY
WAØQIT
KØRW
KEØSR
WØSR
WBØSYV
KØTVY
NTØU
KEØVF
WØVV
WBØYJT
WBØZQN

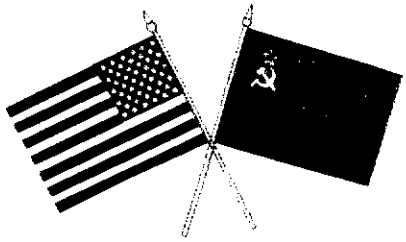
VE1CFQ
VE4HQ
VE7YL
VE7CDK

I8ACB
IK8DOI

OA4OS

SWLs

Francis H. Welch
Gary Szucs
David A. Glow, KDX1A



Tune in to Glasnost

Part 3: Soviet hams enter new arenas from subterranean to extraterrestrial.

By James D. Cain, K1TN
ARRL Contributing Editor
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Andover CT 06232

On the Richter scale it was 6.1. An earthquake of like magnitude in Mexico City in 1985 killed "only" 4200 people. Yet when the earth moved under Armenia the morning of December 7, 1988, it leveled hundreds of buildings and left in its wake more than 70,000 dead and a quarter million homeless.

This was not a drill.

News reporters found civil defense "pathetically ill prepared to cope." Some people who survived in the village of Lasakhpur froze to death before help arrived, while rescue teams wasted hours stuck in airports or awaiting ground transportation to the quake area. The same fate befell Amateur Radio volunteers—and their gear.

Take repeaters. It is impossible for American amateurs to imagine an Amateur Radio response to a localized emergency without them. Not only do the Soviets have no repeaters, they have few hand helds.

[In early 1987] "We installed a repeater at Moscow State University [MGU]," wrote Leonid Labutin, UA3CR, in *Radio* for February 1989. "The results were excellent. It seemed that a new era was dawning in our hobby. But suddenly a document arrived from the GIE [their FCC] shutting down the repeater—no reasons, no explanations.

"It's simpler to prohibit [than to work out problems]. After all, in our country, unfortunately, people aren't held accountable for prohibitions. But one can suffer for permitting something.

"Such is the logic still today. In my view, an antisocial logic. One that leads to our Amateur Radio lagging progressively behind the rest of the world."

Radio Relaying

Radio senior editor Gennady "Gene" Shulgin, UZ3AU, was one of the first Soviet amateurs to rush to Armenia following the earthquake. Shulgin is a keen observer and skillful writer, as well as a gifted fix-it man. K7JA describes UZ3AU's reaction to a broken radio on the May 1989 4J1FS expedition:

"Someone had misadjusted the ALC on our prototype Japanese transceiver, leading to final amplifier failure. We had no schematic. 'Let me take a look' Shulgin said, peering down at the radio, a bagful of parts in his hand.

"About an hour later I found Gene on the air with the formerly dead transceiver. 'Works OK now,' he said nonchalantly. 'Has new Russian coil.'"

Shulgin wrote of his month-long experience at the Chernobyl nuclear plant in the April 1987 issue of *Radio*, but did not elaborate on actual amateur communications. The article appeared fully a year after the incident.

When avalanches in Georgia took a heavy toll in lives in January and February, 1987, radio was described as the only reliable means of communication. But the Georgian Republic Sport-Technical Club later was criticized for failing to develop Amateur Radio since the snowstorm disaster.

At the earthquake sites, "Personal radio sets were desperately needed," Shulgin wrote, "to organize rescue work and dispatcher communication... [Soviet] radios adequate for youth games and training were woefully deficient for serving devastated towns."

Amateurs on the scene "steered" those in other countries toward sending hand helds, Shulgin says. Their portable units were incapable of direct communication and "We had to resort to intermediaries, which also led to deplorable results."

Meanwhile, six packet stations sent to Moscow by ARRL were delayed in arriving in Armenia, and two Americans, members of the US-based International Amateur Radio Network, arrived in Moscow with equipment, only to be turned back by authorities who, according to UB5WE, "simply did not understand why Amateur Radio operators would be there to help."

Saving Lives

Soon after the earthquake, collective station UG7GWO in Yerevan, the Armenian capital, reported there was no communication with the areas affected by the quake.

Several amateurs from Yerevan set out for Spitak, site of the most grievous damage. Upon learning that the Republic

Yuri Katyutin, UA4LCQ, operates from Soviet Armenia. *(photo courtesy UA4LCQ)*

Inside *Radio*

If you have a soldering iron and a set of earphones in the Soviet Union or eastern Europe, you probably read *Radio* magazine.

On our way to US0SU last March,† *Radio*'s lab chief UZ3AU invited us to their Moscow offices. Editor-in-chief Anatolij Gorokhovskiy was surprised. Someone had forgotten to brief him on this first-ever event.

At a long table watched over by the ever-present portrait of Lenin, he sat with us for morning tea accompanied by huge bowls of cookies and orange slices. Deputy Editor Boris Stepanov, UW3AX, translated. Anatolij gave us a brief and routine history of the magazine as he sipped from a glass of tea held in his personal silver sconce.

Ron Oates, a nuclear engineer from North Carolina, asked Gorokhovskiy if *Radio* planned to cover our expedition. "Well, yes, of course," he answered. Then he looked at me and said, "I will make you a business proposition." (I had been introduced as a journalist.)

"Will you write for us an article telling us about your expedition? Write it just as you see it from American eyes." To my photo vest he pinned a green pin with the word "Radio" in Russian letters, identifying me as the magazine's correspondent.

I began my job by asking a few questions. Women are found in Soviet mines, taxis, and sawmills, but I have yet to meet a female ham or hear one on the air. Deputy editor Stepanov explained that most radios are easy for women to operate, "but it would be almost impossible for them to build one."

I was there to listen, not to argue.

What have glasnost and perestroika meant to *Radio*? I asked. Because of what Gorokhovskiy calls "the new situation here and in the world," meetings like ours are now possible. Since glasnost, he added, the magazine has become "more willing to criticize the shortcomings of the industry. In previous years when we wanted to [criticize], people said we shouldn't because maybe the Americans will understand it."

Although *Radio* receives part of its funding through the military, recently it has been critical of "our brass," Gorokhovskiy said. For example, he cited the drafting of Amateur Radio operators who were then assigned to nonelectronic fields.

Radio is published monthly in magazine format on cheap paper with very little color. Like most Soviet publications, funding comes from the government. The only product promotion is for Soviet electronic gear. While the quality of its photos might not impress American readers, its technical information has enabled thousands of Soviets to get on the air.

In the magazine's small laboratory, chief experimenter Gennady "Gene" Shulgin, UZ3AU, has developed two prototype transceivers that *Radio* markets as kits. American hams looking at the diagrams are surprised at the relative simplicity of the technology.

If market economics continue to reshape Soviet society, readers of Radio could one day be seeing ads for Japanese and American components.—*Wallace Kaufman, KC4EBX*

†W. Kaufman, "US-Soviet Radio Relations Thaw in the Arctic," *QST*, Oct 1989, pp 14-16.

[Editor's note: An editorial board of DOSAAF and Ministry of Communications officials dictates the makeup of *Radio*. While investigative reporting to uncover local bureaucrats not doing their job has long been a *Radio* trademark, only under Mikhail Gorbachev have the editors been unleashed to criticize both DOSAAF and the Ministry. Editor-in-chief Gorokhovskiy is chairman of the editorial board.

Although Amateur Radio makes up perhaps 20% of *Radio*'s content, both its deputy editor and laboratory director are hams. Gorokhovskiy is an electrical engineer but not a ham.]

Gene Shulgin, UZ3AU, talks with rescue workers. *(photo courtesy UA4LCQ)*

Sport Technical Club had prohibited UG7GWO from transmitting any information on the earthquake situation, they returned in despair to Yerevan.

"Not everyone shared this attitude (of some bureaucrats) toward amateur communication," UZ3AU wrote in *Radio*. "I learned that on the orders of the chief of the Central Radio Club, a group of radio amateurs had been organized to go to Armenia. The team was equipped to operate autonomously, was well equipped, and would fly out in half an hour."

Shulgin, unable to join this team in time, got UW3AA and himself on a special flight to Yerevan. There, they went straight to UG7GWO, whose operators hadn't left the station for days. The participants in the unsuccessful trip to Spitak also were there.

UG7GWO's chief operator, UG6GAT, said the leaders of the Republic Sport Technical Club had turned down the idea of organizing an Amateur Radio net with the affected cities. This confirmed what Shulgin had heard in Moscow.

Despite this, Shulgin and UW3AA set off for Leninakan, where they set up a 10-watt HF station.

After some initial problems, the word got around. Shulgin and Kostya, UW3AA, were visited by the Minister of Communication of Armenia, saying "There's an urgent need for communication with Yerevan!"

The pair contacted UG7GWO, whom the Minister told to send a telegram to Moscow.

"Why send a telegram via Yerevan?" the two amateurs asked. "We have a solid communication link with Moscow." After a demonstration, the Minister promised all possible assistance to the amateurs.

A Call to Arms

An editorial in *Radio* for June 1989 points out deficiencies in Amateur Radio's response to the earthquake and offers ideas for future improvements.

"While awaiting the establishment of a fast reaction organization on an all-Union (nationwide) basis, we could at least begin with what already exists and what has proven itself in Chernobyl, the snow avalanches in Georgia, and in Armenia.

"Let's equip the already self-organized volunteer groups of shortwavers from Moscow, Georgia, Armenia, Sverdlovsk, Novosibirsk, and the North Caucasus with

Bellevue, Washington firefighter John Ladd, N7HZG/UG6. *(photo courtesy N7HZG)*

UW9CW and UA9CJK supported Armenian earthquake relief efforts from their radio tent. *(photo courtesy UA4LCQ)*

equipment, tents, uniforms, and outfitting—with everything right down to orders and travel documents which take effect at the first report of a disaster.

"This proposal requires funding, as would of course the subsequent establishment of an all-Union fast reaction radio net; funding could in our view be provided without a great deal of effort by DOSAAF and its local committees, the more so since the net could be based on existing collective and individual stations.

The editorial concludes, "Time is pressing. There's no warning of disasters. Often they can't be avoided but they can and must be met in an organized manner."

At the request of *Radio* Magazine Deputy Editor Boris Stepanov, UW3AX, ARRL in mid-September sent an extensive package of emergency communications related material to the Soviet Union.

[This story made possible by many people, including NT2X, K7ZR, KC4EBX, K7JA, K1MAN, W4ASX, and W4KM. I am grateful for their assistance. The photo on p 45 of October *QST* should have been credited to K7UDG.—K1TN.]

This DX-pedition was stopped by "Big Armenia Tragedy" 7th December 1988.
We are very sad about that.....

☐UA6HPV/UG5G ☐UV6HPV/UG5G ☐UW6HWI/UG5G
☐UA6HPR/UG5G ☐UA6HRZ/UG5G ☐ _____/UG5G

To Radio _____ CMF QSO

DATE 19___	UTC	2 WAY	BAND	RST
		CW•SSB	160•80•40•20•15•10	
		CW•SSB	160•80•40•20•15•10	
		CW•SSB	160•80•40•20•15•10	

This QSO is good for the award program of DTDXA & ZDXC

PSE/TNX QSL Via: ☐JG1OUT ☐JO1QUB or ☐UA6HPV

DTDXA % 2-18-14 Kojima, Taito-ku Tokyo 111 Japan. P.O.BOX 999 Stavropl 335044 USSR

The Zilan DX Club had prepared the back of their QSL in anticipation of a joint expedition with members of the Western Washington DX Club (see Oct 1989 *QST*, p 45). The /UG5G space was for the visiting American operators.

Full Quieting from Space

Soviet Cosmonauts prove that line-of-sight is best

By Ed Kritsky, NT2X
PO Box 715
Brooklyn, NY 11230
and James D. Cain, K1TN

When Soviet cosmonaut Musa Manarov returned from 366 consecutive days in space last December, he brought back more than a world record for time aloft. He carried a ham radio logbook of more than a thousand contacts.

And the planning and preparation for his Amateur Radio operation hadn't even commenced until Manarov already had spent several months in space!

Not long after his return to Earth it was learned that Musa Manarov was to visit the United States. His tight schedule included a scientific conference in Washington and brief stops in New York City and Houston. He was unable to make an anticipated visit to ARRL Headquarters, but several New York and New Jersey radio amateurs were privileged to meet with him on May 18, 1989.

We learned that Musa, one of a new breed of cosmonauts with a civilian rather than military background, had no Amateur Radio experience before his historic flight aboard *Mir* (Peace), a permanent spacecraft with rotating crews. *Mir* would change that.

Spaced Out in Space

As far back as the mid-1970s, editors of the Soviet magazine *Radio* had raised the possibility of amateur operation by cosmonauts. But because of the brevity of space flights and the cosmonauts' heavy workload, nothing had come of the talk.

Soviet psychologists long had wrestled with the adverse effects long periods in space might have on their fliers. *Mir* cosmonauts used a two-way TV hookup to talk to their families twice a month, but this left them more homesick than ever.

As described in *Radio*, once the *Mir* crew, then consisting of Musa and Vladimir Titov, had become accustomed to their routines, Musa began to think back to radio and electronics, childhood interests in which *Radio* had played an important part.[1]

So, at the end of March 1988 the *Radio* office received a telephone call from the cosmonaut-psychological support group at the Flight Control Center. Vladimir Titov and Musa Manarov (on their fifth month in space) had requested some fresh reading material—the latest issues of *Radio*.

Up the magazines went, in the next space truck (in May), along with a suggestion from the editors: How about a ham rig?

As they say, appetite comes with eating. Cosmonauts do have time off, and Musa in particular wanted to play radio. Soviet space authorities gave the go-ahead for operating on weekends, during recreation periods.

Top brass at *Radio* tell the story:

"To be frank, we doubted the possibility of realizing this operation. After all, in a very short period of time an appropriate transceiver would have to be found (there clearly was no time to build one), a special ultrashortwave antenna would have to be designed and built, and necessary instructions would have to be prepared.

"Time was short because the 'trucks' didn't go that often, and the antenna [which would be installed outside the orbiting station] would have to be delivered prior to the cosmonauts' excursion into open space.

"The transceiver problem was resolved relatively simply. Without any hesitation, well known Soviet shortwaver Valery Agabekov, UA6HZ, agreed to send off his ultrashortwave transceiver from Essentuki, where he lives, to Moscow. [The 2-watt Yaesu hand-held and antenna were then ground tested for interference to the spacecraft's vital systems—*Ed.*]

"The instructions presented no particular problems—these consisted of the "Shortwaver's Guide" and specially prepared instructions on transceiver operation and on amateur communication procedures.

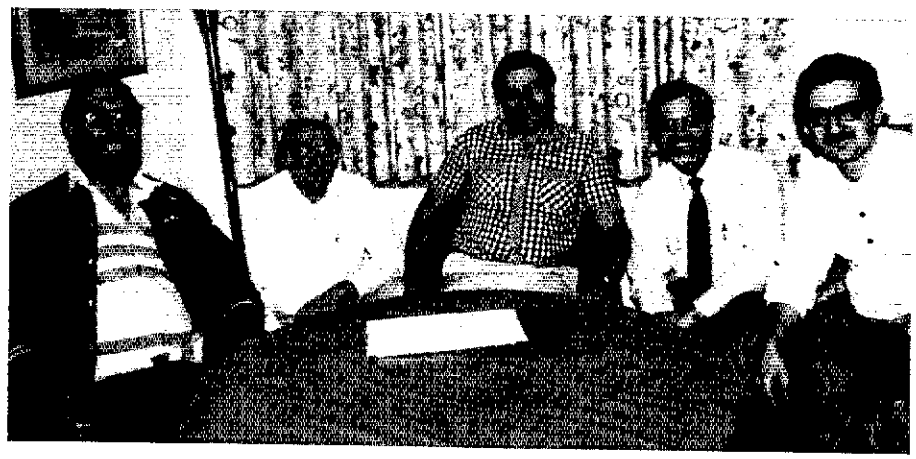
"But the ultrashortwave antenna took some tinkering. It was a normal dowel rod, but . . . the peculiarities of putting it in place had to be considered [the cosmonauts work in spacesuits, which naturally restrict their ability to move around].

"The equipment was assembled and sent to the cosmodrome so fast that we didn't even have time to take photos for memory's sake. All we had were remnants of the dowel rod cut off in the process of tuning the antenna to the working frequency and also rough drafts of the instructions.

"Then a long wait—the package went to the cosmodrome, the equipment was sent to the spacecraft, and finally the long awaited call from the Flight Control Center: The antenna is installed."[2]

The antenna, fastened to the hull of the ship, served double duty by flying the Soviet flag.

Special calls were assigned to the cosmonauts—U1MIR to Titov; U2MIR to Musa; and U3MIR to Valery Polyakov.



Several New York and New Jersey hams had the pleasure of spending an evening with Soviet cosmonaut Musa Manarov, U2MIR, in New York City last May. (l-r) Allen, N2KW; Gene, N2AA; Musa, U2MIR; Marc, WA2S; Leo, WN2L. *(NT2X photo)*

[1]Notes appear on p 52.

So that the cosmonauts could get used to the transceiver (by SWLing), the ground team first switched on several terrestrial beacons. Then UA6HZ and UK3KP went on the air, and a test contact with UK3KP (the collective station of *Komsomol'skaya Pravda*, the newspaper of the party youth organization) was made on November 8, confirming that the station was ready for operation.

On November 12 and 13, "lively discussions" on amateur operation took place between *Radio* employees and the cosmonauts on their service channel (off the amateur bands).

What Musa lacked in experience he made up for with enthusiasm and true pioneer spirit. He received his first coaching—on the air—from Boris Stepanov, UW3AX, deputy editor of *Radio*. Musa taped these sessions for later review.

The first lesson: How to conduct a QSO.

Their Novice Accents

But the students couldn't wait—earlier on November 12, during a break between classes when the spacecraft was out of direct line of sight of Moscow (and their teachers out of the classroom)—Musa and Titov had their first independent radio communication, a two-way with W4BIW, at an AMSAT symposium in Atlanta.

When operating began in earnest, Musa was at first distressed that no one seemed to hear him. His station had worked well during the initial test contacts. But the entire *Mir* operation had materialized so quickly that advance publicity was impossible. Among the first stations he called were two American amateurs—who took Musa for a pirate!

It so happened that around this time the author (NT2X) was talking to UA6HZ, who mentioned the DXpedition. He asked it be publicized, and *QRZ DX* (a DX newsletter) and ARRL HQ were notified. They broke the news.

Suddenly, Musa was lonely no more.

Musa's description of the experience of flying over populated areas, as hundreds (or perhaps thousands) of stations called him, is reminiscent of the experiences of US hams in the Space Shuttle. Over Japan his frequency buzzed like a hive of angry bees —not only were hundreds of JAs calling *Mir*, but Musa also was hearing ordinary QSOs between Japanese amateurs. (His frequency, 145.55, is a popular simplex calling frequency in Japan.) Talk about low-power DX!

U2MIR's signals were strong and easily copied on Earth. But Musa, a brand new ham, was getting his first taste of real DX pileups.

Europe wasn't much easier for him. It went like this: As the space station passed over West Africa, U2MIR could work such good DX as Senegal and the Ivory Coast with ease. Then, after a short intermission, they approached Europe—and wham! The frequency sounded like a new DXCC country had just come on the air.

The cover of the January 1989 issue of *Radio* featured U2MIR in the space station.

The space station travels at eight kilometers per second, so Musa had eight minutes to work a given terrestrial station before moving out of range. Pleading with others not to call while a QSO was in progress didn't help much—as *Mir* moved, new stations that hadn't heard Musa's admonishments appeared, calling U2MIR.

The original plan for Musa to operate split hadn't worked out, so simplex was used; many QSOs went unfinished when stronger signals desensed Musa's receiver. Often, in passing over the US, the deep pileup nearly made operating impossible. Musa would maintain radio silence for a couple of passes, while some of the pileup went to bed.

"Once I nearly 'got a fever' from the exhaustion and stress of picking calls through the QRM," Musa recalled. Despite the problems, more than a thousand stations entered the *Mir* logbook.

As the year-long mission drew to a close, Musa began training his companions, U1MIR and U3MIR, in the art of ham radio. Both Vlad and Valery tried radio briefly before the crew rotated (at various times there were two, four—and at one point six—cosmonauts on board), but it was Musa who was the "born ham."

Musa's English is quite good, but he lacked practice at conversation—his Amateur Radio operating thus provided an unexpected benefit. And Musa laughingly told us he didn't know Russian ham phonetics, hampering his first contacts back home. Nevertheless, U2MIR contacted Russian-speaking operators in Argentina, Brazil, and in South Africa.

One memorable QSO was with a South African ham of Russian descent who hadn't spoken a word of Russian for 50 years. Another ZS, unable to break in, yelled the only Russian words he knew: "Na zdrovye," then "glasnost" and "perestroika"—and made a contact.

In another QSO, a 70-year-old Soviet amateur operating from a club station said in a trembling voice that his hands were shaking with excitement. Musa was deeply touched.

Since their operations came at the close of the mission, hams around the world took the opportunity to wish the three cosmonauts a safe return to Earth. Typical of their sentiments was that of well known English satellite enthusiast Patrick Gowen, G3IOR (quoted in *Radio*):

"Your cosmonauts are performing wonderful work, helping medical, technical, and environmental research. And now contacts with the world radio amateur community have been added. They [the cosmonauts] are first class diplomats!"[3]

Since returning to Earth late last year, Musa Manarov's whirlwind schedule has left him little leisure time, but he has requested U2MIR for his personal call. He plans to be active on HF, and hopes to be part of a future *Mir* crew.

As for the *Radio* staff who made the *Mir* operations a reality, they are busy boosting Amateur Radio from space:

"Compared to [setting space records], Vladimir Titov's and Musa Manarov's operation on the amateur bands might seem insignificant. But of course it wasn't.

"First, the possibility of carrying on Amateur Radio communications is important for the psychological support of the cosmonauts, particularly for those who spend long periods in space.

"Second, the impression made on the millions-strong amateur community around the world was no less important. Shortwavers from the most remote corners of our planet contacted the cosmonauts. Stories about these contacts appeared in many newspapers in the USA, Australia, Argentina, and elsewhere."

For now, U3MIR continues to occasionally be heard from space, as do the call signs of his comrades Aleksandr Volkov, U4MIR, and Sergey Krikalev, U5MIR. QSL manager for *Mir* operations is UA6HZ.

The authors are grateful to Dexter Anderson, W4KM, for his translations to English of articles from *Radio* magazine.

Notes

[1]*Radio*, Mar 1989.
[2]*Radio*, Apr 1989.
[3]See note 2.

Conducted By John C. Hennessee, KJ4KB
Regulatory Information Editor

ARRL Petitions FCC for Codeless Class of Amateur License

On August 31, 1989, 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. The FCC has assigned the ARRL petition file number RM-6995.

Under the ARRL proposal, the new codeless license would require the applicant to pass a written examination somewhat more comprehensive than the present Technician class written examination, including some questions relating to Morse code, but without a Morse receiving, sending or recognition requirement. Three accredited volunteer examiners would administer the examination, and upgrading to a Technician class license would involve taking a 5 WPM code examination. Privileges would include all amateur frequencies and authorized modes above 220 MHz, with a maximum output power of 250 W. The licensee could not be a control operator of a repeater or auxiliary station. Call signs would be assigned from the Commission's "Group D" block.

The ARRL petition noted that the subject of an Amateur Radio license not requiring a demonstration of proficiency in the International Morse code has been debated with renewed vigor within the past year. Such debate has centered on how to attract to our ranks increasing numbers of people able to contribute to the development of Amateur Radio.

The League has not previously favored the creation of a codeless license class. It is the League's intention that new hams learn and use Morse code, and the proposed new license class would include questions about the code in the written exam. At its July 1989 meeting, however, the League's elected Board of Directors, by a vote of nine in favor to six opposed, voted to seek the creation of a new, codeless class of Amateur Radio license. The split vote of the League's Board reflects the controversy that surrounds this issue. Numerous amateur licensees expressed their opinions to various Board members. The Board also considered the recommendations of a special study committee, which had gathered information on the subject and rendered a comprehensive report. The Board adopted a more conservative proposal, relative to the privileges proposed. The changes reflected the input received from the amateur community.

Background

The concept of a codeless license has been around for quite some time. In 1974, in Docket 20282, the Commission considered the possibility of a codeless amateur license. In 1979, the FCC said it believed that a codeless, VHF-only license was necessary. Because four years had elapsed between the receipt of comments and consideration of the proposal, however, the matter was left hanging. After March 1979, Docket 20282 was closed.

In 1978, the FCC considered the creation of a codeless license for handicapped persons (Docket 78-250). It was determined that handicapped amateurs generally did not desire special dispensation in the substance of amateur examinations. Rather, they merely asked that the examiners take into account their specific needs in procedural aspects of the exam.

In early 1983, the Commission again proposed a codeless class of license in Docket 83-28. The overwhelming rejection of the Commission's 1983 codeless license proposal by the Amateur Radio community must be viewed in its historical context, recognizing the circumstances prevailing at the time: a distrust of the Commission as the result of its WARC-79 surprise posture on Morse code requirements at HF; the inability of the amateur community to rely on the compromised FCC written examination as a substitute for the Morse code test; the novelty of the yet-untested volunteer examination program; and the perception that any volunteer examination program would be burdened in its infancy by the creation of yet another type of license. Each of these factors alone could have led to the unequivocal rejection by the Amateur Radio Service of the 1983 Commission proposal. The combination of circumstances caused rejection of any codeless license whatsoever, by an overwhelming ratio. The Commission terminated the proceeding without action in December 1983.

League's Study of a Codeless License Issue

The ARRL petition said that Novice Enhancement has been a great success in terms of reducing attrition and encouraging upgrading, but that it had not increased significantly the overall rate of influx of new Novices into the Amateur Service. Many amateurs have stated that there is a need for growth in the Amateur Radio Service, and a need to show to more people the benefits and opportunities of Amateur Radio. The success of the Novice Enhancement proceeding in retaining newcomers to the Amateur Radio Service leads one to consider the possibilities for attracting newcomers by creating a codeless license. While it is subject to serious debate whether the present five-word-per-minute code requirement is in fact a barrier to the entry of newcomers to Amateur Radio, there cannot be any doubt that the Morse code requirement is perceived as a barrier to entry among numerous nonamateurs. Many overcome that perception and become Novice licensees, but many do not.

The League, recognizing that the circumstances now prevailing are radically different than in 1983, and considering that a codeless license class is being actively debated again among amateurs, convened a special study committee on the subject in December 1988, calling for a report by mid-1989. Foremost among its resource materials were the results of a survey conducted by the League of the experiences of other countries with codeless licenses.

The Committee sent a questionnaire to each IARU society which was known or believed to have a codeless license (in compliance with ITU regulations). The conclusions drawn from the study were interesting. Some countries showed little or no growth, despite such a license class being available. Essentially unanimous among those countries which reported negative experiences with codeless licenses was the sentiment that their written examination was inadequate or too simple to test qualifications. In such cases, the creation of the license class was typically the effort of the country's government, and was intended to accommodate CB-type service licensees.

On the other hand, in countries such as Australia, Federal Republic of Germany, and Belgium, where the written examination appears adequate to determine an operator's technical qualifications, the percentage of codeless licensees who upgrade to a traditional amateur license is extremely high; in some cases as high as 95%. The Amateur Radio societies of each of these countries report the presence of ongoing, active Morse code activities among codeless licensees who are working to upgrade their license class. One premise for the League's proposal is that similar programs will be sponsored for US codeless licensees. The concept can be a success in attracting newcomers, but an effort to create an incentive for these amateurs to upgrade their license class is necessary.

Four basic conclusions of the committee led to its acceptance by the League's Board that a codeless entry class license, with limited VHF and UHF privileges, should be created. These were (1) the perception that the code proficiency element of the amateur entry level examination is a significant barrier to entry and reduces the attractiveness of the Amateur Radio Service to certain technically-inclined persons who may be otherwise desirable and who might themselves benefit from it; (2) the code proficiency requirement does not act as the essence of an appropriate "filter" to weed out undesirables from the Amateur Radio Service; (3) there are many good reasons for maintaining a code proficiency requirement for any amateur license which confers HF communications privileges; and (4) there is nothing antiquated, nor irrelevant about the Morse code, nor its use in the Amateur Radio Service, but this is a matter that some individuals must learn for themselves, in order to appreciate that relevance.

The League's Board of Directors reviewed the committee's report. Individual Board

members had also surveyed the attitudes of amateurs in their divisions. Although there were regional differences in the results of those studies, it appeared overall that the attitude of amateurs was significantly more favorable toward a codeless amateur license than in 1983.

The Proposed Codeless License Class

The League proposes a new class of amateur license entitled "Communicator." The ARRL proposal noted that it is not, however, the same as or similar to the codeless license of the same name proposed by the Commission in 1974. It is not an "entry-level" license in the same sense as the Novice class license. The written examination will be reflective of the privileges to be earned, requiring a greater commitment than does the present Technician class written examination. The lessons learned from the codeless licenses of other countries necessitate a significant written examination.

The written examination proposed for the Communicator license would encompass Elements 2 and 3A of the present amateur examination structure; the latter upgraded with some additional questions related to the specific privileges afforded these licensees, and some questions concerning the Morse code. The new class of license would be administered by established Volunteer Examiners through the VEC program.

The ARRL petition went on to say that there should be an upgrade path from the Communicator class of license to the present Technician license by way of a five-word-per-minute Morse code examination, administered by the VEC program. This is self-explanatory, in that a Communicator has taken Element 2 and an expanded Element 3A in order to obtain his or her Communicator license. Elements 2 and 3A together are the total written examination requirement for the Technician license. Thus, for a Communicator class licensee to take an Element 1A code test from an accredited VE would result in the passage of all elements of the Technician examination.

According to the petition, call signs for this new class of license should be assigned from Group D of the present call sign block for the Amateur Radio Service. This is most important, as the goal of the codeless amateur license is to bring such licensees into the "mainstream" of the Amateur Radio Service, and to encourage them to upgrade their license class. It is thus important not to "label" these licensees as distinct from other entry-level amateurs, or attach a stigma to the license class. Rather, the effort should be to assimilate them into the Amateur Radio Service by permitting them to interact with other classes of licensee in those bands in which Communicator licensees are permitted to operate. The League determined that the only acceptable balance of privileges is to afford such licensees unfettered operation above 220 MHz. With respect to power levels, the League, in the proposal, sees no need to permit the Communicator class licensees to operate at greater than 250 W PEP output, since greater power output can be reserved for higher-class licensees. This would create the incentive to upgrade. For the same reason, the League proposes to prohibit such licensees from being the control operator of a repeater or auxiliary station, though use of such would be permitted.

Conclusion

The ARRL believes new amateurs attracted to a codeless license will strengthen the Amateur Radio Service. Those who have a true interest in becoming radio amateurs will have the opportunity to join, unfettered by unfounded preconceptions about entry barriers. They will not only have the opportunity to become amateurs, but will also have a more favorable exposure to the benefits of having a personal, cognitive communications skill, which is shared worldwide in the Amateur Radio Service. The learning of Morse code will be viewed more as an opportunity than as a burden, or a hurdle over which they must jump.

The ARRL petition concluded by saying that the creation of a codeless amateur license should be successful in the US, as it has been in other countries. The key ingredients seem to be a substantial written examination, significant incentives to upgrade, provisions for including codeless licensees in the on-air activities of other licensees and assimilating them into the mainstream of Amateur Radio. For its part, the League and the rest of the amateur community will have to create events and activities to provide such licensees a significant exposure to the benefits and utility of Morse code, so that Communicator licensees have an opportunity to learn and appreciate it.

In the petition, ARRL noted that this subject is not one which yet enjoys universal acceptance in the Amateur Radio community. It is, however, one which the League now supports as beneficial to the future, short and long term, of the Amateur Radio Service. The only way the plan can fail is if the Amateur Service rejects Communicator class licensees as full-fledged members. The League firmly believes this will not occur, as the Amateur Service has a tradition of mutual assistance, and guidance of newcomers by the more experienced members.

Congress Moves Ahead with $30 License Fee Proposal

While many amateurs were using their licenses to provide emergency communications in the wake of Hurricane Hugo, a budget reconciliation bill containing a license fee proposal was introduced into the House as HR 3299 on September 20.

The Schedule of Charges is contained in Section 4701(a). The bill proposes to amend Section 8 of the Communications Act by adding a new subsection including a $30 fee for new licenses, modification of a license, renewal of a licenses, application for reciprocal permit and to obtain a Special Temporary Authority.

The House Rules Committee has permitted only five amendments to be offered on the floor of the House to this lengthy and complex bill and it appears unlikely that there will be any opportunity for the House to amend or strike the fees. On the Senate side, a $35 fee proposal was working its way toward floor action as a part of the Senate Commerce Committee's version of the budget reconciliation bill. See page 9 of this issue and check W1AW for late-breaking news.

ARRL OPPOSES BROADCASTERS IN PART 97 RECONSIDERATION PETITION

On July 20, a Petition for Reconsideration in PR Docket 88-139 (the new Part 97 rewrite) was jointly filed by the Radio Television News Directors Association (RTNDA); the National Association of Broadcasters; American Society of Newspaper Editors; CBS, Inc; Capital Cities/ABC, Inc; National Broadcasting Company, Inc; National Public Radio; Post Newsweek Stations, Inc; and the Reporters Committee for Freedom of the Press.

In their petition, the broadcasters assert that the Commission's newly stated rule (97.113[c]) concerning instances in which Amateur Radio operators may convey information to broadcasters for dissemination to the public is confusing and overly restrictive. Their expectation, based on the FCC's Report and Order regarding the revised Part 97, was that the category of circumstances in which Amateur Radio operators may furnish information to broadcasters was to be broadened.

In its Opposition filing on August 21, ARRL states that the "RTNDA [et al] misunderstands what the Commission's regulatory policy is with respect to news gathering using Amateur Radio facilities..."News gathering was and still is prohibited absolutely. Amateurs' ability to convey information to broadcasters...is a narrow exception to the rules...It applies only in the most

limited of circumstances [and] cannot be broadened beyond the concept of emergency communications...lest the noncommercial nature of the Amateur Radio Service be subject to compromise, and the Service exploited."

DIVISION DIRECTOR ELECTIONS

The ARRL Election Committee has completed its examination of nominating petitions filed by members in seven Divisions for ARRL Director and Vice Director for two-year terms of office beginning January 1, 1990.

The following candidates are unopposed and were declared elected without balloting: Pacific Division Director—Rodney J. Stafford, KB6ZV; Southeastern Division Director—Frank M. Butler, W4RH; Great Lakes Division Vice Director—George E. Race, WB8BGY; Pacific Division Vice Director—Charles P. McConnell, W6DPD.

Ballots were ordered mailed to full members in six Divisions, as follows:

ATLANTIC DIVISION

For Director:
Hugh A. Turnbull, W3ABC
Robert B. Weinstock, KN1K

For Vice Director:
Kay C. Craigie, KC3LM
James M. Mozley, W2BCH

DAKOTA DIVISION

For Director:
Richard P. Clem, WØIS
George E. Frederickson, KCØT
Howard B. Mark, WØOZC

DELTA DIVISION

For Director:
Joel M. Harrison, WB5IGF
Arthur P. Kay, W5APX

For Vice Director:
James A. Amundson, W5TRD
Henry R. Leggette, WD4Q
John M. Wondergem, K5KR

GREAT LAKES DIVISION

For Director:
Leonard M. Nathanson, W8RC
Allan L. Severson, AB8P

MIDWEST DIVISION

For Director:
Paul Grauer, WØFIR
Robert S. McCaffrey, KØCY

For Vice Director:
Lyndell C. Miller, WAØKUH
Laurance S. Staples, WØAIB

SOUTHEASTERN DIVISION

For Vice Director:
Evelyn D. Gauzens, W4WYR
Alan H. Page, KE4WO

There is no candidate for Vice Director in the Dakota Division. In the six divisions where there are contests, ballots have been mailed to all Full Members. Ballots must be returned by noon, November 20.

FCC RELEASES ERRATA LIST IN PART 97 REWRITE

On July 19, ARRL submitted a Request for Issuance of Errata List to the FCC in the Part 97 rewrite proceeding. It was submitted to "change the rules which were, in the League's opinion, unintentionally changed; where typographical errors were made; or where errors of omission appeared."

FCC responded with its Errata list released on September 7. After a review of the FCC's corrections list, ARRL Executive Vice President David Sumner, K1ZZ, said in a letter to the Directors, "This satisfies some, but not all, of the concerns expressed in our request for the issuance of errata."

Rick Palm, K1CE, editor of the newly rewritten *FCC Rule Book*, said the Errata will be included in the book's appendix.

PETITIONS FILED TO AMEND PART 97

On September 14, the FCC issued a Public Notice listing filings from ARRL and eleven other petitioners for amendment of the FCC's Part 97 Rules concerning the restructuring of licensing classes. ARRL, along with six other petitioners, filed for the creation of a code-free class of amateur license. Two petitioners filed for a change in code-speed requirements. Three others filed to restructure amateur operator licensing requirements and operating privileges. The ARRL petition was designated RM-6995.

Interested persons had 30 days (ending October 14, 1989) to file comments on these petitions with the FCC. The full text of these documents is available for viewing and copying in Room 239, 1919 M Street NW, Washington, DC, or may be purchased from the Commission's copy contractor, International Transcription Service (202-857-3800). Any FCC docket may be purchased from ITS.

FCC ENFORCEMENT ACTIONS

In conjunction with the San Francisco FCC Field Office, the US Attorney's Office in Fresno, California, has initiated a second criminal prosecution against Donnie Ray Johnson of Red Monkey Communications in Fresno for the alledged marketing of illegal Citizens Band (CB) radio equipment. In 1985, Mr Johnson was convicted for the same offense and was fined $5000 and placed on two years probation. On August 14, 1989, engineers from the San Francisco Office, along with US Marshals, conducted a search and seized $2000 worth of illegal CB linear amplifiers. The seized equipment was capable of operating in the CB band in excess of the power permitted by FCC rules.

Johnson's prosecution is part of a continuing enforcement program to assure that the FCC ban on manufacturing and selling CB linear amplifiers and other non-type-accepted transmitters is observed. Federal law (47 USC 302 (b)) prohibits the marketing and manufacture of such noncompliant electronic equipment. A second conviction for violation of this law carries a maximum fine of $100,000 and/or two years imprisonment.

In another action, US Marshals and investigators from the San Francisco Office of the FCC seized $3000 worth of alledged illegal CB radio equipment from the residences of John Robinson of Sacramento, California, Andrew and Mary Lou Calloway of East Palo Alto, California, and Ted Green of Oakland, California. The CB equipment seized included two non-type-accepted transmitters capable of operating on frequencies not authorized for use in the Citizens Radio Service. Also seized were six CB linear amplifiers.

According to an FCC release, FCC engineers from the San Francisco Office investigated and identified the locations of the three operators after receiving many complaints of interference to TV and radio reception from their neighbors. Robinson, Calloway and Green reportedly refused to permit FCC personnel to inspect their CB radio stations. FCC Rules (47 CFR 95.426) require that all CB radio stations be made available for inspection upon request of an authorized FCC official.

Warning letters and fines were issued for failure to permit inspection of their stations. All three operators refused to pay the civil penalties. FCC officials and the US attorney agreed that the seizure of the equipment was necessary to achieve compliance with US radio laws. In total, $3200 in fines were issued to Robinson, Calloway and Green.

FEMA EMERGENCY PREPAREDNESS GUIDE AVAILABLE

Millions of Americans Have Experienced Disaster—Are You Prepared? is the title of a publication offered by the Federal Emergency Management Agency (FEMA). This 18-page booklet reviews Civil Defense organizations in the country, how they work in times of natural and man-made disasters, and heightens public awareness of the value of such organizations. At the end of the brochure is a list of other FEMA publications.

FEMA is responsible for a wide range of emergency planning and response activities. It works with state and local governments and national organizations to help communities plan for emergencies of all types.

...*Are you Prepared?* and other FEMA publications may be obtained free by writing to: FEMA, PO Box 70274, Washington, DC, 20024.

PART 97 RULES COVERING INTERNATIONAL RADIO COMMUNICATIONS

The FCC has issued a Public Notice concerning communication with amateurs in foreign countries. The following subjects have been addressed:

Permissible countries: Section 97.111 states when the administration of a country objects to its amateurs contacting US hams, it becomes a "banned country." Currently there are no banned countries.

Prohibited transmissions: Section 97.113 says that communications for the purpose of facilitating the business or commercial affairs

of any party is prohibited. Use of amateur communications as an alternative to broadcast, common carrier, maritime, land mobile or other authorized radio services is also prohibited.

Third-party arrangements: Section 97.115 "...authorizes an amateur station licensed by the FCC to transmit messages for a third party to any amateur station within the jurisdiction of a foreign government whose administration has made arrangements with the United States to allow amateur stations to be used for transmitting international communications on behalf of third parties."

Countries that have made the necessary arrangements with the US to permit third-party messages are: Antigua and Barbuda, Argentina, Australia, Belize, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, The Gambia, Ghana, Grenada, Guatemala, Guyana, Haiti, Honduras, Israel, Jamaica, Jordan, Liberia, Mexico, Nicaragua, Panama, Paraguay, Peru, St Christopher and Nevis, St. Lucia, St Vincent and the Grenadines, Sierra Leone, Swaziland, Trinidad and Tobago, United Kingdom (special event stations with call sign prefix GB followed by a number other than 3), Uruguay, and Venezuela.

United Nations stations 4U1ITU in Geneva, Switzerland, and 4U1VIC in Vienna, Austria, have also made arrangements with the US to permit third-party communications.

FOREST SERVICE FINALIZES FEES FOR COMMUNICATIONS SITES

Over the past two years, *QST* has reported on the proposed rental fee schedules for various radio and television services, including Amateur Radio, which rent US Forest Service land for communications sites in six of nine Forest Service Regions. Originally, the Forest Service proposed fees ranging from $300-$1200 for amateur repeaters. ARRL and individual amateurs submitted comments urging little or no fees. Later proposals suggested a $75 nonwaivable yearly fee for amateur repeaters.

According to the August 23, 1989 *Federal Register*, the Forest Service has now finalized its fee schedule for communications uses. The fee for amateur repeater sites in the six affected Regions has been set at $75. According to the notice, the $75 fee offsets the Service's administrative costs, and will not be reduced. The Forest Service Regions are: Intermountain (Nevada, Utah and parts of California, Idaho and Wyoming), Northern (Montana, North Dakota, and parts of South Dakota and Idaho), Rocky Mountain (Colorado, Kansas, Nebraska, South Dakota and Wyoming), Pacific Southwest (California), Southern (Alabama, Arkansas, Florida, Georgia, North Carolina, South Carolina, Tennessee, Virginia, Kentucky, Louisiana, Mississippi, Texas and Puerto Rico), and Southwest (Arizona and New Mexico.) The effective date for the changes was September 22, 1989.

FCC-ISSUED CALL SIGNS UPDATE

The following is a list of the FCC's most recently issued call signs as of September 1.

District	*Group "A" Extra*	*Group "B" Advanced*	*Group "C" Tech/Gen*	*Group "D" Novice*
0	WW0G	KF0EV	N0KZG	KB0FDO
1	NY1M	KC1QF	N1GXH	KA1UJF
2	WS2R	KE2PD	N2JVZ	KB2IND
3	NW3C	KD3OS	N3HLK	KA3VCY
4	AB4QF	KM4XI	N4WTV	KC4MFK
5	AA5NR	KG5XY	N5PDG	KB5KMF
6	AA6QE	KJ6ZE	N6WET	KC6FOP
7	AA7BR	KF7WI	N7NLL	KB7IOC
8	WU8Z	KF8BE	N8LGA	KB8IBG
9	WK9E	KE9SB	N9IVP	KB9DIU
Guam	KH2K	AH2CF	KH2ED	WH2AMH
Hawaii	**	AH6JV	NH6UK	WH6CFB
Alaska	**	AL7LM	NL7SO	WL7BVN
USVI	NP2F	KP2BQ	NP2DI	WP2AGY
Puerto Rico	**	KP4QH	WP4WR	WP4INE

**indicates that all 2 × 1 calls have been issued in those areas.

NTIA TO STUDY USE OF RF SPECTRUM

The National Telecommunications and Information Administration (NTIA) says that "Commencing this fall...[*we*]...will undertake a comprehensive policy review of the use and management of radio spectrum in the United States." This marks the beginning of the first fundamental reexamination of spectrum policy objectives and issues since NTIA's organization in 1978.

NTIA indicates that the review is timely in light of ever-increasing demands for frequency allocations. These demands will cause changes requiring the development and fostering of policies that will encourage the most effective, efficient and fair use of available frequencies.

In the near future, NTIA intends to issue a Notice of Inquiry (NOI) to request public comment on specific economic, technical, and regulatory issues concerning US spectrum policy.

The NTIA is the executive branch agency principally responsible for the development and presentation of domestic and international telecommunications policy. NTIA acts as principal adviser to the president on telecommunication policy, and is directed to develop a long-range US spectrum management plan. The agency also has statutory authority to license government radio frequency use.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Eastern New York, Eastern Pennsylvania, San Diego, South Dakota, Louisiana, North Carolina, Virginia, and Pacific sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

A petition, to be valid, 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 Headquarters on or before 4:00 PM Eastern Standard Time December 8, 1989. Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before January 2, 1990. Returns will be counted February 20, 1990. SMs elected as a result of the above procedure will take office April 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 January 1, 1990.

If no petitions are received for a Section by the specified closing date, such Section will be resolicited in April 1990 *QST*. An SM elected through resolicitation will serve a term of 18 months. Vacancies in any SM office between elections are filled by the Field Services Manager.

You are urged to take the initiative and file a nomination petition immediately. For more information, contact Richard K. Palm, K1CE, Field Services Manager, ARRL HQ.

• *At the Foundation*

DXing the Foundation

Here's an example of how a specialized Amateur Radio interest can help broaden the educational opportunities for our fellow hams.

By Mary E. Schetgen, N7IAL
Secretary
The ARRL Foundation, Inc

For many people, travel affords a wonderful chance to see, hear and experience the variety of cultures and lifestyles in places different from their own day-to-day environments. For hams who enjoy DX, every QSO offers the vicarious thrill of travel, while never leaving the comfort of the shack easy chair. Hams who have the time and resources to travel often heighten DX enjoyment for all us through their voluntary operations during DXpeditions. Our geographic knowledge increases, we learn more about our greater *international* Amateur Radio community, and in turn, become better informed *world* citizens.

A few DXers have become some of the best remembered and well-loved hams in the international world of Amateur Radio. Some have achieved an almost legendary status for their DX activities, and their stories have graced the pages of ham publications for many years. Two such special hams, Donald Riebhoff, K7ZZ, and Bill Bennett, W7PHO, both Silent Keys, became legends even beyond the DX community. Their contributions to our hobby were different (see Nov 88 *QST* p 47) but important to international appreciation for the friend-making potential of Amateur Radio. Friends of K7ZZ and W7PHO understood the importance of keeping the goals of these dedicated DXers alive and established Foundation scholarship funds in memory of each man, respectively. These scholarship funds are to provide scholarship awards to hams involved in an international studies curriculum.

When each of our funds reaches the $10,000 mark, scholarship awards will be made to deserving students. We'll be publishing the scholarships' "Terms of Reference(s)," so you'll know what you need when applying for these scholarships. Fund balances for each of these scholarships, as of June 30, 1989:

Donald Riebhoff, K7ZZ Memorial Scholarship Fund—$7,145
Bill Bennett, W7PHO Memorial Scholarship Fund—$1,588

Your support of these two scholarships will help us reach our goal of making scholarship awards in the upcoming 1990-91 academic season. If you agree that our hobby offers unique opportunities for greater understanding between communities and nations and want to help our fellow ham-students who are involved in international studies, designate a contribution to the fund of your choice and mail today to: The ARRL Foundation, 225 Main Street, Newington, CT 06111.

THE MERITORIOUS MEMBERSHIP: GIVE A HAM A HAPPIER HOLIDAY

What is a Meritorious Membership? Who receives one? How can I help? The Jesse Bieberman Meritorious Membership Fund is intended to provide for a one-year membership extension for individuals meeting the following criteria: (1) US ARRL membership of 25 years or more; (2) 65 years of age or older; and (3) elderly and/or disabled with a known financial need. Recommendations for Meritorious Membership are made by Division Directors, only. If you know of an individual meeting the above criteria, make a recommendation, in writing, to your Division Director (see listing on p 8 of this issue). And remember: Your contribution to the Meritorious Membership Fund will help assure that longtime ARRL members who may no longer be able to afford membership receive a much appreciated extension. Naturally, we keep our Meritorious Membership recipients confidential, to ensure their privacy.

Contributor's Corner

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

The Victor C. Clark Youth Incentive Program Fund

Tri-City Amateur Radio Club (CT)
in memory of Stanley Lamb, W1WHQ and, A. William Welles, W1KYW

The New England FEMARA Scholarship Fund

Tri-City Amateur Radio Club (CT)
in memory of Stanley Lamb, W1WHQ and, A. William Welles, W1KYW

The General Fund

Frank F. Bateman, N4HRP
Orven D. Hillman
J. F. Meyer, W6ZKF
in memory of Everett Oliver, K9ZHZ
Kenneth C. Hopper, N9VV
Major Wm R. Chaires, K4MSJ
Charles E. Debes, KA5WVH
James M. Pulliam
Virgasun A. Sordillia, Sr, KH6BBC
Walter P. Krueger, W9CTR
Gordon W. Bridwell, K4NGT
Joseph R. Vicich, W9OPI
William B. Thompson, N5KLG
James N. Pruitt, WD4LSS
Charles Timothy Via, WB4SVL
William E. Brosious, WA2HOJ
J. R. Goldthwaite
Sidney T. Smith, W4MV
Paul L. Park, K5OTM
Morley Genuth, NH6NG
Lawrence E. Small, K6GZM
Robert W. Carlsen, K4ALZ
Martin F. Baade, K2LKL
David D. Robb, WØYRN
Chester T. Rice, WA6PAC
Navarro Amateur Radio Club (TX)
in memory of Dan Moffett, N5MOR
Anthony J. Sarli, Jr, N9GLY
Carlton R. Lindell, W8MNG
R. A. Wetzel, W8KNT

As received and acknowledged during the month of **August.**

RSGB 144-MHz Contest Inspires YL

By Diane Jennings, G1YMF
1 Somerville Close,
Little Neston, South Wirral,
Cheshire, L64 0ST United Kingdom

Christopher Partington, GØCLP, and Diane Jennings, G1YMF, stand next to their site during the RSGB's 1988 144-MHz September Trophy Contest on Black Coobe in England's Lake District.

My first contact with Amateur Radio occurred when I overheard Chris, now my fiance, talking of his latest ascent of Black Coombe in England's Lake District to take part in something called "an Amateur Radio contest."

This discussion took place many times in the student union bar of Coventry Polytechnic, and I was soon to discover what these events consisted of—no problem, I thought, if he can do it, then why can't I?

Chris and I became good friends, and as I was also very keen on walking, I decided to prove to myself (and others) that women are just as capable of taking part in a physical challenge as men.

We decided that I would climb Black Coombe with Chris and make the food and the endless cups of coffee that he would consume in the course of the 24-hour, single-operator section of the RSGB 144 MHz September Trophy contest. The weekend was to start with a hectic car journey from Coventry to our accommodation in South Lakeland.

We arrived at Chris's parents' cottage at about 2200 that Friday evening. I was ready for an early night after the tiring journey, but found it rather difficult to sleep as Chris was moving around the cottage until the early hours messing with radios, microphones, batteries, sleeping bags, and countless bits of aluminum mast and aerial pieces.

Ding, ding, ding. The alarm sounded on that Saturday morning and I peered with my eyes virtually closed at the clock—0600. I climbed out of bed and was surprised to find Chris was still preparing for the contest.

After breakfast we began packing the rucksacks. The contest site was to be reached on foot, and I therefore didn't have the comfort of knowing that all this equipment lying before me could be taken to the site by a vehicle. We left the warmth of the cottage at 0830 and proceeded to the bottom of the mountain.

"It's only 2000 feet," I heard Chris say many times, and I didn't think it too bad until I saw the sky turn pitch black and the rain start to pour down as I had seen it do countless times before in that part of the country.

We had divided out the kit, and luckily I had only about 15 pounds to carry. We started the ascent at 0930. I couldn't understand why Chris was in such a hurry to reach the top, since the event wasn't due to start until 1400.

Diane Jennings, G1YMF, received her license after she had a first-hand experience with VHF contesting.

Just over an hour later we arrived at the windy, misty summit. Quickly we began to pitch the ridge tent that was to be our home for the next 27 hours. I soon realized why we had started the day so early. Next came the struggle with the 8-element Yagi. This took some time to anchor down on the 16-foot portable mast in the strong wind. After it was up, I began to wonder how long it would remain on the weather-beaten summit. At last we could retire to our shelter.

Wrapped in down coats, Chris set up all the radio gear and I arranged a "kitchen" for myself. I made a well-needed pot of coffee, and Chris began to check the gear by sending out a series of CQs. It sounded so very strange, shouting out in the middle of nowhere. Then I heard a voice on the other end. It was very clear, and Chris said the signal was 59. After we knew the gear was working, it was time for a coffee break before the contest started.

The 1400 alarm sounded and Chris eagerly picked up his microphone and called CQ. I knew I would not be able to talk to him for the next 12 hours at least. Time passed quickly at first as contacts rolled in. I was sent outside a number of times to check the tent. The sides flapped merrily in the wind.

After the first few hours the number of contacts calmed down a bit, as I suspected people were sitting at home in their centrally heated rooms, drinking a nice cup of tea. Tea for us consisted of soup followed by tinned sausage and beans, which were easy to heat up.

It soon fell dark, and the contest entered another phase. Gas lanterns were lit for heat as well as light, and I crawled into a sleeping bag. As contacts were only coming at the rate of three or four an hour, Chris decided he would close down the station at 0230. The radio gear was moved to one side for a few hours, the lamp put off and we snuggled down in sleeping bags to grab some sleep. A few hours later the alarm rang—another 0600 start. Chris dived to the rig, and began calling CQ for another eight hours.

I thoroughly enjoyed my introduction to Amateur Radio. From the enthusiasm and determination Chris had shown in the contest, I was inspired to study for the City and Guilds exam the following May. In August 1987 I became a radio amateur and have survived several multioperator contests as part of a one-man, one-woman team.

How's DX?

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

CQ de RZ6AWL/UF6O

With the idea in mind for a joint US-USSR DXpedition to UF6 (summer of 1990), a group of Armavir City hams decided to go through a dry run. They chose the mountains of the South Ossetia, in the rare oblast UF6O, 015. The team included RW6AC, UW6CD, RA6AJ, UV6AMT, UW6DR's XYL and several offspring.

On June 30 they began the 1200 km trip along the Black Sea coast to the mountains, through beautiful subtropical scenery, ancient castles, churches and cathedrals. The chosen site was a large meadow on the edge of the woods at 4000 feet above sea level. An abandoned house with commercial power made a convenient shack. One transceiver failed to operate, so the station was limited to one rig and a linear amplifier.

Propagation on the mountain was different from that in the valley, with 80 and 40 meters dead most of the time. While their signals were reported to be strong in Europe, the group did not hear EU signals at all, except for a couple of big guns! Even local contacts were marginal. They made just 100 contacts on 80 and 300 on 40. On the other hand, 20 and 15 meters were great: Contacts totaled 4500, including 2000 with the US.

Jack, RW6AC, was chief of the RZ6AWL/UF6O DXpedition.

The group could have worked more, but their camp attracted the intense curiosity of residents of nearby Georgian villages. The inhabitants were friendly and hospitable, but they knew nothing about ham radio and couldn't understand why the team kept one guy "stuck" to the radio! When the locals found out the group may come back next year with Americans, they gave assurances that all would be welcomed. On July 5, storms approached and the decision was reached to leave while the roads were still passable.

Those who worked RZ6AWL/UF6O twice (on two bands or on two modes on one band) can get the Armavir—150 Years Award. Apply with 10 IRCs to Jack Tatashvili, RW6AC, Box 16, Armavir 352900, USSR. If you make three contacts with different Armavir hams, you can qualify for the jubilee award. (If you'd like to join this international field day operation next year, write Jack for details.—*Ed.*)

CIRCUIT

☐ **The Ten Biggest DX Lies:** (1) I didn't need it. (2) I got him on the first call. (3) I worked him before. (4) The card is in the mail. (5) He answered my CQ. (6) I'll call you just as soon as he comes on. (7) Two more and I make the Honor Roll. (8) He QSLed direct. (9) Sure, I've got them all. I just don't bother to turn the cards in. (10) I'm a DXer and my wife just loves it. (Thanks to K7NG's XYL for the suggestion, and recent enthusiastic convention participation in this weighty discussion, which included ARRL directors W7RM and AGØX!)

☐ **Events:** The New England DXCC Convention and Dinner, Saturday November 18, starting at 1 PM at the Sheraton-Sturbridge Hotel, Sturbridge, Massachusetts. Last-minute info from Fred Lucas, K1EFI, tel 203-775-1896. The 1990 International DX Convention in Visalia, California, will be hosted by the Southern California DX Club at the Visalia Holiday Inn, April 6-8. Don't wait to reserve your room. Call toll free inside CA, 800-821-1127; outside CA, 800-348-8877.

☐ **Bouvet:** At column deadline, LA6VM reports that 90 DXers in 14 countries have contributed toward a charter ship with helicopter to go to Bouvet.

☐ **W4BPD:** The venerable Gus Browning, veteran of 170 or so DXpeditions, has suffered three heart attacks and is in grave financial straits. Cards to Gus' *Callbook* address.

☐ **IOTA:** Nov 11-12, the Florida Westcoast DX Ring will operate KO4J from Egmont Key, just west of Tampa Bay in the Gulf of Mexico 82-46W, 27-35N, IOTA Island NA-34.

☐ **C6:** N4JQQ, KR8V and W8LU will be in the Bahamas Dec 7-11. They'll use C6AFP during the ARRL 10-Meter Contest only, cards via KR8V with SASE. Other confirmations go via individual home calls.

☐ **HS:** Significant 1990 Thailand activity by individuals is anticipated now that the country's King holds HS1A (the club HSØA is now HSØAIT).

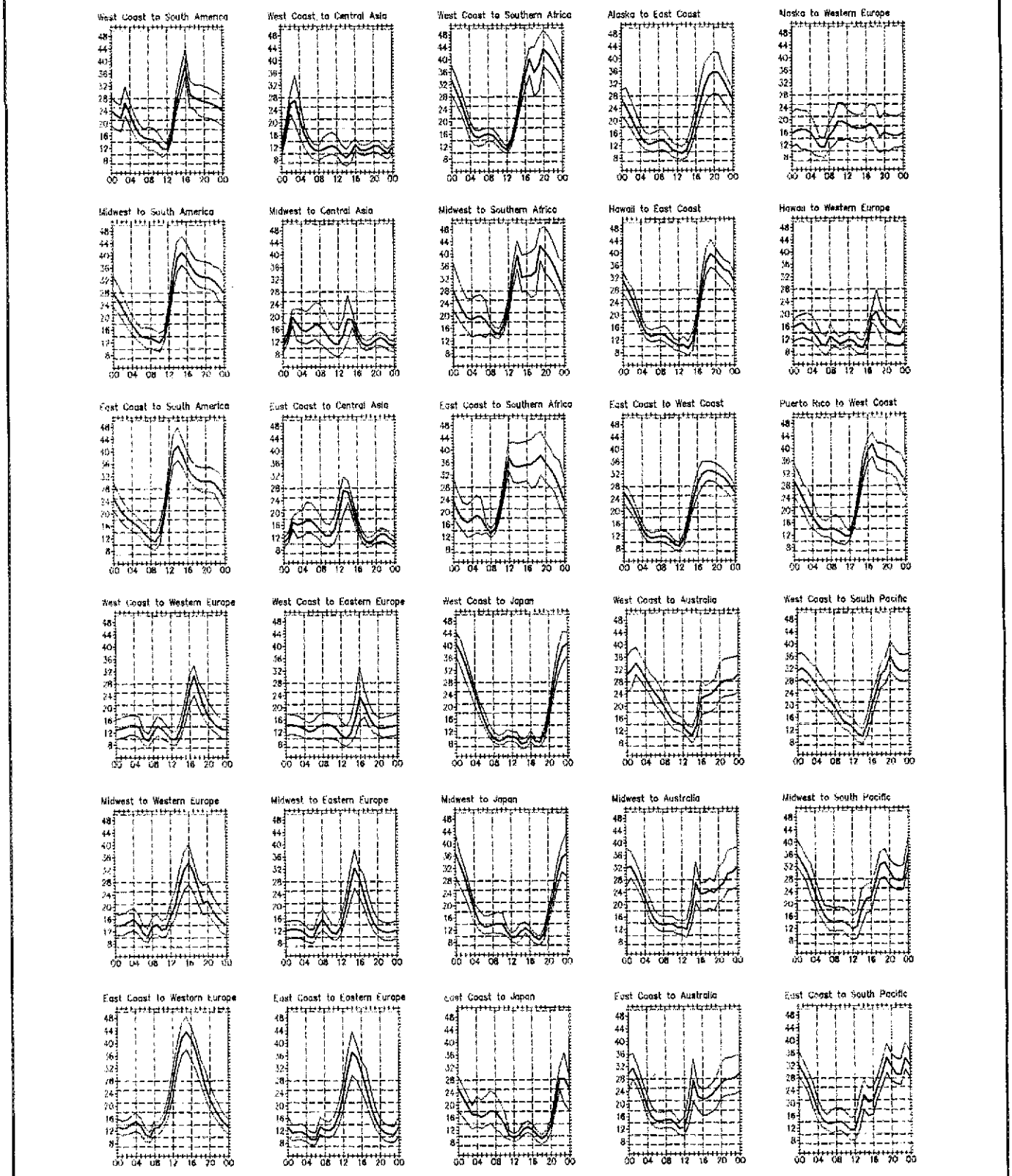
☐ **HL:** The American Radio Club of Korea has old cards just released by the post office. If you were an American HL9 during the past 10 years, send an SASE to the Club, PO Box 153, APO San Francisco, CA 96206. Include the HL9 call and dates it was valid.

☐ **XT2CW:** Globe trotting DK7PE worked 6500 QSOs on all bands in August after receiving a personally signed license from the Burkina Faso PTT Minister. Rudi notes that one of his most interesting contacts was with N9US who was running 1 W on 160 meters!

☐ **RSGB:** The new address for cards from overseas to the UK QSL Bureau is PO Box 1773, Potters Bar, EN6 3EP, England.

☐ **YASME:** The YASME Foundation, Box 2025 Castro Valley, CA 94546, has received numerous old logs from the wife of the late KV4AA: 1956—VR1B VR4AA VK9TW. 1958—VP2AY VP2KF VP2KFA VP2VB VP2MX VP2DW VP4DW YVØAB. 1959—VP2LW VP2GDW VP2SW VP7VB. 1960—VP5VB HC2VB HKØAA. (Thanks RSGB's *DX News Sheet*.)

In a March 1988 trip to the Soviet Union, KA1HBV visited these two Russian hams who hoped to visit the US at year-end. Toivo, RA3AR (r) is chief operator of the Moscow Intersectoral Scientific/Technical Eye Microsurgery Complex Club Station, UZ3AZZ. He is a former Aeroflot pilot, and holds the title of Master of Sport—a busy QSL manager who handles cards for the Antarctic stations 4K1A, 4K1HK, 4K1ANO. He also manages UAØZDA in Kamchatka. Natasha, RA3AP, is an engineer and active on all CW bands. QSL via Toivo Laimitainen, Box 459, 127349, Moscow, USSR. *(photos courtesy KA1HBV)*



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 smoothed (E/GC2), Boulder, Colorado. Curves are generated using IONCAP. These predictions, for November 16 to December 15, 1989, assume a smoothed sunspot number of 190, which corresponds to a smoothed 2800-MHz solar flux of 234.

Correspondence

Conducted By John C. 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.

EXCELLENT ADVICE

☐ Just read N4LBJ's letter in the September issue of *QST* entitled "Switch to Safety" and in no way could I more closely identify with him. It brought to mind a similar experience in 1938 shortly after my coveted ticket arrived.

At 17, I was servicing (poking around) a power supply I had just built. The output filter was a bargain-type cocoa box unit with two porcelain insulators. As I lifted the lug from the positive terminal, a spark as thick as a pencil and a half-inch long suddenly hissed menacingly at me. After regaining only partial composure, it became obvious that not only was the line cord plugged in, but the B+ toggle was on. After discharging it with a long screwdriver, a VOM was attached and the line cord plugged in. After waiting for the rectifier to heat, the B+ toggle was thrown with a piece of wood. The meter read 960 volts dc.

Only by the grace of God did my body not contact ground when unloosening the nut on the positive terminal!—*Dick Abeles, W2LMR, Hicksville, New York*

10-METER CALLING FREQUENCY

☐ September *QST* had two letters of interest to me. [With regard to] Chuck Albecht's letter, I sure wished the editor had put in a comment about not dropping down [from the 10-meter repeater subband] to the 29.3-29.5 MHz segment which is reserved for satellite operations! We [at AMSAT] are still getting comments from our satellite users about the QRM from FM stations.

[With regard to the letter from] Pete Gerardi, KE4TP [concerning] "SSTV and The Gentlemen's Agreement," there is also a calling frequency for mode B satellite operation using SSTV, namely, 145.888 MHz. —*John Champa, K8OCL, AMSAT, Dearborn, Michigan.*

DIAMOND JUBILEE AWARD: IN CELEBRATION OF ARRL

☐ The stool has three legs now that I have worked 75 countries on the 18- and 24-MHz bands. Back in January, I submitted my application for the League's Diamond Jubilee Award after working 75 ARRL/CRRL Sections and 75 Novice/Technician stations. These accomplishments put the first two legs on the tripod for my Diamond Jubilee Award. Now the third leg has been earned, as I worked 4X4OG in Israel on 18 MHz for my 75th country on the 18 and 24-MHz bands. This well thought out League program has clearly been a great stimulus for the Amateur Radio community in bringing attention to these wonderful WARC bands, and it has brought the League's 75th anniversary to the attention of Amateur Radio operators and others throughout the world. My experience in discovering these new bands as a direct result of the League's Diamond Jubilee program has been an unexpected pleasure. Much of my operating in prior years has been on the congested traditional bands of 14, 21 and 28 MHz. Operating on these new bands has been a delightful experience.—*Kenneth Miller, K6IR, Rockville, Maryland*

BRAVO, *QST*

☐ I wish to compliment ARRL on the current format of *QST*. It used to be rather dull reading in years past, but no more! The September 1989 issue was quite a marvel, especially the "Tales of Triumph" in the Novice Notes section. This is what Amateur Radio needs more than anything else: *human interest* stories, lively written with the ring of truth in them.—*Dr F. Paul Kosbab, NF4E, Tulsa, Oklahoma*

SUPPORT NEW AMATEURS

☐ A codeless license would let the public know that we are surely on the cutting edge of communications technology with the digital modes enabling the networking of computer systems worldwide through radio. Right now, my impression is that many nonhams see our service as an "old man's hobby" of the pre-World War II era. As a result, they (especially teenagers and young adults) shy away. We should concentrate our energies not only in terms of the sheer variety of what today's Amateur Radio has to offer the prospective licensees, but also emphasize that it's *everyone's* hobby, the only initial prerequisite being an interest in radio communications.

I would like to emphasize how proud I am to be an Amateur Radio operator and a member of ARRL. Through the hobby, I have made several close friends, engaged in public-service work and have had hours of fun operating and making contacts all over the world. Without the unselfish support of hams, it would not have been the pleasure it has been to be a member of the fraternity. If we desire to continue our proud tradition, let us make the necessary positive changes. Let us show each and every prospective licensee that we, the worldwide amateur fraternity, appreciate their interest, and we will give them all the guidance and encouragement we received from our Elmers. I pray that, through the conscientious effort of every one of us, Amateur Radio will remain a strong worldwide service, and hopefully we will become even stronger as years pass.—*L. S. "Steve" Williams, KC4AZO, Snellville, Georgia*

AMATEUR RADIO IN CHINA

☐ I noticed with some interest the article entitled "Squelch Tails from China's Great Wall" in September *QST*. There seems to be some question as to the status of Amateur Radio since the events of June 1989 in Beijing. I was recently in Beijing and visited with Tong Xiao-Yong, Director of BY1PK.

There was reportedly no violence near BY1PK in the June incident. Everything in Beijing seems to be back in order, but people seem to be more careful as to whom they talk with and what they say. I find the people of Beijing to be generally warm and friendly.

Mr Tong reports that there are now over 300 licensed hams in China. Chinese salaries (on the average) are very low and import duties high, so it is not likely that we will see many big stations that are privately owned. Mr Tong also indicated that because of various other duties at the Chinese Radio Sports Association (CRSA), it may take up to one year to respond to QSLs.—*Scott Irvin Brear, VS6WS/KG6QT, Lantau Island, Hong Kong*

HURRICANE HUGO

☐ I recently had a chance to listen to the various nets that were in operation during the Hurricane Hugo disaster. What I heard made me proud to be a ham and, at the same time, made me feel ashamed. Some individuals, rather than standing by to help if needed, jammed the nets! During the emergency, I couldn't believe the juvenile behavior that was displayed. We argue that CW is supposed to be the "buffer to keep the riff-raff out." Well, a few of the sick individuals who seem to pop up whenever something important is being done must not be aware of this fact.

Most of the nets I monitored were run well and efficiently. The operators in the affected areas were, in most cases, using low power and simple antennas. It was sometimes a chore just to hear them. The net controls exhibited extreme patience under tough conditions and they are to be commended. As for the sick individuals who insist on disrupting vital communications, they do need help. Watching TV footage of the hurricane makes one realize that this was not a game, an exercise to amuse the hams, but a real emergency. Peoples homes and businesses were swept away in a matter of hours.

To all who helped, even if only standing by, good job. To the jammers, go crawl back under your rock!—*John Meyers, KD8MQ, Alliance, Ohio*

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. You may endorse your award in 25-country increments through 250, 10-country increments through 300, and 5-country increments above 300. The Satellite, 160 Meter, 80 Meter and 40 Meter DXCC awards are endorsable in 10-country increments through 200, and 5-country increments above 200. The totals shown below are exact credits given to DXCC members from June 20 to July 10, 1989. An SASE will bring you the rules and applications forms for participation in the DXCC program. Send $1. to request the ARRL DXCC Countries List.

NEW MEMBERS

Mixed

DJ4GJ/119
JF1MCX/109
JE2DTL/149
JH4DVJ/110
KP4AOD/176
LU5EIC/113
SM6ANW/106
VE2FVO/102
XX9JN/102
ZS4TX/124
KA1SKL/105
N1FBG/149
WA1WMS/278
KA2UHJ/110
KB2BBG/101
KE2DJ/105
W2IRZ/102
NK3Z/104
WB3IMM/101
AA4W/109
AB4GA/106
K4ODL/235
KM4FI/114
N4REE/152
WB4DIW/110
WB4UMJ/142
AI5P/PA/193
WB5KYK/102
AA6GH/110
K6RUW/125
W6EQB/156
WB6QKG/103
K7SXI/118
N8IAG/115
KE9OR/100
N9GWG/137
N9HXG/106
NO9Q/101
NS9A/110
KØCX/112
WB9HCH/110

Phone

CP6IH/144
CT1DGK/176
DJ4FU/106
GW4TFX/103
HK4HHG/165
I6VYV/302
IK8LFN/123
JH4DVJ/110
KP4AOD/176
PA0HVF/290
SM4GTB/122
VU2GUY/109
XX9JN/102
YC6OP/107
YC8MCA/171
YT7CC/109
ZS4TX/124
KA1OFC/130
W1HGY/102
KA2UHJ/110
KB2BBG/100
W2FIU/127
WA2CBU/278
W3ERN/108
WB3DVD/101
KF4MA/114
KM4FI/105
W4PWR/110
WB4UMJ/129
KB6LEI/100
KE6JP/150
KF6AY/100
N6QPY/103
K7SXI/118
K8BL/104
KD8CM/113
KS8W/104
N9EWE/101
N9FFP/104
NØGWR/213

CW

DF4XR/109
DK1WE/134
DL1FU/106
G3MXJ/215
I8IGS/109
JR1ARK/103
JE2ARR/105
JA3ART/187
JA3RMW/110
JA6CBG/106
LU8MAH/108
NQ1K/102
N2ZZ/107
N4ZQ/118
WA4FOF/115
N5DKS/101
K6RUW/125
KI8W/115
KS8W/127
N8IAG/102
W8CTI/219
K9DFK/130

RTTY

HB9DCQ/110
KA1AE/102
WA8FLF/104

Satellite

KD6PY/100

160 Meters

F6BLP/101

80 Meters

ZL4LZ/161
NQ1K/105

40 Meters

DL2XN/102
G3TJW/303
ZL4LZ/200
KZ3H/185
W3GG/277
WB5ZKR/142
NY7Z/114

10 Meters

VE4ROY/100
NQ1K/125
KA2UHJ/110
WA2FUZ/100
N3FXW/110
WB5MTV/104
N6IXX/104
NY7Z/112
NØRR/205

5BDXCC

N5TC
EA5BYP
WA6RLE
WA4DPU
ON7PQ
K7OX
EA6WV
WØVV
KD8FO
K4IJQ
KA9TNZ
W6AUG
AJ8J
N1CTD
IK5ACO
Y21UG

New Honor Roll Members

Mixed

314

DL7WL/318

313

GW4BLE/319
VE6OU/318
WB4GNT/318

312

DL7MAE/312
JA2JYP/315
SP5EAQ/316
W2JGR/320
KJ3L/316
N7EF/316
W7KS/338
W8WOJ/326
K9RHY/317
NA9O/318

Phone

314

KØGT/317

313

4X4UH/318

312

SP5EAQ/316
K4CKS/316
WB4GNT/317
N6HL/314

CW

308

W3EKN/311

Endorsements

Mixed

DJ4EN/156
DJØGN/157
DL3ZI/354
DL6RAI/306
F6EEM/180
HB9BZA/311
HB0LL/333
I1BRB/228
IV3JWR/269
I6VYV/304
JA1CB/313
JA1NTK/257
JH1OJU/322
JJ1KUV/211
JA2FCZ/313
JF2HPA/293
JA3ART/331
JA3DLE/160
JR3HZW/310
JA4ESR/270
JA7FWR/302
JA7JH/332
JAØCRG/301
JAØDWY/313
JHØLME/125
KP4DQ/200
LA2KD/295
LA6XM/281
OE2KGM/291
OE2SNL/220
OH2BC/348
OH2BH/348
OH2DW/253
OH3NM/264
OK1ADM/351
OK1KRS/311
OZ5PA/255
PY2DBU/304
SM6CKS/340
SM7DMN/329
SM7LOX/252
SP9AI/330
TF3IM/135
VO1CA/300
VE3HO/321
VE3JFS/301
VE3NE/341
VE4IU/275
VE6KY/289
VE7BD/332
XE2GAT/125
AJ1T/125
K1AR/320
K1HI/124
K1JIU/281
K1KI/330
K1VKO/319
KA1A/303
KA1LMR/153
KA1MX/227
KB1HY/290
KC1DQ/175
KE1K/303
KN1I/250
KZ1L/224
N1CLC/154
NQ1K/300
W1AXA/362
W1OO/345
W1WW/326
W1YCO/149
WA1EOT/322
WB1EEU/134
AF2C/312
K2BS/346
K2ENT/315
K2FL/362
K2LE/344
K2QPM/175
N2DL/325
N2JV/319
N2ZZ/201
NK2H/300
W2AXZ/305
W2IRV/357
W2KE/324
W2OW/265
W2SE/225
W2VAV/234
WA2MOE/316
WB2FTK/263
WE2L/301
K3RT/318
KA3LHP/202
KC3WY/126
KY3T/154
N3BQS/179
NM3C/273
NS3K/250
W3EKN/340
W3HCW/299
W3MQF/272
W3NB/340
WA3EBA/199
AA4H/315
AA4MM/339
AA4NA/316
AB4AE/284
AB4DU/153
AE4X/355
K4AVC/290
K4DLI/307
K4DY/341
K4HMX/259
K4KJZ/318
K4PT/279
K4TXJ/316
K4UEE/329
K4XI/329
KC4MJ/260
KE4HX/305
KF4IX/276
KI4HL/279
KJ4GK/267
KJ4VH/256
KJ4YF/196
KK4JF/271
KK4YA/157
KM4IH/168
KN4F/301
KN4KWD/278
KT4M/263
N4GDJ/210
N4HH/323
N4IA/326
N4OL/331
N4ZQ/212
NK4L/308
NY4A/181
W4BFR/354
W4CZU/324
W4DXI/336
W4FGX/310
W4GW/300
W4IF/357
W4JFL/250
W4MGN/354
W4OHZ/321
W4OO/356
W4USW/268
W4UXI/306
W4VN/317
WA4BEU/150
WA4DAN/317
WA4FVT/316
WA4HDD/313
WA4JZS/289
WA4VDE/320
WB4BBH/283
WD4FWE/303
WD4IKI/259
WI4K/300
WW4Q/276
AA5BK/250
AA5CV/127
K5FJ/358
K5JUC/317
K5TSQ/316
KF5EA/269
N5HB/301
NZ5O/210
W5QK/357
W5RKK/303
WB5UFR/269
WN5MBS/260
WS5E/290
WZ5I/232
K6NL/309
K6TS/280
KC6X/263
KI6AN/225
KJ6NZ/229
N6CR/322
N6HL/317
N6JE/225
N6NMH/130
N6RJ/330
NB6L/313
W6BVM/357
W6KG/357
W6KUT/363
W6QL/343
W6SQP/361
W6YK/362
WA6JCD/226
WB6OHH/177
WB6RSE/319
WD6L/125
WW6F/171
K7AA/333
K7JBQ/156
K7LAY/321
K7NTW/225
KC7LZ/155
KE7X/281
N7CNH/150
NB7N/185
W7BMM/153
W7IIT/260
W7IR/364
W7LGG/317
W7MB/370
W7OEV/340
W7YS/251
WB7CLU/317
WB7EEI/313
WC7F/163
AI8S/318
K8BL/177
K8JP/303
K8MNG/318
K8OHG/349
K8ONV/354
K8TU/337
KA8ANQ/253
KB8DA/213
KN8Z/335
KS8W/152
N8DLR/270
NI8C/260
W8CBA/308
W8CNL/338
W8ILC/341
W8YMB/300
WA8MZO/215
WB8RNY/253
K9CJK/345
K9KA/338
K9QXY/320
K9WJU/300
KA9GZM/126
KG9N/309
KC9O/270
NC9T/252
NJ9R/156
W9BB/202
W9HK/352
W9IT/335
W9NYG/228
W9TY/321
W9ZM/369
WA9TBA/201
KØIEA/334
KØWWX/333
KD8JL/279
KS8Z/305
N8ICU/176
N8JR/278
NA8Y/356
ND8F/301
NI8G/292
W8BW/367
W8CJZ/347
W8EJ/305
W8VV/260

Phone

DJ6FN/327
DJ8AF/147
DL7MAE/307
EA5AT/294
F3EJ/206
F6CQT/314
F6DLM/320
F6FWW/305
G8FWG/182
HK8BVN/305
IK7FPV/291
I8IGS/303
JA1NTK/230
JH1OJU/319
JJ1KUV/193
JA2FCZ/307
JA2JYP/313
JF2HPA/277
JH2UVL/263
JR2UBS/205
JA3ART/304
JA3DLE/130
JA4ESR/237
JA7FWR/286
JA7JH/331
JAØDWY/308
LU4MEE/310
OE2KGM/285
OK1ADM/345
SM6CKS/340
SM7LOX/250
TI2CC/326
TI2HP/368
VE3HO/320
VE3NE/340
VE6OU/310
VK5QW/282
KA1YK/225
KE1K/280
NQ1K/271
W1JCI/237
W1NM/309
WA1EOT/313
AF2C/296
K2BS/343
K2ENT/315
K2FL/353
N2ZZ/183
NK2H/300
WA2MOE/309
WE2L/301
K3RT/287
KA3LHP/177
KB3PJ/328
KJ3L/312
W3EKN/319
W3HCW/299
W3MQF/270
AA4MM/339
AB4AE/284
AE4X/334
K4DLI/305
K4HMX/258
K4KJZ/318
K4ODL/233
K4UEE/306
KB4IT/315
KB4SSS/194
KC4MJ/260
KD4NZ/281
KE4HX/305
KF4CM/205
KK4JF/271
KK4YA/151
KM4IH/168
KN4F/281
KT4M/264
N4IIA/130
N4MAD/262
N4MZL/203
N4PUQ/159
N4REE/152
NU4D/302
W4BFR/334
W4FPS/339
W4MGN/345
W4RNZ/308
W4TDW/344
WA4DAN/311
WA4DRU/317
WA4ETN/286
WA4FVT/307
WA4HDD/312
WA4LPM/201
WA4OBZ/191
WA4PZD/150
WA4VDE/319
WB4BBH/251
WB4FQP/308
WD4IKI/254
WD4LJY/269
WI4K/299
K5FJ/348
KA5WOO/261
KE5PA/290
NI5D/248
NJ5L/174
NZ5O/201
W5EZ/310
W5RKK/301
WN5MBS/260
K6FNS/200
KJ6BI/231
N6CR/322
N6IXX/128
W6BCZ/162
W6KUT/348
W6UVW/211
WA6JCD/190
WA6LOD/292
WA6RLE/301
WA6RTA/331
WB6PSY/310
WB6RSE/308
AL7EL/305
K7GEX/315
K7LAY/296
N7EF/312
NB7N/180
NK7Y/280
NZ7D/280
W7BMM/152
W7OEV/333
WB7CLU/316
WC7F/153
AI8S/317
K8ONV/338
K8TL/314
KA8ANQ/249
KB8DA/213
KN8Z/334
W8CBA/307
W8CNL/334
W8ILC/335
W8TN/314
W8WOJ/316
WA8VPN/280
WA8YTM/289
WB8RNY/253
WB8WWK/131
K9KA/336
KC9YX/290
KD9RG/152
KG9N/294
NA8Y/350
NJ9R/153
NJ9X/239
W9HHS/205
W9TY/281
W9VSL/261
W9ZM/357
KBJRG/292
KØWWX/329
WØBW/360
WØEJ/262
WA8EWU/125
WB8CIW/320

CW

DL7MAE/303
DL7WL/303
DL9LBR/154
G3VQO/178
GU4RUK/125
HK1BAU/259
I2IWM/252
JH1OJU/294
JA2JYP/263
JH2UVL/228
JH8CMZ/160
JAØDWY/276
LA2KD/254
LA9XG/290
OE2KGM/235
OE2SNL/157
OZ5PA/223
PY4WS/177
VE3HO/283
VE6OU/269
K1VKO/287
K1YR/202
KE1K/225
N1CIX/227
W1JR/316
AF2C/236
K2ENT/301
K2FL/321
WA2ASQ/175
KA3LHP/125
KA3OGU/136
AA4DO/260
K4OQK/205
K4PR/268
K4UEE/299
K4XI/285
KA4YAE/203
W4BFR/304
WA4DAN/296
K5TSQ/294
K6TS/264
K6NVN/216
WB6RSE/318
KE7X/277
N7EF/302
NQ7B/141
NR7F/271
W7IIT/251
AI8S/290
K8TL/253
KN8Z/290
W8CNL/266
KG9N/255
KU9C/126
NJ9X/174
W9TY/311
W9ZM/319
N8JR/229
NI0G/263
W8BW/314
WØEJ/253
WA8EWU/125

RTTY

I8AA/275
OE2SNL/200
K2ENT/175

160 Meters

W1JR/163
K4PI/171
K4UEE/173
W4MGN/172
W6DAO/110
KJ9I/151

80 Meters

JA3EMU/250
W3MFW/305
W4MGN/232

10 Meters

K3UA/250
K4CKS/300
K4PI/291
WA6BYA/175
WB6PSY/295
K7GEX/130

The following is a list of those amateurs who have qualified for 40 Meter DXCC during the period from May 1 to June 19, 1989. For those members whose applications were received by May 1, 1989, award number is shown, followed by member's call sign and total number of DXCC countries confirmed on 40 meters. The award number has been omitted for awards earned after May 1, 1989. Applications received by May 1, 1989:

1. W4DR/330
2. W8AH/321
3. JA2BAY/318
4. G3KMA/310
5. K4DY/308
6. JA8DWR/307
7. JA1ELY/306
7. W9ZR/306
9. N4KG/305
10. JA2VPO/302
11. JA8EAT/301
11. SM6AJU/301
11. VK6HD/301
14. K1MM/299
15. DL1PM/297
16. K1MEM/295
17. JA1UQP/294
18. K5UR/293
19. K2TOC/292
20. W4VQ/291
21. K4PI/290
22. W1JR/289
22. K3FN/289
24. K1XM/288
25. W1NG/287
26. I8WDX/285
26. N4JJ/285
28. K2FL/283
29. OZ1LO/282
30. 4Z4DX/278
31. K4CIA/271
32. W3AP/268
33. K1IU/267
34. KQ1F/262
34. K4XQ/262
36. GM3ITN/259
37. K7UR/258
38. HB9RG/256
38. VE7AHA/256
40. N2LT/255
41. G3XTT/251
41. OK1MP/251
41. W1GL/251
44. W1AX/250
45. W1YY/249
46. W1WAI/248
47. SM6CVX/245
47. K3UA/245
49. W7IGE/244
50. W8PGI/243
51. K5OVC/242
52. DL7EN/238
52. SM5AKT/238
54. I1JQJ/237
55. JA1GTF/236
55. WB2P/236
57. K1EFI/235
58. W2FR/234
59. K8II/233
60. W4WJ/231
60. WB4MAI/231
60. KB0G/231
63. K6EID/229
64. AA4V/228
65. DJ5JH/225
65. K5UC/225
67. OZ3PZ/223
67. W1MK/223
67. KA8CDN/223
70. N4MM/222
71. K4KUZ/221
71. W8JR/221
73. W3UM/219
74. VE7DX/215
75. KD7SO/214
76. KZ4V/212
77. K1NTR/210
77. K5TSQ/210
79. K2UO/207
79. WA7BPI/207
81. K5AQ/205
82. SP6CDK/204
82. W1RR/204
84. DK6WL/202
85. KJ3Q/199
86. K5KLA/197
87. NR1R/196
88. WB4TDH/194
89. W8YK/193
90. N6ET/192
90. NS7Z/192
92. K1ZZ/189
92. KB8DB/189
94. K7SP/188
95. JH7LVK/187
96. W1KSZ/185
97. WA2UKA/182
97. N7US/182
97. W6HBH/182
100. K3NW/181
101. W6JD/179
101. K9IW/179
103. AB9O/178
104. DL9TJ/174
104. KB1BE/174
106. W2KKZ/173
107. WA2UUK/171
108. K9FD/170
109. WF4G/169
110. GM4KHE/168
110. KS3L/168
110. K8CH/168
113. N4XR/167
114. AE6H/166
115. AA4DO/165
116. OZ3SK/162
116. K4XG/162
118. K1TO/161
119. W8SR/158
120. WB8ZRL/156
121. NQ7M/155
121. K9ALP/155
123. WA4QMQ/154
124 DK5WL/153
125. W4OUE/152
126. N2KW/151
126. K4IQJ/151
128. K2POF/150
129. W1ENE/149
129. W8IZ/149
131. ZS6BCR/148
132. JAØUMV/146
133. JH1IED/145
133. W3KYN/145
135. JA2NQG/143
135. NE4A/143
137. NY2E/141
137. WB2DND/141
139. WA2DHS/139
140. AA4UJ/138
141. VE3OU/138
141. K3SEW/138
143. WA5TOS/134
143. KØQQ/134
145. W2WOE/133
146. W6KG/132
147. VE3JGC/131
147. WA2LIY/131
147. N4ONI/131
150. K7WA/129
150. W8IQ/129
152. HK7MQC/128
152. K4SE/128
152. W4FRU/128
155. W1BFT/127
155. AK5Q/127
157. K6SIK/126
158. WA7UVO/125
159. KL7XO/124
160. JH3VNC/123
161. K1CLN/122
162. W2FCR/121
162. KI4LP/121
164. JF1SEK/120
165. VE7EW/117
165. W6QL/117
165. N7JB/117
168. KE7LU/116
169. KC7EI/115
170. KM1D/114
171. AA4XR/112
172. DL5SBA/111
172. AI6Z/111
172. N6CGB/111
172. WI8P/111
176. N2CIC/110
176. WØYDB/110
178. JA1ADN/109
179. WB4FOT/107
180. LZ2JE/105
180. K7NN/105
180. K8IIR/105
183. N9AG/104
184. NG8T/103
184. K9ZXG/103
186. NQ1K/102
186. NY5F/102
186. KØHQW/102
189. WB1EAZ/101

Applications received from May 2 to June 19, 1989

SM6CST/207
NT5G/195
KC7V/180
DL1EV/141
K3PA/136
K1KOB/107
K6YRA/225
SMØDJZ/219
N6JM/119
WB8SSR/102
K4II/253
DL3RK/234
SM6BGG/205
NX7K/158
HB9BMY/141
VK1ZL/106
NØZA/135
VE1ACK/110
W6ISQ/243
YBØABV/106
W4LZW/102
K4MF/211
K6MA/162
N6JV/233
JA1SJV/147
WØJF/126
K3JGJ/117
JA3CSZ/294
WA8YTM/153
WD4JHY/101
JA7TQK/112
KØOST/102

Public Service

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

The Train Without a Whistle

By C. Russell Allor, N5ADF, ARRL SEC, Louisiana

Grosse Tete, Louisiana is a small bayou town surrounded by Bayou Grosse Tete, Interstate 10, and the Union Pacific Railroad. Local people are accustomed to freight trains rumbling through town several times a day, blowing their whistle at the crossings.

On Thursday, June 8, 1989, shortly after 6 AM, some of the townspeople heard the familiar rumbling train sound, but "it had no whistle blowin'" as stated by one person in a later interview. It was in fact a violent tornado that destroyed about a third of the homes in this tiny town.

The funnel cloud roared out of the Atchafalaya basin, across cultivated fields, the railroad, and into the town that morning. To our amazement, only two fatalities and a couple of dozen injuries resulted. Even the Baton Rouge weather bureau didn't expect tornadoes. Warnings and watches had been called off earlier, and 6-AM radar showed only a thin line of rain on the trailing edge of a frontal system. The tornado took everyone by surprise.

The event was first reported on the Rosedale repeater, located four miles to the north. Within minutes, Avery Bossier KB5HPQ reported the unbelievable destruction. The State Police was immediately called on Baton Rouge's 19/79 repeater, 20 miles away. Within the first 30 minutes, welfare messages and calls for emergency personnel were being handled on the local autopatch.

Law enforcement personnel set up a command post at a local truck stop. Communications were maintained between the command post and hams who were assisting Red Cross volunteers in planning shelters at the Grosse Tete Lions Club and, later, at the the T. A. Levy school in Rosedale. Amateur Radio Service communications equipment was in place and on the air by 9:45 AM.

The devastating winds did not end their destruction at Gross Tete. Soon after the tornado had left there, it was sighted near Baton Rouge by Chauncey Patterson, WA5TZU. The 19/79 repeater was utilized to contact the National Weather Service in Baton Rouge to pass on eye-witness reports. Based on the integrity of past reports by hams on the local SKYWARN net, the NWS issued a tornado warning for the surrounding area.

During the next hour, other tornadoes were spotted by hams from Iberville, Livingston, Pointe Coupee and East Baton Rouge Parishes.

Later in the day, the National Guard arrived at Grosse Tete to prevent looting. Additional hams were called in to assist both the Guard and local law enforcement officials with the job of watching the town that evening.

Communications were maintained through the weekend until 6 PM Sunday when operations officially ended for the ham operators. Some of these dedicated Amateur Radio Service volunteers had little or no training and had never been involved in this type of public service communications activity. In spite of this, these individuals and the other sixty-or-more hams that participated in the communications emergency are to be commended for a job well done.

Oregon Amateurs Assist USFS

By Frank Erickson, Eagle Cap Ranger District, Enterprise, Oregon

When Forest Service fire fighters began battling the 8000-acre Summit Fire in northeastern Oregon last summer, they were faced with a serious problem: they had no way to communicate with the outside world.

The Summit Fire, caused by several lightning strikes on July 26, was situated on the western rim of Hells Canyon in the Wallowa-Whitman National Forest. The fire burned rapidly through steep, rough country that is hours from the nearest town, tiny Imnaha. To say that the area is remote is somewhat of an understatement.

The existing two-way radio system on the Wallowa-Whitman National Forest was overtaxed with traffic from other fires, and no portable fire communications systems were available. To solve the problem, fire managers looked to local Amateur Radio operators for help.

Within hours, local operators mobilized to establish a communications system for the Summit Fire. Gene Wilson, W7FRM, a 50-year veteran of both Amateur Radio and commercial broadcasting, coordinated the effort from his home in Enterprise. As well as being an experienced radio operator, Wilson had first-hand knowledge of the terrain in the vicinity of the fire, as well as experience in dealing with emergency situations.

Three lines of communication were established: two utilizing a pair of 2-meter simplex frequencies, and another utilizing the Spout Springs repeater, located between Pendleton and Elgin, some 5500 feet up in the Blue Mountains. The repeater operates under a special-use permit from the Forest Service, and provides three-state coverage and, in this case, noise-free communications from the Summit Fire base camp, some 70 miles away, to fire dispatchers in LaGrande, 30 miles from the repeater.

Forest Service communications specialists Mike Reagan and Mark Armstrong had nothing but praise for the radio operators. "The hams are a good resource to draw on," commented Armstrong. "Without them, communication would have been limited and certainly inadequate."

"They helped us with a critical communication problem for 18½ hours on last year's Tepee Butte Fire," said Reagan, who is a radio operator himself. "They're back helping us again this year, donating both their time and equipment. We owe them a great deal of thanks and a pat on the back."

Field Organization Reports August 1989

(The Field Organization reports appearing in September *QST* were actually those from June rather than July 1989.)

Section Emergency Coordinator Reports

Twenty-four EC reports were received, denoting a total ARES membership of 17,068. Those sections reporting were: AZ, GA, IA, ID, IN, KY, ME, MI, MN, MO, NFL, NH, NM, OH, OK, OR, ORG, RI, SD, SDG, STX, VA, WWA, WTX.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	107	86.30	476	1001
TCC Central	93	95.00	371	389
TCC Pacific	90	72.58	346	671
Summary	290	84.62	1193	2061
Cycle Three				
TCC Eastern				
Cycle Four				
TCC Eastern				
TCC Central	71	78.30	382	793
TCC Pacific	200	83.06	479	949
Summary				

TCC ROSTER

Eastern Area Cycle 2: KW1U Director. K1EIC W1FYR K1GRP KT1Q W1QYY KW1U WA2FJJ W2FR NN2H WB2MNA W2MTA KA2UBD N2XJ N3AZW N3EMD NC3V WA3YLO AA4AT W4FRR N4GHI NJ4L WB4PNY N4SS W8BO KA8CPS WT8L WD8LDY W8PMJ NJ8S WB8YDZ W8YP VE3ORN.

Eastern Area, Cycle 3 & 4: KN1K Director. N2IC ND5T K6LL W6EDT W6VZT WF6O KA7CRT KN7H NR7E W7EP W7GHT W7LG W7VSE KØDJ KØSN KØTER KCØD KJ6G.

Central Area, Cycle 2: NØFBW Director. WA4JDH W6CTZ KD5KQ AE5I NS5M K5UPN WB5YDD W5YQZ KE5ZV KA9FEZ KAØEPY WØFE WBØWNJ VE5KZ.

Central Area, Cycle 4: K5GM Director. WB5J W5JDF KM5L K5MXQ N5TC K5TL W5TFB W5TNT KB5W W9CBE NR9K W9KLN KAØEPY WØGRW AIØO NRØS NBØZ.

Pacific Area, Cycle 2: ND5T, Director. W5JOV K6UYK WF6O KI6ZH W7AMM VE7EIL KF7R W7TGU W7IGC NØIA WAØYNP.

Pacific Area, Cycle 4: KØDJ Director. N2IC ND5T K6LL W6EDT W6VZT WF6O KA7CRT KN7B NN7H NR7E W7EP W7GHT W7LG W7VSE KØDJ KØSN KØTER KCØD KJØG.

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep to Area	% Rep to Area
Cycle Two						
Area Nets						
EAN	31	867	28.00	.676	90.0	
CAN	31	756	24.39	.466	100.0	
PAN*	56	345	6.16	.414	88.2	
Region Nets						
1RN	62	453	7.30	.454	91.0	100.0
2RN	54	200	4.07	.358	84.8	96.8
3RN	31	142	4.60	.370	83.1	93.6
4RN						100.0
RN5						100.0
RN6	62	61	.98	.154		96.4
RN7						100.0
8RN	62	386	6.22	.317	98.9	100.0
9RN	62	380	6.12	.383	92.8	100.0
TEN	62	523	8.43	.317	84.0	100.0
TWN	61	392	6.43	.526	81.0	95.4
ECN						54.8
Cycle Three						
Area Net						
EAN	31	222	7.16	.497	77.4	
Region Nets						
1RN	31	56	1.81	.197	92.2	100.0
2RN	29	131	4.51	.384	97.9	87.1
3RN						93.5
4RN						87.1
8RN						96.7
ECN						64.5
Cycle Four						
Area Nets						
EAN	31	1090	35.1	1.265	95.4	
CAN	31	904	29.1	1.056	100.0	
PAN	29	702	24.2	.798	96.7	
Region Nets						
1RN	62	549	8.86	.625	97.0	100.0
2RN	52	186	3.57	.418	78.4	96.7
3RN						93.5
4RN	62	306	4.94	.440	80.0	93.5
RN5	62	896	8.05	.560	87.7	100.0
RN6	62	243	3.92	.408	91.9	100.0
RN7	62	413	6.66	.674	89.2	100.0
8RN	59	301	5.10	.400	90.0	96.7
9RN	62	279	4.50	.400	95.6	100.0
TEN						100.0
TWN	52	199	3.83	.294		91.9
ECN						96.7
ARN	31	105	3.38	.091		90.3

*PAN operates both cycles one and two.

ARRL Section Traffic Managers reporting: AL, AR, CT, DE, EMA, ENY, EPA, GA, IA, IL, IN, MDC, ME, MI, MN, NC, NFL, NLI, NTX, OH, OK, OR, ORG, RI, SD, SB, SFL, STX, TN, VA, VT, WMA, WNY, WPA, WTX, WWA.

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 written notification to ARRL Public Service Branch, will be awarded a special PSHR certificate from HQ. This certificate is a one-time award, ie, it is not issued more than once.

453
KC9CJ
369
WD8V
322
W8AKF
161
WB2OWO
157
WTØG
155
WA2SPL
149
N4GHI
136
WG9J
134
W2QNL
130
WI2G
129
W2MTA
128
WT7A
126
KF5BL
123
N1CPX
120
WB4VMX
117
WA1TBY
116
W9YCV
115
WA9VND
114
K4NLK
KI6ZH
113
WA4GXT
111
Ki4YV
KAØKPY
K9CNP
WB4DVZ
110
N7JLC
KD7ME
109
K5UPN
K5CXP
108
N5MEA
WA4PFK
WA9W

107
ND2S
WB7WOW
WB2ZJF
W9CBE
106
WB6DOB
WA7MCL
N5NZH
KF8AU
K8TVG
W7VSE
N9BDL
105
WF6O
104
WA4JDH
KD8HB
N4EXQ
103
KA1S
KJ4VT
102
KW1U
101
KA1GEP
KA1GWE
WE2G
W4PIM
WG7H
AG9G
100
NM1K
WB4WII
N3EMD
KA7AID
NØFOO
99
WT8L
98
KB9LT
NS9Q
N2XJ
97
WB2VUK
W1PEX
WAØHTN
WØOYH
N5NAV
W4ANK
96
N1FLO
KT1Q
KØBXF
WB8SYA
W4CKS
WD5GKH
WY7U
95
WX7A

94
K4IWW
K5MXQ
N4MEJ
KT9I
KA2VZX
93
NN2H
KAB1AF
WA4EIC
W3FA
92
WA2ERT
WB8SYA
WB4KSG
K4ZK
91
WD8KQC
KA9FVX
90
KA8ZGY
89
WB4WQL
88
KG2D
W6VOM
87
K4MTX
W9HBI
KC3Y
86
W5CTZ
W7LNE
N2GPA
NØJL
K3JL
85
NO3M
W7TVA
WB4ZTR
KC4BHX
KM4LS
84
W1KX
W1ALE
KA8WNO
W2RRX
81
K2YAI
N1FNN
NR9K
KA1JXH
K3RXK
80
N2EIA
KA2QOO
NJ3V
KC4GCK
N4JTG
N8EFB

79
W4QAT
WB5J
WDØGUF
78
N6NLW
WD4LOO
NY8W
KF8J
WA9VLC
77
K3JL
KC5NG
WB8FSV
N7BGW
76
W4TZC
75
WA3UNX
KJ9J
74
WA2FJJ
WB1BTJ/T
WA1JVV
N2AKZ
N2IMP
73
KC2HJ
N5KCL
WA4PUP
WB4PNY
WAØTFC
KA2INE
72
WB2OEV
NDØN
KB5BNU
N4KSO
71
W2GJ
KAØUEQ
KØERM
KD4HHE
70
N8HSC
K8JDI
K4ZUY
K2VX
69
N8FPN
KJ3E
68
AC5Z
WI8J
KD8KU
WS8A
NB2D
67
N1DHT
NZ5J

WB8KWC
66
WØOUD
K8CQF
WB8YPG
KA8CPS
KB4CAU
KK4FV
WA4RUE
65
NW8M
WB5YDD
KA1KML
N2HLZ
K2TWZ
64
W2FR
KB7LX
WTØE
KDØYL
WB2FTX

63
WB2QIX
K1GGS
NØCYR
KB5CPY
W6SX
WA4YYQ
KA2KJF
W3YVQ
62
WA8DHB
WA4RNP
N8FWA
KI4W
KA4FZI
61
KA2ZNZ/T
W1TC
KM5L
WD8KBW
KA7EEE

K4BGZ
NC9T
WA4LLE
WA2UKM
60
KB5JVU/T
W4IBU
N8INP
W9UMH
KA7WFW
KB4OPR
KAØARP
KDØNH
N2DXP
59
KA9CTW/T
KE2JX
57
N2EVG/T
WA2PAC

56
N4ORZ/T
55
N4LST
54
KA6HJK/T
53
KA2JMA/T
49
KA1RSY/T
NØKIA/T
KA9TVU/T
47
KA1HPO/T
KA6TND/T
42
KA2UIU/T
WB2ZIE/T
44
N6VMK/T

The following stations qualified for PSHR during the month of July, but were not included in last month's Public Service Column: KB2EPU, WB2VUK, N5MEA, KI6ZH, WG7H, W8AKF, AIØD, WAØHTN, NDØN, WØOUD. (June) W8AKF 258.

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 call sign-engraved BPL medallion.

Call	Orig	Rcvd	Sent	Dlvd	Total
W8AKF	309	1821	2499	305	4934
W3CUL	962	891	1432	71	3356
WBØTAX	0	1536	1536	0	3072
W1PEX	7	695	1614	13	2329
WB9YPY	0	1292	114	841	2247
W3IWI	0	1080	1107	0	2187
KB4N	0	675	672	0	1347
KØHOA	2	536	537	1	1076
NØBQP	19	596	22	421	1058
KC9CJ	8	572	74	352	1006
K5UPN	3	500	472	8	983
W3VR	281	199	402	27	909
N3AZW	12	421	421	19	873
KØYFK	32	410	401	23	866
WA2GYM	38	366	401	43	848
K1UGM	0	412	412	0	824
KA1IFC	0	332	310	20	762
WA4JDH	0	377	406	3	706
WT8L	0	314	368	3	685
WB1BTJ	0	197	415	0	612
WG9J	15	321	212	28	576
KI4FL	2	283	285	0	570
WF6O	14	266	278	12	570
W7VSE	0	314	252	3	569
KI6ZH	29	257	248	18	552
WT7A	7	279	239	24	549
KA9FEZ	—	—	—	—	546
KF5BL	15	210	291	25	541
N4GHI	8	258	234	23	523
WA9VND	4	270	229	19	522
W2MTA	13	307	197	3	520
NM1K	34	215	251	16	516
AJ6F	0	251	251	0	502

BPL for 100 or more originations plus deliveries:

WD6BZQ	193	WB2OWO	132
WB2QMP	144	W5TNT	120
NR9K	143	WØFIR	105

The following stations qualified for BPL during the month of July, but were not listed in last month's issue: N5MEA 613, W8AKF 3959, WBØWNJ 958, KT9I 746, KA1IFC 621. (June) W8AKF 3346.

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	27	339	399
Early Bird Net:	31	589	201
Empire Slow Speed Net	31	62	367
Golden Bear Amateur Radio Net	31	64	1485
Great Lakes Emergency Traffic Net	31	58	1076
IMRA	27	656	1589
Mission Trail Net	31	164	867
Northern California Net	93	345	1229
NYSPTEN	31	59	407
Southwest Traffic Net	31	210	1383
West Coast Slow Speed Net	30	44	353
7290 Traffic Net	50	340	3277
75 Meter ISSB Net	31	169	1034

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.

World Above 50 to Reach New Heights

Starting this month, World Above 50 will be expanding its coverage of happenings on the microwave bands. Those of you with suitable material are encouraged to submit your reports and information to the address listed at the top of this column.[1]

Don't get the idea that because the column will be covering more ground that there is a diminished need for reports. Quite the contrary. It is especially important that you continue to send them. I can't include news that I do not receive! Remember, my deadline for submission to the column is the 10th of each month. Thus, anything that happens after about the 5th should be called in on the answering machine. Thanks for your understanding and continued cooperation.

[1]*QST* is encouraging the submission of construction articles, general-interest articles and news of operating achievements relating to the microwave bands. These articles should be submitted directly to *QST*.

ON THE BANDS

August and early September were marked by a number of interesting occurrences in the world above 50 MHz. The Perseids certainly ranked high among these. As it often does, this shower of showers provided a first taste of meteor scatter for many new VHFers. One of these was WBØJNR from Aurora, Colorado. Roger came up with 10 2-meter QSOs, all for new grids. He notes that he was surprised to find strong signals considerably outside of the predicted beam headings. Computer-generated meteor predictions are useful, but we shouldn't be intimidated by them to the extent of not trying other times and directions. One who is anything but new at meteor scatter is W5AL from Amarillo, Texas. Len's report in the August SWOT Bulletin lists five completed skeds out of 11 tries the evening of August 10 and the morning of the 12th—all with stations to the west. Attempts to the north, northeast and east failed. This was considerably before the predicted peak of the shower. The next day went better, as expected. Beginning at 0400Z on the 12th, Len completed 15 out of 21 attempted contacts, including four non-sked (random) QSOs. Sunday morning was also good, with five of eight skeds completed successfully. Altogether, Len worked 20 grids from DN07 to EL97 and FN00. He credits the 75-meter coordination frequency (3818 kHz) for enabling him to set up so many skeds on short notice. Another

50-MHz DX STANDINGS

DXCC countries based on information received as of September 5, 1989. Space limitations dictate that continental US and lower-tier Canadian stations with fewer than 15 countries and others with fewer than 10 countries not be listed. Those residing in countries not generally authorizing 6-meter operation who have submitted a list of at least 5 countries worked via crossband are included in a separate list. Those not submitting a report within the past two years are subject to being dropped from the list. They will be reinstated upon presentation of a written statement of their continued activity on the band. It is not necessary that they have worked any new countries in order to be reinstated. Countries are those listed in the latest ARRL Countries List but deleted countries worked prior to their deletion have been counted. Credit has not been granted for contacts with stations known not to have been authorized 6-meter operation at the time of the contact. Unless noted, totals are those worked by individual or club stations operating from a single location or multiple locations within a radius of 150 miles. The next update will be published in the May, 1990 column. In order to be included in that update, reports must arrive at the address listed at the head of this column by March 1, 1990. Reports need not be on the special forms, but use of these forms is encouraged. They are available for an SASE to the column address. Whether or not reports use the forms, they must state each country, one station worked in that country, an indication as to whether the contact was two-way on 6 meters or crossband, the date of the contact and whether the contact has been confirmed by receipt of a QSL card.

6-Meter Two-Way Contacts

Countries worked/confirmed

JA4MBM*	95	95
LU3EX*	94	93
VE1YX*	94	92
W5FF*	91	90
K5FF*	89	88
K1TOL*	89	87
W2CAP/1*	88	87
W4CKD/8*#	88	86
W3XO/5*#	86	71
W2IDZ*#	85	85
WB4OSN*	85	82
JA3EGE*	83	83
WB2CZB*	82	79
JA1VOK*	81	81
KH6IAA	81	81
K8WKZ*	81	78
W4OO*	80	80
W3IWU*#	79	77
N3AHI/4*#	78	75
WA4OWC*	77	77
W3JO	77	76
JA1RJU*	77	76
VE1BNN	77	74
W8CMS	77	72
WA5IYX*	77	65
WB8IGY*	76	73
W5VY*	76	72
K2QIE*	76	71
WA8LXJ*	76	65
WA1OUB	74	71
KA1PE*	74	70
W3WFM	73	72
WA2BPE*	72	70
WB2WSV*	72	69
W4WHK	72	64
ZD8TC*	71	71
K4KUZ*	71	70
K3QMX*	70	70
WA6BYA*	70	69
K1GPJ*	70	69
K2YOF	70	68
W1JR*	70	68
K4CKS*	70	66
K5CM*	69	67
W5HUQ/4*#	68	64
N5KW*	66	64
JA2DDN*	65	65
JE1TGN*	65	64
WA4UAS*	64	63
N4EJW#	64	60
HC2FG*	64	58
KA1A	62	62
K5ZMS*	62	61
W6BJI*	61	58
NØLL*	60	58
K5SW*	59	59
W2RTW	58	55
WB8YFE*	58	53
LU7DZ*	57	55
WA3DMF	56	55
WA5UFH*	56	53
N5DDB*	56	52
N4MM	56	52
KØGJX*	55	52
LU8MBL*	55	48
W1QXX	54	54
K6QXY	54	54
WB4RUA	54	52
W3OTC	54	42
WA7EPU/5*#	53	53
JK1PEC	53	53
K8UNV*	53	52
KS2T	53	52
WA5HNK*	53	51
K5GE*	53	51
N4TL	53	50
WA6PEV*	53	46
K3ICH/4	53	45
VK3OT	53	42
WA1AYS	52	51
KA1CDZ	52	44
W1EJ*	51	50
WA2QCE	51	48
N6AMG	51	47
WB6BMB*	51	45
W3BWU	50	49
WBØPKN*	50	49
K5LZO	50	45
AE3T*	49	49
WA5LIG/6#	49	48
K4QXX	49	48
XE1GE	49	48
K1FJM/4*	49	
WBØV*	49	46
ZL1MQ	49	46
KØTLM*	49	45
JF3QJR*	49	45
JA2TTO	48	48
JA1TTO	48	48
WB8YFE/9*	48	47
K1SF	48	42
NI6E/KH6	48	6
JA6YBR*	48	—
WD4FAB	47	47
KB4CRT	47	45
KA1DHO	47	44
KG6DX	47	42
W5NZS*	46	43
G4UPS	46	43
LU8BF	46	42
W4NVW/3	45	44
K2OVS	45	43
K2QWD*	45	41
CX8BE*	45	35
N9CEX*	44	44
W1AIM*	44	42
K1LPS	44	41
W1GXT	44	38
LU9MA*	44	28
K6JZK	43	43
VK8GB	42	42
WA8RCN*	42	41
KN5S	42	36
KH6FLD	42	35
KG4SM	42	28
N5BBO*	41	41
WB7SLY*	41	38
W5HN*	41	35
N4VC	40	38
VP2MO	40	34
K4GOK	39	37
JA1NVG	38	38
WA1CRE	38	37
WA5VJB	38	35
K5UR	38	29
KØUS*	38	23
W5OZI	37	36
WA6HXM	37	29
VE3DSS*	36	36
WA6THT	36	34
WB8PAT*	35	35
K8TGC	35	31
ZS6WB	35	31
WB4SLM	35	16
W2CNS*	34	33
VP2MJ	34	26
WA7GCS	33	33
K6PHE	33	33
GØJHC	33	29
WA1NOV	33	28
N4VA#	33	27
W3ZZ	33	23
CE3BFZ*	33	20
9Y4VU	33	—
VK4ZJB	32	32
K6BEM	32	32
N6VI	32	31
VK2BA	32	31
WS4F	32	30
KD9JQ#	32	29
WØJRP*	32	26
VE3EVW	32	22
WA2EQK	31	30
W7JF*	31	—
VK2BA	30	30
VE3LNX	30	27
G4GLT	30	21
VK2DDG	29	28
WA5QCP*	29	27
KH6JJK	29	20
WB5QBV	28	23
N9ANO*	27	27
VK2VC	27	27
W7FIV	27	26
WA5OLT*	27	25
VK2QF	27	25
KA6ING	27	24
VK3AUI	27	19
WA9DYV*	26	26
VK2DDG	26	25
VK3XQ	26	24
J52US	26	20
WA8LLY/6	25	25
W9NAW	25	20
TI2KD	25	19
XE1FE*	25	17
W7HAH	24	23
GØIMG	24	22
WBØRJR	24	22
W8QOI	24	21
HK4EB	23	23
W7ABX	23	22
VK2KAY	23	21
W7JXU	23	20
KK6C	23	17
VK3AWY	22	22
VK5LP	22	21
KD6PY	21	21
KB6OX	21	21
VK2BNN	21	20
KA4CRT	21	20
K6EID	21	20
VK9XT	21	17
VE6CX	20	20
VK4ALM	20	20
K9LCR	20	19
VK7JG	20	18
KB1WW	20	18
VK7JG	20	18
NØAJU	20	17
G3COJ	20	12
KB6OK	20	—
VK4TL	19	19
PY2DJC*	19	15
NA4I	19	12
VK4ZAL	18	18
GW3MHW	18	15
ZD8MB	18	7
VK3AMK	17	17
VK3NM	17	16
N2AVR	17	15
W7IDZ	16	16
VK4ZSH	16	15
VK2ZRU	16	15
KI6BU	16	15
N1DJB	16	13
GJ3RAX	16	—
FP/KA3B	15	15
CO2KK	15	—
VK9YT	14	12
GW3LDH	14	10
VK2EEC	13	12
VK3ZZX	13	12
VK6HK	13	8
GJ3YHU	11	3
VK6OX	10	10
VK4KHZ	10	8

Crossband 10-to-6-Meter Contacts

Countries worked/confirmed

DJ2RE	33	—
OZ7JV	19	11
DK6JL	11	4
CT2EE	5	2
OZ9QV	5	1

* 6-meter two-ways claimed with all continents.
\# Some contacts made from locations more than 150-miles apart.

old hand at MS, W2RS, had particularly good fortune working CY0DXX (Sable Island, FN93) for a new country and grid on 2 meters.

Sporadic E, or E Skip, as the 2-meter gang likes to refer to it, persisted into late August. W7JF in Billings, Montana, writes that on the 24th, beginning at 0225Z, he worked 12 stations in Missouri, Illinois, Tennessee and Georgia. The Georgia station was W4GJO in EM74, who Ken worked during another E_s opening June 1 for state number 47.

Many on both 6 and 2 meters characterize the E season based on the openings on their favorite band. But the only person that I know of who keeps accurate records is WA5IYX in San Antonio. Pat's favorite span of frequencies to monitor is the 88- to 108-MHz FM broadcast band. Thus, he doesn't have to be concerned about lack of activity. His figures for summer 1989 show what many of us suspected: much more E_s during July than June. This is counter to most years. For July 1989, Pat's records show 3720 minutes of E_s at the FM band compared with 1420 for June. For 1988, the numbers were 1130 for July and 4606 for June—a more typical situation.

N5KWB reports a fine tropo event beginning about 0100Z September 4. From his EM32 location in Louisiana, Tom worked 48 2-meter stations in 22 grids as far away as EN81. On 1¼ meters, he hooked up with 13 stations in nine grids, with EN81 his best effort. The opening boosted his 1¼ total by six states. N5DUH in Bossier City, Louisiana, also in EM32, encountered the same conditions. It was Keith's first experience with a good tropo opening, having been on the band only two weeks. Despite being limited to 25 W, he made the best of it—working 19 new grids and 10 states. Another new convert to 2-meter SSB, WA4PGM, in FN07, says he has worked 11 states and 31 grids in five weeks of operation, running 10 W to a 16-element Yagi at 12 feet. Catching some good E_s openings during July was part of the secret of his success.

Although it may be old hat by the time you read this, it's very encouraging to watch 6 meters in the final days of summer. The band is beginning to show signs of coming to life in various parts of the world. ZS6WB reports an opening to Japan during the morning hours of August 29. Hal says that signals ranged up to S-9, but only a few stations were on at each end of the path. On August 30, he caught FD1NLQ/7X for country number 35. The next evening, signals to the Mediterranean were very good, with ZC4MK in Cypress participating in his first good opening to southern Africa. On this side of the world, the west coast has already caught at least one opening to VK, and the afternoon of August 29 produced contacts with HP3XUH and LU1DMA for this conductor. Later in the evening, about 0245Z on the 30th, I worked LU9EHF with S-9 signals.

In the sad news department, K3QMX passes along the information of the death of N4HRH. Walt will perhaps be better remembered as VP9WB.

W4HHK sends along details of his 23-cm beacon. The frequency is 1296.237 MHz and the power is 4 W. The antenna is bidirectional (east-west) and uses a 2-wavelength waveguide section. The beacon has been heard as far as Dallas and Chattanooga.

The west coast microwave travelers have been out again. This time, W6HCC set up camp at Blue Ridge in DM14di at an elevation of 7200 feet, while WA6EXV set out for Castle Cliffs, just south of St. George, Utah in DM37bc. Although conditions were not particularly good, the two stations did manage 3-cm contacts on SSB and CW over the 286-mile path. An attempt on 13-cm failed. WA6EXV's next effort was from 11400-foot Brian Head Mountain in DM37nr. After the first try failed, a sked was arranged for the next morning. At that time, they were able to complete a 10-GHz CW contact over the 356-mile path, but signals were too weak for SSB.

FM/RPT

Conducted By Stan Horzepa, WA1LOU
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Simply Say Simplex—with Caution

In the last FM/RPT, Jeff Towle, WA4EGT, asserted that hams should not tie up repeaters when they can communicate as well on a simplex channel. Not to knock the fine art of simplex operation, this month's writer, George Hinds, N8CIX, suggests that we use caution when selecting a simplex frequency.

There is a long history of experience in the development of channelized FM communications based on the technical parameters of the equipment used. Almost as long in development is band planning for channel use with a goal of attaining maximum use with minimum interference to users.

The ARRL band plans did not arise from pipe dreams or the exercise of individual rights. They arose from the experience of the public safety and commercial users who were familiar with VHF-UHF band planning. This band-planning experience permitted those agencies to operate efficiently within equipment limitations and was brought to Amateur Radio by the first hams to work 2-meter FM. Many of those hams were radio technicians for public safety agencies and utilities who used surplus VHF high-band rigs to begin amateur 2-meter FM.

They learned about interference caused by adjacent-channel operation. Bandwidth limited the closeness of channel spacing, however, improved equipment changed channel spacing. At first, 60-kHz spacing was essential, but, as rigs improved, 30-kHz separation became possible. As the demand for spectrum increased, closer spacing (15 kHz) was adopted with distance separating adjacent users. As most FM enthusiasts know, you still cannot put 15-kHz-spaced repeaters within 60 or 70 miles of each other without some interference to either the repeater, its users, or both. Much of the gear we use today simply cannot operate interference-free in such conditions. And it certainly cannot operate interference free with a mere 10-kHz channel spacing, when the transmitted signals are deviating 5 kHz on either side of the center frequency!

Considering the need to understand why we devise and follow band plans, perhaps questions should be included in VE-testing on channelized operation, the reason for band plans and how to avoid being the source of potential interference to others. Obviously, many hams do not know from whence we came in regard to the development of the FM mode.

One Pikes Peak area repeater recently was bothered from time to time by noisy, mostly unreadable signals on the repeater input, but not from its regular users. It turned out that a small group of folks in Longmont, Colorado, had decided that no one was using a particular frequency, so they decided to make it their own private simplex channel. Why not? Well, if they had checked *The ARRL Repeater Directory*, they would have quickly noted that their choice was, in fact, a repeater input. It would have shown them that simplex operation in that segment of the 2-meter subband was inconsistent with the accepted band plan. With 25 two-meter simplex channels available, 17 of which are simplex only, why would an otherwise intelligent person choose to operate simplex on repeater inputs? Why toss years of experience out the window and operate contrary to time-proven guidelines?

We pride ourselves as being responsible amateurs, able to police our operations through self-discipline. But, obviously, not everyone accepts that responsibility. Back in 8-land, where I came from, we termed operators guilty of such sloppy operation as "lids, kids and space cadets."—*George Hinds, N8CIX, from Ø Beat, the newsletter of the Pikes Peak Radio Amateur Association (PPRAA), Inc, of Colorado Springs, Colorado. PPRAA meets the second Wednesday of each month at the Colorado Springs Hewlett-Packard facility at the junction of Lexington and Union.*

Conducted By
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New OSCAR Horizons Now In View

This month, we'll look at the next series of OSCARs to be launched. According to the latest estimate, a group of six OSCARs will be launched this month.

The launch on an Arianespace Ariane-4 rocket will carry SPOT-2 as the primary payload together with six OSCARs from five different organizations. Articles in the May and June 1989 issues of *QST*[1] addressed the AMSAT-NA, AMSAT-LU, BRAMSAT and Weber State College Microsats. The other two new satellites are being built at the University of Surrey, England, where UoSAT-1 and 2 (UO-9 and UO-11) were born. What follows is a description of Surrey's new UoSAT-D and UoSAT-E projects that comprise the balance of the six OSCARs being launched.

According to the UoSAT Unit at Surrey, UoSAT-D and UoSAT-E will take on the mission objectives of the postponed UoSAT-C mission:

- Amateur Radio packet communications and the advancement of store-and-forward communications technology.
- Studies of the orbital radiation environment and its effects on semiconductors.
- In-orbit demonstration and evaluation of novel spacecraft technologies.
- Development of low-cost charge-coupled device (CCD) imaging techniques.
- Refinement of low-cost, computer-controlled attitude determination and control systems.

For more information on getting started on OSCAR and information on AMSAT membership and membership benefits, call AMSAT at 301-589-6062 or write: AMSAT, PO Box 27, Washington, DC 20044. Please include a business-size SASE.

Packet-Communications Experiment

The primary payload on UoSAT-D will be the Packet-Communications Experiment (PCE), which was to be carried on UoSAT-C. The PCE is an orbiting packet node with 4 Mbytes of message-storage space. The PCE advances the work done on UoSAT-2 with the Digital-Communications Experiment (DCE). The PCE system (hardware and software) is being developed under a contract from the Volunteers In Technical Assistance (VITA), who hope someday to use store-and-forward communications as a link with development workers in remote areas. The flight of the PCE on UoSAT-D and its use by radio amateurs is funded by AMSAT-UK.

All amateur stations with proper equipment will have open access to the PCE via AX.25 packet radio. The UoSAT-D PCE will use 9600 bit/s frequency-shift-keyed (FSK) uplinks and downlinks. These protocols will be compatible with existing modems from G3RUH and K9NG. The band plan will be Mode-J: a single uplink in the 2-m band, and a downlink in the 70-cm band. RF links should be good enough to provide consistent service to ground stations with modest, unsteered antennas, and an experimental high-power mode for very small ground stations will be included.

Although the UoSAT/AMSAT-UK PCE will use standard AX.25 communications links, it will also provide a platform for experimentation with higher-level packet-communications protocols. Current PACSAT systems employ ALOHA access (each station transmitting when it wants to) and user interfaces based on terrestrial BBSs. The PCE will employ experimental access techniques aimed at more efficient machine-to-machine communications. The user-friendly BBS-like interface will be on the ground, in the ground station's personal computer or TNC. The ground station and the satellite will communicate using high-level protocols, making the best use of short satellite passes. Software to support these ground station-to-satellite protocols (along with complete specifications of the protocols) will be developed at UoSAT and made available to the Amateur Radio community.

The UoSAT/AMSAT-UK PCE will be at one end of the spectrum of amateur-satellite store-and-forward communications systems. By the end of 1989, amateurs will be able to select a PACSAT facility that suits their communications needs and capabilities, choosing from UO-11, FO-12, the AMSAT-NA Microsats and UoSAT-D. (JAS-1B is scheduled to be launched in early 1990. It's an upgraded FO-12.)

Cosmic-Particle and Total-Dose Experiments

The Earth's magnetic field shields the surface of the planet from much of the radiation emitted by the sun and other cosmic sources. Satellites in orbit, however, are not protected by this magnetic shield, and they receive high levels of cosmic radiation. Assuming the satellite has survived the rigors of launch, radiation is the primary threat to a satellite's electronics. The total dose of radiation absorbed by semiconductors causes them to fail, as happened to the AMSAT OSCAR-10 Integrated Housekeeping Unit (IHU). Less dramatic—but equally serious—are the temporary effects of energetic particles entering semiconductor memories. These particles cause Single-Event Upsets (SEUs), changing the contents of memory. This can cause computers to crash or data to be corrupted. Satellites are becoming more reliant on microprocessors, peripherals and memories, and as more functions are placed on smaller and smaller ICs, the ICs become increasingly radiation sensitive. Measurements of radiation levels in space and observations of radiation effects on satellite electronics help designers select the correct components for future satellites.

With this in mind, the UoSAT unit has conducted a series of in-orbit radiation experiments. UoSAT-1 carried Geiger counters for measuring radiation, and the on-board computer (OBC) has an SEU monitor on its memory. On UoSAT-2, radiation-effects monitoring was taken a step further. The Particle-Wave Experiment (PWE) monitors the electron flux spectrum at eight energy levels. The 1802 OBC has an SEU counter, and the DCE and data store and readout (DSR) monitor SEUs in a total of 300 kbytes of memory.

UoSAT-D will continue this series of experiments with a Total-Dose Experiment (TDE) monitor and a Cosmic-Particle Experiment (CPE) detector. The TDE will allow—for the first time—direct measurement of the absorbed radiation dose at various points in the satellite. This will allow assessment of shielding provided by the satellite structure. The TDE uses seven radiation-detecting FETs monitored by an 80C31 microcontroller. The CPE detects cosmic particles as they pass through a diode array. As the cosmic particles pass through the diodes, they deposit a charge that is measured by a charge-integrator circuit interfaced to the 80C31. The measured charge can reveal the energy of the particle and the angle at which it entered UoSAT-D. This CPE/TDE package, along with SEU monitoring on the 4 Mbytes of PCE memory, will significantly increase the amount of information available to designers of computer systems for satellite use. The CPE/TDE will send its data to a file in the PCE, where it will be available to users of the PCE who want to follow the radiation experimentation. The CPE/TDE is funded by the Harwell Laboratory (UK).

On-Board Data Handling

UoSAT-D will have a standard UoSAT 1802 OBC to assist the 80C186 as necessary. Both computers will be interfaced to a central telemetry system monitoring 32 analog channels throughout the satellite. Telemetry will be available direct to the downlink through

[1]D. Loughmiller and B. McGwier, "Microsat: The Next Generation of OSCAR Satellites," Part 1, *QST*, May 1989, pp 37-40; Part 2, *QST*, Jun pp 53-54 and 70.

hardware interfaces, or it can be gathered by the 80C186 and presented as AX.25 packets. This system combines the reliability of an all-hardware system with the flexibility of computer-driven packet telemetry.

The three computers on UoSAT-D (1802, 80C31, 80C186) will be linked to each other and to uplinks, downlinks, telemetry and telecommand through a multiple-access, serial data-sharing bus. This bus eliminates many of the dedicated serial links present in UoSAT-1 and UoSAT-2, without eliminating the redundant data paths that are available if primary paths fail. The bus interface is a simple circuit that can be added to any UART chip.

Attitude Control

UoSAT-D will be an Earth-pointing satellite that uses a gravity-gradient boom augmented by computer-controlled magnetorquing. This system (which uses no continuously moving parts or expendable fuels) is ideal for small, inexpensive satellites in low-Earth orbit. UoSAT-2 has maintained a pointing stability of 5 degrees using this system, and it is hoped that improved algorithms and increased computing power available on UoSAT-D will result in even better results.

UoSAT-D and UoSAT-E Modular Design

The modular design developed for UoSAT-C proved itself when the UoSAT team had to change emphasis to the UoSAT-D and UoSAT-E missions. Although UoSAT-D and UoSAT-E must be lighter and smaller than UoSAT-C, many of the mechanical and electrical subsystems for UoSAT-C could be simply taken apart and reassembled in a new order to make UoSAT-D and UoSAT-E.

What About UoSAT-E?

The UoSAT-E satellite will be based on the same bus as UoSAT-D: OBC, telemetry, telecommand, power generation and conditioning, and mechanical structure will remain the same. The compliment of payloads and experiments, however, will change. UoSAT-E will be primarily a technology-demonstration mission, flying the transputer data-processing experiment (TDPE), Solar Cell Experiment (SCE) and CCD-imaging system that were to fly on UoSAT-C.

Transputers

The TDPE is a parallel computing system based on three transputer parallel-processing microcomputers. The three transputers can be used in parallel on different parts of a single task, greatly improving computing speed. They can also be used to monitor one another, watching for erratic behavior that might result from a radiation-induced SEU. Both the increased performance of the parallel-processing arrangement and the increased reliability of the watchdog arrangement will be studied. Results of this study will be used by the European Space Agency Technical Labs (ESTEC) in the design of high-performance, on-board data-handling systems for future satellites.

Advanced Solar-Panel Technology

The UoSAT-E SCE is an array of solar-cell samples that will be constantly monitored for changes in performance caused by radiation, temperature, and other environmental effects. The cells will represent the complete range of solar generator technologies under development: gallium arsenide, indium phosphide and silicon. The cells will be covered by various cover slides designed to enhance panel efficiency and/or reduce panel degradation caused by radiation. The SCE panel will replace part of a solar panel on UoSAT-D.

The SCE monitoring system will wait until the sun is directly upon the SCE, and then make a series of measurements. These data will be sent in a burst to the satellite's 1802 OBC for later downloading.

CCD-Camera-Imaging Experiment

The UoSAT-E CCD camera will continue the series of UoSAT experiments with these low-cost imagers. UoSAT-1 carried one of the earliest two-dimensional CCD arrays: certainly the first in orbit. The results from this imager were spectacular when one considers the novelty of the technology, although the fact that UoSAT-1 is not stabilized makes the imaging somewhat random(!). The UoSAT-2 CCD camera is a high-sensitivity system intended to take images of the auroral oval as UoSAT-2 passes over the poles. The camera is connected to two 96-kbyte memory banks with serial readout and error-detection-and-correction coding. Unfortunately, results from UoSAT-2 have been inconclusive. No readily identifiable images have been downloaded. UoSAT-E will carry another CCD camera, optimized for meteorological-scale imaging. The resolution of the system will be on the order of 1-2 km, with a field of view 1000 square km. The inclusion of this system on UoSAT-E is a response to widespread interest in medium-resolution imaging for low-cost meteorology satellites.

The UoSAT-E camera will generate a 96-kbyte raw image, which will be sent to the TDPE where the parallel processors will compress the image for transmission. The data-compression stage will provide a 50- to 90-percent reduction in the amount of memory required to store an image. This also decreases the downlink time required to transmit a picture to a ground station.

Conclusion

The PCE on UoSAT-D will provide a packet-radio networking experiment and a service to radio amateurs worldwide. The various technology and engineering experiments on UoSAT-D and UoSAT-E will continue the important transfer of information between Amateur Radio and the professional engineering community.

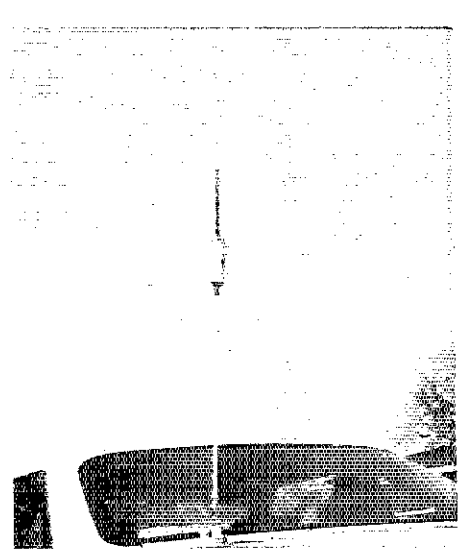
New Products

HUSTLER 22-INCH MAST FOR HF-MOBILE ANTENNAS

Hustler, manufacturer of a popular line of HF-mobile antennas, has introduced the MO-4, a 22-inch mast designed for various mounting arrangements to allow the use of Hustler's line of HF resonators on vehicles with plastic bumpers. The MO-4 can be mounted on roof racks, trunk lids, mirrors, ladders, etc, and when used with Hustler's standard resonators, the MO-4 can be used with a magnetic mount.

The MO-4 is supplied with three 30-inch tip rods for use with the 10, 15 and 20-meter resonators; these tip rods are used in place of the rods supplied with those resonators. (The 30-inch rods are required to resonate the system with the shorter mast; no rod changes are necessary with the 40, 75 and 80-meter resonators.)

Suggested retail price for the MO-4 is $19.95. For more information, contact Hustler, Inc, One Newtronics Pl, Mineral Wells, TX 76067, tel 817-325-1386.—*Rus Healy, NJ2L*



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.

†**Alabama (Montgomery)—November 18.** *Sponsor*: Montgomery ARC. *Time*: setup 6 AM, public 8 AM-3 PM. *Place*: Garrett Coliseum at the South Alabama State Fairgrounds on Federal Dr. *Features*: free parking, flea market, VE exams (code testing begins at 8 AM, written exams begin at 9 AM; bring a copy of your current license, picture ID and $2), special hamfest rates at: Knight's Inn, I-85 at Ann St, ($28.50 + tax for up to four guests, desk phone 205-834-4055 or 800-722-7220 for central reservation operator; Coliseum Motel across the street from hamfest site, single $23/double $29 + tax, phone 205-265-0586. *Talk-in*: 146.24/84, call W4AP, Ragchew 146.32/92 (with phone patch, *up/#down), 147.78/18, 444.50/449.50. *Admission*: free. *Contact*: Hamfest Committee, c/o 2141 Edinburgh Dr, Montgomery, AL 36116, or Phil 205-272-7980 (after 5 PM).

†**Arizona (Apache Junction)—December 2-3.** *Sponsor*: Superstition ARC. *Time*: Saturday dawn to dusk, Sunday dawn to noon. *Place*: P & M Rodeo Grounds, Brown and Meridian Rds. *Features*: refreshments, ARRL Division Director, ARRL Section Manager. *Talk-in*: 147.72/12. *Admission*: $1 per person, $3 per vehicle for tailgaters. *Contact*: Bill or Marge Glaze, KA7SUF/K1YCZ, 602-832-3955.

Colorado (Denver)—November 5. *Sponsor*: Rocky Mountain Radio League. *Time*: setup 7 AM, public 9 AM-3 PM. *Place*: Jeffco Senior Ctr, 6842 Wadsworth Blvd, Arvada, CO. *Features*: swap, exhibits, refreshments, handicapped accessible. *Talk-in*: 146.34/94. *Admission*: $2. *Tables*: $7. *Contact*: (D) Dan Duryee, KBØJ, 303-458-5444, (N) Fred Brachle, NØFIK, 8230 Reed Ct, Arvada, CO 80003, 303-425-5791.

Connecticut (North Haven)—November 12. *Sponsor*: South Central Connecticut ARA. *Time*: sellers 7 AM, public 9 AM-3 PM. *Place*: North Haven Park and Recreation Ctr, 7 Linsley St. *Features*: VE exams, commercial exhibits, refreshments, wheelchair accessible. *Talk-in*: 146.01/61. *Admission*: $3, children under 12 free. *Tables*: advance $12, door $15 (reservations for tables must be received with a check by November 2; no reservations by phone). *Contact*: send SASE to SCARA Flea Market, PO Box 81, North Haven, CT 06473, or call Brad Oestreicher, WA1TAS, 203-265-6478, 7-10 PM.

Illinois (Grayslake)—October 29. *Sponsor*: Waukegan CAP. *Time*: 7 AM-5 PM. *Place*: Lake Co Fairgrounds, Rtes 120 and 45. *Features*: flea market, refreshments, free parking. *Admission*: $3. *Tables*: $5. *Contact*: send SASE to CAP, 637 Emerald St, Mundelein, IL 60060.

Illinois (Rockford)—November 12. *Sponsor*: Rockford & Experimental ARAs. *Time*: 8 AM-3 PM. *Place*: Junction of Illinois Rte 173 and Forest Hills Rd. *Features*: Amateur Radio and computer dealers, flea market, tailgating, refreshments, ample free parking, wheelchair accessible. *Talk-in*: 146.01/61, 146.52. *Admission*: advance $3, door $4. *Contact*: Lonnie Miller. Advance Tickets: SASE to Rockford Hamfest, PO Box 10003, Rockford, IL 61131, (N) 815-623-7576.

Indiana (Fort Wayne)—November 12. *Sponsor*: Allen County Amateur Radio Technical Society. *Time*: 8 AM. *Place*: Allen Co Way Memorial Coliseum Exposition Ctr. *Features*: parking $1, meeting of the Indiana Repeater Council. *Talk-in*: 146.28/88, 443.80/448.80. *Admission*: advance $3.50, door $4. *Tables*: standard tables $12, premium tables $25, ac power extra. *Contact*: ACARTS, PO Box 10342, Fort Wayne, IN 46851.

Massachusetts (Billerica)—November 18. *Sponsor*: 1200 Radio Club. *Time*: setup 10 AM, public 11 AM-4 PM. *Place*: Bull Information Systems, 300 Concord Rd, Billerica, MA 01821. *Features*: Ham and Electronics Auction. *Admission*: 15% sales commission; $1 minimum, $30 maximum. *Contact*: Dave Meldrum, KA1MI, 28 Cedar Ln, N Andover, MA 01845.

†**Massachusetts (Sturbridge)—November 18.** *Sponsor*: New England DX Convention. *Place*: Sheraton-Sturbridge. *Features*: afternoon session 1 PM, evening dinner 6 PM. *Contact*: Fred Lucas, K1EFI, 72 Long Meadow Hill Rd, Brookfield, CT 06804, 203-775-1896.

New Jersey (Newark)—November 11. *Sponsor*: RATS & NJIT ARC. *Time*: 8 AM-6 PM. *Place*: Hazell Ctr on the NJIT campus. *Features*: tech talks, VE exams from 8 AM-11 AM, commercial equipment, TNC tune-clinic, free parking. *Talk-in*: 144.59/5.19. *Admission*: free. *Contact*: Gordon Beattie, N2DSY, 201-387-8896 or N2DSY @ KD6TH via packet. For exam info contact Pete Adely, K2MHP, 201-796-6622.

†**New York (Suffolk/Long Island)—November 12.** *Sponsor*: Radio Central ARC. *Time*: 9 AM-4 PM. *Place*: Long Island Expy exit 62, north 1 mile to Suffolk Co Community College. *Features*: manufacturers, seminars, guest speakers, dealers, forums, VE exams, refreshments. *Admission*: advance exhibitors $15, door exhibitors $20, attendees $4. *Contact*: John Mark, KB2QQ, 5 Indian Valley Rd E, Setauket, NY 11733, 516-689-6343.

North Carolina (Greensboro)—November 25-26. *Sponsor*: Greater Greensboro Hamfest. *Time*: Saturday 9 AM-5 PM, Sunday 9 AM-3 PM. *Place*: National Guard Armory, Franklin Blvd. *Features*: VE exams, forums, exhibitors. *Talk-in*: 146.16/76, 144.65/5.25. *Admission*: advance $4, door $5. *Tables*: inside $12 per 6-ft table, good both days; outside paved tailgate space $2. *Contact*: GGH, PO Box 8252, Greensboro, NC 27419, 919-292-6565 except Wednesdays. For exams contact TEARC, Jim Williamson, NQ4T, 3504 Stonehurst Pl, High Point, NC 27260, 919-841-7576.

Ohio (Massillon)—November 19. *Sponsor*: Massillon ARC. *Time*: setup 7 AM, public 8 AM-5 PM. *Place*: Massillon K of C Hall on Cherry Rd, (west from US Rte 21). *Features*: refreshments, free parking, auction at 11 AM. *Talk-in*: W8NP, 147.78/18. *Admission*: advance $3.50, door $4. *Tables*: $7 per 8-foot space. *Contact*: Massillon ARC, PO Box 73, Massillon, OH 44648, SASE please.

Ohio (North Olmsted)—November 26. *Sponsor*: North Coast ARC. *Time*: 9 AM-2 PM. *Place*: North Olmsted Community Cabin, 28114 Lorain Rd, located between West Park and East Park Drives, north of Lorain. *Talk-in*: 144.69/5.29, 223.24/4.84. *Admission*: $2. *Tables*: $5 for 8-foot tables, $3 for 4-foot tables. *Contact*: North Coast ARC PBBS (C NO8M-1 on 145.09), download the files entitled COMCABIN.LOC AND SWAPFEST.INF, or Chuck Early, K8RSH, 216-777-1595.

†**Pennsylvania (Washington)—November 19.** *Sponsor*: Washington Amateur Comm. *Time*: 8 AM-3 PM. *Place*: I-79 north from Washington, PA, exit 8W, "Racetrack Rd," I-79 south from Pittsburgh, exit 8, "Meadowlands." *Features*: refreshments, large parking lot. *Talk-in*: 144.89/5.49 W3CYO/R, 146.52. *Admission*: $1. *Contact*: Walter Piroth, N3BKW, 225 W Pike St #4, Houston, PA 15342, (D) 412-258-5353, (FAX) 412-258-8342, (N) 412-746-2327.

South Carolina (Sumter)—November 11. *Sponsor*: Sumter ARA. *Time*: 9 AM-4 PM. *Place*: Sumter Co Exhibition Ctr, 700 W Liberty St. *Features*: VE exams (bring photocopy of license), flea market, ATV seminar, handicapped access, refreshments. *Talk-in*: 147.615/015 repeater WA4UMU/R. *Admission* advance $4, door $5. *Contact*: Sumter ARA, PO Box 193, Sumter, SC 29151-0193 or call Ted Kreipe, KB4FIQ, 803-773-5189.

Texas (Odessa)—November 4-5. *Sponsor*: West Texas ARC. *Time*: Saturday 8 AM-5 PM, Sunday 9 AM-2:30 PM. *Place*: Holiday Inn Convention Ctr, Hwy 80 east of Odessa. *Features*: refreshments, forums, QCWA, VE exams. *Talk-in*: 147.40, 146.28/88, 146.10/70. *Admission*: advance $5, door $6. *Contact*: G. B. Brock, NG5R, 1126 East 44th, Odessa, TX 79762, 915-362-6069.

Wisconsin (Milwaukee)—November 4. *Sponsor*: Milwaukee Repeater Club. *Time*: sellers 7 AM, public 8 AM-1 PM. *Place*: Serb Hall, 51st and Oklahoma Ave. *Features*: swapfest, VE exams, handicapped accessible, free parking, refreshments. *Talk-in*: 146.31/91, 146.52. *Admission*: advance $3, door $4. *Tables*: 4-ft, advance $4, door $5. *Contact*: send check and SASE to Milwaukee Repeater Club, PO Box 2123, Milwaukee, WI 53201, 414-444-4589 (24-hour answering machine).

†ARRL Hamfest

Coming Conventions

SOUTH FLORIDA SECTION CONVENTION

November 18-19, 1989, Tampa

The South Florida Section Convention is sponsored by the Florida Gulf Coast Amateur Radio Council. It will be held at the Curtis Hixon Convention Center, 600 Ashley Dr. Doors are open on Saturday from 9 AM-5 PM and Sunday 9 AM-3 PM. Admission is advance $5, door $6. Features include ARRL forum, DX, public service, VE exams (Saturday 1 PM, Sunday 10 AM), commercial exhibits, swap tables, packet, technical meetings, traffic handlers, MARS, AMSAT, Saturday evening dinner dance. Talk-in is on 147.705/105, 224.74/223.14. For further information, contact Ticket Chairman, 1556 56th Ave N, St Petersburg, FL 33703, 813-525-5178.

TEXAS STATE CONVENTION

November 3-5, 1989, Houston

The Texas State Convention is sponsored by the Houston Ham Conventions, Inc, and Houston area ARCs. It will be held at the Sheraton Crown Hotel and Conference Ctr, 15700 John F. Kennedy Blvd. Doors are open on Saturday from 8 AM-5 PM and Sunday from 9 AM-2 PM. Admission in advance $5, door $7, children under 12 free. Features include ARRL Forum, Friday night auction (7 PM), seminars, VE exams, swap fest, commercial vendors, transmitter hunt, Saturday night dinner. Talk-in is on 147.68/08, 222.66/224.26, and 146.52. For further information write Com-Vention '89, PO Box 742183, Houston, TX 77074-2183.

1989

November 3-5
Texas State, Houston, TX

November 18-19
Southern Florida Section, Tampa, FL

ARRL NATIONAL CONVENTIONS

June 8-10, 1990—Kansas City, Missouri

August 23-25, 1991—Saginaw, Michigan

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance.

Special-Event Station 9M8STA Promotes Amateur Radio in Sarawak

At the invitation of the Sarawak Tourist Association, a group of thirteen 9M2s from the Malaysian Amateur Radio Transmitters' Society (MARTS) went to the port city of Kuching, Sarawak, in August to set up the first-ever special-event station from Sarawak, effectively putting the Malaysian state on the Amateur Radio map. 9M8STA was operated from the evening of August 4 until the morning of August 7. At the same time, arrangements were made for Yoshi Hayashi, JA1UT, to carry out 50-MHz propagation tests from Kuching. Yoshi had previously carried out 50-MHz propagation tests from Singapore and Trengganu (peninsular Malaysia).

The 9M2 group arrived at the Holiday Inn with 22 packages of equipment and immediately proceeded to set up a triband beam, VHF/UHF antennas, an all-band collinear antenna, two stations for operating HF CW, SSB, AMTOR and packet, and a satellite station.

The station was declared open by the Minister of Environment and Tourism the Honorable YB Datuk Amar James Wong Kim Min. The Director General of Telecommunications of Malaysia Taun Hj Mold Ali Yusoff flew in from Kuala Lumpur to attend the ceremony and stayed for the duration of the operation. Local senior officers of his department in Kuching were also present for the opening ceremony and showed a keen interest in the station operation. IARU Region III Director D. D. Devan, 9M2DD, attended the event on the invitation of the Sarawak Tourist Association as a representative of the Region III Association.

The event was an unqualified success, with the dedicated 9M2 hams operating in shifts throughout the day and night, making a total of 3039 contacts in 80 countries. JA1UT's 6-meter propagation tests were also very successful with over 300 contacts being established by the morning of August 7, with further tests scheduled through the following week.

From conversations with the Minister of Tourism and Environment and other Sarawak officials, it was obvious that they had little previous information on Amateur Radio until they witnessed the 9M8STA operation. Some of them thought that Amateur Radio was a clandestine affair, and one had thought that the special-event station was to be something of a "disk-jockey" job. In my opinion, the operation of the special-event station enlightened the Sarawak officials to the potential of Amateur Radio and the desirability of its further promotion—not only from the tourist angle, but also in developing much-in-demand technical knowledge. Favorable reports of the event were reported in local newspapers.

At a dinner hosted by the Sarawak Tourist Association, D. D. Devan, 9M2DD, spoke to the audience about the IARU, the ITU, their respective functions and roles, the limited resource of radio spectrum and how pleased he and Chairman of IARU Region III David Rankin, were with special-event station 9M8STA. *—D. D. Devan, 9M2DD, Director, IARU Region III Association*

(l-r) IARU Region III Director D. D. Devan, 9M2DD; Director General of Telecommunications of Malaysia Tuan Hj Mold Ali Yusoff; Minister of Environment and Tourism the Hon YB Datuk Amar James Wong Kim Min; Malaysian Amateur Radio Transmitters' Society President Lee Fook Seng, 9M2LF; and Regional Manager of Malaysian Airlines Encik Abdul Aziz at the opening ceremony for special-event station 9M8STA, which promoted Amateur Radio in Sarawak.

Mr Pekka Tarjanne, most recently the Director General of Finnish Post and Telecommunications, was chosen by the Plenipotentiary Conference of the International Telecommunication Union in Nice to serve as Secretary-General of the ITU. Although not a licensed amateur himself, Mr Targanne is well acquainted with Amateur Radio and has already indicated a desire to work cooperatively with the IARU. *(photo Tapio Mustasaari)*

Silent Keys

Administered by Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

WA1CPX, Robert V. Jenks, Pascoag, RI
W1CWG, W. A. Searle, Jr, Worcester, MA
W1IEF, Edmund I. Elgart, Longmeadow, MA
KA1IMK, Elinor P. Pingree, Duxbury, MA
WA1QPT, Laurence F. Cleveland, Newtonville, MA
*AB1R, Francis H. Morrison, Enfield, CT
W1ZYQ, Henry Leveillee, Leicester, MA
KA2BSY, Edward L. Spear, Smithtown, NY
K2EUU, Ida S. Wexler, Islip, NY
WA2FCI, Barnard Simmons, Pepperell, MA
W2JUH, Donald C. Delalla, Cutchogue, NY
K2KVR, Joseph Nagy, Edison, NJ
W2UAL, Robert E. Graves, Albertson, NY
W2UWD, Robert D. Turrell, Binghamton, NY
WA3BOH, Arnold I. Littman, Pittsburgh, PA
N3DKD, Homer C. Grasberger, Philadelphia, PA
KI3O, John W. Harrell, Sharon, PA
KA3ORJ, Raymond R. Ramson, Bethlehem, PA
W3YNK, Gilbert L. Foster, Temple Hills, MD
WB4EKP, Butch Howard, Tampa, FL
**W4EWR, Philip Ewald, Knoxville, TN
WD4FOB, Frederick A. Aebie, Brooksville, FL
KC4FZW, Carl C. Carhart, Catlettsburg, KY
K4GBQ, Herschel E. Peters, Ringgold, GA
K4GGP, James T. McKenzie, Camden, SC
N4HWH, Charlie W. West, Jr, Manchester, TN
K4ITA, Carl R. Hibshman, Ocala, FL
KB4JBI, Arthur W. Luce Jr, Palm Harbor, FL
W4LKP, Craig R. Woodward, Bowling Green, VA
W4LRC, Clarence N. Quinlan, Jr, Fort Walton Beach, FL
W4NDY, Edward A. Strode, Winchester, KY
WD4NGR, Lou E. Eigher, Jr, Bay Pines, FL
W4OCZ, M. Dale Redlingshafer, Rio Rancho, NM
WB4PIC, Herman E. Denzin, Floral City, FL
W4PUK, Paul R. Smith, Orlando, FL
N4QPS, John R. Clore, Louisville, KY
WA4SJV, Hugh A. Russell, Newport, TN
K4SMN, E. F. Mattison, Clearwater, FL
W4STC, Robert L. Nowell, Tampa, FL
W4TN, Harvey J. Crane, Big Pine Key, Fl
W4TXQ, Roy A. Edmonds, Springville, TN
KB4VJG, Tommy Tucker, Osprey, FL
W4WYY, Myrtle B. Johnson, Baxter, KY
N5ALW, Harold L. Hardy, Sanger, TX
WA5CUJ, Lawrence L. Johnsey, Lawton, OK
W5DAD, Alva R. Wilson, Roswell, NM
N5GCD, Edward J. Cash, San Antonio, TX
W5GWI, Warren V. Elrod, Albuquerque, NM
KE5ID, Ben H. Julian, Mesquite, TX
N5LRS, Donald A. Donovan, New Roads, LA
W5MGR, Clayton C. McFadin, Sr, McComb, MS
WA5VWG, Edmund M. Snyder, Jr, Houston, TX
K5YVO, Robert E. Kale, Conchas Dam, NM
KB5Z, A. T. Ray, Austin, TX
KA5ZWW, William E. Thurner, Meridian, MS
W6AIX, Albert E. Wolfe, Lancaster, CA
WA6CUH, Michael Downs, Riverside, CA
W6DNY, Virgil J. McCluskey, Napa, CA
W6EBL, F. E. Robinson, Sonora, CA
N6HAB, Harold W. Annis, Daly City, CA
KA6HBR, Boyd U. Holifield, Apple Valley, CA
K6PGE, John E. Donnelly, Valley Center, CA
WB6RKE, Earl S. Raybourn, Fresno, CA
W6UAP, Frederick W. Young, San Marcos, CA
KD6UF, William B. Crum, Woodland Hills, CA
K7CTN, R. F. Hemenway, Vancouver, WA
WB7DQB, Robert O. Simpson, Chehalis, WA
W7JMJ, Dave E. Carter, Ashland, OR
WB7N, Derald D. Dion, Moscow, ID
KE7ZX, Robert L. Schenk, Liberty Lake, WA
N8AET, Arthur W. Grant, Detroit, MI
W8CGP, Charles A. Vimmerstedt, Youngstown, OH
*KC8C, Michael W. Colesante, Temple Hills, MD
KB8DED, Vernon C. Cowfer, Akron, OH
W8LK, Donald F. Alexander, Dayton, OH
KC8OF, William C. Goggin, Midland, MI
W8OQV, Francis D. Gilliland, South Euclid, OH
W8PVB, Joseph L. Hassett, Rogers City, MI
W8SYC, Clinton W. Flowers, Piqua, OH
W8VJX, Robert Lyman, Mentor, OH
KO8X, Donald J. Barnes, Wheeling, WV
*W9AMO, Herbert Pascal, Chicago, IL
WD9EEX, L. E. Westbrook, Northbrook, IL
KA9FLJ, Walter J. Norman, Mountain Home, AR
W9GAK, John Chopper, Chicago, IL
WB9GX, H. J. Reed, Elkhart, IN
W9NGG, Harvey C. Lugar, Pontiac, IL
KA9OSX, Ron Thune, Green Bay, WI
W9RDW, James R. Oliver, Wabash, IN
W9TKD, Walter C. Wisnowski, Chicago, IL
W9WF, Willis F. Eleam, Metropolis, IL
K9ZHZ, Everette S. Oliver, Danville, IL
WØBDZ, Owen Hill, Marshalltown, IA
WØBOE, L. H. Estes, Marble Hill, MO
NØCDA, Jack E. Randall, Nathrop, CO
WBØGIM, Marshall D. Hoffman, Pueblo, CO
WØHDX, Lawrence A. Peterson, Marion, IA
KØHJY, F. Louis Bald, McCook, NE
NØHKX, Wayne Maxfield, Wichita, KS
WØHYC, F. Earle Webb, Lucerne Valley, CA
KDØKL, Audrey Kimpe, Mankato, MN
WØOTP, Lee F. Wilson, Hardy, IA
WØGHY, James H. Wilson, Webster Groves, MO
KØSEV, Robert W. Green, Sioux City, IA
WØYAE, John E. Dean, Fort Collins, CO
WØZN, Maynard C. Mielitz, Fort Dodge, IA
LU1EKM, Alan A. Campbell, Buenos Aires, Argentina

*Life Member, ARRL

**Charter 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

November, 1939

☐ Early Washington jitters about communication security, prompted by the war in Europe, have somewhat subsided; the Editor says if we behave ourselves, it is likely we can stay on the air.

☐ Five-meter enthusiast W2DKJ applied the principles of the extended double Zepp antenna to 56-Mc. radiator construction, and found (with some modifications) considerable improvement over most antennas currently in use on that band. It was outstanding also in use at W2USA, the N.Y. World's Fair station.

☐ Broadcast station WTIC has an experimental transmitter W1XEH on 63.5 Mc. to follow up on the late Ross Hull's investigation of air-mass bending of u.h.f. waves. The novel stacked coaxial radiator, four in-phase elements of downspouting, is described for us.

☐ The recent League poll of amateur views as to whether 7200-7300 kc. should be opened to 'phone work (in the event this step was necessary to enable us to combat foreign broadcast interference) showed that 82% of the replies favored such a course.

☐ W6AJF and W2DIY relate the advantages of cathode modulation (once known as "center-tap modulation"), particularly that it requires only one-fifth the power needed for plate modulation, and still is 50 to 60 percent efficient.

☐ The League-sponsored u.h.f. relay and field day, held in September, brought enthusiastic participation; the record relay was New York to Chicago, passing through ten stations—all on 56 Mc.

☐ The idea of ganging a variable inductance and a variable condenser is not new, but seldom has been applied to amateur transmitters. W1LJI describes a single-control tank circuit covering three bands with a constant L/C ratio, yet without switches.

☐ W5EME has a three-element beam with continuous rotation in either direction; he uses ¼-inch copper tubing coils to provide inductive coupling.

☐ The Radio Corporation of America, wisely aware that many amateurs run transmitting tubes well over the published power ratings without excessive damage, is now using two sets of maximum ratings. One is "continuous commercial service," where the figures for each tube will not be changed; the second and new class is "intermittent commercial and amateur service," with higher ratings, providing a relatively large increase in useful power output.

25 Years Ago

November, 1964

☐ The Editor blows the League's horn a bit, reciting some of the ARRL-sponsored achievements of recent years—e.g., expanded 160-meter privileges, a new Hq., a commemorative postage stamp, a reciprocal-licensing bill, expanded power on 420 Mc., to name a few.

☐ Many Novices, frustrated by no contacts, eventually find that mistuning has caused them to transmit on one band but listen on another! W1ICP draws on the old, familiar absorption wavemeter to design a gadget which will avoid the problem.

☐ A "featherweight portable station for 50 Mc.," designed by W1HDQ, weighs less than three pounds, including power supply, microphone and a good antenna system; the secret is transistors, of course, which provided 1000 miles per watt.

☐ K5JVF used a standard telescoping TV mast for a full quarter wavelength vertical on 80 meters, mounting it on a king-size pop bottle.

☐ Directional couplers are pretty useful indicators for s.w.r. measurement, but K1PLP points out they are not precision instruments; e.g., the crystal diode rectifying a small portion of r.f. has enough resistance to cause some error in the meter reading.

☐ An amateur applicant living more than 75 miles from an examining point may take his exam by mail, but FCC is concerned about the recent growth in the percentage of these Conditional Class licensees and so proposes to adopt a new distance figure of 175 miles.

☐ The 50-year anniversary section highlights the late 50s, in particular the 1959 international radio conference in Geneva, Switzerland, where after resisting heavy foreign attacks we retained all U.S. privileges; however, amateurs elsewhere received more cuts at 7 Mc. because of inroads by broadcasters.

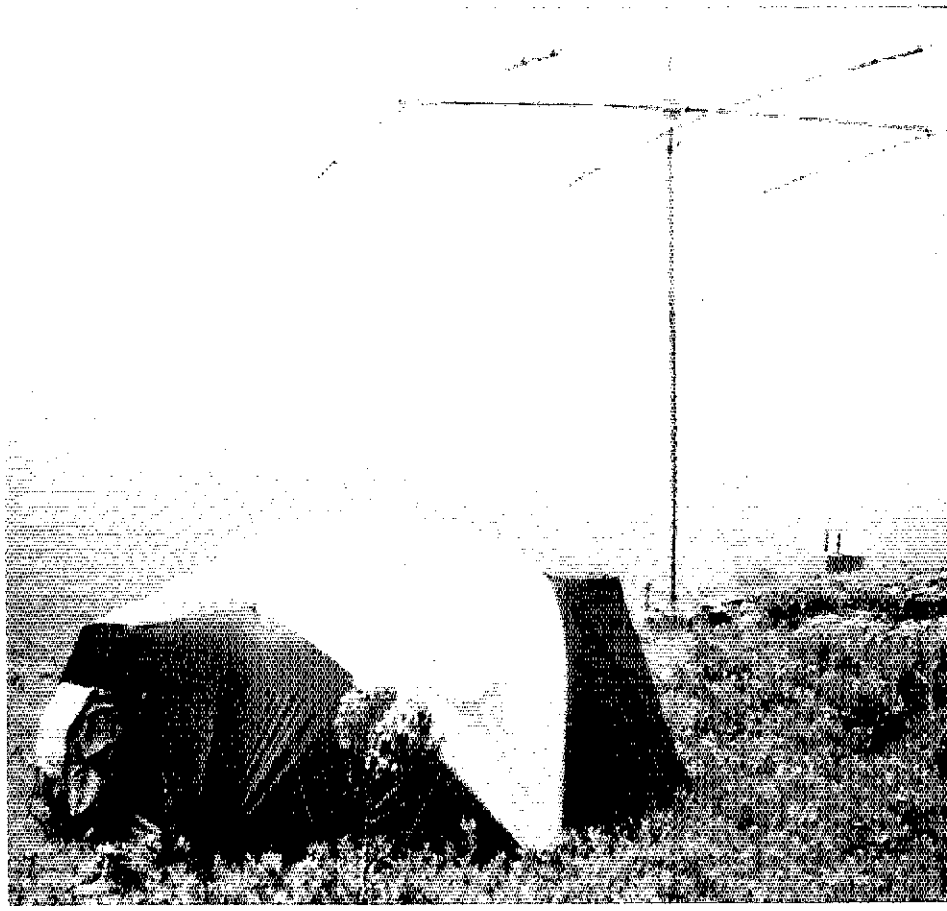
☐ If you bought (or received through MARS) one of the thousands of surplus I-177 tube checkers, K4YPY shows how it can be modified to provide an up-to-date unit at minimum cost.

☐ A "12-volt" transistor is not always immune to damage just because your power supply is 12 volts or less; W1CUT points out that in an audio amplifier, for example, the audio voltage adds to the d.c. component and may double the rated figure.

☐ In an article bound to stimulate discussion, K4KXR (by profession an equipment manufacturer, natch!) argues that building your own is a waste of time and money in these days of complicated electronic construction procedures, requiring specialized tools and sophisticated measuring and test equipment.—*WIRW*

Field Day 1989

By Billy Lunt, KR1R
Contest Manager
and
Mark R. Burke, KA1MIS
Contest Assistant



NK1I and N1FJ operated in the 1B 2 op battery category from this remote mountaintop location.

On the weekend of June 24-25, Field Day stations could be found most anywhere: in meadows, on hilltops, snuggled in public parks, in backyards, at shopping centers and just about any other imaginable place. FD is fast paced and exciting. At the drop of the green flag (1800Z Saturday), the fun began with transmitters blazing with CW, SSB, packet, RTTY, FM, slow scan, AM and any other mode you can think of. This pace continued for 24 straight hours (27 if you waited till the start to set up). Even though the pace may be grueling at times, FD operators find time to enjoy themselves. George, WD4CYV, informed us that their "operation was nearly continuous, except for a watermelon break financed by club president, W4SFF." Little interruptions such as that can strengthen club ties and boost morale while not diverting from the overall goal—to win! This is what Field Day is all about. FD hones our skills in portable station emergency communications by placing us in less than optimum conditions. It provides us with a competitive atmosphere, but at the same time, fun times for all.

Field Day can attract a lot of visitors. It is a good idea to set up a visitors booth with hand outs, manned by a few good public relations people to help explain your club's operation. This extra activity can earn your FD group bonus points. Mike, WN2A, noticed that "being located at the town's municipal building brought in a steady stream of onlookers." Frank, NG1I, was "surprised at the number of non-Field-Day hams and nonhams who constantly stopped by to view our station and ask questions." To those curious visitors who just happened by, all those unfamiliar sounding noises and messages being exchanged must seem mighty strange without the public relations people explaining what FD and Amateur Radio is all about.

Field Day participation keeps on growing! During Field Day '89, a reported total of 28,701 people headed to their favorite FD spots and set up 1742 sites—up slightly from the 1988 figures. Continuing the trend, SSB was the favorite mode during Field Day again this year. There were 895,936 phone QSOs reported and 465,922 CW QSOs for a grand total of 1.3 million contacts. When the Contest Branch finished tallying all the claimed bonus points, there was a total of 847k bonus points credited, making the total score earned by all entries over 4.7 million points. Not bad at all!

Field Day is an emergency preparedness exercise, with emphasis placed on setting up temporary stations in a minimum of time for emergency communications. Of the 1742 FD stations, 1698 of them ran 100% emergency power. There were 1563 Generator-powered stations and 135 battery powered. Amateur Radio has again met its goal for providing temporary powered stations practicing emergency communications.

The 2A entry class was the favorite entry category again with 532 entries. The second most popular class was 3A with 304 entries. Check the boxes for further breakdowns and information for your group's plans in preparing for the 1990 Field Day.

Comments from several groups are listed below. You can get comparison information or ideas for revamping your group's next FD effort. See you next June 23-24 during Field Day 1990.

Entries per Field Day Class

1A	249	3C	1	7A	16
1B1	65	3D	4	8A	17
1B2	64	3E	6	9A	6
1C	29	4A	107	10A	6
1D	92	4C	1	11A	3
1E	74	4D	1	12A	1
2A	532	4E	1	13A	1
2B1	1	5A	65	15A	1
2B2	20	5B2	1	17A	1
2C	1	5D	1	23A	1
2D	9	6A	42	24A	1
2E	16	6D	1		
3A	304				
3B1	1				

Top Scoring Stations

Call	*Score*	*Entry Class*
K5DX	25,260	23A Battery
K6CAB	23,685	17A Battery
N1NH	20,810	15A Battery
KØNA	18,265	3A Battery
KS3L	16,805	3A Battery
W2GD	15,430	4A
W1NY	15,100	9A
N6ME	14,772	8A
KRØB	13,975	2E
N6AW	13,670	3A

SOAPBOX

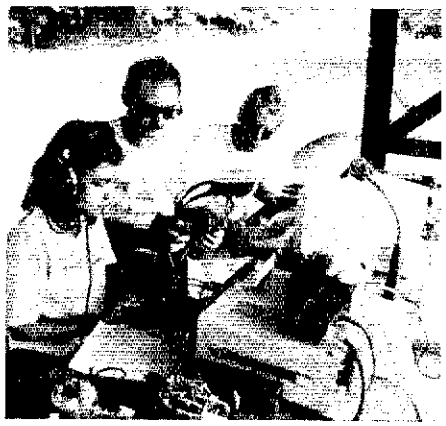
VE6FD, 1A

Saturday morning dawned bright and clear and found me outside my tent trying to build, singlehandedly, a 4-element, 40-meter wire LPDA. VE6VQ rolled in about 10:00 AM and began erecting supports. The effort involved caused him to retire to my tent and spend the rest of the day producing loud, irregular, snoring noises. He later claimed these were merely a new type of ultra-low-frequency packet.

VE6KEY dropped by, accompanied by his wife and two Doberman pinschers. He tried his hand at making his first-ever phone QSOs, while the dogs tried to catch squirrels. It should be noted that in spite of several valiant canine attempts at tree climbing, the squirrels remained unmolested.

For the rest of the time, we operated, ate, drank, drank, ate, chased beavers away from the antenna

Centralina ARC, N4QR claims the cows participated in Field Day '89, but they were not included in the "head count."



Three of the ops of the W2TZ group making phone QSOs.

supports, operated and listened to VE6VQ snore. The LPDA worked fine—we made two whole contacts with it, and then reverted to our normal 20-meter habitat. Needless to say, we did nothing special for points this year, but, as usual, a fine time was had by all.

AA5EQ, 1B—2 operators

FD '89 was a "kinder and gentler" experience than that of last year. We didn't get hit by any severe weather, and the insect attacks were minor. We had no equipment problems either. The only negative things that happened were two "raids" by the local police who thought we were running a still, and my partner's bug gun. Alan, KB5CUS, had brought along a squirrel cage fan to run off the generator. He had it aimed at the operating position to help counter the heat and humidity. It did a good job at providing a breeze, but it also made a very effective shredder and launcher for June bugs. I would duck every time I heard a June bug rattle into the fan. You had about a second before the inevitable spray of bug parts would come whistling at the mike.

In retrospect, we should have set up an information booth. We could have easily picked up some bonus points from the continuous stream of passersby who wanted to see what we were doing, not to mention the half-dozen police who came by. It wasn't a total waste to be sure. A local teenager came by several times and spent hours watching and asking questions. Later, I got a phone call from him. It seems he got charged-up by the experience and ran out and got one of those Novice class kits. He studied it and passed the test. In a few weeks, he will have his ticket and be on the air. He called me to volunteer to help us next FD!

W5QX, 2A

Field Day 1989 started off hot for the San Angelo ARC. In fact, things got hot before competition even began!

Charles, K5JEZ, while transporting one of the club's generators to the site, was flagged down by a passing motorist and told the trailer was on fire. Sure enough, it took all the drinking water K5JEZ and the motorist had to extinguish the flames. An oversized tire rubbing against the trailer frame was the culprit. The generator, dubbed the "Africa Queen," remained undamaged and performed beautifully.

The operators got off to a blazing start. However, the heat would have been more intense if the SSB station had realized it was attempting to operate 20 meters from the 40-meter dipole. Once corrected, a great FD began to fall into place—or out of place.

While Noel, KE5NO, was taking part in an on-camera, television interview, explaining how technical expertise contributes greatly to the total points, the primary generator died due to fuel pump failure. An auxiliary generator was pressed into service, and the CW station was operational again.

With Murphy and a host of gremlins exorcised, initial butterflies removed from the operators' stomachs, and a solid cloud cover to keep the Old Sol away, we began to generate points. At the end of the 24 hours, more than 3000 contacts had been made, each station setting a new club record. And for the first time in the history of SAARC, not one of the 40 participants said, "Never again!"

N1GKJ, 2A

It was a most enjoyable weekend for the three of us indeed. Operating with Technician privileges only made for some slim times in the middle of the night. It was most discouraging that 10 meters did not open up for Saturday evening. But our location at Good Hill Airport, 1000 feet above sea level, made for many nice ground-wave contacts, the longest of which was a contact with KA1STB in Gay Head, Massachusettes—a distance of about 130 miles.

The evening did provide us with some laughs too. Our contact with N1FOJ, a 2A station in New Hampshire, was a lesson in perseverance. It took too many repetitions of our various information to count because of the weak signals of our stations. Finally after at least 5 minutes and a lot of yelling, we were able to exchange all the required information, at which time everyone in our tent let out a big yell. I'm sure that everyone in New Hampshire was pretty happy too.

We all had a very good time talking with the people that stopped by. Most were very interested in the whole concept. I know that all of us here are looking forward to it again next year. Of course, next year we should at least have General class privileges, and we will probably start to organize the whole thing more than four days in advance. Thank you, and we'll see you next year.

N8IAO, 3C

This year was probably one of the most offbeat stations assembled. N8ITP and myself held FD aboard a 28-feet sailboat. However, before nightfall, we had to return to the dock. That is when the fun really began. After talking to WD8OCS and N8CDN on 2-meter simplex, we found ourselves hosting quite a little party. Before it was over, KC2FQ, KA8PMI, N8JBI and several nonhams participated. Overall participation included operators, crew members—even the security guard at the marina helped out for a few minutes! I was very surprised how many people from the marina came over to see what was going on and showed an interest in ham radio. We also managed to get some prospective Novices lined up for an upcoming class.

We may not have set a record in the point standings, but I'll challenge anyone to beat the fun we had!

WG7X, 4A

Well, we came, we saw, but we didn't conquer—not by a long shot, but we did have fun. This was the second time that we had gone out for FD using my call. The year before, we had not put out a big effort. This year was different.

Randy, N7HNX, put forward a tremendous effort as our equipment chairman. He put up an antenna farm that would be the envy of many a ham. We had a better setup for FD than many of us have at home! We all learned a lot about the fine art of tower raising from Randy. He really had that situation under control.

We just barely got the 20-meter station operating in time for the contest start. We were only an hour late! We then concentrated on the 10- and 15-meter station. We got everything working, and it only took us a day and a half! Then, Murphy attacked the rotator. Some frantic trouble shooting ensued, and the problem resolved in record time. We really got some exercise running up and down a 35- foot tower. The locking pliers saved the day!

Feedback

Please refer to November 1988 *QST*, pp 79-87, for the following corrections. In 2A, W8SP should have had 6,914 points instead of 6,804. Also in 2A, N5RR's line score should have read 2989-2-10-9,152, not 4216-2-10-14,060.

Scores

Class A stations are clubs or groups operating with more than two operators. Score listings are grouped according to the number of transmitters in simultaneous operation. The listings show club or group name, call(s) used, total number of QSOs, number indicating power output used (5 is less than 5 W; 2 is less than 150 W; 1 is more than 150 W), number of participants and total score including bonus points. Scores are listed from highest to lowest in each class. Non- club groups are identified by the letters "NCG." Class B stations are portables manned by one or two operators. These may have one or two transmitters in simultaneous operation. Class 1B stations manned by one operator are listed first, followed by those with two operators, followed by Class 2B stations. When there are two operators, the other operator's call is listed in parentheses, if it is known. Numbers following the calls indicate QSOs, power and final score. Class C stations are mobiles. They are listed by call, QSOs, power, number of operators and final score. Class D stations are home stations using commercial power. Line scores are the same as Class C. Class E stations are home stations using emergency power. Line scores are the same as Class C.

Club/Non-Club Portable

1A Battery

Panama City ARC
W4RYZ 1278- 5- 30- 9,335
Dinosaur Valley DX Soc
K5MW 630- 5- 10- 6,835

Callaway ARL
K5GM 569- 5- 12- 6,550
Spectrum First
ND7A 672- 5- 3- 6,285
NCG
WB6ITM 635- 5- 5- 6,030
Central NC DX Chasers
N4DAZ 648- 5- 8- 6,010
University ARC
KU7D 598- 5- 14- 5,020

Central MO RA
ND0N 358- 5- 9- 4,180
Real Studs
K2RS 491- 5- 3- 4,115
Hiawatha & Falls City ARCs
W0PB 467- 5- 21- 3,960
NCG
W9VV 321- 5- 4- 3,610
Davis Co ARC 1
NS7K 297- 5- 58- 3,610

KC QRP
NR0R 317- 5- 11- 3,585
RCA ARC
N9RJ 489- 5- 15- 3,455
UM des Sans-filistes de Montreal
VE2UMS 250- 5- 20- 3,300
Steubville-Wellton ARC
KE8SX 285- 5- 30- 3,050
Lookout Mountain ORPers
KA4LKH 423- 5- 6- 3,050

Lightning Arrestors
KC8ZT 250- 5- 3- 2,700
NCG
N8A 229- 5- 3- 2,690
Thumb ARC
W8AX 328- 5- 5- 2,555
QRP Electron Squirters
WB8VGE 255- 5- 3- 2,455
U of S ARC
VE5US 202- 5- 11- 2,305
North Texas Frequency Assn
NQ5X 296- 5- 15- 2,275
Bloated Toads
AC7A 254- 5- 3- 1,705
Carbon ARC
N3IK 204- 5- 7- 1,345
Windy City Chaverim
W9ZDK 6- 5- 10- 280

1A

Ramapo Mt Contest Group
NW2D 2101- 2- 6- 7,314
Other Club
N7ZZ 2249- 2- 4- 6,016
Motley Crew ARC
KK9H 1342- 2- 20- 5,326
Maui ARC
KH6RS 1595- 2- 20- 5,036
Bozo and the Lids
W9TG 1080- 2- 4- 4,910
Acadiana ARA
W5DDL 1311- 2- 30- 4,722
HDL RC
K3TM 1156- 2- 6- 4,554
Ohio State Univ ARC
W8LT 1006- 2- 4- 4,524
Fist and Mouth Contest Co
W5EW 1142- 2- 6- 4,302
Dr Loomis Junior Mechanics League
N4YE 1266- 2- 9- 4,188
Whiskey Lakers
KF5QP 1368- 2- 5- 4,178
Mama's Radio ARC
W7MR 1172- 2- 12- 4,030
Collins ARC
K5BU 1215- 2- 12- 3,934
Arrowhead RAC
W0GKP 1218- 2- 25- 3,926
Montrose ARC
K0GAS 1238- 2- 14- 3,912
Hannibal ARC CW Group
N5BZ 921- 2- 19- 3,822
Reeve's Hill Group
N3IJ 1070- 2- 4- 3,634
Twin City FM Club
K8AD 1056- 2- 12- 3,632
Ticks & Chiggers ARC
KØWA 1158- 2- 3- 3,604
Mercer Co ARC
W3LIF 941- 2- 10- 3,520
Buster's Beach Bums
K4IX 738- 2- 7- 3,444
Richardson Wireless Klub
K5RWK 969- 2- 21- 3,370
Piscataway ARC
KO2K 1332- 2- 15- 3,364
River Rats FDG
KB9S 892- 2- 6- 3,290
Cavendale's Commandoes
VE3ICV 753- 2- 8- 3,222
Tuscaloosa ARC
W4XI 768- 2- 30- 3,190
First State ARC
K3QBD 877- 2- 16- 3,138
York Co ARS
K4YTZ 794- 2- 28- 3,096
Trailer Buddies
K7SF 761- 2- 4- 3,022
Gunnison Co ARC
W0GYV 1269- 2- 19- 3,010
Azalea Coast ARC
K4UWH 954- 2- 12- 2,998
Hilltoppers
WA5CMI 1129- 2- 6- 2,978
Pepperell ARA
K1BG 850- 2- 4- 2,958
NCG
NC9F 713- 2- 3- 2,958
Randallstown ARC
N3IC 873- 2- 6- 2,946
Sussex ARA
K3JL 801- 2- 23- 2,926
Thibodaux ARC
W5YL 907- 2- 20- 2,888
WV CW Nuts
WR0L 614- 2- 4- 2,856
Los Alamos & Northern NM ARCs
W5PDO 1163- 2- 20- 2,848
HF War Group
KA8VNM 1062- 2- 10- 2,824
Merrymeeting ARA
N1MA 864- 2- 20- 2,810
147.33 Repeater Group
WZ5S 1028- 2- 17- 2,756
AT&T CRES ARC
W8ZPF 995- 2- 12- 2,748
Forty Niner's
KF4PX 699- 2- 5- 2,736
Cubs ARS of Sedro Woolley HS
WY7Q 1022- 2- 21- 2,718
Beacon RA
W3AA 900- 2- 8- 2,692
Seaway Raiders
N2MD 638- 2- 3- 2,684
Mid Willamette Valley ARC
W7AEP 929- 2- 18- 2,658
Just-For-Fun Contesters
NI9E 857- 2- 9- 2,640
Federation of ART
WB9ZAJ 767- 2- 6- 2,566
Oshkosh ARC
KD9BC 805- 2- 8- 2,588
Madison Co ARES
KI2A 616- 2- 10- 2,556
SRO/CFMC
W9EJ 593- 2- 43- 2,526
Signetics Orem ARC
NR7P 637- 2- 7- 2,514
Lawrence Technological Univ ARC
W8QOA 549- 2- 7- 2,454
NCG
W8YHE 983- 2- 3- 2,442
Nanaimo ARA
VE7NA 736- 2- 12- 2,390

Murphy's Law-Yers
N6JF 862- 2- 6- 2,382
North Jersey DX Assn
NA2R 568- 2- 3- 2,372
Heart of America RC
W8RR 640- 2- 15- 2,352
Case ARC
W8EDU 484- 2- 3- 2,236
Silicon Gulch ARC
AE6C 2008- 1- 6- 2,208
Honolulu ARC
KH8WO 969- 2- 20- 2,198
Sumner Co ARA
K4DZR 692- 2- 12- 2,196
Just Three Hamsters
WA7LNW 838- 2- 3- 2,168
Halton ARC
VE3OD 631- 2- 15- 2,120
Hawk Mt Skunks
WA4YGG 759- 2- 4- 2,102
Columbia ARA
K3EF 725- 2- 8- 2,070
South Florida Ham-sters
N4FL 714- 2- 20- 2,068
North Shore ARC
VE7NSR 448- 2- 16- 2,066
Tamaqua TS
W3TI 475- 2- 5- 2,062
GA Tech ARC
W4AQL 568- 2- 10- 2,046
Denton Co ARC
W5NGU 502- 2- 20- 2,042
LL's
N5LLK 964- 2- 5- 2,028
CRASOI
VE2CEV 527- 2- 14- 2,006
Athens RC
NB4X 564- 2- 14- 1,994
Reno Co ARC
WØJY 600- 2- 10- 1,966
NCG
WB5CLE 550- 2- 3- 1,956
Hellgate ARC
NZ7M 580- 2- 30- 1,944
Worldradio Staff ARC
N6WR 726- 2- 4- 1,940
Southern Ohio ARC
N8KTW 766- 2- 25- 1,936
ARA of SW Florida
K4FA 711- 2- 21- 1,922
Nanticoke ARC
N3GIL 605- 2- 16- 1,896
Kauai ARC
KH6LG 1190- 1- 38- 1,890
Cumberland ERG
VE3CER 790- 2- 12- 1,880
Northern Illinois RA
KE9JH 524- 2- 5- 1,876
Kennydale Key Klicks
W7JIE 424- 2- 4- 1,866
Medina Two-Meter Group
K8TV 410- 2- 6- 1,858
Woodchuck ARC
N8DKQ 810- 2- 11- 1,820
Novatel ARC
VE6NOV 515- 2- 5- 1,790
Matagorda Co ARC
W5WTM 409- 2- 29- 1,788
Broadcast Band Refugees
KH6W 409- 2- 8- 1,786
Butte ARC
W7FO 1452- 1- 20- 1,784
VSPARC
K4AAB 773- 2- 12- 1,756
Stanly Co ARC
K4OGB 676- 2- 18- 1,754
Great Bend ARC
KØWRZ 595- 2- 20- 1,734
Ledyard Extras
KY1F 335- 2- 5- 1,724
Washington Co ARC
W9SIZ 360- 2- 9- 1,724
Lake Country ARC
NF5T 651- 2- 6- 1,702
Suncoast ARC
WA4T 478- 2- 10- 1,694
Shenandoah Valley ARC
W4RKC 281- 2- 11- 1,654
WRECS
K8NI 630- 2- 10- 1,634
Lancaster Co ARC
AK4N 376- 2- 15- 1,630
North Valley Group
NC7K 558- 2- 5- 1,622
Winona ARC
WØNE 430- 2- 10- 1,618
Highland Quartet +2
KG8W 415- 2- 6- 1,586
Central Washington ARC
K7PK 409- 2- 4- 1,578
Baltimore ARC
W3FT 432- 2- 15- 1,568
Carmine A1 Group
K5DL 340- 2- 3- 1,560
FM-36 Repeater Club
N9GMT 606- 2- 6- 1,556
Volunteer ARC
NY4N 416- 2- 3- 1,554
NCG
N7JKF 340- 2- 4- 1,554
Texas A&M ARC
W5AC 365- 2- 11- 1,550
Ollie Hopnoodles Haven of Bliss
K8TK 1543- 1- 4- 1,548
Salkehatchie ARS
WA4FOF 532- 2- 8- 1,530
Eastern OH AWA & N Panhandle ARC
WK8T 386- 2- 20- 1,522
Shafamma
N6ESV 350- 2- 12- 1,512
Ski Country ARC
K9MWM 693- 2- 8- 1,486
Hillsborough ARS
KY4G 460- 2- 20- 1,482
Issaquah ARC
W7BI 529- 2- 22- 1,478
Faulkner Co ARC
W5LL 401- 2- 10- 1,442
Bankhead RC
KJ4FF 667- 2- 5- 1,434
West Essex FDG
WF2Z 352- 2- 3- 1,426
Oklahoma State Univ ARC
W5YJ 386- 2- 20- 1,404
Wine Springs Bald CW Ops
KA4RNI 300- 2- 4- 1,400

Indianapolis Power & Light ARC
N9TT 494- 2- 8- 1,384
Mason Co RC
K8DXF 448- 2- 27- 1,372
Uniontown ARC
W3PIE 405- 2- 7- 1,370
Pioneer ARC
VE3NA 464- 2- 20- 1,366
Sand Hills ARC
WØMI 478- 2- 20- 1,356
Augusta ARA
W1TLC 373- 2- 22- 1,338
Yucaipa Valley ARC
W6CV 566- 2- 10- 1,332
West Alabama ARS
KC4GS 515- 2- 25- 1,330
Eastern Oregon RC
W7NYW 463- 2- 7- 1,326
Silver City ARF
N5BKW 273- 2- 8- 1,308
Scioto ARC
KS8O 402- 2- 5- 1,306
Splitrock ARA
WK2R 897- 1- 25- 1,297
South Huron ARC
VE3LRO 473- 2- 4- 1,292
Hoffman Estates ESDA
W9NIC 379- 2- 6- 1,288
Lehigh Valley DX Assn
K3SY 332- 2- 4- 1,236
Prince Rupert ARC
VE7EEE 464- 2- 5- 1,228
Last Mountain RC
VE5LM 419- 2- 10- 1,220
3M ARC
K9MBB 372- 2- 8- 1,216
Eastern Nevada ARS
WB7WTS 552- 2- 6- 1,204
New Cuyama Quad Hoppers
N6PC 295- 2- 3- 1,196
Centralina ARC
N4QR 298- 2- 43- 1,190
Southern CA Amateur Network
WA6TKO 579- 2- 6- 1,184
LARC
KC7MP 163- 2- 4- 1,170
South Lyon Area ARC
N8AR 390- 2- 5- 1,166
Shiawassee ARA
W8QQO 265- 2- 4- 1,160
Oak Park ARC
W8MB 464- 2- 12- 1,128
Lakes Area ARC
WB8RFK 425- 2- 7- 1,110
Anaconda ARC
W7VNE 449- 2- 35- 1,098
NCG
KA9YUP 335- 2- 3- 1,070
Plattekill Irregulars
K2OW 378- 2- 3- 1,068
Keno ARC
WD6EAW 276- 2- 13- 1,060
CRA Laval Laurentides
VE2CRL 160- 2- 28- 1,040
North Isalnd ARS
VE7ARK 407- 2- 8- 1,032
Dillingham ARA
KL7N 305- 2- 8- 1,020
Theodore Roosevelt ARC
N5ØH 355- 2- 8- 1,010
West Nebraska ARC
WØAFG 400- 2- 16- 1,000
South CA Six-Meter Club
AA8DD 492- 2- 5- 984
Peninsula ARC
W4MT 437- 2- 12- 974
Iowa Radiosport Society
WKØI 200- 2- 3- 968
Relay Repeater Club
N8PZ 382- 2- 15- 964
David Co ARC 2
AC7H 276- 2- 56- 952
RDARC
KH6JJX 272- 2- 9- 944
Huntsville ARS
KG5LN 191- 2- 11- 936
Hannibal ARC
WØKEM 217- 2- 13- 934
River Cities ARA
N4PVK 263- 2- 19- 934
Tri-State ARC
KW3U 256- 2- 6- 924
Huron ARC
WØNOZ 256- 2- 10- 912
M&M RC
W8PIF 238- 2- 7- 910
Chevron ARC
N6MUG 335- 2- 14- 908
Detroit Metropolitan RC
W8LXE 242- 2- 4- 884
Lima Area ARC
WØEQ 218- 2- 10- 860
Montco RACES/ARES
NE3I 91- 2- 3- 856
Enterprise ARS
WD4ROJ 214- 2- 10- 828
ICOM Lumberjacks
WB8NSL 252- 1- 6- 810
Yellowhead ARC
VE6YAC 304- 2- 4- 808
Peel ARC
VE3XR 209- 2- 10- 806
Kerr Lake Campers
N4SW 300- 2- 6- 800
Hays ARC
NKØV 129- 2- 15- 792
NCG
N2EBG 229- 2- 3- 788
Pembina River Flying Dinosaurs
VE6FD 466- 1- 8- 766
ICARES
WBØOY 141- 2- 8- 720
Iowa City Ham Club
WØJV 195- 2- 12- 720
Martuni Group
KU7K 187- 2- 3- 696
Siemens ARC
AB4OU 299- 2- 8- 698
Hartford Co ARC
W1NEM 235- 2- 15- 670
Lubbock ARC
K5LIB 226- 2- 25- 658
Ampex RC
WBEIJ 201- 2- 5- 644
NCG
KØOJ 543- 1- 5- 643

Grand Strand ARC
WD4JMT 268- 2- 5- 636
Confluence FDG
N9DBL 256- 2- 10- 612
Dade City DX Bandits
AB4KA 100- 2- 4- 610
Hastings RC
N9FKC 65- 2- 4- 570
Cornell University ARC
WB2CKM 203- 2- 4- 556
Capilla Peak FDG
K5FSB 438- 1- 7- 539
Coon Valley ARC
KV9N 167- 2- 15- 534
Sand Hill Fleas
W4SIS 104- 2- 14- 516
Mara Lexington Group
N4AHA 157- 2- 3- 514
Neshoba ARC
WG5I 145- 2- 6- 498
Koolau ARC
WH6BKQ 91- 2- 15- 494
BBBBARTSS
WD4EIQ 181- 2- 5- 482
Ozone Pioneers
WA8ACX 147- 2- 4- 476
New Era Repeater Technocrats
WD8DAS 138- 2- 3- 472
Pahrump Valley ARC
K7NV 129- 2- 6- 458
NCG
VE3AOY 224- 2- 8- 448
Lockheed ARC
WA8CEY 155- 2- 3- 410
Clearwater Valley ARC
KE7RT 133- 2- 8- 366
Last Minute Brigade
VE5EB 119- 2- 6- 338
White River Valley ARS
N8DST 87- 2- 7- 274
NCG
W7VLG 79- 2- 7- 258
Tower ARC
K2IZZ 33- 2- 7- 166

1A Commercial

Rainbow Canyons ARC
N7KM 833- 2- 18- 2,166
Imperial Valley ARA
WM6Z 792- 2- 8- 1,784
IN Lakeshore Amateur Burnouts
NN9J 1202- 1- 8- 1,402
Clemson Univ ARC
WD4EOG 276- 2- 4- 1,160
S Port la FD Marching & Chowder Soc
W1GGA 382- 1- 5- 687
AREN ARC
KG5FF 234- 2- 9- 478
Harrison ARC
N8TF 143- 2- 8- 366
Hardin Co ARC
W8UMU 50- 2- 5- 210

2A Battery

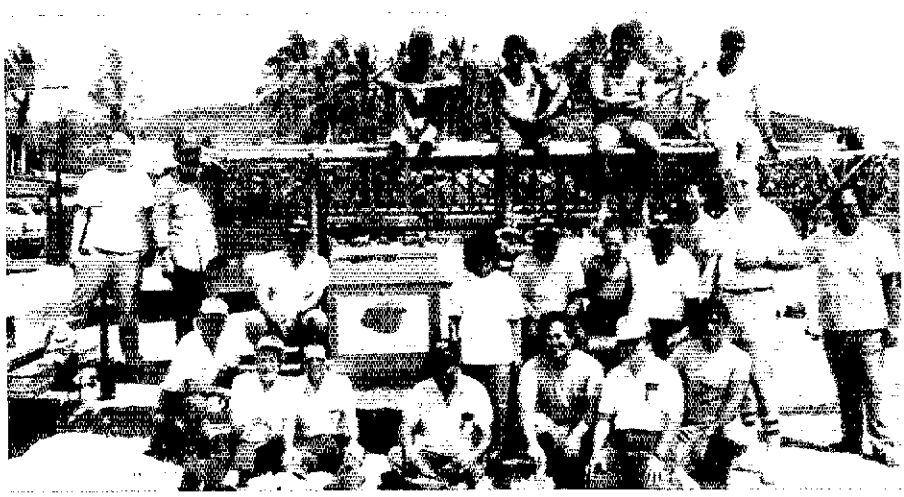
Southern Humboldt ARC
W6JTI (+N6SRY) 1421- 5- 11- 10,776
Chatlee-Lake ARA
W8LSD (+N8UJJ) 1399- 5- 10- 10,575
Meriden ARC
W1NRG (+N1EGT) 1000- 5- 25- 10,140
Massillon ARC
W3NP (+KB8AKD) 858- 5- 21- 7,265
Maryland Mobileers ARC
NC3F 761- 5- 18- 7,170
LAPA QRPers
K2ECQ (+KA2QPP) 796- 5- 15- 6,820
Berrys Mt ARC
W3TS 796- 5- 5- 6,790
Walton RA
W2LZ 551- 5- 8- 6,010
Eagle Rock ARC
NO7B (+N7LQX) 616- 5- 15- 5,605
West Park Radiops
W8VM (+KA8ZEP) 591- 5- 17- 5,430
Le Frog
N9EEE 535- 5- 4- 5,050
Bloomington ARC
W9NX (+KA9IPC) 474- 5- 18- 4,900
MI QRP Club
K8DD 563- 5- 6- 4,850
Portland AWA
W1KVI 411- 5- 18- 3,735
Athens QRP Club
KB4GIB 361- 5- 6- 3,605
Goddard ARC
WA3NAN (+N4OSD) 450- 5- 17- 3,590
Jackson QRP Outlaws
K8IMR (+KB8FTO) 667- 5- 14- 3,580
Univ of MD ARA & Hopkins ARC
W3EAX (+N3HAU) 490- 5- 15- 3,575
AWARE
WA8R (+N8ITF) 474- 5- 10- 3,575
Antennas West Funteam
KK7C 400- 5- 4- 3,515
NCG
WK8G 289- 5- 3- 3,190
Columbiana Co ARC
N8FIG (+N8HGN) 354- 5- 20- 3,125
Kalamazoo QRP
WG8J 361- 5- 3- 3,055
Niagara Co DX ARC
N2QH (+KA2EUM) 128- 5- 8- 1,425
Noahs ARC
W2FMM 98- 5- 7- 1,365
Lafayette HS ARC
KA2WFT 24- 5- 5- 640
Rason QRP & RAS of Norwich
N1DAT (+N1FHR) 57- 5- 7- 590

2A

S FL DX Assn & IBM ARC—Boca Raton
N4TL (+N4PYB) 3523- 2- 17- 10,718
United RAC of San Pedro
K6AA 3324- 2- 20- 10,212
Muskogee ARC
W5EJK (+KA5IIS) 3822- 2- 20- 9,434
Harris ARC
W4KS (+N4RGO) 3064- 2- 57- 9,364
444 DX Group
K2SG 2929- 2- 5- 9,204
Silicon Junction RC
K1VT (+N1PKV) 3104- 2- 14- 9,052
San Angelo ARC
W5QX (+N5MMR) 3041- 2- 40- 8,582
Batteseville Area RC
NG5M (+KB5IXL) 2815- 2- 15- 8,472

Arlington ARC
KS5LD (+N5HAI) 2704- 2- 57- 8,434
Escondido ARS
N6WB (+N6SUN) 2780- 2- 20- 8,422
Albuquerque DX Assn
N5RR (+N5GFR) 2775- 2- 19- 8,586
Radio Amateur Technical Soc
AJ9D (+K9TZZ) 2497- 2- 8- 7,322
Delaware ARA
W8QLS (+KB8ENJ) 1797- 2- 25- 7,300
Owensburo ARC
K4HY (+N4PHW) 2145- 2- 30- 7,158
Campbell Co ARC
WC7M (+N7MKW) 2047- 2- 8- 6,928
Mountaineer ARA
W8SP (+KA8AVQ) 2096- 2- 22- 6,858
Satellite ARC
W8AB (+N8TME) 2447- 2- 12- 6,856
N KY RC
NM4A (+KB8GUL) 2188- 2- 9- 6,804
San Jose State Univ ARC
W6YL 2177- 2- 15- 6,684
Serious Hams ARC
AA4W (+KC4KJJ) 2459- 2- 14- 6,648
Ham Assn of Mesquite
KE5ID (+N5AIB) 1911- 2- 27- 6,614
Ohio Valley ARA
W4FU 2189- 2- 9- 6,608
Daytona Beach ARA
K4BV (+KC4LFK) 1949- 2- 30- 6,552
Halifax ARC
VE1FO (+VE1MGT) 1896- 2- 30- 6,508
Pike & Lincoln Co ARES
N8MU (+N8JCP) 1974- 2- 20- 6,412
WK ARC of Greater Milwaukee
N9AW (+KA9TEP) 2023- 2- 11- 6,412
Tri Co ARA
K9LJN 1883- 2- 4- 6,214
Providence RA
W1OP (+KA1RSH) 2167- 2- 15- 6,078
Motor City RC
W8MRM (+N8JVN) 1828- 2- 60- 6,070
Radio Oregon
K7RO 1860- 2- 7- 6,044
Muncie ACS
K9NN (+N9GTJ) 1817- 2- 10- 6,028
Anoka Co ARC & ES
WØCF (+NØBPE) 1992- 2- 20- 6,028
Big Bend ARC
K5PD (+N5JOE) 1920- 2- 17- 6,024
NARS
N5FD (+KB5EYR) 1917- 2- 61- 6,016
Carroll Co ARC
K3PZN (+KA3PRG) 1930- 2- 25- 6,006
Northern Ohio DX Assn
W8XD (+N8DMM) 1949- 2- 25- 5,962
Southwest Missouri ARC
WØEBE (+NØIRN) 1991- 2- 74- 5,960
Green Mountain Wireless Soc
N1VT (+KA1QLE) 1906- 2- 20- 5,910
Kingsport ARC
W4TRC (+KC4JMH) 1539- 2- 30- 5,848
Austin ARC
W5KA (+WH9AAH/5) 1842- 2- 25- 5,836
Syosset HS Alumni
K2PV 2172- 2- 8- 5,826
Falmouth ARA
K1AK (+N1GLC) 1815- 2- 35- 5,796
Lake Co RACES
K9SA (+KA9MCX) 1781- 2- 18- 5,776
Boulder RA Group
K2NA (+KB4SWK) 1819- 2- 9- 5,744
STT/STJ ARES & VIARC
NP2E (+NP2CW) 1659- 2- 19- 5,718
Antelope Valley ARC
K9OX (+N9PRS) 1702- 2- 20- 5,712
Suburban Cincinnati ARS
AE8I 1630- 2- 25- 5,684
St Louis ARC
KØLIR (+KA8MLA) 1508- 2- 20- 5,672
Cape Fear ARS
K4MN (+N4UGH) 1625- 2- 52- 5,664
Loveland RA
WØDZ 1857- 2- 30- 5,534
Mid-Mo ARC
NØSS (+KAØOLD) 1590- 2- 20- 5,528
Norwood ARC
K1JMR (+KA1UAX) 1412- 2- 20- 5,516
VARA/MARA
WX4C (+KB4OLM) 1653- 2- 63- 5,486
MATPARC
W4QO (+N4TMW) 1397- 2- 40- 5,480
Elgin ARS
W9IKN (+KA9RVN) 1534- 2- 15- 5,434
Rocky Mt/Wilson ARS
NE4J (+WA4TCC) 1832- 2- 23- 5,430
Gower Gulch Gang
N6LL (+N6JVH) 1845- 2- 14- 5,426
Williamsburg Area ARC
K4MU (+WD4JYC) 1504- 2- 25- 5,426
Fairfield ARA
NV1D (+KA1TFM) 1486- 2- 27- 5,412
Limestone ARES
AB4KK (+N4TXP) 1821- 2- 30- 5,324
Farout ARC
WB8SMC (+KB8DLS) 1585- 2- 33- 5,256
Western KY DX Assn
WA4QQV (+N4HID) 1596- 2- 9- 5,232
Trident ARC
AA4IX (+KB4LAU) 1626- 2- 150- 5,194
Dallas ARC
W5FC (+WD6AAZ) 1623- 2- 45- 5,116
Acadiana DX Assn
NK5Y (+KB5DUP) 1810- 2- 20- 5,096
Gaffatin Ham RC
W7ED (+N7MCW) 1369- 2- 30- 4,988
West Valley ARA
W6PIY (+N6STK) 1522- 2- 47- 4,918
Anderson RC
W4FX (+WD4BUH) 1307- 2- 12- 4,914
Reading RC
W3BN (+KA3MVN) 1468- 2- 16- 4,904
Utica ARC
K2IQ 1547- 2- 15- 4,882
Maryland Apple Dumpling ARS
W3PH (+N3EYF) 1438- 2- 15- 4,876
Calgary ARA
VE6NO 1454- 2- 22- 4,822
HP/ATL ARCs
NN7N 1528- 2- 14- 4,786
Free State ARC
K3IVO (+N2GTE/3) 1258- 2- 18- 4,752
Findlay RC
W8FT (+KB8ETT) 1280- 2- 35- 4,726
Univ of Alabama ARC
K4CWW 1414- 2- 8- 4,680

Brazosport ARC
WB5J (+KA5CCIA) 1245- 2- 40- 4,674
Saline Co ARC
K5NE (+KB5IJG) 1422- 2- 21- 4,670
Union Co ARC
WK4S (+N4QIN) 1262- 2- 30- 4,670
Rockwell Automatics RC
KI6X (+KB6EID) 1208- 2- 20- 4,620
Cedar Valley ARC
W6GIQ (+N6BJK) 1301- 2- 50- 4,598
Fauquier ARA
NZ4N (+KC4KUD) 1187- 2- 17- 4,556
Northwest Illinois ARC
W9AF (+KA9JAX) 1197- 2- 20- 4,528
ARA of Southern New England
W1AG 1322- 2- 19- 4,518
Spartanburg ARC
K4II (+N4TIR) 1130- 2- 12- 4,502
South Carroll ARG
W3FCR (+KA3NNR) 1268- 2- 13- 4,472
Charleston ARS
WA4USN (+KB4ADF) 1366- 2- 15- 4,456
Calumet ARES
KN9P (+N9IHN) 1152- 2- 11- 4,398
Decatur ARC
W4ATD (+WB4NQP) 1552- 2- 19- 4,368
CRA Vallee Du Richelieu
VE2CVR 1050- 2- 20- 4,366
Tucson IBM ARC
WO7F 1429- 2- 19- 4,338
Metropolitan ARC—Little Rock
AF5M (+N5OOI) 1414- 2- 33- 4,326
Blue Ridge RS
AC4Q (+N4TTY) 1191- 2- 20- 4,304
Stockton-Delta ARC
W6SF (+N6VHN) 1331- 2- 12- 4,300
Beaches ARS
WU4R (+KC4APJ) 1158- 2- 46- 4,278
Radio Free Southampton
NR2L (+WB2KID) 889- 2- 20- 4,264
Pikes Peak RAA
WA6VTU (+N6UJF) 1457- 2- 50- 4,258
Hollister Hams
KG6GF (+KB6KTZ) 1512- 2- 12- 4,248
SVARA
K8DAC (+KB8DXE) 1299- 2- 21- 4,246
Mountain ARC
W6UAW (+N6HNZ) 1134- 2- 22- 4,244
Texins ARS
K4RWP 1756- 2- 12- 4,232
Amateur Radio Caravan Club
WA5Y (+N5JUQ) 1083- 2- 40- 4,224
Amateur Radio Transmitting Society
W4CN (+KB4WEW) 1152- 2- 40- 4,214
West Texas ARC
N5ETX (+KB5EOF) 1709- 2- 35- 4,212
Clairemont RA
WM6J (+N6LLK) 1253- 2- 28- 4,198
Pioneer ARC
AA4HF 1080- 2- 18- 4,174
Granite State Hill-Toppers
AF1T 1462- 2- 7- 4,164
ARINC ARC
W3ZH (+KA3TOI) 1232- 2- 15- 4,158
Northern Chautauqua ARC
W2SB (+N2HTE) 1282- 2- 15- 4,158
East Pasco ARS
KJ4UW 1145- 2- 12- 4,152
Tri-Co Ham RC
N8CG (+KA8ZMF) 1143- 2- 15- 4,140
Northwest Arkansas ARC
KM5G (+KB5IBX) 1157- 2- 37- 4,118
Bartlesville ARC
W5NS 1117- 2- 29- 4,114
Cowichan Valley ARC
VE7CVA 1285- 2- 19- 4,058
Bullitt ARS
AA4KY (+KA4TEV) 1501- 2- 29- 4,050
East Bay ARC
W6SCUS (+N6VJL) 1141- 2- 55- 4,050.
West Virginia AR
NK8Y (+N8GZA) 1042- 2- 16- 4,048
Metro DX Club
WC9R 1118- 2- 15- 4,022
Royal Canadian Mounted Police ARC
VE3RCMP 1395- 2- 15- 4,006
Suburban RC
W8DCW (+KB8EAT) 1218- 2- 60- 3,954
Yellowstone RC
K7EFA (+KB7HKA) 1225- 2- 16- 3,920
Shy-Wy ARC
W7NE (+N7JPR) 1016- 2- 13- 3,884
Tyler ARC
AA5AA (+N5LVN) 1320- 2- 21- 3,868
Fort ARC
KE0A (+KB0CTG) 914- 2- 21- 3,852
Smartt Club
WA6VNO (+WD6FGV) 1035- 2- 17- 3,826
Hopkins Co, Tradwater & Dawson Spgs ARCs
KM4CH (+KC4JTA) 996- 2- 25- 3,822
St Peters ARC
KB0V (+N0GOM) 960- 2- 24- 3,814
Milford ARC
W8SDL (+N8HIA) 1041- 2- 27- 3,806
Hattiesburg ARC
W5NA (+KB5AXZ) 1546- 2- 24- 3,798
Valley Forge FDG
N3KZ (+KA3UUM) 1194- 2- 14- 3,776
Bryan ARC
N5TC (+N5INV) 1278- 2- 25- 3,754
Ozarks ARS
KE0I (+N0GNH) 1241- 2- 10- 3,752
Penny Pines Brass Pounders
N7CW (+KB6VUE) 1228- 2- 6- 3,744
Blackstone Valley ARC
W1DDD (+WA1POX) 1585- 2- 18- 3,742
Fairfiel ARA & Univ of Cininnati ARC
W8YX (+KB8DWZ) 1335- 2- 12- 3,730
N Ridgeville RA
K8JK (+N8KMO) 877- 2- 12- 3,696
Lynchburg ARC
K4HEY (+KB4OLC) 1021- 2- 23- 3,896
Wilderness Trail ARC
KI4B 926- 2- 15- 3,686
Old Pueblo RC
W7GV (+KB7GOW) 1329- 2- 20- 3,618
Joliet ARS
W9DFR (+KA9YPD) 1033- 2- 12- 3,614
Regina ARA
VE5NN 1309- 2- 32- 3,606
Osceola ARC
K4MF (+KC4KPP) 932- 2- 15- 3,602
Metuchen ARC
K2YNT 1046- 2- 21- 3,598
BPARA
K6ANP 1025- 2- 8- 3,578
Novi ARC
W8RS (+KB8HME) 839- 2- 16- 3,572
Gadsden ARC
K4JMC (+KC4ANB) 946- 2- 40- 3,568
Monterey Bay FDG
KI6EO (+N6VKB) 1607- 2- 8- 3,494
Ottawa Valley Mobile RC & Ottawa ARC
VE3JW 886- 2- 33- 3,474
Big Island ARC
KH6B (+WH6BIR) 1286- 2- 82- 3,462
Twin City Hams
W5EA (+N5NNJ) 1076- 2- 25- 3,456
McHenry Co WA
KB9I (+K9ERG) 1179- 2- 20- 3,456
San Fernando Valley ARC
W6SD (+KB6WDL) 946- 2- 53- 3,450
Huntington Co ARS
NO9F (+N9IEM) 1240- 2- 21- 3,448
Foothill ARS
K6YA 930- 2- 13- 3,442
Utah ARC
W7SP 998- 2- 20- 3,400
Grand Rapids ARA
W8DC 902- 2- 9- 3,358
Lewis & Clark RC
WD9E (+KB9CUD) 992- 2- 20- 3,352
Tamaqua Area ARA
W3VA 882- 2- 17- 3,344
Billy The Kid Chapter
WZ5R (+KB5GIV) 980- 2- 19- 3,342
N Augusta-Belvedere RC
K4FR 740- 2- 15- 3,320
Irvington RAC
K2GC 1266- 2- 20- 3,310
ARC of Savannah
W4HBB (+WD4FIH) 955- 2- 39- 3,296
Lewisville Texins ARC
KC5NG (+N5GEJ) 991- 2- 16- 3,270
Las Cumbres ARC
K6FB (+N6TCM) 943- 2- 18- 3,248
Old Bridge RA
WQ2N (+KB2HVQ) 1107- 2- 21- 3,242
S MD ARC
W3PT (+KA3RZJ) 1011- 2- 57- 3,240
Quinte ARC
VE3RL 791- 2- 28- 3,224
Cherryland ARC
NF8T (+N8JIM) 907- 2- 76- 3,224
BEARS & Vashon Is RC
K7NWS (+N7EXC) 872- 2- 50- 3,204
Montcalm Area ARC
WB8Z (+N8JIQ) 421- 5- 18- 3,195
Virginia Inbreds
N4PMQ (+N4TRX) 1200- 2- 18- 3,184
American Red Cross ARC
NV1L (+N1EWO) 781- 2- 31- 3,178
Pecos Valley ARC
K5LWU 726- 2- 9- 3,158
Tandem RAC
AA6BS (+N6TPT) 864- 2- 14- 3,154
Rip Van Winkle ARS
W2FSL (+KB2IBP) 853- 2- 32- 3,128
Carolina ARL
KS4S (+KB4LLC) 1145- 2- 12- 3,126
Emergency ARC
KH6BI (+KH6NJ) 1024- 2- 40- 3,104
ARES of Edison Township
W2VY 924- 2- 15- 3,082
Pilgrim AWA
N1AIS (+N1ELF) 1166- 2- 25- 3,076
Kendall ARS
WK5O (+KA5OSM) 978- 2- 12- 3,076
NCG
K7YLV (+KB7HVI) 1241- 2- 15- 3,074
Emerson Electric ARC
KA0GGI (+N0IPF) 882- 2- 16- 3,068
NCG
WB6ZQZ 1105- 2- 20- 3,048
Humboldt ARK
K0GP (+N0GME) 875- 2- 20- 3,016
Gonzaga Prep Ham RC
KC7FJ 1167- 2- 9- 3,004
Orville ARS
KD8EU 1067- 2- 40- 3,000
Echo RA
NZ9Y 823- 2- 20- 2,998
Mamoroad Club
W9DK (+KB9APS) 913- 2- 22- 2,996
NOARS
K8KRG (+KA8VTS) 921- 2- 30- 2,988
ZOT ARS
KI6VC 692- 2- 3- 2,968
Manatee ARC
K4GG (+N4UEN) 1207- 2- 19- 2,948
Saratoga Co RACES
WA2UMX 968- 2- 15- 2,942
Mason Dixon ARS
N3DVK (+KA3SEQ) 971- 2- 23- 2,932
ARA of Bloomington
WG0R (+N0BUA) 882- 2- 26- 2,928
Racal Milgo ARC
ND4G (+KB4RLS) 684- 2- 15- 2,922
Canton ARC
W8AL 766- 2- 61- 2,914
US Sprint ARC
KF4CI 971- 2- 7- 2,912
Watertown ARC
N9HR 862- 2- 10- 2,904
Gulf Coast ARC
WC4O 753- 2- 35- 2,896
Mt Vernon ARC
K8EEN 844- 2- 9- 2,884
PCARS
AB4GI (+N4QWV) 680- 2- 50- 2,880
Ausable Valley ARC
WT8G (+KB8HJI) 757- 2- 14- 2,878
Greater Norwalk ARC
KE1F (+KA1RAD) 650- 2- 35- 2,852
Ole Virginia Hams
N4SN (+KB4RKL) 799- 2- 25- 2,852
Tri-State ARS
W9OG (+KB9CNE) 774- 2- 27- 2,848
QSI. Crazies
NH6SL 1254- 2- 3- 2,844
Nappanee ARC
NR9M (+N9EWN) 1163- 2- 30- 2,826
Lake Co ARC
W9LJ (+KA9BLU) 733- 2- 48- 2,818
Yonkers ARC
WO2D (+N2JDF) 1051- 2- 15- 2,816
Straits Area ARC
W8FF 782- 2- 12- 2,814
Calhoun Co ARA
KM4GE (+N4NAU) 748- 2- 30- 2,810
Waterton ARS
W8NT (+N8ZHI) 911- 2- 10- 2,802
Coconino ARC
NN7A (+N7JWM) 767- 2- 21- 2,768
Citrus Belt AR
K6IG (+KB6ONG) 801- 2- 60- 2,768
Central Kansas ARC
W0CY (+KA0QNB) 657- 2- 21- 2,762
Candlewood ARA
W1QI (+WB1EPO) 850- 2- 20- 2,756
Gaston Co ARS
KK4T 741- 2- 20- 2,752
Northern Alberta RC
VE6NC 997- 2- 23- 2,720
Western Colorado ARC
W0RRZ (+KB0CMR) 907- 2- 15- 2,720
ERAA & Tin Lizzy ARCs
K8VA 966- 2- 30- 2,702
Stillings Farm Expedition
W9RVP (+KA9KBU) 720- 2- 4- 2,698
North Arkansas ARS
K5LG (+KB5EHR) 864- 2- 21- 2,682
Champlain Valley ARC
W2UXC 713- 2- 20- 2,680
Middlesex ARC
W1HEB (+W1TYY) 682- 2- 12- 2,664
Upper Valley ARC
AA8O 1079- 2- 20- 2,658
Rideau ARC
VE3IPC 735- 2- 12- 2,654
Texoma & McKinney ARCs
K5QQD 760- 2- 22- 2,650
HAREM
K3EI 654- 2- 10- 2,644
Navarro ARC
AA5MB (+N5OLC) 1030- 2- 51- 2,614
American Red Cross ECS
N2MH 919- 2- 15- 2,600
Clinton Co ARC
W9PC 709- 2- 12- 2,600
Mt Baker ARC
K7SKW (+N7MMH) 864- 2- 40- 2,594
Sweetwater ARC
WO7P (+KB7HEQ) 733- 2- 25- 2,590
Southegon Valley ARC
NN1M (+WB1HBW) 891- 2- 15- 2,584
Xerox ARC
WO2P (+KB2HQS) 749- 2- 24- 2,584
St Paul RC
K8AGF (+KA8PFZ) 787- 2- 25- 2,572
Bristol ARC
W4VS (+KC4CLW) 567- 2- 31- 2,568
Casper ARC
W7VNJ (+KA7DYX) 981- 2- 15- 2,562
LAMARS
W9HOQ (+KA9UNQ) 909- 2- 25- 2,550
Old Fruitville ARTS
N4TKS (+KB4SYV) 878- 2- 20- 2,550
Western Pennsylvania FDA
KS3N (+KA3LNQ) 757- 2- 20- 2,536
Florida Keys ARC
KA4TTS (+KC4JCU) 909- 2- 11- 2,530
Suburban ARC
K3MTK (+KA3MER) 668- 2- 12- 2,528
NEMO ARC
W0CBL 586- 2- 8- 2,526
Hiawatha ARA
KD8U 623- 2- 25- 2,500
Northrop B-2 Division ARC
AA6CR (+KB6OYD) 754- 2- 17- 2,490
TRIAC ARC
W3SV 1044- 2- 12- 2,490
Transylvania Co ARC
N4GBY (+KB4QHR) 795- 2- 14- 2,484
Loudon Co ARC
W4WVJ 934- 2- 30- 2,482
Weasel's Weirdos
KW4M (+N4TLR) 682- 2- 11- 2,470
SCCARA
W6UW (+KB6ICQ) 722- 2- 26- 2,450
St Clair ARC
K9GKU 523- 2- 7- 2,440
Lodi ARC
K6PJV (+KB6SLE) 837- 2- 16- 2,430
Central Michigan ARC
W8MAA (+KB8DGC) 614- 2- 20- 2,422
Kern River Valley ARC
W6TN 556- 2- 11- 2,416
Yuba Sutler ARC
W6HBU (+KC6CNP) 659- 2- 13- 2,416
Niagara RC
W2QYV 636- 2- 20- 2,408
Laurel ARC
N5KKG (+N5NCH) 742- 2- 15- 2,356
NCG
K1DII (+KA1TKL) 1004- 2- 22- 2,348
West Seattle ARC
W7AW 744- 2- 20- 2,340
Forsyth ARC
W4NC (+N4UIY) 573- 2- 50- 2,302
Johnson Co RAC
W8EFH (+KB8DKK) 624- 2- 34- 2,300
Ephrata Area RS
N3RJ 677- 2- 7- 2,300
Stu Rockafellow ARS
W8NJH (+KB8AKS) 620- 2- 20- 2,298
Stewart Lake ARC
WD7X (+N7MCJ) 858- 2- 10- 2,298
Contoocook Valley RC
K1BKE (+N1GJF) 548- 2- 8- 2,288
Blue Ridge ARC
N4FBC 694- 2- 18- 2,280
Chesapeake Bay Area ARS
KM3I 696- 2- 11- 2,254
Bridgerland ARC
AE7T 613- 2- 20- 2,252
Audrain ARC
WT8A (+KB8OUH) 581- 2- 11- 2,250
Albemarle ARS
WM4D (+N4VQJ) 632- 2- 21- 2,242
Aroostook ARA
KA1B (+KA1QNK) 645- 2- 41- 2,238
Oddensburg ARC
WN2R (+N2ITR) 590- 2- 13- 2,230
Onslow ARC
WD4FVO (+KB4EJK) 668- 2- 25- 2,226
Harlan Co ARC
WI4M (+KC4IVG) 720- 2- 10- 2,224
South East Texas ARS
W5SSU (+KB5GXN) 592- 2- 50- 2,220
SLURP
KC8PR 745- 2- 9- 2,218
NWARES
K9NO 844- 2- 12- 2,204
Patrick AFB MARS Team
K4FD 709- 2- 13- 2,200
Willmar Area EAR
W8SW 780- 2- 10- 2,196
Hot Springs ARC
WA5BRF (+KB5HPH) 726- 2- 32- 2,196
Lower Yellowstone ARS
WM7D (+KB7FGN) 651- 2- 19- 2,186
Lakeview ARA & S&C ARC
NG9U (+KA9GZU) 681- 2- 25- 2,186
Peterborough ARC
VE3RB 583- 2- 20- 2,182
Carver ARES/SMARTS
KB0CQ 602- 2- 20- 2,170
North Kitsap ARC
WO7B (+N7KUH) 588- 2- 20- 2,170
South Towns ARS
WB2ELW (+KB2EQV) 630- 2- 18- 2,164
Central Wisconsin Radio Amateurs
W9NN 540- 2- 10- 2,156
Kanawha ARC
W8GK (+KA8ZGY) 545- 2- 24- 2,154
Waldo Co ARA & Pen Bay ARC
KB1OF 741- 2- 23- 2,144
Parsons Area ARC
WS0R 578- 2- 18- 2,132
Huntington Beach DX Assn
N6RDL 567- 2- 5- 2,116
Texins ARC
K5OJI (+N5NFP) 473- 2- 11- 2,110
Cape Ann ARA
W1RK (+N1GPX) 455- 2- 46- 2,100
Chippewa ARC
WB8BAA 465- 2- 20- 2,092
Albany Co RACES
KN2I 417- 2- 8- 2,082
Branch Co ARC
WB8R 444- 2- 15- 2,080
Ft Madison ARC
NW0X 551- 2- 15- 2,078
CRA Maskoutin
VE2CAM 419- 2- 14- 2,078
Centerville ARS
WO8A 767- 2- 12- 2,076
Bellbrook ARC
AB8U 837- 2- 10- 2,074
Central Vermont ARC
W1BD (+KA1LDL) 732- 2- 55- 2,064
South Side ARC
WD8P (+N8KNQ) 656- 2- 10- 2,050
Athens ARC
W5CR 656- 2- 12- 2,028
US Center ARC
NZ0M 420- 2- 20- 2,018
Blossomland ARA
W8MAI (+WD8MWT) 477- 2- 34- 2,010
ARC of Mt Vernon
W9BFO (+N9AXB) 703- 2- 14- 2,010
West Georgia ARS
WI4FWD 592- 2- 13- 2,004
Auburn ARA
WA2L (+KB2EMX) 420- 2- 15- 2,000
Chesapeake Bay RA
KD3B (+N3GSW) 399- 2- 14- 1,990
YARS
N8GF (+N8QGG) 689- 2- 14- 1,988
Mobridge Area ARC
NY0X 447- 2- 6- 1,982
Jupiter-Tequesta RG
K4ZRP (+KB4CWF) 888- 2- 17- 1,978
Tampa ARC
W4DUG (+KB4FFI) 1097- 1- 30- 1,967
Liberty Co ARC
N4PUJ (+KB4SXN) 460- 2- 34- 1,952
Nostalgia ARC
NM5D (+KB5IPT) 694- 2- 26- 1,950
West Morris Wireless
WN2A (+KA8PKD) 584- 2- 15- 1,936
Allegany Highlands ARC
W2SAM 474- 2- 20- 1,934
Clarksville ATS
KF4L 501- 2- 21- 1,932
Fairfield HS ARC
KB8PR 577- 2- 10- 1,930
Missouri Valley ARC
W9NH 562- 2- 20- 1,926
Fair Lawn ARC
WK2T (+KB2FUN) 488- 2- 21- 1,924
Moose Horn ARC
KL7IEJ 472- 2- 9- 1,914
Sabine Valley ARA
WI5L 674- 2- 20- 1,912
Sheridan RAL
W7GUX 483- 2- 6- 1,906
Fox Cities ARC
W9ZL 464- 2- 12- 1,898
Southern Catskill ARS
WC2E 567- 2- 13- 1,898
Northeast Wisconsin RL
WF8H (+KB9BNN) 495- 2- 12- 1,896
Arlington CD
N1IR 678- 2- 10- 1,884
Plano ARK
AA5GT (+N5DBI) 457- 2- 20- 1,884
Lockport ARA
W2RUI (+KB2CXM) 623- 2- 8- 1,876
ARA of Bremeton
W7VE 330- 2- 9- 1,868
Falls ARC
K9RHH 453- 2- 10- 1,862
Johnson City RA
W4ABR 478- 2- 21- 1,858
Wantagh ARC
W2VA 596- 2- 25- 1,850
Grand Is ARC
W0CUO 629- 2- 25- 1,848
Ham & Eggs Soc
WT5U (+KB5JHK) 486- 2- 15- 1,846
Amateurs for Better Communications
KC9NG (+KB9CVL) 641- 2- 6- 1,842
Central Kentucky ARC
WA4UXJ (+KA4HHZ) 569- 2- 14- 1,834
Steamboat Mt ARC
KR5D 665- 2- 10- 1,830
Aurora Repeater Assn
K0WIQ (+N0KAI) 604- 2- 54- 1,816
Greer ARC
W4IQQ (+KC4FBV) 568- 2- 21- 1,816
Estero ARC
W6UU 380- 2- 12- 1,808
Franklin ARC
NT4N 443- 2- 34- 1,802
New Ulm ARC
N0BMA (+N0KKH) 491- 2- 12- 1,796
Lehigh Valley ARC
W3OI 808- 2- 20- 1,796
Nevada Co ARC
W6DD 566- 2- 20- 1,786
Great Falls Area ARC
K7ABV 549- 2- 20- 1,768
Lanierland ARC
W4IKR 649- 2- 20- 1,778
Southeast Louisiana ARC
WB5NET 600- 2- 15- 1,764
OCARE
WA5ZAA 443- 2- 4- 1,754
Corry Amateur Operators
NB2K 664- 2- 25- 1,752
Haskell ARC
KG5NW (+N5NTB) 606- 2- 11- 1,744
Fullerton RC
W6ULI 620- 2- 15- 1,740
Leward Oahu ARC
KH6MOP (+WH6BVE) 1129- 1- 42- 1,727
Lake Co ARS
K6RAC (+KB6WUW) 386- 2- 27- 1,722
Hermiston ARC
KD7VX (+N7LJY) 702- 2- 14- 1,716
NCG
VE3SOO 466- 2- 20- 1,700
STARS
WA9X (+KB9BNB) 352- 2- 9- 1,698
Marshfield Area ARS
WA9IK 535- 2- 12- 1,694
Maple Ridge ARC
VE7CMR 576- 2- 5- 1,694
RAGS
K7JUV (+KB7DRT) 601- 2- 31- 1,692
Butler Co VHF Assn
W8CCI (+N8KKP) 653- 2- 18- 1,682
Huber Heights ARC
N8TD (+KB8ELA) 387- 2- 6- 1,680
Melfort ARC
VE5YD 567- 2- 13- 1,678
Catalpa ARS
W8AG 417- 2- 15- 1,674
York Region ARC
VE3YRA 683- 2- 15- 1,660
SOTS-RATS-WATTS
W4AY 426- 2- 20- 1,652
HTTY-AMSAT Houston
N5EM 479- 2- 13- 1,636
Ellsworth AWA
W1TU 1020- 1- 24- 1,630
Santa Ynez Valley Hams
N6JNS (+N6SUP) 533- 2- 11- 1,628
NW AR/Electonics Assn
NO8G 380- 2- 10- 1,626
Robbinsdale ARC
K0LTC (+N0GKO) 485- 2- 18- 1,620
Ogden ARC
WA7ADK 552- 2- 15- 1,604
Rappahannock ARA
AA4OH (+N4VCZ) 585- 2- 23- 1,586
Dial ARC
W8BLV 406- 2- 28- 1,586
Dixie ARC
WI7J 807- 2- 14- 1,584
XWARN
WD8PWG (+KB8GRO) 476- 2- 8- 1,582
Southern Appalachian Wireless Soc
WR8M 610- 2- 15- 1,564
Acadia ARA
K1NAN 488- 2- 5- 1,562
Accident Radio Nerds
WB2EKK 442- 2- 4- 1,560
SMARTS
NT5K (+N5OKV) 414- 2- 30- 1,558
Thunder Bay ARC
K8CHS (+KB8HMF) 574- 2- 10- 1,548
Porter Co ARC
N9FB 584- 2- 25- 1,540
Ellis Co ARC
N5KFC 412- 2- 19- 1,532
Tompkins Co ARC
WK2K 380- 2- 12- 1,528
Glynn ARA
K4TVE (+KC4DNI) 274- 2- 15- 1,524
Central Georgia ARC
AA4WS (+KB4NMH) 364- 2- 18- 1,520
Cascade RG
N7CFO (+N7LRO) 405- 2- 8- 1,518
Lakes Area ARC
WB9PZH 372- 2- 15- 1,516
Goshen ARC
K9TSM (+KB9ATH) 450- 2- 18- 1,504
Mogollon Monsters
K7LPA (+KA7RZV) 409- 2- 19- 1,504
Parkland ARC
VE5II 552- 2- 8- 1,504
Humboldt ARC
KA4P 913- 1- 18- 1,484
WIGWAG
W8PDT 285- 2- 10- 1,476
Northwoods ARC
N9BDL (+KB9CHP) 268- 2- 61- 1,476
Kings ARC
NW6K 387- 2- 11- 1,474
Lee DeForest RC
W6ETB (+KB6JSI) 338- 2- 46- 1,468
Seneca RC
W8ID 379- 2- 5- 1,458
Wichita ARS
WW5I 516- 2- 35- 1,456
Los Angeles ARC
N6YA (+KC6DHW) 376- 2- 27- 1,452
STARS
NY8D 542- 2- 4- 1,446
Ponca City AC
W5HZZ 396- 2- 15- 1,428
Columbia Area Amateurs
AA3C (+KA3UQA) 329- 2- 12- 1,426
Mercury Midwest Columbus Contingent
K8ES (+N8IWE) 215- 2- 22- 1,412
Morse Memorial RA
K6DYX (+K9TGT) 377- 2- 7- 1,408
Huntingdon Co ARC
W3VI 287- 2- 10- 1,404
224.080 RG Clarkston
N8DR (+KA1RIX) 447- 2- 15- 1,394
Delta Group
N1GIK 395- 2- 3- 1,390
Polk CCDACS
W4TJM 334- 2- 10- 1,384
Ft Pierce ARC
KJ4YF (+WB4NDZ) 400- 2- 18- 1,380
West Marin RACES
K6JOQ 221- 2- 6- 1,378
Flathead Valley ARC
K7LYY 390- 2- 12- 1,376
Antigonish NS ARC
VE1EMA 274- 2- 12- 1,348
SEARC
KB5MY (+KB8CZU) 297- 2- 20- 1,348
Fentress City ARC
K8DOC 572- 2- 10- 1,344
Borderline ARC
WX7L 405- 2- 34- 1,338
Harvard Repeater
K1BOX 493- 2- 9- 1,334
Cal State Fullerton ARES
NX6M 245- 2- 5- 1,332
El Paso ARC
W5ES (+KB5HQE) 460- 2- 45- 1,330
Martin Co ARA
K4ZK 241- 2- 11- 1,324
Conneaut ARC
W8SD 456- 2- 18- 1,322
Bishop ARC
NW6C (+KC6CHT) 351- 2- 15- 1,306



Pictured are some of the 38 members of the Kauai ARC, KH6LG.

Dave, N6SHD, and Dick, WA6HYO, operated the 10-meter station at W6RFF's FD setup.

NCG
KI6OD 436- 2- 6- 1,302
Pike Co ARC
W9CZH 326- 2- 15- 1,296
Clinton Co ARC
WA9YKO 299- 2- 20- 1,294
Statesboro Area RS
NC4D (+N4TUZ) 452- 2- 6- 1,282
Newport Co RC
W1SYE 314- 2- 15- 1,278
NCG
KI6WD 368- 2- 4- 1,276
Apple Valley ARC
AI6G (+KA6QQB) 331- 2- 16- 1,262
Central Carolina ARS
WR4E 275- 2- 9- 1,250
Middle Peninsula ARC
NB4P 394- 2- 16- 1,234
Roanoke Valley ARS
AA4SJ 381- 2- 12- 1,232
Mission Emergency ARS
VE7MIS 343- 2- 8- 1,230
ARA de la Mauricie
VE2MO 389- 2- 20- 1,220
Greenwood ARC
VE1WN 243- 2- 10- 1,210
Garden City ARC
KC8HR 297- 2- 15- 1,208
Richmond ARC
VE7RAR 437- 2- 21- 1,200
Sunrise Co ARA
K6TOV 481- 2- 5- 1,162
St Peter ARC
WQ8A (+N8JHG) 238- 2- 8- 1,158
Kings Co RC
W2RAK 257- 2- 48- 1,120
Mahaska ARC
NR0C 407- 2- 20- 1,114
Univ of Idaho ARC
W7UQ 270- 2- 20- 1,110
Harrisburg Radio ARC
W3UU 398- 2- 9- 1,106
South Bay ARC
W6ATT 240- 2- 8- 1,102
Elgin RC
WD9CVP 244- 2- 3- 1,082
Mercury ARA
KC7FN 215- 2- 22- 1,056
6-Meter Club of Chicago
K9ONA 164- 2- 3- 1,052
Piqua ARC
W8SWS (+KB8GGZ) 238- 2- 20- 1,048
Babilan ARC
K9GSV 320- 2- 15- 1,040
Sandy River ARC
KI1B 310- 2- 11- 1,020
Lake Huron ARC
W8JC 359- 2- 16- 1,018
Tarsands ARC
VE6CF 212- 2- 10- 994
Pendleton ARC
W7PL 324- 2- 4- 958
NCG
WA3UXZ 305- 2- 3- 952
Elmwood Park ARC
K9YHB 225- 2- 5- 950
Mare Huntville Group
KK4AI (+KC4IWW) 147- 2- 14- 928
Manotick ARG
VE3AIR 313- 2- 20- 926
Collins Radio ARC
K9CKP 257- 2- 10- 914
LKM ARS
W8ISO 226- 2- 4- 852
Apple City ARC
W7TD 162- 2- 9- 850
Illinois Valley ARC
NN9M 257- 2- 25- 838
Westcurn ARC
CY1WHC 107- 2- 7- 814
Old Post ARS
W9EOC 257- 2- 7- 814
11th Hour Contest Group
KA8VYB 146- 2- 9- 802
Barrie ARC
VE3GCB 229- 2- 16- 800
Covington ARS
K2AS 268- 2- 9- 794
Chilliwack ARC
VE7AFA 253- 2- 10- 716
Botsford ARC
KC8GP 158- 2- 12- 716
Spalding Elementary Students
AB4KS 153- 2- 3- 706

Lambda ARC
K9AT 52- 2- 10- 704
Egyption RC
W9AIU (+KA9HDZ) 90- 2- 5- 684
Franklin Co ARC
AC4W (+N4UKQ) 135- 2- 17- 670
Salem Area ARA
NW9E (+KB8HOC) 134- 2- 26- 668
Wedxie ARC
WB4MZO 207- 2- 5- 614
Cricket Wireless Assn
K1SSO 108- 2- 15- 612
Out of Our League FDG
K1ET 190- 2- 7- 590
Tippecanoe River Radio
WD9I 151- 2- 3- 570
Ft Wayne RC
W9TE (+N9GSP) 276- 2- 11- 552
Indian Foothills ARC
WB0WMM 120- 2- 6- 540
Mid-State ARS
NF4S 119- 2- 7- 538
Country Cousins
K3KW (+KA3NWM) 99- 2- 3- 494
Crete ARC
K9JOQ 59- 2- 6- 488
Heart Of Texas ARC
W5ZDN 82- 1- 20- 482
Red River RA
NK0A 236- 2- 5- 472
Valley Latin RA
K5F 75- 2- 10- 450
Michigan Army MARS RC
AF8D 88- 2- 5- 404
CHARRO
W5KR 81- 2- 9- 388
Trojan ARC
K6BJ 139- 2- 5- 340
Tu-Buro RC
W2BMW 57- 2- 7- 314
Cooke Co ARC & RA
N5ACJ 104- 2- 12- 308
West Tennessee ARS
KB4YGI 73- 2- 15- 246

2A Commercial

Pottstown ART
N3WW 1466- 2- 10- 4,554
Boiled Owls of New York
W2AX 2915- 1- 14- 4,320
Reidsville ARG
N4IV 903- 2- 17- 3,542
Bluegrass ARS
K4KJQ 760- 2- 4- 2,704
Sumter ARA
WS4P (+N4HTX) 917- 2- 25- 2,690
Mohawk ARC
NA1P (+N1EWJ) 665- 2- 35- 2,662
West Side RC of Toronto
VE3JJ 593- 2- 6- 2,324
Rowan ARS
W4EXU 731- 2- 14- 2,252
Gully Hill ARG
KG2F 565- 2- 9- 1,498
North Shore RC
WV7T 320- 2- 10- 1,214
Genesee RA
W2RCX 475- 2- 14- 1,098
East Kootenay ARC
VE7IP 396- 2- 18- 996
Prarie Dog ARC
W0OJY 267- 2- 10- 734
SPARK
K3CSG 188- 2- 6- 590
NCG
N1FWC 68- 2- 3- 266

3A Battery

Arapahoe RC
K0NA (+KB0AOQ) 2280- 5- 30- 18,265
Summit ARA
K53I (+N3DPB) 2603- 5- 16- 16,805
Zygo ARC
W1ECH (+KA1MWT) 1233- 5- 9- 10,715
Anne Arundel RC
W3VPR (+KA3TDD) 1195- 5- 37- 9,895
Thomasville ARC
W4UCJ (+WD4CJI) 899- 5- 17- 8,420
Montgomery ARC
N3BE (+KA3USD) 878- 5- 30- 7,490
Ampex Empl ARC
K6QEZ 777- 5- 10- 7,240
"6" Team
W4RRW 661- 5- 8- 7,010

North Coast ARC
KB8A (+WB8ZZG) 702- 5- 21- 4,265
OK QRP
W5LGO (+WD5IRL) 396- 5- 6- 4,046
ABARC-QRP ARCI Group
W1XH 239- 5- 8- 2,755
Michigan QRP Group
W8UHG 224- 5- 5- 2,540
RF Triangle
WB5TXW (+WD5HNI) 76- 5- 4- 380

3A

Hughes Fullerton Emp Assn ARC
N6AW (+N6RNG) 4535- 2- 50- 13,670
Ashtabula Co ARC
W8CY (+KA8LTE) 3840- 2- 18- 12,450
Shanktooth ARC
N6NW (+N6TPN) 3715- 2- 10- 11,854
Poughkeepsie ARC
N2YL (+KB2GYB) 3502- 2- 45- 10,140
Acton-Boxboro ARC
W1UC (+KA2DJH) 2842- 2- 25- 9,648
Radio Central ARC
K2VL (+KB2BBG) 2758- 2- 50- 9,434
Rochester (NY) DX Assn
W2TZ (+KB2CHC) 2894- 2- 31- 9,294
Red Ryder CC
W8VS 3004- 2- 11- 8,788
SW Ohio DX Assn
W8FN 2471- 2- 12- 8,484
Waterbury ARC
K1EB (+KA1RRG) 3289- 2- 28- 8,270
Shreveport ARA
W5AU (+KA5RDA) 2548- 2- 35- 8,126
Northwest ARC
W9LM (+KB9BSW) 2208- 2- 22- 8,010
East Bay AWA
N1RI (+KA1OTN) 2453- 2- 22- 7,894
Calumet AR Enthusiasts
KE9I (+KA9ZFG) 2369- 2- 27- 7,782
Jet Propulsion Laboratory ARC
W6VIO (+KA6DAN) 2443- 2- 32- 7,754
Hebron AWG
K1DW (+N1GOX) 1988- 2- 10- 7,350
Redwood Empire DX Assn
N6CJ 2071- 2- 14- 7,338
Paso Robles ARC
W6LKF (+KC6DFD) 2215- 2- 39- 7,162
Cape Way RC
K1BU (+KA1BBU) 1856- 2- 21- 7,110
Delaware Lehigh ARC
W3OK (+KA3TER) 2276- 2- 50- 7,034
Fredericton ARC
VE1ND 1930- 2- 19- 6,962
Daubenville DX Assn
NM3E (+KA9PLC) 2389- 2- 25- 6,790
Albany ARA
K2CT (+K2CBA) 2084- 2- 35- 6,566
Shelby Co ARC
AC4T (+N4SYY) 1690- 2- 51- 6,532
Southern Peninsula ARK
W4PRO (+N4PUV) 2158- 2- 81- 6,474
Hamfesters RC
WA5AA (+KA9STV) 2341- 2- 25- 6,276
Ozaukee RC
W9WQ (+N9INV) 1623- 2- 37- 6,256
North Shore RA
W1ND (+N1FKF) 1718- 2- 36- 5,952
Band Dit-Dahs
K2MP (+KB2DNF) 1609- 2- 16- 5,922
San Mateo RC
W6LMN (+N6TOC) 1887- 2- 30- 5,868
Palo Alto ARA
W6OTX (+KC6AGP) 1855- 2- 28- 5,830
General Dynamics RC
W5IU (+KB5JTG) 2068- 2- 35- 5,718
AR River Valley ARF
K5PXP (+N5KVR) 1422- 2- 38- 5,564
Kilocycle Club
K5LP (+KA5EOO) 1808- 2- 13- 5,560
Twin City RC
W7LA 1780- 2- 12- 5,554
Gozie Gang
K2SA (+KB2CHV) 1345- 2- 15- 5,168
Kent Co ARC
W3HZW (+KA3MIY) 1686- 2- 28- 5,006
CFB Gagetown ARC
VE1JQ 1294- 2- 12- 4,888
Japanese American ARS
W6AN (+KB6GIT) 1373- 2- 21- 4,672
Club de Radio Sherham
VE2FT 1354- 2- 20- 4,670

San Andreas Faultline Survivors
NZ8N 1867- 2- 20- 4,650
Clark Co ARC
W9WWI (+N9DPR) 1300- 2- 60- 4,602
Paducah ARA
W4NJA (+KC4ENA) 1371- 2- 30- 4,598
San Lorenzo Valley RC
N6TU (+N6QLL) 2980- 1- 20- 4,563
Columbus ARA
W8TO (+KB8EMG) 1385- 2- 20- 4,510
Downey ARC
W6TOI (+N6OPR) 1221- 2- 80- 4,476
Virginia Beach ARC
WA4TGF (+KB4UED) 1300- 2- 150- 4,472
Washington Co ARA
KC1G (+KA1RDI) 1516- 2- 30- 4,468
HCARES
KN9K (+KB9CMS) 1326- 2- 26- 4,436
Longview-East Texas ARC
K5LC 1542- 2- 17- 4,434
MS Coast ARA
K5OS 1172- 2- 25- 4,412
Elkhart Red Cross ARC
W9XD 1291- 2- 10- 4,262
Oregon Tualatin Valley ARC
KO7B (+N7LMK) 1507- 2- 60- 4,258
Schaumburg ARC
K9SB (+KA9ZOO) 1157- 2- 33- 4,186
West Alls RAC
W9FK (+KB9AUQ) 1544- 2- 17- 4,178
Springhill ARC
N5II 1314- 2- 20- 4,158
Colonial Wireless
NU1R 1164- 2- 18- 4,140
Sioux Empire ARC
W0ZWY (+N0MV) 1056- 2- 25- 4,138
Delaware Valley RA
W2ZQ (+KB2GOM) 1235- 2- 15- 4,076
Tri-Town RAC
W8VT (+N9FUW) 1140- 2- 17- 4,062
Hoosier Lakes RC
K9RD (+K9BXG) 1441- 2- 11- 4,034
Great Bay RA
WB1CAG (+KA1LLP) 1249- 2- 30- 4,008
Great South Bay ARC
K2TV (+N2FIM) 1065- 2- 70- 3,938
Oklahoma City APA
K5OK (+N5DDB) 1044- 2- 20- 3,912
Douglas Co ARC
W0XI (+KA0TXJ) 1193- 2- 30- 3,900
Frontier ARS
NW7S (+N7CFC) 938- 2- 34- 3,900
Chattanooga ARC
W4AM (+N4NTX) 1207- 2- 36- 3,898
Argonne ARC
W0QVE (+KA9PVD) 993- 2- 13- 3,872
Parker Co RC
WD5F (+N5ONE) 1115- 2- 30- 3,866
RF Communications ARC
WB2PSI 1127- 2- 8- 3,866
Williamson Co ARC
W5XD 1223- 2- 11- 3,856
Ft Smith Area ARC
W5ANR 1293- 2- 30- 3,838
Newington ARL
W1OKY (+KA1KRP) 1041- 2- 31- 3,818
Ascension ARC
WN5K 1072- 2- 35- 3,814
CRA de Quebec
VE2CO 901- 2- 35- 3,800
Top of Michigan ARC
WN8V 1056- 2- 12- 3,780
Montgomery ARC
W4AP (+N4MDV) 1100- 2- 17- 3,725
McKean Co ARC
W3VV (+KA3UVD) 1152- 2- 22- 3,700
Abbotsford ARC
VE7ECC (+VE7IAA) 1349- 2- 15- 3,594
Canadian Valley ARC
WB5U (+N6TSO) 1248- 2- 13- 3,562
Jones Co ARC
W8GN 1140- 2- 9- 3,512
Discrete Components of 955
K3WJV 957- 2- 10- 3,504
Clinton Co ARA
WF8B (+N8JWR) 890- 2- 15- 3,494
Anaheim ARA
K6SYU 917- 2- 20- 3,494
Corona Norco ARC
KJ6B (+N6RNO) 1266- 2- 21- 3,488
Smoky Mountain ARC
W4OLB (+KA4RUI) 1135- 2- 17- 3,484

Colorado Bighorn ARC
KC7KC 1348- 2- 7- 3,462
Coastside ARC
WA6TOW 932- 2- 13- 3,448
MITRE-Washington ARC
AA4VN (+N4UUA) 802- 2- 12- 3,444
Tri-City ARC
W7VPA (+WB7VCC) 901- 2- 20- 3,414
Twin Cities RC
WØZR (+KB0EDG) 947- 2- 35- 3,368
New Providence ARC
K2JV 587- 2- 20- 3,364
NCG
K6PD 975- 2- 5- 3,378
Panhandle ARC
W5WX 909- 2- 20- 3,378
South Western VA WA
KC4DY (+KC4IUP) 888- 2- 15- 3,354
Key City ARC
AE5I (+KB5JOR) 1088- 2- 30- 3,330
Livermore ARC
K6TS (+KB6YWY) 1192- 2- 10- 3,320
Southeast Florida RA
N4SBF (+KB2EKZ) 1454- 2- 20- 3,318
Lake of the Ozarks ARC
WA0F (+KB0CAC) 804- 2- 23- 3,308
Oakville ARC
VE3HS 830- 2- 21- 3,266
North Hills ARC
W3XX (+W3BIS) 757- 2- 21- 3,264
Palisades ARC
NK9Y (+KA9ZKT) 858- 2- 13- 3,258
Malibu DCS
NW6A (+KB6ZZN) 797- 2- 100- 3,256
Raw Valley ARC
W0CET (+KA0BNL) 1072- 2- 25- 3,242
Independent ARC
WE8M 872- 2- 11- 3,240
Clarkston Crazies
WD8RMC 1129- 2- 7- 3,184
Port City ARC
W1WQM (+WA1TOL) 862- 2- 40- 3,178
PART of Westford
AB1A (+N1GRC) 913- 2- 22- 3,156
Poway ARS
K6CD (+N6VJV) 1007- 2- 25- 3,126
Bill Hoehl Memorial FDG
W4UXT 950- 2- 20- 3,104
Jayhawk ARS
W0LB (+N0CV) 884- 2- 30- 3,084
West Island ARC
VE2CWI 887- 2- 26- 3,076
Burnaby ARC
VE7BAR 934- 2- 25- 3,058
Sangamon Valley RC
W9DUA 905- 2- 15- 3,042
Rappahannock Valley RC
K4ME (+KC4AUV) 743- 2- 15- 3,040
Spa ARA
KE5RK 1180- 2- 52- 2,962
South Georgia ARC
WX4T (+N4UXE) 1043- 2- 11- 2,958
Northern RI RC
NM1Y 2254- 1- 15- 2,923
OH-KY-IN ARS
K8SCH 981- 2- 35- 2,916
3M ARC
WB9R (+N9KII) 848- 2- 25- 2,916
VCARA
W9MJL (+KB9BYV) 955- 2- 14- 2,860
Opequon RS
WA8FSE (+N8GFN) 867- 2- 15- 2,852
Bodega Beach Bums
K6EO 710- 2- 8- 2,836
Western Michigan WA
W8FH (+K8VQJ) 1704- 1- 10- 2,800
Marshall RC
W0BMJ 1043- 2- 15- 2,786
Framingham ARC
W1FY 705- 2- 20- 2,780
Racine Megacycle Club
W9UDU 877- 2- 25- 2,772
Calaman Club
KM4FE (+N4UWX) 713- 2- 11- 2,758
Staten Island ARA
W2CWW (+N2GMU) 892- 2- 12- 2,750
Southwest Dallas Co ARC
K5HJ 965- 2- 20- 2,746
JSARS
W2DOR 1083- 2- 20- 2,718
Surray ARC
VE7SAR 915- 2- 15- 2,695

Westark ARC
WE5L 1745- 2- 26- 2,690
Benicia ARC
WB6DHH 696- 2- 16- 2,664
Purdue ARC
W9YB 795- 2- 5- 2,662
Brightleaf ARC
W4AMC (+KC4AJM) 862- 2- 27- 2,648
Pine State ARC
K1CZ 710- 2- 15- 2,634
Metrocrest ARS
KB5A (+N5NXO) 745- 2- 9- 2,626
Alford Memorial RC
W4BOC (+KC4KOB) 708- 2- 30- 2,624
Hawaii West ARS
NH6LR 893- 2- 13- 2,610
Queen City Emergency Net
W8VVL (+KB8GFK) 587- 2- 25- 2,610
Kentucky Colonel ARC
AB4Y (+KC4KDI) 562- 2- 25- 2,596
Wichita ARC
W0SOE (+KB0DGI) 814- 2- 60- 2,566
St Charles ARC
N0GL (+WB0RAB) 742- 2- 26- 2,546
Shore Points ARC
NR2Q 638- 2- 22- 2,522
Adams Co ARC
K9HA 775- 2- 25- 2,516
Mid-State ARC
NV9K (+N9INN) 721- 2- 18- 2,504
RAGE
N2DM 792- 2- 8- 2,500
Bloomfield ARC
W1CWA 739- 2- 11- 2,476
Jefferson Co RAC
WB2YCA 688- 2- 35- 2,468
Larkfield ARC
WA2PNU (+N2HGU) 684- 2- 25- 2,464
Las Vegas RAC
K7SN 854- 2- 52- 2,450
Santa Clarita ARC
W6JW (+N6QHJI 873- 2- 40- 2,450
LAARA
W0TD (+N0INF) 817- 2- 14- 2,442
FURAR
AF9M 670- 2- 20- 2,440
Orange Co ARC
WE2H 887- 2- 20- 2,438
Grant Co ARC
W9EBN (+N9GTL) 700- 2- 25- 2,426
Marple Newtown ARC
W3JS (+KA3OKU) 527- 2- 31- 2,422
ESL Radio Sporting Club
AA6FI (+N6VIV) 542- 2- 10- 2,418
Charlotte ARS
KC4K (+WA3DUX) 515- 2- 20- 2,376
Granite State ARA
K1RD (+N1GCU) 718- 2- 33- 2,376
Holland ARC
K8DAA 985- 2- 25- 2,292
Pennyroyal ARS
WA4ZVL 616- 2- 7- 2,266
Mid-Ohio Valley ARC
WF8U (+N8KVU) 740- 2- 20- 2,262
Muscatine ARC
KE0Y 672- 2- 19- 2,244
Cambridge ARA
W9VP 819- 2- 17- 2,236
Umpqua Valley ARC
W6DFF (+N7JNJ) 558- 2- 15- 2,208
Laurel ARC
N3GPR 689- 2- 25- 2,205
Ucluelet ARC
VE7UEP 526- 2- 10- 2,198
Miami Co ARC
K9ZEV 520- 2- 16- 2,150
Sudbury ARC
VE3BLZ 801- 2- 25- 2,146
Brandon ARS
K4TN 608- 2- 21- 2,132
CRA de L'outaouais
VE2CRO 911- 2- 50- 2,122
PHD ARA
WA8UGU (+KB8EQR) 559- 2- 27- 2,112
RPI ARC & Rensselaer Co RACES
W2SZ (+KB2GPK) 579- 2- 18- 2,106
Headwater ARC
K0SUV (+KB0ERS) 724- 2- 7- 2,106
Del Norte ARC
NK6Z 772- 2- 10- 2,092
Vintage RG
N8VY 565- 2- 3- 2,080
Tri-State ARA
W8VA 528- 2- 20- 2,088
South Bay ARA
N6BFO (+N6QWF) 578- 2- 42- 2,072
NORAC
VE7NOR 471- 2- 8- 2,060
Fallbrook ARTS
N6TRS 617- 2- 18- 2,060
Pearland ARC
N5FLS (+WB5TSN) 449- 2- 15- 2,058
Salem ARC
W7SAA (+KB7DRB) 382- 2- 17- 2,056
Clinton ARC
W0CS (+N0KLS) 572- 2- 20- 2,054
Chippewa Hills ARC
W8EL 720- 2- 7- 2,050
Ft George ARC
VE7FG 1099- 1- 20- 2,018
Pawnee ARC
AF0N 431- 2- 20- 1,990
Kinston ARS
W4OIX (+KB4BGE) 552- 2- 19- 1,980
Boonville ARC
KE2DX (+KA2SJG) 347- 2- 8- 1,962
Mammoth Cave ARC
KD4SS 469- 2- 16- 1,960
Mankato ARC
W0WCL (+KA0EEK) 456- 2- 23- 1,932
S Hills Brass Pounders and Modulators
K3WNX 586- 2- 30- 1,928
Kansas City ARC
KBOKI (+N0KCP) 649- 2- 25- 1,916
Honeywell ARC
WA0NLP 403- 2- 17- 1,892
Missionary Radio Network
KJ6RB 636- 2- 12- 1,892
NCG
W8CEV 563- 2- 17- 1,880
AWARE
NG3Z 504- 2- 10- 1,878
21 Repeater Group Club
W8WM 693- 2- 13- 1,838
Dauphin ARC
VE4NUF 465- 2- 10- 1,836
Kansas Nebraska RC
W0TQ 329- 2- 20- 1,832
Irving ARC
KX5G (+N5MFH) 544- 2- 22- 1,828
Golden Empire ARS
W6RHC 514- 2- 44- 1,826
Melpar ARC
WB4YZS 608- 2- 6- 1,810
Harrison ARC
KM9E (+KB9ABA) 403- 2- 18- 1,806
Rochester ARC
W8MXW 781- 1- 35- 1,797
Zephyrhills Area ARC
K4VLD (+KC4KUS) 412- 2- 13- 1,784
Tippecanoe Co ARA
W9REG 477- 2- 23- 1,782
Ocean-Monmouth ARC
KC2Q 576- 2- 12- 1,780
Ozone ARC
KN5Y (+KB5ARE) 685- 2- 20- 1,774
Snohomish Co Hams Club
WA7LAW 755- 2- 22- 1,752
Chesco ARA
K3BKG 564- 2- 12- 1,752
Juneau ARC
KL7GPG 302- 2- 15- 1,750
Tioga Co ARC
NR3K 569- 2- 22- 1,748
Macon ARC
W4BKM 554- 2- 31- 1,700
Henry Co ARC
K8TII 332- 2- 11- 1,682
Southern Alberta ARC
VE6CAM 496- 2- 30- 1,676
Mt State Transmitters
K8VNQ 334- 2- 12- 1,628
Houston Echo Soc
WX5X 517- 2- 14- 1,616
Kenahoochee ARC
KD4BB (+N4POK) 428- 2- 12- 1,608
Sierra ARC
AA6FE (+KB6ZOO) 334- 2- 25- 1,548
Naval Research Lab ARC
W3EW 310- 2- 19- 1,536
Scotland ARA
K0AAR 375- 2- 20- 1,518
High Plains ARC
W0LHA 608- 2- 9- 1,516
Delaware Valley OMIK & Elec Comm Assn
W3IAR (+N3GPQ) 522- 2- 23- 1,516
Lake Area Radio Klub
WU0L 373- 2- 20- 1,494
Jamestown ARC
W0FX 297- 2- 15- 1,488
Wilson ARC
WA4MFI 243- 2- 6- 1,486
Chemung Co ARES
W2ZJ (+KB2GMG) 266- 2- 22- 1,444
South West AR RC
N5KIG (+N5NMC) 329- 2- 20- 1,432
Milwaukee RAC
W9RH 475- 2- 17- 1,428
Allen Co ARTS
W9INX (+KA9ZNN) 812- 1- 35- 1,407
National Trail ARC
K9UXZ (+KB9CQW) 403- 2- 11- 1,398
Shoreline ARC
W1BCG 370- 2- 12- 1,388
Randolph Co Amateurs
W9BNF 422- 2- 25- 1,364
Albert Leu ARC
NX8C 294- 2- 10- 1,348
Southern Counties ARA
K2BR 319- 2- 20- 1,326
Whitman ARC
WA1NPO 294- 2- 14- 1,326
Redwood ARC
N6AFT (+KC6CFF) 320- 2- 9- 1,318
Nutley ARS
W2GLQ 386- 2- 10- 1,302
Lake Success RC
W2YKQ 346- 2- 14- 1,292
Pearl River Co ARC
WW5U 310- 2- 32- 1,290
AR & RC of Luna Co
N5JNA 272- 2- 14- 1,288
Pueblo Ham Club
KR0K 433- 2- 12- 1,266
Bill Gremillion Memorial ARC
K4SEX 567- 2- 12- 1,262
Wood Co ARC
K8TIH 268- 2- 12- 1,254
Geraldton & District ARC
VE3KRX 301- 2- 4- 1,222
Ottawa ARA
W0OW 248- 2- 3- 1,196
Blue Valley ARC
WA0HOU 329- 2- 31- 1,176
Beloit ARC
WA9EZT 387- 2- 6- 1,174
NCG
KX5H 265- 2- 3- 1,174
Washington Co ARC
KA8SHM 215- 2- 16- 1,130
NCG
WA7HPL (+WB7HRU) 211- 2- 6- 1,128
Cumberland ARC
K3IEC 456- 2- 12- 1,084
Yellow Thunder ARC
WB9FDZ 197- 2- 15- 1,066
Gratiot Co ARA
WA8AEG 311- 2- 9- 1,060
NCG
KC7OO 327- 2- 13- 1,048
Hualapai ARC
WS7T 302- 2- 7- 1,044
Butler Co ARA
W3UDX 268- 2- 7- 1,036
Caddoe Creek Contesters
WC5Z (+N5NAT) 307- 2- 9- 1,030
Badminster ARC
K2RB 352- 2- 10- 1,028
South Central CT ARA
W1GB 505- 2- 12- 1,010
Hamilton Co AR
K8KWO 175- 2- 8- 950
SEMO ARC
K0CEA 215- 2- 25- 940
Streator ARC
K9CAU 113- 2- 8- 926
Dunnville ARC
VE3AKQ 47- 2- 15- 912
North Shore ARC
VE3NSR 301- 2- 12- 902
Quad Co ARC
K3PS 253- 2- 25- 878
Benton and Marshall Co ARES Group
N5LFA (+KB5FLC) 81- 2- 3- 874
Longwire Ranch RC
VE4DQ 382- 2- 6- 854
Bluestone ARC
KA8RAB 267- 2- 7- 834
Firelands ARA
NI8G 274- 1- 27- 793
NCG
AA5GB 224- 2- 10- 786
MARA—Boise
N7IFD 122- 2- 16- 744
Conveir ARC
W6UJS (+KB6HUP) 316- 2- 16- 736
Messabi Wireless Club
NM0S 222- 2- 6- 720
Jackson Co ARC
K8BST 215- 2- 10- 678
ITT RF Design ARC
N2HFZ (+KB2HDD) 243- 2- 4- 608
MAS ARC
NX9K 243- 2- 6- 592
Hangtown ARC
WA6ZJF 252- 2- 6- 504

3A Commercial

Cape May Co ARC
K2CGD 1112- 2- 16- 3,372
Appalachian RA
WB8CNN (+KA8OTX) 1389- 2- 12- 3,188
Jax/Cabot AA
AA5IU 474- 2- 7- 1,626
Kingston
VE3UEL 318- 2- 6- 1,140
Somerset Co ARC
NJ3T 431- 2- 11- 1,062
Platt Co RA
K9IYP 423- 2- 10- 1,046
Coos Co RC
K7CCH 280- 2- 21- 760
Spencer ARK
W0ZDT 175- 2- 37- 750
Barstow ARC
W6HUG 230- 2- 52- 648
TARCOM
W2FWG 129- 2- 6- 258

4A Battery

Portland ARC
W7KYC (+KA7ZDD) 1006- 5- 13- 8,935
Zuni Loop Mt Expeditionary Force
W6SKQ 986- 5- 7- 7,975
MDARC
K8HS (+KB8CBZ) 750- 5- 22- 4,915
St Louis QRP Soc
N0ZZ 362- 5- 12- 4,115

4A

Cherryville RA
W2GD 4702- 2- 20- 15,430
Kettle Morain RA
N9KS (+N9HZF) 3440- 2- 43- 11,336
Scottsdale ARC
K7TR 3671- 2- 42- 11,322
Hughes Aircraft HESEA ARC
K6ZT (+KC6DTI) 2620- 2- 27- 10,030
Stundy Mem Hosp & Foxburo Co ARCs
K1ZZJ (+N1DZJ) 3156- 2- 47- 9,850
Westchester ECA
N2SF (+KB2GTD) 2563- 2- 45- 8,880
Wayne ARTS
WD8LLD (+KB8HKJ) 2754- 2- 10- 8,844
Santa Barbara ARC
K6TZ (+N6RRJ) 3157- 2- 53- 8,614
Columbia ARC
AA4V (+N4QOG) 2757- 2- 35- 8,034
Cary ARC
N4NC (+N4TED) 2214- 2- 25- 7,746
L'Anse Creuse ARC
K8RO (+KA8VSR) 1776- 2- 40- 5,686
Parkersburg ARK
K8UC (+N8KTH) 1260- 2- 77- 5,658
Pentagon ARC
K4AF (+N4VBW) 1334- 2- 19- 5,320
Reservoir ARA
K8QYL (+KC4IRP) 1719- 2- 25- 5,164
MOARC/GARC
WF2L (+N2IBU) 1388- 2- 18- 4,830
Riverside Co ARA
W6TJ (+KC6ECT) 1369- 2- 25- 4,806
DuPage ARC
W9DUP (+KB9AGO) 1794- 2- 35- 4,800
West Palm Beach ARC
W4HAW (+N3CNK) 1656- 2- 45- 4,710
Kankakee Area RS
W9AZ 1471- 2- 15- 4,508
Arizona ARC
W7IO (+N7LQM) 1584- 2- 45- 4,448
Greater Lawrence ARF
W1FW (+KA1SWT) 1155- 2- 20- 4,304
Spokane RA
W7NBR (+N7KYW) 1372- 2- 60- 4,234
Lancaster RTS
W3AD 1142- 2- 5- 4,076
York RC
W9PCS (+KB9CSU) 1044- 2- 18- 4,024
BRASS
KX3U (+KA3UOB) 1047- 2- 14- 4,020
Davenport RAC
W0BXR (+KB0DPQ) 1273- 2- 40- 3,914
Greater Memphis FD
W4EM (+KB4QFU) 892- 2- 140- 3,854
Rock Creek ARA
W3RCN (+KA3UBJ) 1211- 2- 29- 3,802
UC ARC & NALCO ARES
W6BB 930- 2- 25- 3,734
Ripley Co RA & Laughery Valley ARA
WB9I (+N9HEH) 1316- 2- 39- 3,682
FD's Finest
N9DD 1090- 2- 7- 3,658
Anthralite RA
W3SJI (+KA3UPA) 1092- 2- 25- 3,540
Zanesville ARC
KD8HR (+KB8HBC) 1167- 2- 30- 3,468
ARES Dist 22
N0AVS (+KB0EKP) 870- 2- 26- 3,466
Portage ARC
KJ3O 1110- 2- 21- 3,396
Poinsettia ARC
N6SR (+N6OPB) 987- 2- 27- 3,380
Southern Sierra ARS
K6RL 795- 2- 15- 3,330
San Gabiel Valley RC
W6QFK (+N6REU) 801- 2- 45- 3,300
Grumman ARC
WA2LQO 1007- 2- 35- 3,230
North Shores ARC
K8HAI 924- 2- 25- 3,220
Boulder ARC
WØDK 903- 2- 28- 3,168
Mid-Atlantic ARC
W3SA (+KA3UUO) 908- 2- 27- 3,136
Rio Hondo ARC
W6GNS (+KB6ZDT) 1130- 2- 25- 3,090
Niagara Peninsula ARC
VE3VM (+VE3TEC) 808- 2- 200- 3,054
Garden State RA
W2GSA 1132- 2- 35- 3,050
Quana Powitt RC
W1EKT (+N1FXL) 784- 2- 33- 3,036
Tri-County ARC
NA4T 834- 2- 23- 3,034
Muskegon Area ARC
W8ZHO (+KB8ARY) 981- 2- 40- 2,980
Natchaug ARC
N1EBY (+N1FNV) 976- 2- 23- 2,890
MENNO Net
K3SW 937- 2- 17- 2,882
South Bay ARS
K6QHQ (+KB6TPD) 653- 2- 16- 2,862
Susquehanna Co ARC
KM3E 575- 2- 10- 2,856
Stamford ARA
K1GF (+N1FOA) 713- 2- 75- 2,818
Naval Postgraduate School ARC
K6LY (+N6UEG) 718- 2- 30- 2,740
Jefferson Co ARC
WO7O 818- 2- 18- 2,708
Key West ARC
K3ML 529- 2- 8- 2,654
Raritan Bay RA
K2GE 724- 2- 16- 2,566
Southington ARA
W1ECV 652- 2- 30- 2,554
Carthage ARS
W0LF 600- 2- 9- 2,502
Marin ARC
W6SG (+N6VAW) 542- 2- 32- 2,488
Allegan Co ARC
N8DAG (+KD8FMX) 835- 2- 17- 2,486
BRATS
WB3DZO 800- 2- 30- 2,456
Skyline ARC
NW2X (+N2IKS) 762- 2- 33- 2,454
Rogue Valley ARC
W7OEK (+KB7FMC) 815- 2- 26- 2,444
Lincoln ARC
K0KKV 674- 2- 50- 2,308
Massasoit ARA
WB1FLD (+WB1CNX) 71- 2- 25- 2,305
Sabine Parish ARC
K5ABA 795- 2- 9- 2,200
Temiskaming ARC
VE3CTT 489- 2- 10- 2,172
Ray-Clay ARC
K8EET (+KB8CZP) 659- 2- 24- 2,170
WACOM
W3IBT (+KA3UGT) 543- 2- 26- 2,160
Sacramento ARC & Hewlett-Packard ARCS
W6AK (+N6UTP) 620- 2- 17- 2,160
Portsmouth RC
KB8CLB (+N8HVH) 637- 2- 20- 2,140
Dalton ARC
KK4LL (+KC4HUR) 617- 2- 48- 2,128
Lebanon Valley SRA
NJ3G 599- 2- 15- 2,066
St Aug ARS
WF4S 468- 2- 23- 2,058
Island Co ARC
W7PN 398- 2- 17- 2,028
Ebonaire ARS
NF2N (+KA2TWZ) 406- 2- 26- 1,984
Rebels ARC
WG7X (+KB7GNJ) 492- 2- 9- 1,884
Refugio Co ARC
K5ZOD 459- 2- 18- 1,772
Salem ARTS
NS7E 437- 2- 12- 1,748
Ambassador ARA
N6SN 615- 2- 9- 1,732
North Bay ARA
K6LI 419- 2- 7- 1,722
Laurel ARS
K4QKS 549- 2- 14- 1,670
Hazel Park ARC
W8JXU (+KB8CRM) 495- 2- 20- 1,586
Pilot Knob ARC
N8SF 371- 2- 14- 1,578
Fayette ARA
KE8FQ 307- 2- 10- 1,514
Triad ARA
KC4CPP 398- 2- 6- 1,430
Highlands Co ARC
WD4M 337- 2- 18- 1,376
Pahoomaland ARC
W7JTR 260- 2- 10- 1,342
Foothills ARC
N4TGY 136- 2- 6- 1,336
Grays Harbor ARC
W7ZA 527- 2- 12- 1,304
Lambton Co RC
VE3IG 337- 2- 20- 1,282
Kokomo ARC
KK9I 285- 2- 20- 1,270
Cincinatifit ARC
NS3F 188- 2- 4- 1,234
Talawanda HS ARC
WB8PTN 327- 2- 4- 1,086
Cafaveras ARS
WA8YGA 216- 2- 17- 1,058
Fulton Co ARC
K8BXO 214- 2- 25- 928
Parma RC
K8UZW 184- 2- 18- 904
Cenois ARC
K9HGX 180- 2- 16- 860
Wheat Straw ARC
WA5IPE 41- 2- 8- 782

4A Commercial

807 Club of Kokomo
W8XX 1785- 2- 15- 5,078
RA of Western New York
W2PE 920- 2- 19- 2,974
Lawton-Ft Sill ARC
W5KS (+N5NVQ) 694- 2- 18- 1,816

5A

NCG
W4DOC 3007- 2- 20- 9,516
Old Barney ARC
N2OO (+N2JGZ) 2845- 2- 30- 8,812
Palomar ARC
W6NWG 2901- 2- 44- 8,574
Twin City ARC
K9CW (+KA9QZO) 2770- 2- 35- 8,448
Livingston ARK
KW8G (+N8KPU) 2447- 2- 22- 7,646
Cuyahoga Falls ARC
W8VPY (+KB8BKJ) 2283- 2- 36- 7,314
Schenectady ARA
K2AE (+N2GXH) 1880- 2- 36- 7,076
Frankford RC
W3GM 3954- 1- 13- 6,715
Two Rivers ARC
W3UST 1824- 2- 30- 6,706
Mt Diablo ARC
W6CX 2389- 2- 34- 6,512
GE ASTRO ARC
W2DU (+KB2FXV) 2015- 2- 37- 6,410
Bergen ARA
K2ZO (+KB2CEO) 1729- 2- 15- 6,374
Burlington Co RC
K2KED (+WA2SXD) 1809- 2- 31- 6,236
Armadillo Gang
AA5GIG 2130- 2- 35- 6,042
Wheaton Community RA
W9CCU 1661- 2- 20- 5,496
Long Island Mobile ARC
K2GRS (+N2IUU) 1434- 2- 132- 5,366
Peorta Area ARC
W9UVI (+KB9CPG) 1669- 2- 70- 5,342
Everglades ARC
W4SVI 1362- 2- 20- 4,998
Monongalia WA
K8WV 1589- 2- 30- 4,980
West Coast ARC
WD8X (+KC6CKE) 1383- 2- 62- 4,830
Organge Co ARC
W6ZE 1595- 2- 27- 4,516
Clear Lake, Johnson Space Ctr & IBM ARCs
W5RRR 1128- 2- 35- 4,360
Sonoma Co RA
W6LFJ (+N6ONZ) 958- 2- 20- 4,294
Kitchener-Watterloo ARC
VE3IC 1485- 2- 18- 4,290
AR Fellowship
N8MC 1085- 2- 17- 4,174
Danville ARS
W4MAV 1414- 2- 15- 4,054
Montachusett ARA
W1GZ (+WA1KPO) 1312- 2- 22- 4,028
Algonquin ARC
N1BHI (+KA1TOK) 1173- 2- 18- 3,910
Steel City ARC
W3KWH 1172- 2- 18- 3,770
Southern California ATS
WB6LRU 1379- 2- 20- 3,758
Mt Vernon ARC
N4BV (+KC4GCO) 1059- 2- 40- 3,730
Big Bear ARC
W6AT (+KC6DSX) 1000- 2- 21- 3,658
Stafford Area RA
N4VA (+N2GBB) 1101- 2- 40- 3,524
Alexandria RC & Arlington ARC
W4HFH (+N4HCP) 871- 2- 40- 3,350
Midland ARC
W8KEA (+N8KRT) 930- 2- 40- 3,336
Starved Rock RC
W9MKS 821- 2- 10- 3,290
Brantford ARC
VE3BA 1100- 2- 25- 3,224
Tulsa ARC
W5OK 991- 2- 20- 3,168
Warren ARA
W8VTD (+KA8ZSO) 867- 2- 12- 3,118
Coastline ARA
NC1D 1077- 2- 75- 3,000
Intermountain ARC
W6LKV 908- 2- 23- 2,956
Sun Country ARC
N4KIM 768- 2- 9- 2,766
Champaign Logan ARC
WB9EBG 708- 2- 35- 2,742
Delaware ARC
W3SL 625- 2- 10- 2,660
Victor Valley ARC
K6QWR (+KC6DVU) 866- 2- 35- 2,588
Sierra ARC
WA6YBN 659- 2- 19- 2,490
Mt Tom ARA
NA1V (+KA1SWK) 709- 2- 20- 2,278
Cedar Creek ARC
NN5J 420- 2- 40- 2,268
Idaho Soc of RA
K7ZZL 580- 2- 25- 2,218
Three Generations
W6SGJ 423- 2- 12- 2,114
Silverton ARC
KD7X (+KB7HXE) 698- 2- 16- 2,056
Clallani Co ARC
W7FEL 504- 2- 20- 1,988
Turlock ARC
W6BXN 405- 2- 21- 1,874
Beaver Valley ARA
W3SGJ 417- 2- 15- 1,666
Jefferson Barracks ARC
KB2FK 502- 2- 44- 1,648
Prescott ARA
K7AA 408- 2- 14- 1,516
Amador Co ARC
N6KD 241- 2- 28- 1,470
Palestine/Anderson Co ARC
KB5OQ (+KB5JHW) 187- 2- 20- 1,320
Catskill Mt ARA
KC2H (+WA2KCK) 253- 2- 10- 1,306
Michiana ARC
W9AB 235- 2- 20- 1,276
Yakima ARC
W7AQ 221- 2- 10- 1,262
Party ARC
KJ6KY 354- 2- 6- 1,226
South Waterloo ARC
VE3SWA 286- 2- 10- 1,172
Christian Co ARC
NT9Q 110- 2- 9- 846

5A Commercial

High Point ARC
ND4S 694- 2- 34- 2,126

6A

Huntsvile ARC
K4BFT (+N4VOO) 4307- 2- 35- 13,650
Orlando ARC
AI4U (+KC4HFP) 4321- 2- 129- 13,032
Lake Co ARA
K8BL (+N8GAK) 4059- 2- 39- 12,204
Birmingham ARC
W4CUE (+KB4PNF) 3529- 2- 100- 11,622
Mike & Key ARC
K7LED (+KA7SEH) 3437- 2- 85- 10,676
Northrop RC & Palos Verdes ARC
W6CN (+N6NELI 3889- 2- 38- 10,656
RC of Tacoma
W7DK 3277- 2- 30- 9,918
South Pickering ARC
VE3SPC (+VE3SLU) 2831- 2- 51- 9,634
Hoodview ARC
WB7QIW (+KB7GUJ) 3245- 2- 57- 9,598

BARS
NW9K (+KB9CJO) 2317- 2- 30- 7,620
N Florida ARS
W4IZ (+KC4GLM) 2626- 2- 75- 7,144
Four Lakes ARC
W9JZ (+KA9TNQ) 1706- 2- 24- 5,794
Billerica ARS
KS1A (+KA1QCL) 1395- 2- 15- 5,280
Middlesex ARS
W1EDH (+KA9UMR) 1676- 2- 31- 5,192
Catalina RC
N7WS 1602- 2- 18- 5,072
Central NH ARC
N1LT 1293- 2- 20- 4,950
Kalamazoo ARC
W8VY (+KB8HBU) 1291- 2- 38- 4,808
Central MA ARA
W1BIM 1186- 2- 35- 4,318
Vienna Wireless Soc
K4HTA 1206- 2- 40- 4,118
Peninsula ROS
NT3I 1359- 2- 29- 3,874
SMARS
W8DF (+KB8EJD) 1120- 2- 58- 3,818
Binghamton ARA
W2OW 883- 2- 18- 3,810
Iroquois Ford ARS
WB9TAH 1287- 2- 15- 3,770
AR-SAR-BEN ARC
W9EQU (+KB9EPE) 1092- 2- 25- 3,740
Brazos Valley ARC
WJ5B (+N5GZW) 947- 2- 75- 3,712
Durango ARC
WI0S (+N6UTE) 1047- 2- 15- 3,376
NBARC
WD4JMS (+N4PPD) 783- 2- 45- 2,932
MPARC/FVRA
K9GIP (+N6NWW) 895- 2- 21- 2,788
San Francisco ARC
W6PW 600- 2- 20- 2,668
Pymatuning ARC
NI3B 842- 2- 8- 2,564
Dual Banders
W2BAG (+KB2EGG) 788- 2- 7- 2,446
Susquehanna Valley ARC
NR3U (+N3FOV) 863- 2- 15- 2,348
AREA & Markham ESDA
KE9X 551- 2- 20- 2,308
Ft Lewis ARA
W2USA 543- 2- 8- 2,296
Bellevue ARC
W8WYV 457- 2- 11- 2,244
South Orange ARA
WS6S (+KA8TND) 472- 2- 15- 2,030
Mobile Sixers RC
W3AWA 473- 2- 13- 1,848
2099 ARC
W8BOO 483- 2- 30- 1,788
RA of Erie
W3GV 281- 2- 26- 1,748
Kimberling ARC
NQ0G 359- 2- 10- 1,746
Burlington ARC
VE3RAB 286- 2- 18- 1,568
Mid MI ARC
NQ8T 245- 2- 10- 1,190

7A Battery

Raleigh ARS
W4DW 1236- 5- 12-11,215
Central Oregon RAC
WX7A 742- 5- 15- 6,405

7A

Fox River RL
W9CEQ (+N9IIH) 3174- 2- 65- 9,808
TRW ARC
W6TRW 2777- 2- 25- 7,356
Baldwin Hills ARC
WA6P (+N6RBR) 2342- 2- 30- 6,634
West Branch ARA
W3AVK (+KA3TUG) 1434- 2- 31- 5,290
Roanoke Valley ARC
W4CA (+KA4YUY) 1150- 2- 60- 4,698
Murgas ARC
K3YTL (+KA3UBV) 1328- 2- 30- 4,232
Sierra Foothills ARC
W6RFF 1275- 2- 55- 4,076
Valley RC of Eugene
W7PXL 1212- 2- 12- 3,554
Empire RC
N8AY 887- 2- 18- 3,290
BOMB Squad
KJ6QE (+N6TAX) 972- 2- 25- 3,132
North Hills RC
K6IS 1018- 2- 19- 2,660
Warren Co RACES
WF8T 773- 2- 23- 2,672
Mayflower ARC
N1EZS 638- 2- 23- 2,618
NCG
WA6SLA 737- 2- 9- 2,398

8A Battery

Alameda Co RC
N6WG (+N6NFB) 973- 5- 25- 7,630

8A

Western ARA
N6ME (+N6EIV) 5390- 2- 55-14,772
Windsor ARC
VE3OW 3257- 2- 50- 9,482
Gloucester Co ARC
W2MMD 2517- 2- 35- 9,124
Crystal RC
W2DMC 2657- 2- 22- 7,926
RF Hill ARC
W3AI 1793- 2- 24- 6,680
Keuka Lake ARA
WG2R 1814- 2- 26- 6,252
Rockford ARA
W9AXD 1409- 2- 60- 5,586
ARA of Long Beach
W6RO 1884- 2- 74- 5,380
Mahoning Valley Amateur Assn
W8CLY (+KB8HDO) 1225- 2- 35- 4,252
Antietam RA
W3CWC 830- 2- 27- 3,524
Mountain ARC
W3YMW 961- 2- 17- 3,322
Wellesley ARS
W1TKZ 643- 2- 35- 2,822
Iredell Country ARS
AI4O (+KC4DBY) 432- 2- 18- 2,790
Chicago Suburban RA
NT9N 690- 2- 57- 2,814
Ft Venango Mike & Key Club
W3ZIC 582- 2- 20- 2,434
Toledo RAC
N8DGZ 375- 2- 14- 1,946

9A Battery

Scarborough ARC
VE3WE 536- 5- 64- 4,795

9A

Agawam CD & HCRA
W1NY (+KA1TMV) 4994- 2- 38-15,100
San Antonio RC
W5SC 1840- 2- 54- 6,196
Triple "A" ARA
AC9J 1334- 2- 45- 4,568
Eastern Ontario ARC
VE3SAU 894- 2- 11- 3,250
Interstate RS
KX1T 419- 2- 51- 2,078

10A

Woodbridge Wireless
W4IY (+KC4FUE) 4127- 2- 50-12,660
South Jersey RA
K3AA (+KB2EUC) 3946- 2- 40-12,582
Warminster ARC
K3JA (+KA3OKS) 3491- 2- 70-11,334
Utica-Shelby ERC
WB8G (+N8KVS) 2963- 2-140- 8,176
Silver Springs RC
K4GSO 1886- 2- 38- 6,658
OPARC
NU4Y (+N4OOF) 590- 2- 35- 3,016

11A

Kern Co & Central Valley ARCs
W6LIE 766- 2- 25- 3,476
Clearwater & St Petersburg ARCs
N4SBC 1554- 1-110- 3,357
El Dorado Co ARC
W6AJJ (+KB6VEA) 610- 2- 25- 2,980

12A

NCG
VE3CRC 1238- 2- 27- 4,240

14A

Nortown ARC
VE3NAR 2098- 2- 25- 6,588

15A Battery

Nashua ARC
N1NH (+KA1SIE) 2710- 5- 75-20,810

17A Battery

Conejo Valley ARC
K6CAB (+N6TZU) 3119- 5- 40-23,685

23A Battery

TDXS
K5DX (+N5HHS) 3326- 5- 28-25,260

24A Commercial

Englewood ARA
K2ND 106- 2- 10- 626

One or Two-Person Portable

1B-1 op Battery

NR8J 262- 5- 2,820
N6RUX 296- 5- 2,635
N9FVN 365- 5- 2,460
K3WGR 290- 5- 2,320
W8AP 196- 5- 2,260
KE8UI 201- 5- 2,000
K4RDU 179- 5- 1,990
K7BFL 161- 5- 1,615
WA2DFI 111- 5- 1,410
N7JAM 244- 5- 1,320
KA1OVE 225- 5- 1,250
WD4NGI 114- 5- 1,240
K6LMN 186- 5- 1,230
KA2KMU 70- 5- 1,200
NW2I 124- 5- 1,190
KA5DUU 96- 5- 1,160
N5MZX 148- 5- 1,040
N3ANW 138- 5- 1,035
N9FFM 33- 5- 930
AA6AV 131- 5- 920
KI8G 59- 5- 890
K2JT 89- 5- 890
WB8QDL 121- 5- 705
AF5U 48- 5- 480
WB2DLA 22- 5- 420
W6BR 37- 5- 325
AA4WE 2- 5- 320
K1II 10- 5- 290
W6MHS 7- 5- 170
KB2ENI 5- 5- 150
N6DDX 13- 5- 65
WA3LGG 6- 5- 50

1B-1 op

WB8JBM (KW8N,op) 1438- 2- 4,980
KM0L 1099- 2- 4,416
W4NW 799- 2- 3,198
K3MD 685- 2- 3,140
K2ITT 235- 2- 2,450
W1EQO/VE1 893- 2- 1,894
WB8YJF 339- 2- 1,456
K2TB 268- 2- 1,352
KA9EWN 262- 2- 1,148
WB5IUG 306- 2- 1,138
N6KFS 251- 2- 834
N9HKD 243- 2- 814
WB5FID 342- 2- 784
NJ1Q 189- 2- 770
K8CWW 276- 2- 752
N4EE 78- 2- 610
N5MHZ 101- 2- 504
NBAHA 179- 2- 458
KF7BP 75- 2- 452
NJ0Y 159- 2- 404
K6JVK/L7 73- 2- 392
W7IWU 74- 2- 378
KF7CD 65- 2- 330
KB8CPC 108- 2- 316
KF4W 50- 2- 300
WB2SHR 51- 2- 202
KA1VW 49- 2- 198
K4JOP 74- 1- 179
KB9CRY 21- 2- 142

1B-1 op Commercial

KJ8I 522- 2- 1,906
WD8S 440- 1- 589
WB8WFK 112- 2- 224
WB5CIT 9- 2- 38

1B-2 ops Battery

K9ES (+WB2EHY) 784- 5- 4,960
WD2D (+WB2BHC) 417- 5- 4,470
W7EL (+K7PJT) 376- 5- 4,060
N8AGU (+WA8RJF) 402- 5- 3,855
NK1I (+N1FJ) 337- 5- 3,530
N1EVR 311- 5- 3,210
K5EJL (+WB5IKP) 321- 5- 3,120
VE3OS (+VE3FIU) 411- 5- 3,100
WB8RXF (+WA8ZPT) 304- 5- 2,940
AA6DT (+WB6VRN) 297- 5- 2,895
K7VYY (+N7KCP) 248- 5- 2,770
N7IR (+N7KLT) 288- 5- 2,720
N5AE (+KF5QE) 286- 5- 2,035
VE3HIE (+VE3OBS) 165- 5- 1,850
WB8TSV (+WB8UUD) 235- 5- 1,780
NA8Z (+NT8I) 121- 5- 1,410
KD2DH (+AJ6T) 120- 5- 955
W8WT (+WB5RIC) 106- 5- 945
WA8RLY (+KA8JWC) 73- 5- 845
NB8QW (+KB8DTR) 156- 5- 780
ND8P (+WA9BLK) 43- 5- 355

1B-2 ops

W8TK (+WD8AUB) 1253- 2- 5,322
N7AZ (+WB7SRC) 1315- 2- 4,432
N9DJ (+N9NE) 1032- 2- 3,224
KK7A (+WB7Y) 1218- 2- 3,098
W4XD (+WA4GXA) 729- 2- 3,016
W9LNO (+N9ALC) 704- 2- 2,868
NY9C (+KB9X) 643- 2- 2,832
K4HAV (+WD4NAE) 1023- 2- 2,428
K8RYU (+KA8YZT) 734- 2- 2,424
AD7L (+KA7WDM) 576- 2- 2,424
K0BP (+WB0LDU) 1136- 2- 2,372
WV5G (+WA5VAL) 1022- 2- 2,244
WE2Y (+WB2GWA) 564- 2- 2,234
N2EY (+WA3UZI) 571- 2- 2,216
W1FEA (+KC8EPU) 589- 2- 2,016
VE2OST
(VE2s BP,WH,ops) 359- 2- 2,000
WD7Z (+N7LPV) 658- 2- 2,000
N0LS (+N0OS) 653- 2- 1,724
AA5EO (+KB5CUS) 488- 2- 1,632
WB3KAS (+KA3AHI) 667- 2- 1,592
K3USV (+WB3ESR) 439- 2- 1,406
WT7T (+KA7FYC) 520- 2- 1,310
KJ6LG (+N6AZO) 400- 2- 1,310
KA8ESO (+KA7WZM) 378- 2- 1,156
NR2R (+KB2EEN) 354- 2- 1,038
NW1S (+N1GJL) 270- 2- 1,018
W7ACA (+W7JHS) 143- 2- 772
NY7E (+KC7AW) 288- 2- 762
N7JRP (+N7JZX) 304- 2- 712
WA8PSD (+KB8ZNF) 301- 2- 702
N1EXA (+KA1IOO) 147- 2- 694
KB2XP (+KB2ALL) 173- 2- 548
WA7NCL (+WB7NRC) 209- 2- 518
W1SE (+N4OZD) 41- 2- 482
N1FCU (+WA1OJB) 139- 2- 478
W8XY (+N4VYT) 128- 2- 456
KB6UWC (+WB6PIW) 64- 2- 328
NU8Q (+KA8CWY) 56- 2- 258
KA7PDH (+KB7AIL) 75- 2- 256
KA5B (+KC4UX) 49- 2- 244
WR7Z (+N7LGK) 47- 2- 202

1B-2 ops Commercial

WE9L (+KB5IED) 608- 2- 1,328
W1HBP (+WB1FAW) 386- 2- 872

2B-1 op

WA6RND 202- 2- 1,204

2B-2 ops Battery

N6MBY (+WB6UER) 290- 5- 2,320
N6PFK (+WB6WI 102- 5- 1,360
K7RK (+N9FBG) 120- 5- 1,335
W7BYK (+W7KJ) 124- 5- 1,080
KC2J (+KW2R) 66- 5- 990

2B-2 ops

K8GIV (+K8BOI) 1143- 2- 4,180
KJ6FD (+KB6NLO) 455- 2- 1,312
K6BXI (+W1EJI) 343- 2- 1,282
N5LIH (+N5LQO) 433- 2- 1,266
AF8Z (+WB9BVZ) 405- 2- 1,228
WE9K (+KA9UDA) 413- 2- 1,194
KA9OTU (+N9BJB) 274- 2- 1,102
N2IIH 401- 2- 1,002
WB5OAP (+WB5OAO) 165- 2- 992
AB4GB (+N4OBR) 361- 2- 962
KO9S (+K8AM) 105- 2- 802
WA3KEY (+WB3CUU) 179- 2- 642
WB5TTG (+WB7UGB) 170- 2- 540
KA2PIB (+N2HEC) 57- 2- 314

3B-1 op

W9WI 56- 2- 738

5B-2 ops

W8TQE (+WE8Z) 272- 2- 1,212

Mobile Stations

1C

N2BA 448- 5- 2- 4,185
W5GN 1258- 2- 4- 3,440
AA8OP 810- 2- 4- 2,744
NO6B 307- 5- 2- 1,535
K1WGM 323- 2- 1- 1,292
K7SDW 74- 5- 1- 740
VE3HK 217- 2- 3- 466
KG5E 213- 2- 2- 426
KA4YLD 85- 5- 2- 425
WA6ZUF 180- 2- 2- 360
NI8N 133- 2- 1- 278
WB6OZK 129- 2- 1- 258
W7ON 125- 2- 2- 250
WB1GCM 114- 2- 2- 236
KB4MIL 118- 2- 1- 236
WB7WHT 107- 2- 1- 214
K5LCJ 102- 2- 1- 204
WD9EGW 44- 2- 1- 176
WE8D 55- 2- 1- 156
N7LOD 67- 2- 1- 134
NX9T 60- 2- 1- 120
KJ6NO 57- 2- 1- 114
K8HP 47- 2- 2- 94
W7VIH 33- 2- 1- 2
KI4I 43- 2- 1- 86
KB2C 34- 2- 1- 68
ND7V 27- 2- 2- 54
KB8OPJ 9- 5- 1- 45
N9HZW 14- 2- 2- 28

2C

N6DD 650- 2- 12- 1,382

3C

N6IAO 23- 5- 8- 120

4C

WD9DBL 200- 2- 4- 480

Home Stations

Commercial Power

1D

KV6I 934- 2- 1- 2,824
WD4AHZ 886- 2- 1- 2,412
KB5GEO 1137- 2- 2- 2,274
KR8V 736- 2- 2- 2,100
AL7JP 958- 2- 4- 2,024
NJ9C 644- 2- 2- 2,008
KD7E 542- 2- 1- 1,950
K3GWA 426- 2- 1- 1,704
WR0S 530- 2- 1- 1,662
W1FM 467- 2- 2- 1,440
K9TT 1092- 1- 1- 1,437
K5ZD 1093- 1- 1- 1,429
KE2V 318- 2- 2- 1,272
K1EI 298- 2- 2- 1,160
N4DDL 525- 2- 1- 1,050
VE3NUL 249- 2- 1- 996
N9NUT 440- 2- 1- 898
NW4G 216- 2- 1- 864
WC9P 210- 2- 1- 840
WJ2O 532- 1- 1- 796
NR8J 321- 2- 3- 782
N4MSY 368- 2- 2- 776
W8OSK 765- 1- 1- 765
KJ4UF 382- 2- 3- 764
N1DJX 374- 2- 1- 748
N5LBQ 340- 2- 1- 682
WA3RGH 328- 2- 2- 656
W3ZGD 286- 2- 15- 652
WA3KBH 324- 2- 5- 648
VE3UR 317- 2- 3- 634
VE3LPM 221- 2- 1- 608
W8YNY 133- 2- 1- 532
N8FQN 184- 2- 2- 516
WD9ISG 128- 2- 2- 504
KC3LM 172- 2- 1- 494
AB8I 245- 1- 1- 490
KC4IGY 229- 2- 1- 490
KA9EHL 202- 2- 1- 464
WB4SWW 232- 2- 1- 464
WB7RAL 191- 2- 2- 480
WD9FTZ 208- 2- 1- 418
AB1U 98- 2- 1- 376
W3BUC 183- 2- 1- 366
WD8OYG 178- 2- 1- 356
N4KWX 178- 2- 1- 356
WA6HRK 170- 2- 1- 340
KC1EW 159- 2- 3- 318
N8HAM 143- 2- 1- 286
W2DW 100- 2- 1- 280
WA1UMA 123- 2- 1- 276
W5NR 134- 1- 1- 268
W7EK 92- 2- 3- 268
W5JUV 130- 2- 1- 260
KD4BT 108- 2- 1- 250
WA7AHF 122- 2- 1- 244
WA5YKO 230- 1- 1- 230
AB4AH 112- 2- 1- 224
AL7HS 108- 2- 1- 216
WB4DVN 107- 2- 2- 214
WJ2L 91- 2- 1- 214
N2FRW 101- 2- 1- 202
W2TI 46- 2- 1- 184
WA2QXA 84- 2- 1- 168
W4LEP 81- 2- 1- 162
K9GL 73- 2- 9- 160
W8VEN 77- 2- 1- 154
K4UK 76- 2- 1- 152
AK8Y 152- 1- 1- 152
KA1DSQ 149- 1- 1- 149
KE2FT 42- 2- 1- 130
WD4CBZ 59- 2- 1- 130
W8XT 31- 2- 1- 122
KF4GW 59- 2- 1- 118
WB8IMY 50- 2- 1- 114
KB5AYO 44- 2- 1- 102
N8EDI 50- 2- 15- 100
WA8WAU 98- 1- 1- 98
VE3NTK 49- 2- 1- 98
N6VGI 48- 2- 1- 96
WA8MJY 47- 2- 1- 94
NL7DU 87- 1- 1- 91
N3CZB 20- 2- 1- 80
VE3MOU 20- 2- 1- 80
KB9PA 34- 2- 1- 68
WA1DTX 29- 2- 1- 58
W9REC 27- 2- 1- 54
KB9AYD 15- 2- 2- 30
KA3AFY 14- 2- 1- 28
K5HIM 21- 1- 1- 21
WA1PLK 10- 2- 1- 20
KB8ZWA 7- 2- 1- 14
K9BAD 1- 2- 1- 2

2D

WB4OBC 586- 2- 5- 1,578
N5AU 674- 3- 24- 1,348
K0BS 469- 2- 10- 1,310
WC7C 359- 2- 4- 1,130
WB8PHI 808- 1- 3- 1,018
W6DTV 385- 2- 5- 770
K8MIA 587- 1- 4- 750
KA3QFC 229- 2- 3- 480
AE8A 304- 1- 6- 317

3D

NM3B 928- 2- 4- 2,332
KM3D 331- 2- 6- 1,020
NG2N 286- 2- 20- 654
W2CXN 200- 2- 10- 422

4D

W3YA 456- 2- 40- 1,488

5D

KC8WR 1165- 2- 19- 2,586

6D

KO4J 1747- 2- 14- 4,392

Home Stations

Emergency Power

1E

K3ONW 511- 5- 1- 5,110
KV4FZ 1868- 2- 2- 5,048
K9SH 1758- 2- 2- 3,636
NM9H 402- 5- 2- 3,536
W6PRI 334- 5- 1- 3,180
N6MI 1010- 2- 1- 3,118
KE5AL 2036- 1- 3- 2,934
WD6EGS 1287- 2- 5- 2,795
KC8OH 256- 5- 3- 2,560
KA3MMM 240- 5- 1- 2,400
W5ORM 239- 5- 1- 2,390
NN8B 238- 5- 1- 2,380
AB4EL 321- 5- 1- 2,256
N4PC 1120- 2- 6- 2,240
K8CV 218- 5- 1- 2,020
NI1L 266- 5- 1- 2,010
WD8X 401- 5- 1- 2,005
AA4YZ 210- 5- 5- 1,830
W4WKQ 702- 2- 1- 1,766
WB2HJW 654- 2- 1- 1,496
KJ6JJ 688- 2- 9- 1,410
WB4ENE 451- 2- 3- 1,404
WB7UNU 1143- 1- 5- 1,375
K1BTD 127- 5- 1- 1,270
N4ID 126- 5- 3- 1,260
WD4DIY 594- 2- 1- 1,242
WC8P 617- 2- 1- 1,234
W3NNL 122- 5- 1- 1,215
W3DP 120- 5- 1- 1,200
WV6Z 472- 2- 2- 1,188
N5GFX 117- 5- 1- 1,170
WD5DUT 288- 2- 1- 1,132
NE8V 417- 2- 6- 1,102
VE2ABO 106- 5- 4- 1,060
KB3WN 209- 5- 1- 1,075
KI4VY 212- 5- 3- 1,055
WU7F 103- 5- 1- 1,030
WA8TXT 103- 5- 2- 1,020
KC9HI 132- 5- 1- 1,020
KK4OK 495- 2- 5- 998
WB2UEY 481- 2- 1- 962
W5TJT 430- 2- 1- 860
N6KL 264- 2- 8- 852
W6JTA 221- 2- 1- 842
KA9YMV 375- 2- 3- 750
N2GBY 352- 2- 1- 704
WB6EGE 209- 2- 4- 698
W5THT 155- 2- 1- 620
W2CVW 70- 5- 1- 599
KB1AF 143- 2- 1- 572
WA5WCY 190- 2- 5- 530
N9DHX 103- 5- 2- 515
VE2OWL 51- 5- 1- 510
WA9NPS 181- 2- 1- 402
VE7FB 200- 2- 2- 400
W7DFO 52- 5- 1- 365
WB8DFA 181- 2- 1- 362
KB8ORY 168- 2- 1- 336
N8KDV 154- 2- 1- 308
K5GD 128- 2- 1- 258
AA8JM 45- 5- 1- 245
KC7DH 115- 2- 1- 230
WA1TYG 73- 2- 2- 226
KC1MC 110- 2- 1- 220
WA2VJL 110- 2- 3- 220
W8THN 22- 5- 1- 220
N8UNM 65- 2- 1- 204
W8NCD 90- 2- 2- 180
N5MAX 71- 2- 1- 142
WB8WJ 28- 2- 1- 56
WD4NIT 22- 2- 1- 44
KA6WBQ 18- 2- 1- 32
W7JLF 10- 2- 1- 20

2E

KR9B 3000- 5- 5-13,975
N4TY 2724- 2- 5- 7,332
N3AE 988- 5- 2- 7,245
WB4YP 389- 5- 9- 3,115
K7MM 1043- 2- 10- 2,984
WX8M 2551- 1- 25- 2,928
K8LL 2198- 1- 39- 2,631
K5XI 1270- 2- 8- 2,540
K5BDA 1225- 2- 10- 2,520
K8CH 328- 5- 2- 2,515
K5QHD 732- 2- 29- 1,464
WA3LOS 291- 2- 15- 788
K6EAG 263- 2- 9- 734
KD2PQ 297- 2- 8- 692
WD4IIO 128- 2- 3- 444
KA9PHH 225- 1- 5- 425

3E

WF5E 1598- 2- 35- 4,980
KD6SA 996- 2- 9- 2,046
N9DZN 319- 2- 9- 786
N8JOZ 305- 2- 3- 610
WB6KQY 241- 2- 12- 570
KE6SU 362- 1- 1- 362

4E

W1ORS 277- 2- 11- 928

Checklogs:

AK7L, HC3LRC, K4ZRH, K5UV, K6NA, K7FD, K8BYI, K9HA, KA6HQW, KA8KKV, KB2HEE, KH6IJ, KJ8O, KJ8H, KL7AA, KU8B, KX7T, N2CV, N4KZL, N5DL, N6ZT, NE3H, NR3T, NU8K, NV7J, VE2CPT, VE7SCA, W1WEF, W2LRJ, W2UH, W2WOE, W3VD, W4JVO, W4MTE, W8HHF, W8ICS, W8VUV, W8YSE, WA5PCD, WA8ZEF, WA7KYT, WA7UHD, WA8T, WN8O, WW7R.

Rules, ARRL 10-Meter Contest

1) Object: For amateurs worldwide to exchange QSO information with as many stations as possible on 28 MHz.

2) Contest Period: Second full weekend of December (December 9-10, 1989). Starts 0000 UTC Saturday; ends 2400 UTC Sunday. All stations operate no more than 36 hours out of the 48-hour period. Listening time counts as operating time.

3) Categories

(A) *Single operator:* One person performs all operating and logging functions. Use of spotting nets (operator arrangements involving assistance though DX-alerting nets, etc) is not permitted.

(1) Mixed mode (phone and CW)
(2) Phone only
(3) CW only

(B) *Multioperator:* Single transmitter, mixed mode only. Those obtaining any form of assistance, such as relief operators, loggers or use of spotting nets.

4) Contest Exchange

(A) W/VE stations (including KH6/KL7) send signal report and state or province (District of Columbia stations send signed report and DC). Novice and Technician stations sign /N or /T.

(B) DX stations (including KH2/KP4, etc) transmit signal report and serial number starting with 001.

(C) Maritime or aeronautical mobile stations send signal report and ITU Region (1, 2 or 3).

5) Scoring

(A) *QSO points:* Count two points for each complete two-way phone QSO. Count four points for each two-way CW QSO. Count eight points for CW QSOs with US Novice or Technician stations signing /N or /T (28.1 to 28.3 MHz only).

(B) *Multipliers:* Fifty US states (plus District of Columbia), Canada (NB—VE1, NS—VE1, PEI—VE1 or VY2, PQ—VE2, ON—VE3, MB—VE4, SK—VE5, AB—VE6, BC—VE7, NWT—VE8, YUK—VY1, NF—VO1, LAB—VO2), DXCC countries (except the US and Canada), ITU regions (maritime and aeronautical mobiles only) per mode (phone and CW).

(C) *Final Score:* Multiply QSO points by total multipliers (the sum of states/VE call areas/DXCC countries/ITU regions per mode). Example: W1XX works 2245 stations including 1305 phone QSOs, 930 non-Novice CW QSOs, 10 Novices CW QSOs, for a total of 6410 QSO points. He works 49 states, 10 Canadian call areas, 23 DXCC countries and a maritime mobile station in Region 2 on phone and 30 states, 8 Canadian call areas, and 19 DXCC countries on CW for a total multiplier of 140. Final score = 6410 (QSO points) × 140 (multiplier) = 897,400 points.

6) Miscellaneous

(A) Call signs and exchange information must be received by each station for a complete QSO.

(B) No cross-mode contacts; CW QSOs must be made below 28.3 MHz.

(C) Single-operator mixed-mode and multioperator stations may work stations once on CW and once on SSB.

(D) Your call sign must indicate your DXCC country (K6LL in Arizona need not send K6LL/7, but K1JD in Hawaii must send K1JD/KH6).

(E) One operator may not use more than one call sign from any given location during the contest period.

(F) All entrants may transmit only one signal on the air at any given time.

(G) The use of non-Amateur Radio means of communication (eg, telephone) for the purpose of soliciting a contact (or contacts) during the contest period is inconsistent with the spirit and intent of this announcement.

(H) A transmitter used to contact one or more stations may not subsequently be used under any other call during the contest period (with the exception of family stations where more than one call is assigned by FCC/DOC).

7) Reporting

(A) Official forms are recommended (available from ARRL HQ for an SASE with two units of first class postage or 4 IRCs).

(B) Logs must indicate time in UTC, mode, call and exchange for each QSO. Multipliers should be clearly marked in the log the first time worked. Entries with more than 500 QSOs must include cross-checking sheets (dupe sheets).

(C) Postmark your entry by January 10 1990.

8) Awards: A certificate will be awarded to the highest-scoring single-operator station (in each category) from each ARRL/CRRL Section and DXCC country. The top scoring Novice/Technician station (in each category) in each ARRL Section will be awarded certificates. Top multioperator entries in each ARRL Division, Canada and each continent will receive certificates. Additional certificates will be awarded as participation warrants.

9) Condition of Entry

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) **Disqualifications:** Excess duplicates and call sign/exchange errors. See January 1989 *QST* for complete details.

Sample 10-Meter Contest Exchanges

Phone

CQ Contest CQ Contest
From Kilo Alfa Five Whiskey Mike Juliett
KA5WMJ

November Seven India Papa Golf

N7IPG Thank you
You're 59 Texas

Roger, you're 59 Utah
N7IPG

QSL, QRZed
KA5 Whiskey Mike Juliett

CW

CQ Test CQ Test
DE KA5WMJ KA5WMJ/N

DE N7IPG/T

N7IPG/T
599 TX

R 599 UT N7IPG/T

R TU KA5WMJ/N QRZ

Contest Branch now accepts entries on disk!

The Contest branch can now accept contest logs on floppy diskettes. The disk must be IBM compatible, MS-DOS formatted (3½- or 5¼-inch sizes). All log information must be in a true ASCII file. Summary sheets should be in a separate ASCII file. The log file should follow the layout of the official contest forms (containing band, mode, date, time in UTC, exchange sent, exchange received, multipliers and points). Remember to include your "report sent." Each submitted log should be on a separate diskette.

Rules, ARRL 160-Meter Contest

1) **Object:** For amateurs worldwide to exchange information with W/VE amateurs on 1.8-MHz CW only. DX-to-DX QSOs are not permitted for contest credit.

2) **Contest Period:** 2200 UTC December 1 until 1600 UTC December 3. Forty-two-hour period with no time limitation.

3) **Categories**

(A) *Single operator:* One person performs all transmitting, receiving, spotting and logging functions.

(B) *Multioperator:* Single transmitter only. Those obtaining any form of assistance, such as relief operators, loggers or use of spotting nets.

4) **Contest Exchange**

(A) W/VE: Signal report and ARRL/CRRL Section.

(B) DX: Signal report. Country name is obvious from the prefix. Send ITU Region if maritime or aeronautical mobile.

5) **Scoring**

(A) *QSO Points:* Two points for QSOs with amateurs in an ARRL/CRRL Section. W/VE stations count five points for DX QSOs.

(B) *Multipliers:* ARRL/CRRL Sections plus VE8/VY1 (maximum of 77) and DXCC countries (W/VE participants only).

(C) *Final Score:* Multiply QSO points by multiplier. Example: K1MM works 357 stations, including 13 DX stations, and has a multiplier of 67. His score would be 753 QSO points [(344 × 2) + (13 × 5)] multiplied by 67 for 50,451 points.

6) **Miscellaneous**

(A) Participants are reminded that 1.830 to 1.850 MHz should be used for intercontinental QSOs only, in conformance with ARRL band plan.

(B) The use of non-Amateur Radio means of communication (eg, telephone) for the purpose of soliciting a contact (or contacts) during the contest period is inconsistent with the spirit and intent of this announcement.

7) **Reporting**

(A) Official forms are recommended (available from ARRL HQ for an SASE or two IRCs).

(B) Logs must indicate mode, date, time in UTC, call, full exchange (sent and received) and QSO points. Multipliers should be clearly marked in the log the first time worked. Entries with more than 200 QSOs must include cross-check sheets (dupe sheets).

(C) Postmark your entry by January 3, 1990.

8) **Awards:** A certificate will be awarded to the top-scoring single-operator station in each ARRL/CRRL Section and DXCC country, and to the top-scoring multioperator stations in each ARRL Division and continent.

9) **Condition of Entry**

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) *Disqualifications:* Excess duplicates and call sign/exchange errors. See January 1989 *QST* for complete details.

Contest Branch now accepts entries on disk!

The Contest branch can now accept contest logs on floppy diskettes. The disk must be IBM compatible, MS-DOS formatted (3½- or 5¼-inch sizes). All log information must be in a true ASCII file. Summary sheets should be submitted in a separate ASCII file. The log file should follow the layout of the official contest forms (containing band, mode, date, time in UTC, exchange sent, exchange received, multipliers and points). Remember to include your "report sent." Each submitted log should be on a separate diskette.

W1AW Schedule

October 29, 1989—April 1, 1990 **MTWThFSSn = Days of Week** **Dy = Daily**

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

UTC	Slow Code Practice	MWF: 0300, 1400; TThS: 0000; TThSSn: 2100; Sn: 0300
	Fast Code Practice	MWF: 0000, 2100; TTh: 0300, 1400; S: 0300: Sn: 0000
	CW Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Teleprinter Bulletins	Dy: 0200, 0500, 2300; MTWThF: 1600
	Voice Bulletins	Dy: 0245, 0545
EST	Slow Code Practice	MWF: 9 AM, 7 PM; TThSSn: 4 PM, 10 PM
	Fast Code Practice	MWF: 4 PM, 10 PM; TTh: 9 AM; TThSSn: 7 PM
	CW Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Teleprinter Bulletins	Dy: 6 PM, 9 PM, 12 PM; MTWThF: 11 AM
	Voice Bulletins	Dy: 9:45 PM, 12:45 AM
CST	Slow Code Practice	MWF: 8 AM, 6 PM; TThSSn: 3 PM, 9 PM
	Fast Code Practice	MWF: 3 PM, 9 PM; TTh: 8 AM; TThSSn: 6 PM
	CW Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Teleprinter Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Voice Bulletins	Dy: 8:45 PM, 11:45 PM
MST	Slow Code Practice	MWF: 7 AM, 5 PM; TThSSn: 2 PM, 8 PM
	Fast Code Practice	MWF: 2 PM, 8 PM; TTh: 7 AM; TThSSn: 5 PM
	CW Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Teleprinter Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Voice Bulletins	Dy: 7:45 PM, 10:45 PM
PST	Slow Code Practice	MWF: 6 AM, 4 PM; TThSSn: 1 PM, 7 PM
	Fast Code Practice	MWF: 1 PM, 7 PM; TTh: 6 AM; TThSSn: 4 PM
	CW Bulletins	Dy: 2 PM, 5 PM, 8 PM; MTWThF: 7 AM
	Teleprinter Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Voice Bulletins	Dy: 6:45 PM, 9:45 PM

Code practice, Qualifying Run and CW bulletin frequencies: 1.818, 3.5815, 7.0475, 14.0475, 21.0775, 28.0775 50.08, 147.555 MHz.
Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.
Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.
Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code practice texts are from *QST*, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from September 1989 *QST*, pages 9 and 83," indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 83.

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

On Tuesdays and Saturdays at 2330 UTC, Keplerian Elements for active amateur satellites will be sent on the regular teleprinter frequencies.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode.

CW bulletins are sent at 18 WPM.

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

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

W1AW will be closed on November 23 and 24, December 25, January 1 and February 19.

Contest Corral

Conducted By Billy Lunt, KR1R.
Contest Manager

NOVEMBER

1

West Coast Qualifying Run, 10-35 WPM, at 0500Z Nov 2 (9 PM PST Nov 1). W6OWP prime, W6ZRJ alternate. Frequency is approximately 3.590 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL HQ for grading. Please include your full name, call sign (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

4-5

ARRL November Sweepstakes, CW, October *QST*, p 83.

International Police Assn Radio Club Contest, sponsored by the German Section IPA, from 0700Z-0900Z and 1500Z-1700Z (CW) Nov 4; from 0700Z-0900Z and 1500Z-1700Z (phone) Nov 5. Phone and CW are separate contests. Single op/all band; Multiop/one transmitter; SWL. Suggested frequencies: CW—3.525 7.025 14.060 21.075 28.075; phone—3.775 7.075 14.275 21.275 28.600. Must remain on band for at least 15 minutes. Exchange signal report and serial number. US stations also send state. IPA members send IPA as part of exchange. Count 1 point per QSO with non-IPA members and 5 points per QSO with IPA members. Multiply by sum of IPA countries/states worked per band. Mail entries by Dec 31 to Dietmar Czirr, DF6VX, Schenkendorfstr 69A, D-4950 Minden, West Germany. For further information send SASE to Thomas Jenkins, WA8VDC, 4828 Elm, Newport, MI 48166.

QST QSO Award Party, phone, see Oct *QST*, p 86.

Ten-Ten International Net Fall CW QSO Party, see Oct *QST*, p 86.

6

W1AW Qualifying Run, 10-35 WPM at 0300Z Nov 7 (10 PM EST Nov 6). Transmitted simultaneously on 1.818 3.5815 7.0475 14.0475 21.0775 28.0775 50.08 147.555 MHz. See Nov 1 listing for more details.

10-12

Japan International DX Contest, phone, sponsored by *Five Nine Magazine*, from 2300Z Nov 10 until 2300Z Nov 12. 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. 80-10 meters (except WARC bands). 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 40-15 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 Dec 31 to *Five Nine Magazine*, Japan International DX Contest, PO Box 8, Kamata, Tokyo 144, Japan.

11

ALARA Contest, sponsored by the Australian Ladies' ARA from 0000Z to 2400Z, Nov 11. Open to all licensed operators as well as SWLs throughout the world. YLs work YLs and OMs. OMs work YLs only. YLs call CQ ALARA Contest and OMs call CQ YL. Each contact may be counted twice on each band for credit—once for phone and once for CW. No net, list or crossmode operations allowed. ALARA members send RS(T), serial number, ALARA member and name. YL nonmembers or OMs send RS(T), serial number and name. Score 5 points for ALARA members, 4 points for YL nonmembers, and 3 points for OMs. CW contacts double QSO points. All logs must indicate date/time UTC, band, mode, call worked, reports and serial number, name of op worked, and points. Send logs to Mrs Marilyn Syme, VK3DMS, PO Box 91, Irymple 3498, Victoria, Australia.

11-12

European DX Contest, RTTY, sponsored by the Deutscher ARC, from 1200Z Nov 11 until 2400Z Nov 12. Work stations once per band; 3.5, 7, 14, 21 and 28 MHz only. Entry Classes: Single operator, all band; Single operator, High band (14, 21, 28 MHz only); Multioperator, Single transmitter; SWL. Stations must remain on a band for at least 15 minutes, except for a quick QSY to work new multipliers. Single operators may operate a maximum of 30 hours. The 6 hours of off time may be taken in one to three periods and must be noted in the log. Non-EU stations work EU only. Exchange signal report and serial number. W/K stations also give state. Count 1 point per QSO and 1 point per QTC (explained below). Multiply by number of EU countries worked per band. European Country list: C31 CT1 CU EA EA6 EI F G GD GI GJ GM GM-Shetland GU GW HA HB HB0 HV I IS IT JW-Bear JW-Spitsbergen JX LA LX LZ OE OH OH0 OJ0 OK ON OY OZ PA SM SP SV SV5-Rhodes SV9-Crete SY-Athos T7 TA1 TF TK UA-1346 UA2/UZ2F UA1-Franz Josef Land UB UC UN/UA1N/UZ1N UO UP UQ UR Y2 YO YU ZA ZB2 1A0 3A 4U1-Geneva 4U1-Vienna 9H1. The multiplier on 3.5 MHz may be multiplied by 4, the multiplier on 7 MHz by 3, and the multiplier on 14-21-28 MHz by 2. A QTC is a report of a confirmed QSO that has taken place earlier in the contest and later sent back to an EU station. QTCs may be sent only by non-EU stations to EU stations. A QTC contains the time, call sign and QSO number of the station being reported (eg, 1307/DA1AA/431). A QSO may be reported only once, and not back to the originating station. A maximum of 10 QTCs to the same station is permitted; the same station may be worked several times to complete this quota. Only the orginal QSO, however, has QSO point value. Keep a uniform list of QTCs sent. For example, QTC 3/7 would indicate that this is the third series of QTCs sent, and that seven QSOs are reported. Awards. List 40 QSOs or QTCs per sheet. Use separate logs for each band. Dupe sheets must be submitted for bands with more than 200 QSOs. Deadline: Dec 15. Mail to WAEDC-Committee, PO Box 1328, D-8950 Kaufbeuren, Fed Rep of Germany.

Montana Centennial QSO Party, sponsored by the Butte ARC from 0000Z Nov 11 until 2400Z Nov 12. Phone and CW. Frequencies: phone—3.890 7.280 14.280 21.370 28.470; CW—40 kHz from low end; Novice—25 kHz from low end. Work stations once per band and mode. CW QSOs in the CW subband only. Exchange signal report, serial number, and QTH (county for MT stations, state/prov/country for others). Count 1 point for phone, 2 for CW. W7FO counts 100 points per band and mode. MT stations multiply points by states worked, others by MT counties. Certificates. Mail logs to be received by Dec 12 (include legal-size SASE for results) to Butte ARC, W7FO, PO Box 4036, Butte, MT 59701.

OK DX Contest, sponsored by the Czechoslovakian Central Radio Club from 1200Z Nov 11 until 1200Z Nov 12. Phone and CW. 160-80-40-20-15-10 meters. Categories: single-op, all band; single-op, single band; multioperator, single transmitter, multioperator, multi-transmitter; QRP (single-op); SWL. OK work DX, DX work OK. Exchange signal report and ITU Zone. OK stations count 1 point for Europeans, 3 points elsewhere. EU/DX stations count 4 points with OK/OL, 2 points with stations in different continent, 1 point in same contenent, 0 point for own country. Multiply QSO points by total number of ITU zones worked on each band for final score. Use separate log sheet for each band. Awards. Entries must be postmarked no later than Dec 15 and mailed to Central Radio Club, PO Box 69, 11327 Praha 1, Czechoslovakia.

QST QSO Award Party, CW, see Oct *QST*, p 86.

18-19

ARRL International EME Competition, see Sep *QST*, p 84.

ARRL November Sweepstakes, phone, October *QST*, p 83.

25-26

CQ World-Wide DX Contest, CW, see Oct *QST*, p 85.

West Virginia QSO Party, sponsored by the WV State ARC, from 1800Z Nov 25 until 1800 Nov 26. Work stations once per band and mode. Exchange signal report and state or province (WV stations send signal report and county). Count 1 point per phone QSO and 2 points per CW QSO. And 25 bonus points for working W8WVA. WV stations multiply QSO points by total of WV counties, states and provinces worked. Others multiply QSO points by WV counties worked. Send logs before Dec 31 to Jimmie Hewlett. WD8MKS, 2207 Fairlawn Ave, Dunbar, WV 25064.

28

W1AW Qualifying Run, 10-35 WPM at 2100Z Nov 28 (4 PM EST Nov 28). See Nov 6 listing for more details.

DECEMBER

1-3

ARRL 160-Meter Contest, see this issue, p 80.

TOPS Activity Contest, sponsored by TOPS International, from 1800Z Dec 2 until 1800Z Dec 3. CW only, 80-meters. Single op stations must take one 7 hour break, multiop stations may operate the entire 24 hours. Classes are single operator, multioperator, and single op-QRP (5 W or less input). Frequencies are 3.500-3.585 MHz. The lowest 12 kHz are reserved for DX contacts. Exchange RST and 3-digit serial number. TOPS members also give their membership number. Count 1 point for QSOs with own country (each call area in W, VE, VK, PY, U and JA counts as a separate country). Count 2 points for QSO with own continent. Count 6 points for each QSO with another continent and count 2 bonus points for QSOs with TOPS member (TOPS members get 3 bonus points for QSOs with other members). For final score, multiply total points by the number of prefixes worked. Send logs before Jan 31 to Helmut Klein, OE1TKW, Nauseagase 24/26, A-1160 Wein, Austria.

5

West Coast Qualifying Run, 10-35 WPM, at 0500Z Dec 6 (9 PM PST Dec 5). See Nov 1 listing for more details.

9-10

ARRL 10-Meter Contest, see this issue, p 79.

10

QRP ARCI Holiday Spirits Home-brew CW Sprint, sponsored by QRP ARC International, from 2000Z to 2400Z Dec 10. Entry classes: all home-brew equipment; mixed home-brew/commercial equipment; commercial equipment. CW only. Single band or all band. Work stations once per band. Exchange signal report, HB (home-brew) or C (commercial), state/province/country and QRP number if

member. Nonmembers send power output. Suggested frequencies: 1.810 3.710 3.560 7.110 7.040 14.060 21.110 21.060 28.110 28.060 50.060. Count 5 points for QSO with ARCI member. Others count 2 points for same continent and 4 points for different continent. If station worked is using home brew, add 5 points per QSO. Bonus points for using home-brew equipment (HB): Add 200 points for each band an HB transmitter is used; add 300 points for each band an HB receiver is used; add 500 points for each band an HB transceiver is used. Multiply QSO points by states/provinces/countries worked per band by power multiplier (0-1 W output × 10; 1-5 W output ×7. More than 5-W output counts as checklog. If 100% natural power, multiply final score by 2; if 100% battery, by 1.5. Include description of home-brew equipment and antennas used and indicate which equipment was used on which bands. Awards. Mail entry (SASE for results) before 30 days after the contest to QRP ARCI Contest Chairman, Red Reynolds, K5VOL, 835 Surryse Rd, Lake Zurich, IL 60047.

12

W1AW Qualifying Run, 10-35 WPM at 0300Z Dec 13 (10 PM EST Dec 12). See Nov 6 listing for more details.

27

W1AW Qualifying Run, 10-35 WPM at 1400Z Dec 27 (9 AM EST Dec 27). See Nov 6 listing for more details.

31

Canada Day Contest, sponsored by the Canadian Amateur Radio Federation, from 0000Z to 2400Z, Dec 31. Everyone works everyone. 160-6 meters, phone and CW. Entry classes: Single op; all band mixed mode (phone and CW), all band CW, all band SSB, and single band mixed mode. There are two multiop classes; single transmitter and multi-transmitter. Work stations once per mode on each band. No crossmode QSOs allowed. Exchange name, RS(T), serial number (starting with 001) and province/state/country. VE1 stations must also send province. Multi-multi stations use separate serial numbers for each band. Count 10 points per VE QSO, 4 points for other countries. 20 point bonus for working any CARF station using TCA or VCA suffix. Multiply by total VE provinces worked per band on each mode (VO1/VO2 VE1-NB VE1-PEI VE1-NS VE2-8 VEØ VY1). Suggested frequencies: 1.810/1.840 3.525/3.775 7.025/7.070/7.155 14.025/14.150 21.025/21.250 28.025/28.500 and 50.040/50.110. Mail logs within 30 days (include SASE or SAE/IRC for results) to CARF Contest, c/o Mr J. Parsons, VE6CB, Acton Corners Rd, Oxford Mills, ON K0G 1S0, Canada.

Computer Diskette Media: Items for this column can now be sent on a standard 5¼- or 3½-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.

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Strays

CALL FOR SPEAKERS

☐ Have an interesting VHF/UHF topic? The Santa Barbara Amateur Radio Club is looking for speakers for its VHF/UHF Convention on May 5-6, 1990. Topics include VHF/UHF, microwave technology and operating. Contact Al Soenke, WA6VNN, c/o SBARC, 228 Hillview Dr, Goleta, CA 93117.

QST congratulates...

☐ Vernon L. Garman, Jr, KØEGA, of Cedar Rapids, Iowa, on being the 1989 Rockwell International Engineer of the Year. Vern is active in Navy Marine Corps MARS.

I would like to get in touch with...

☐ former members of the Harvard Wireless Club. I am preparing an article on the club's history. Gene Simon, W2KOY, Harvard Wireless Club, 6 Linden St, Cambridge, MA 02138.

☐ US Navy Radioman veterans who served on Landing Ship Tanks. Please send name LST number, rate, address, phone number and call sign. Frank R. Prina, N2DLN, Ex-RM2c, LST 931, 116, Woodward, Springville, NY 14141.

Special Events

Conducted By Billy Lunt, KR1R
Contest Manager

Pensacola, Florida: The Serious Hams AC will operate KK4AE from 1700Z **Oct 28** until 1700Z **Oct 29** commemorating the 103rd anniversary of Geronimo's imprisonment. Operation will be in the General and Novice 40, 20, 15 and 10-meter bands. QSL to Don Camacho, KK4AE, 2269 Berrydale Rd, Cantonment, FL 32533.

Albany, Georgia: The Albany ARC will operate W4MM 1200Z-2400Z **Nov 4** in celebration of the 18th annual Mule Day Event. Suggested frequencies: 3.975 7.245 14.250 28.383. For certificate, send large SASE to AARC Inc, PO Box 70601, Albany, GA 31705.

Houston, Texas: The Northwest ARS will operate KG5LZ **Nov 4-5,** 1700Z-2100Z each day, from the Houston Com-Vention. Operation will be SSB, CW, packet, AMTOR and RTTY in the 20, 15 and 10-meter bands. For QSL, send QSL and SASE to NARS, PO Box 1254, Spring, TX 77383.

Claremore, Oklahoma: Rogers Co Wireless Assn will operate N5OK **Nov 4-5,** 1300Z-2300Z each day, to celebrate Will Rogers Days. Suggested frequencies are in the lower 15 kHz of the General 20 and 15-meter bands and 28.430. Send QSL and SASE to RCWA, Rte 3 Box 793, Claremore, OK 74017.

Paducah, Kentucky: The Paducah ARA will operate W4NJA 1600Z-2300Z **Nov 5** from the White Haven Tourist Center. Operation will be SSB and CW 25 kHz up from the bottom of the General bands. For QSL, send SASE to David Tucker, NU4N, 1500 Massac Church Rd, Paducah, KY 42001.

Bismarck/Mandan, North Dakota: The Central Dakota ARC will operate WØZRT 1500Z-2300Z **Nov 5** to commemorate North Dakota's Centennial Celebration. Suggested frequencies: SSB—lower portion of the General 40, 20 and 15-meter bands and Novice 10 meters. For certificate, send QSL, contact number and business size SASE to CDARC, PO Box 7162, Bismarck, ND 58502.

Butte, Montana: The Butte ARC will operate W7FO **Nov 6-12** to celebrate Montana's 100th birthday. Suggested frequencies: 3.890 7.280 14.280 21.370 28.470. For certificate, send 9- × 12-inch SASE to Butte ARC, PO Box 4036, Butte, MT 59701.

Newington, Connecticut: The Armored Force ARN will operate special-event stations from 0000Z **Nov 10** until 2400Z **Nov 12** to honor all veterans who are now Silent Keys. Suggested frequencies: phone—3.920 7.283 14.250 21.375 28.640 28.450; CW—7.065 7.125. For certificate, send no. 10 SASE to WB1DWR, 16 Berkeley Cir, Newington, CT 06111.

Turkey, North Carolina: The Onslow ARC will operate WD4FVO 1500Z-2100Z **Nov 18** commemorating the third annual Thanksgiving Turkey Talk. Operation will be 25 kHz up from the General band edges, Novice 40-meter CW band and the Novice 10-meter phone band. Send QSL, QSO number and SASE to OARC, PO Box 841, Jacksonville, NC 28541.

Pensacola, Florida: N4PHH will operate **Nov 12-18** during Geography Awareness Week. Operation will be on CW 14.060 and SSB 14.250. For certificate, send QSL to Fred Gamble, Dept of Physical Science, Pensacola Jr College, Pensacola, FL 32504.

Norwich, Vermont: The Twin State RC will operate W1FN **Nov 18-19** to commemorate its affiliation and opening of the new home of the Montshire Museum of Science. Operation will be on phone and CW in the lower 25 kHz of the General bands and 28.361. For QSL, send QSL and SASE to Twin State RC, c/o Montshire Museum of Science, PO Box 770, Norwich, VT 05005.

Plimoth Plantation, Massachusetts: The Whitman ARC will operate WA1NPO 1200Z-1800Z **Nov 25** to commemorate the first successful settlement in the New World. Suggested frequencies: 7.290 14.290 21.360 28.350. For certificate, send 9- × 12-in SASE to Whitman ARC, PO Box 48, Whitman, MA 02382.

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QSLing Special-Event Stations: To get your QSL or certificate from any of the special-event stations listed here, follow simple guideline. (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-in 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 Sussex County ARES group participated in emergency operations in August. Volunteers manned the EOC in George-town and Red Cross Shelters in the Frankford area. The area received 15 inches of rain in about 4 hours overnight. Our value to the EOC and to the Red Cross is well established after this job well done. Keep up the good work! There was a Hurricane workshop sponsored by the Sussex County EOC in August. We gave a demo by working a sked with the National Hurricane Center in Miami (via a station in Texas). The Delmarva Hamfest was a great success! Congratulations to the Kent County ARC for one heck of a great job! The Hamfest Committee reports that proceeds from this year's hamfest will be awarded as two scholarships at next year's hamfest. The AWARE club will be awarding a scholarship at their Christmas Dinner December 1st. Looking for something to do with that spare cash in your club treasury? How about donating a package of ARRL books to a local or school library? Aug net rpt; DTN stns 343 tfc 45 in 23 sessions, DEPN stns 43, tfc 9 in 4 sessns, SEN stns 75, tfc 6 in 5 sessns, Traffic: K3YBW 45, WB3DUG 38, KD3GS 33, WA3WIY 30, KA3GRO 21, KQ5G 18, K3JL 12, N3FLD 11, W3FEG 10. Total 218.

EATERN PENNSYLVANIA: SM, Kay Craigie KC3LM ASM WA3PZO, KA3A, KO3B, K3ZFD; SEC KB3YS, ACC KCBQB, OCC W3IB, SGL WA3IAD, STM, BM KB3UD; PIO W3ZXV; TC W3FAF. The PA QSO Party is over—now we wait for the results! Hope your score was the best ever. Does your club sponsor an award available to non-members, such as the Reading RC's "Pagoda Award"? If so, please send complete rules to the Section Manager, so we can put together a list for a future EPA FEEDLINE newsletter and help you drum up business. RF Hill ARC presented their "John C. Willard Memorial Scholarship" to N3FIX. Speaking of winners, two Eastern Pennsylvanians received the Foundation For Amateur Radio scholarship this year: KA3FXX and N3CZB. Eastern PA radio organization's activities illustrate many excellent ways to bring ham radio to the public's attention. Warminster ARC originated over 230 messages from their Middletown Grange Fair booth in 1989. Montgomery County ARES EC W3EAG had a ham radio exhibit at a Cheltenham Twp EMS conference. Reading RC presented a lively panel discussion on the local cable TV system's public access channel. Temple University ARC held regular open house at their club station. These are just a few examples of what hams can do to help ourselves. In this month of Thanksgiving, let's do more than give thanks for Amateur Radio—let's reaffirm our individual commitment to make ham radio better, and make it better known. Attention all traffic handlers: When was the last time you coaxed someone to check in to your favorite Section Net, especially someone from an area that's currently unrepresented? Does your club sponsor a VHF net where newcomers can learn traffic handling from you? The ARRL Net Directory contains a lot of good material for those who want to learn and/or teach traffic handling. For more advise, contact STM KB3UD or one of the Section Net Managers: AA3B, WA3EHD, and WB3EPU. The EPAEPTN bunch enjoyed Pocono ARK's hospitality at their fall picnic. KA3SKT is now an ORS. The fall season brought a number of appointment changes in ARES, but the list wasn't ready yet at press time. TC W3FAF brought his talk on vertical antennas to a Mid-Atlantic ARC meeting; John has several excellent presentations on tap, as do his Assistant TC's. For the whole list, contact John at his CBA. Traffic (August): N3AZW 873, N3DRM 361, W3JKX 177, N3CD 129, WA3GJC 123, NM3K 103, AA3B 89, KD3AO 72, W3IPX 63, W3DP 57, W3KOD 47, W3ZID 44, KA3SKT 42, KA3MVM 41, N3FGC 33, W3NNL 33, N3EFW 27, WB3EVL 26, N3GXK 23, KU3R 23, K3TX 23, KA3QYH 19, KO3M 18, K3ARR 14, W3BNR 13, W3ADE 8, W3VA 8, W3AQN 3, W3HK 3. Nets (QNI/QSP): EPA 524/171, EPAEPTN 441/175, PTTN 243/84, D6ARES 129/8, D8ARES 61/0, MARCNET 42/2, MARCTN 165/62. SEPATN 89/27. @PBBS: @K3RLI 627, @WA3TSW 420, @WB3JOE 62, @N3ET 4. Thanks for all activities and reports!

MARYLAND—D.C. SM: Ken Cohen, NI3F; ASM/PKT:KJ3E; ASM/ACC:WA3YLO; BM: NB3P; PIO: N3BMB; SEC: KN3V; TC: W3VN; STM:N3EGF; SGL:KW3X OOC; WB3EFG

The race is on for Atlantic Director and Vice Director! Be sure to vote (early and often-hi!). Rcvd a warm letter from The Red Cross expressing tnx to all who helped' Response 89' simulated earthquake. MARC assisted with Rotary Runfest for the Fourth year running (hil). Ur Section TC and his ATCs are ready and willing to help Liberal Arts majors (like ur SM) and others with technical questions. KJ3E is sending a non-stop stream of pkt msgs from vacation in Maine using his laptop. W3IWI is in KH6-1and on business! Congrats to the FAIR scholarship winners and to FAIR for hosting such a worthwhile program. Upgrading? Please note that not all VECs will accept certificates of successful completion for theory tests, nor will all accept one minute solid copy as an alternative to the ten question CW exam. Be sure to check with ur examiner first! Traffic (Aug): W3IWI 2187 (BPL), N4QQ 464, KN1K 241, KJ3E 210, NB3P 172, W3FA 172, KC3Y 149, K3RXK 136, K3GHH 115, K3ORW 51, W3YVQ 49, KDOM 46, K3NNI 45, K3USO 36, K1BGT 31, W3DQI 29, KK3F 28, N3EGF 26, WA2WDT 20, NF3X 17, N3GIY 12. WA3GYW 5, KA3DXX 4, W3ZNW 3.

PSHR W3FA 93, KC3Y 87, K3RXK 81, KJ3E 69, W3YVQ 63.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—SEC: K2QIJ. STM: WB2UVB. ACC: K2IXE. TC: N2BQT. PIO: KA2RAF. SGL: VACANT. BM: WB2UVB, OOC: WA2HEB. ATCs K2JF, KA2RJA and WB2MNF. VE testing will be given in Bellmawr on Nov. 16. See Jan., 1989 QST column for full info on this session. Also VE testing being run by the DVRA on Nov. 18, 12:30 PM at the Hopewell Township Branch of the Mercer County Library, W. Delaware Ave. in Pennington. Walk-ins OK, but reservations are strongly suggested. For further info, contact Don Wright, AA2F, at (609) 737-1723. I know I'm getting to sound like a broken record, but we ARE making progress with the "Scanner Law" legislation. In early September, all members of the Senate and Assembly were sent a Fact Sheet and a letter as to why we need the present law repealed. NNJ SM NW2L and I have been working very closely on this, but in order to be successful, we need your help. Please drop your Assemblymen and Senator a line on your QSL card asking their support for S-3593 (Senate), or A- 4557 (Assembly). By the time you read this, the Legislature will be about to reconvene after the elections, so the time is NOW! Until next month, 73. Traffic: (from July) NG2R 125, WB2ZJF 109, WB2UVB 104, KB2CDB 25, WA4JRP 20, KA2CQX 16, K4FFM 10, WB2SYJ 5, KA2YKN 1, N2HQL 1 (Aug.) WB2ZJF 353, KB1BD (PBBS) 148, WA2HEB 6.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—Say, wasn't that Voyager II Neptune Flyby sumpin'? And, there's still more to come! (Galileo, Magellan, AND the parting snapshot from Voyager II of our entire solar system!) Public Service Honor Roll: KG2D N2EIA N2EVG WA2FJJ W2FR W2GJ NN2H KC2HJ W2MTA WB2OEV WB2OWO WB2QIX KA2QOO ND2S NJ3V K2YAI KA2ZNZ. August BPL W2MTA WB2OWO. KA2JXI-1 & -2 dual port on 145.01 and 145.05 in St. Lawrence County—FB! The PROS Club Ham of the Year is outgoing Prez W2QFC.

NET	MANAGER	TIME-DAY	FREQ	QNI/QSP/QND
NYSEMO	N2AGO	0900 SUN	3993.5	084/009/04
NYSR	W2MTA	0930 SUN	3530	011/003/03
NYS/M*	N2EIA	1000 DY	3677	275/228/31
WDN/M*	WB2OWO	1100 DY	146640-R	390/138/31
NY PHONE*	W2MTA	1300 DY	3925	103/071/25
ESS	W2WSS	1800 Dy	3590	367/062/31
NYPON*	KA2UBD	1700 DY	3913/3925	398/313/31
NYSPTEN	KC2IW	1800 SUN	3925	407/059/31
Lewis Co	WA2OEP	1800 SUN	147015 + R	038/000/04
OCTEN/E*	WB2HLY	1830 DY	146940-R	570/133/31
QNET	WA2RXO	1830 DY	146910-R	381/001/29
STAR*	KA3SDB	1830 DY	146130-R	249/033/31
WDN/E*	WB2OWO	1830 DY	146640-R	445/191/31
NYS/E*	N5MEA	1900 DY	3677	310/250/31
BLUELINE	WA2SEF	2000 DY	147330 + R	205/020/30
JCRACN	NW2O	2000 DY	146700-R	558/022/31
OARC Net	KB2CRQ	2000 Wed	146850-R	069/004/05
TIGARDS	W2MTA	2000 SUN	146760-R	038/009/04
VHF THIN	WB2OWO	2000 TUE	146640-R	047/000/05
Blk River	WB2OFU	2100 Dy	146655-R	047/000/05
Oneonta	KB2CRQ	2100 THU	28375	029/000/05
Pathfind	KA2AON	2100 Dy	147150 + R	380/002/30
CNYTN*	WA2PUU	2115 Dy	147300 + R	291/060/31
OCTEN/L*	WB2HLY	2130 Dy	146880-R	270/052/31
WDN/L*	WB2OWO	2130 Dy	146640-R	440/136/31
NYS/L*	W2YGW	2200 Dy	3677	320/248/31

*NTS Net. Binghamton Area has the Early Bird Net on 146.730 weekdays at 0530 (August QNI = 232) EYE JAY ZED says they chew a lotta fat in a half hour...WB2UZ. Club officers: Rome W4BNY, N2IBD KA2JXA W2SYL. Appointments (OBS): N2DCI. OO report: N2FHT. N2DLN is organizing former Navy Radiomen who served on LST's (Landing Ship Tank), so if you were or know of hams who served on landing type vessels as radiomen, let FK know and get acquainted with the gang, wherever you live in the USA. Western New York is BELOW PAR in League Volunteer Counsels. If you are an attorney, why not contact ARRL HQTRS and give a bit back to ham radio? Here's one from the Old Timer (T. O. T): Referring to a statement by new FCC Chairman Siker about NTIA in support of commercial operations expansion into 220 MHz, T. O. T. says "Is this a change for the better? Alfred Siker did one good thing when he moved from Sikeston, MO to Washington DC. He raised the IQ of both places!" Well, anyway, it's good to have the "non-issue" of code free licenses behind us, hi! Now we shall see what is to "issue" from the Commissioners! Have a great fall and enjoy ham radio as we know it. Traffic: (Aug.) W2MTA 520, WB2OWO 465, NJ3V 341, WA2FJJ 294, KC2HJ 254, KA2QOO 241, ND2S 184, K2YAI 176, KG2D 166, N2EIA 161, W2FR 161, WB2NLU 150, NN2H 134, KA2ZNZ 120, WB2OEV 113, N2EVG 105, N2DLN 82, WB2QIX 74, W2GJ 65, AF2K 55, N2EVG 32, W2PPS 32, KA2DBD 29, KB2EOQ 26, WB3CUF 18, KE2EA 6, WA2OEP 4, W2PHQ 2. (July) KA2DQA 16, KA2TWY 15, WB3CUF 3.!

WESTERN PENNSYLVANIA: SM, John T. Fleming, NO3M @ NO3M - ASM: KA3OEM @ NM3G. SEC: WA3UFN @ WA7SSO. STM: K3SMB. BM: KC3ET. TC: N3EFN. ACC: AK3J.

NET	QNI	QTC	SESS	kHZ	T/D	MNGR
WPACW	256	138	31	3585	7:00P/D	WA3UNX
WPAPTN	420	103	31	3983	6:00P/D	WA3HLN
KFN	114	79	22	3983	1:30P	N3EMD
PFN	185	183	31	3958	5:00P/D	WA3THT
WPA2MTN	274	32	31	14688	8:00P/D	KA3BGC
NWPA2MTN	611	44	30	14513	9:00P/D	KC3NY

Hello, I am your new SM. I was SCM in June 1978 and was immediately transferred to Detroit. I was transferred back in 1988 and glad to be able to serve you again. I want to thank Otto for his many years of faithful service to the Section and am glad to see him still holding a Section appointment. Bob Husan, KA3OEM, is my Assistant Section Manager. We will be jointly developing a plan for the section with what we hope to accomplish by December, 1990. I plan on creating a section newsletter and distributing it via packet. Watch for the plan in the packet newsletter. Feel free to use the contents in club newsletters. As you can tell, I like packet. We will have to try the develop a stronger core group of traffic handlers to help clear traffic that is listed on the BBS's. If you can help move these items, please bring the traffic to the local nets and help packet improve its image. Packet makes it nice not to have to meet a fixed schedule, but still be able to process traffic. Please add my name to your club newsletter mailing list. The Radio Assoc of Erie offered their services with the "We Love Erie Days" 10K run. The Pittsburgh area participated in an NDMS drill involving more than 50 hams under the direction of N3DOS. Ham radio served three functions, one of "shadowing" NDMS officials, one of linking the hospitals involved, and the third of using packet to report "casualties" to the Red Cross. Traffic: N3FM 406, N3EMD 375, NO3M 207, W3OKN 155, W3NGO 120, N3AES 109, WA3UNX 108, WA2QXA 66, WA3DBW 61, KC3YE 46, W3RUL 41, N3GLK 29, W3KUN 24, K3SMB 19, KF3V 13, WA3HJC 9, N3HID 8, KA3EGE 6, W3SN 5, KC4ITD 2. (July) WA2QXA 40.

CENTRAL DIVISION

ILLINOIS: SM, Dave Carlson, AA9D—SEC: W9OBH. BM: K9EUI. ACC: WB9SFT. STM: K9CNP. SGL: K9IDQ. TC: N9RF. OOC: W9TT. PIO: W9EWA. DEC: WD9EBQ.

NET	FREQ	TIME (Local Illinois)
ISN	3905	1800 DAILY
ILN	3690	1830, 2200 DAILY
ITN	3705	1900 DAILY
CTN	147.69/09	2100 DAILY
ILARES	3905	1630 1ST, 3RD SUNDAYS
ILLINOIS INDEPENDENT NETS		
IEN	3940	0900 SUNDAYS
ILPN	3855	1645 M-F; 0830 SUNDAY
NCPN	3916	0700 M-SAT
NCPN	7270	1215 M-SAT

25 members of the Northwest Cook ARES participated in the annual Harvestfest in Hanover Park. They had a satellite station set up as well as a computer program running that illustrated the workings of satellite communications. They used the call sign KD9HP. A "Well Done" goes out to 26 hams who assisted with the rescue drill in Alton. New Madison County EC KD9SG was quoted in a newspaper article in the Alton County Journal describing the activity. WA9DIP, WD9HBG, N9DIX, N9FXE, and NM9J assisted the Bolingbrook Police during the Pathways Parade on Sunday, August 27. The following operators handled safety communications for the late summer equestrian field trails in Winfield/Wheaton: N9IIH, WB9MRL, N9FWU, WB9YIN, KD9RU, N9III, KE9BD, KD9KN, N9IIJ, N9IVG, N9BTF, N9FWM, N9IGA, N9KC, N9GWU, KØZTI, KD9XP, WD9GIG, KC9UM, and W9LRG. Traffic: KA9FEZ 546, W9HOT 132, W9HBI 118, WA9VLC 110, K9CNP 96, K9QEW 87, WD9HQW 76, NS9F 72, W9LWH 60, NC9T 56, WB9TVD 52, KA9CTW/T 43, KA9JNE 40, WD9CIR 33, KA9TVU/T 27, WA9AXL 20, WA9SLT 12, N3AIA 11, N9HUW 9, WA9RUM 7, W9VEY/M 7, K9EHP 4, KA9UEX 2, @N3AIA-BBS 18, (JULY) @N3AIA-BBS 17, N3AIA 6.

INDIANA: SM, Bruce Woodward, W9UMH—SEC: WD9AVQ. STM: WA9OHX. ACC: K9ZBM. TC: WA9JWL. SGL: WA9VQO. BM: W9OCL. PIO: N9IPA. OOC: KJ9G. PM: WB9AHJ. Net Managers: ITN: KA9EIV, QIN: KJ9J, ICN: KD9ER, VHF: W9PMT, IWN: KA9ERC. AUGUST Net Reports:

NET	FREQ	TIME DAILY UTC	QNI	QTC	QTR	SES
ITN	3910	1330/2130/2300	2843	447	2043	91
QIN	3656	1430/0000/0300	378	152	807	60
ICN	3705	0100	25	3	145	12
IWN	3910	1310	1404		376	31
IWN VHF BLOOMINGTON			745		310	31
IWN VHF KOKOMO			972		216	31
IWN VHF LIGONIER			781		308	31
HOOSIER VHF NETS (20)			4598	119	3880	257

D9RN for AUGUST 360 QTC 62 ses. IN 95% by WA9OHK, W9UEM, K9ZLS, K9CGS, K9GBR, N9DWU. CAND 756 QTC in 31 ses. D9HN 100% by NR9K, K9ZLS, N9DWU. SILENT KEY: Paul Russell, N9CPZ of Warsaw, In. APPOINTMENTS: Packet Manager Ted Winkel, WB9AHJ. EC Lake County, Richard L. Terpstra, KE9MM Lowell, In. PIA, Daniel M. Shualeck, WB9YRT, Dyer, In. Activity for the month is consistent with a large number of reports. The exception is the Indiana Code Net with only 12 sessions reported during the month. The ICN net time has changed to 8 PM (0100z) please help. EC REPORTS: N9DUZ, WD9X, K9ET, N9ENC, WA9DOL, KA9VNK, KD9HB, W9KGE, WJ9U, KD9ZN, N9DTG, WA9OQT, WA9HEE, WB9NCE, KC9CU, W9SIO, W9CFI, N9ADS, N9GSX, KB9ACX, WB9UNL, N9FQA, N9DFU, KA9ZOR, KB9AVS, KA9KOG, W9EPT, WB9RVN. PACKET BBS REPORTS: W9ZRX 6498, WB9SYK 1694, N5AAA 1478, WA9UXP 1362, KA9LQM 1356, KD9QB 1210, N9BAC 587. PUBLIC SERVICE REPORTS: Hamilton County, WJ9U Triathalon/Allen County, N9ADS Three Rivers Festival Biathon and Display Lake County, N9DTG March of Dimes 4x4 Mud Bog. Hammond, East Chicago, Gary triathlon. LaGrange County, WD9X Amish Land and Lakes Bike Tour. Bartholomew County, W9SIO, Honeysuckle 100 Bike Ride. 146.10/70 monitor program N9FOZ reports 276 hours with 2 fires, 2 road info, 9 accidents, 5 stalled cars, 4 weather nets, 1 power lines, 4 traffic lights, 2 road construction. Traffic: NR9K 270, WA9OHX 175, KJ9J 156, W9UEM 147, W9UMH 103, W9CNE 93, N9BS 74, W9OCL 68, WD9JAA 66, K9ZLS 54, KA9QME 43, N9DWU 39, KE9PR 39, KA9LQM 38, WA9QCF 37, NX9I 35, K9GBR 34, WB9QPA 31, W9PPO 30, K9FEI 28, N9FOZ 28, K9DBY 28, N9HZ 26, K9SBW 22, WB9IHR 18, WD9X 18, WD9HII 18, KB9HH 16, KD9DU 11, W9PMT 10, N9DIY 9, N9DTG 9, WD9DWD 8, K9OUP 8, W9RTH 7, WA9JNC 7, K9ZBM 6, WB9OZZ 6, WD9CIV 5, W9OZJ 5, KB9GX 5, K9KTB 5, W9KMY 4, NZ9S 3, W9XD 3, WB9AJY 3, WB9AHJ 3, W9KT 2, W9BTZ 2, KA9ZOD 2, KB9SU 1, W9CFI 1, WA6OIZ 1, AB9A 1, WA9HEE 1.

WISCONSIN: SM, Richard R. Regent, K9GDR—SEC: W9ZAG. STM: KC9CJ. ACC: KA9FOZ. BM: WB9JSW. OOC: NC9G. PIO: K9ZZ. TC: K9GDF. Congratulations to the Green

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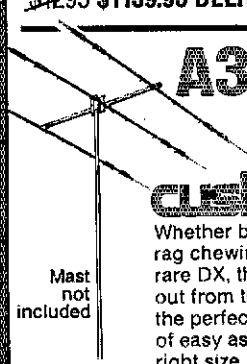

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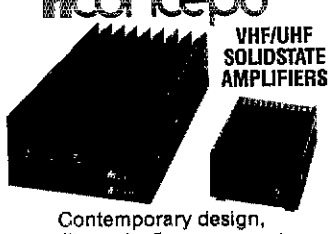

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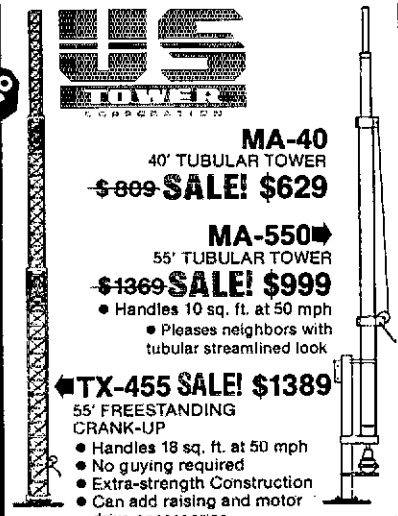

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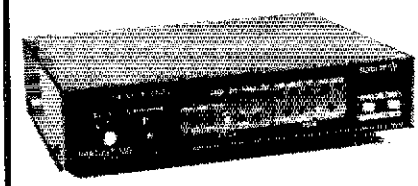

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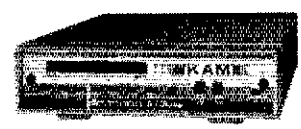

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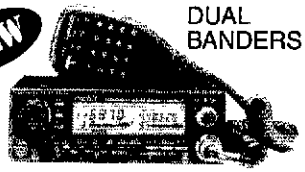

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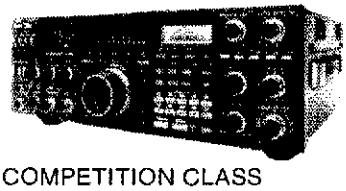

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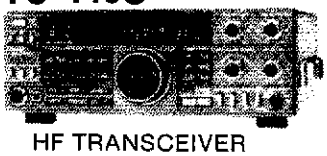

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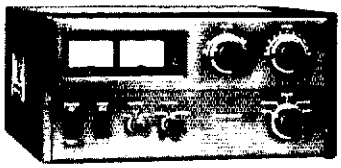

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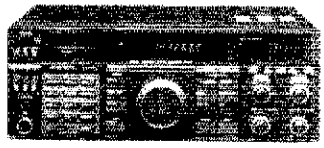

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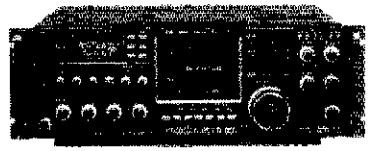

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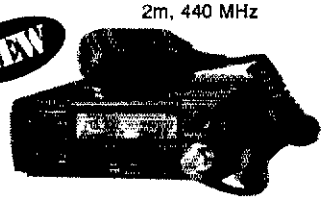

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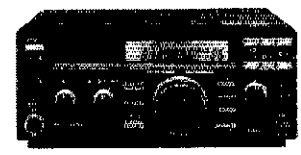

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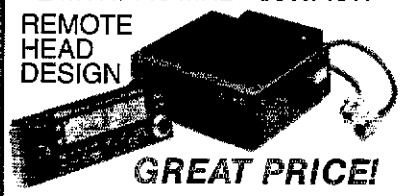

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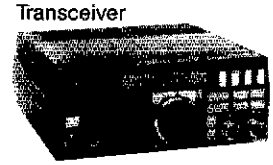

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Bay Mike & Key Club for 50 years of affiliation with the ARRL. Free map showing the revised District Emergency Coordinator boundaries for Wisconsin is available from our Section Emergency Coordinator, W9ZAG. New Emergency Coordinators are: Portage County, KA9ACE; Vilas County, KA9YQH; and Walworth County, KA9JJK. Monroe County EC, KA9PSL, is new Secretary of the Associated Public-Safety Communication Officers and will have Spring Regional Conference in La Crosse on May 8, 1990. Ozaukee Radio Club says new repeater is working fine on 224.18 MHz, give it a try. The Central Wisconsin RA have new WB9QFW/R Hustler G-7 repeater antenna. Watertown ARC has net on 145.49 Thursdays at 8:00 P.M. KJ9I described his DX-pedition and N9HC demonstrated his briefcase emergency packet system at Four Lakes ARC meetings. The 1989-90 $500 scholarship winners of the West Allis ARC are KA9LWN of Shawano and WB9VOZ of Wausau. At the Wisconsin Nets Association Annual Picnic, members presented the 1988 traffic handling plaque to Hale Blakely, W9CBE with 2,939 points; endorsements tags for their previously awarded plaques were given to WB9YPY (21,444 points) and KC9CJ (6,560 points). November 1st, Milwaukee RAC exams Wauwatosa at East High School, send post card indicating tests needed to W9JK to register. November 4th, the Milwaukee Repeater Club will hold the 6.91 Friendly Fest open at 8:00 A.M., 7:00 A.M. for sellers, inside Serb Hall, 51st and Oklahoma in Milwaukee with free parking, contact K9IZV for more information. See you at the friendly ARRL table. The Friendly Fest will have on-site exams given by the Milwaukee RAC VEC starting at 9:00 A.M. November 4th, Racine exams at Red Cross Building, register with N9DMP. Dunn County ARC exams November 11th, Credit Union Office Building, Menomonie, info from WF9I. The West Allis RAC will hold its Awards Dinner soon. November 25th, Tomahawk VE exams 8:30 A.M., appointment with WA9W. Remember to indicate your Club participation when submitting an entry in the November phone or CW ARRL Sweepstakes, mark your log accordingly. Don't delay your antenna work any longer, winter is coming. Happy Thanksgiving to all. Traffic: WB9YPY 2247, KC9CJ 1006, WG9J 576, WA9W 365, W9YCV 278, W9CBE 264, W9KLN 233, N9BDL 159, K9GDF 148, W9IEM 114, W9UCL 112, W9CXY 110, KA9BHL 80, AD9X 76, K9AKG 73, KA9FVX 64, W9NGP 56, AG9G 54, N9HWB 52, KA9KLZ 44, N9BCX 39, WB9ICH 39, K9EP 38, NS9Q 36, K9FHI 35, K9JPS 32, KG9B 31, W9ODV 24, K9UTQ 24, W9UW 9, W9PVD 2. (JULY) N9IKD 14.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, KCØT—In spite of the glowing reports from Mel, NØFOO, in Brainerd, summer is slipping fast. But I do believe that conditions on the lower bands have been somewhat better for traffic nets. So, that's encouraging. Congratulations to Max, NØFKU of Bloomington as The Amateur Of The Month for August. Nice going Max, and thanks to all for your help and participation in MSN activities. I would like to get input from all of you each month for any information or ideas to help me with the write-up of this column. So, keep those cards and letters (and Messages) coming! The Minnesota Amateur Weather Net has resumed their operation for the season and that's good news - 6 PM daily immediately following MSPN/E. Traffic for the month totalled 1,697 with 21 stations reporting - thanks gang! Until next time, 73 es GL, Jim Swisher, KAØEPY, STM MN.

NET	FREQ	TIME	QNI/QTC/SESS	NET MGR
MSN/1	3685	6:30P	276/81/31	KAØEPY
MSN/2	3685	10:00P	273/59/30	KDØNH
MSSN	3710	8:00P	354/29/31**	KABSBY
MSPN/N	3860	12:05P	292/127/29	---
MSPN/E	3860	5:30P	688/168/31	KCØT
PAW	3929	9:00A	2075/240/119	WDØBAC

**MSSN additionally sent 42 training messages. Alt. Freq. MSN/1 and MSN/2-7070; MSPN/N-7232. Traffic: WAØTFC 347, KAØEPY 303, WØGRW 212, NØFOO 160, KT9I 141, NRØS 80, KABSBY 70, NFØG 66, KABARP 62, KCØT 44, KDØNH 43, WDØGUF 41, KØQBE 33, NØJP 27, WØRIQ 25, NØKCM 9, KØOGI 9, WØKYG 9, KØWPK 6, KDØCI 5, NØGNN 5.

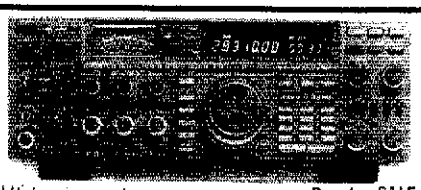
NORTH DAKOTA: SM, Bill Kurtti, WCØM—Grand Forks Hamfest Oct 14. Our search for the 1st Licensed Ham in ND is drawing to a close with these results. The 1st license was issued in 1914 to the University of ND in Grand Forks with the call 9YN, also in 1914 the following licenses were issued. 9GN to Charles Curtis, Pembina ND. - 9EN Ralph Fisher, Fargo, ND. - 9EM Andrew Love, Fargo, ND. - 9BQ Eddie Nelson, Fargo, ND. - 9FS Earl Reineke, Fargo, ND. In 1920 there were 16 licensed stations. 9AFP Richard Black, 9AFJ Vincent Carroll, 9GT James Corum, 9ABU V.M. Cousins, 9AII Paul Farseth, 9AHC Harold Demmer, 9AAO Carl Furnberg, 9ADB Raymond Gilbert, 9EE Herbert Goddard, 9WU E.S. Leavenworth, 9AAM Reynold Moen, 9VJ Palmer Nelson, 9AGN Reul Sande, 9ZX R.H. Pray, 9LW Myron Weis, 9AEJ Bertrum Wick, If you have further info on these hams please let me know if you need the address of the last 16 I will send it to you. Traffic: KAØFSM 73.

NET	FREQ	TIME	SESS/QNI/QTC	MGR
Goose River	1990	9AM SU	4/49/0	NTØV
DATA	3941 kHz	6:30 DA	27/428/9	NØJR
WX NETS	3941	Resume in Oct		WØGFE
Winter only		9AM-12:30PM	Mon-Fri	
STORM NET	3941 kHz	DURING STORMS ONLY		WCØM

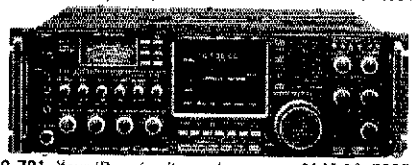
SOUTH DAKOTA: SM, R.L. Cory WØYME Asst Sm NØABE WAØFPR SEC KAØXPY STM KDØYL The South Dakota Centennial Wagon Train has completed its run of 1764 miles and was a great success. Many hams enjoyed their operating experience on the train and totaled over three thousand contacts. Two new repeater antennas have been installed on the Crandall Repeater on a 250 ft tower near Conde. NYØX KCØLI and WØYMB went to Glad Valley and made repairs on the Digi antenna so we expect to have Packet activity going strong again. WBØMJY has put the states first UHF repeater on the air at Watertown. Its input is 444.65 and its output is 449.65 WAØBZD has replaced the Sisseston repeater with a new one still operating on 146.28/88 South Dakota Novice net 7PM CST every Sunday on 3725 MHz. with summer over ham activity will now pick up.

DELTA DIVISION

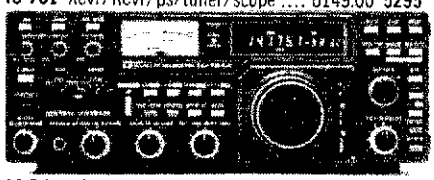
LOUISIANA: SM, John "Wondy" Wondergem, K5KR—ASM: KB5CX. SEC: N5ADF. ACC: K5KR. SGL: KD5SL. TC: W5RWF. OOC: WB4ICV. Packet: WB5ASD. STM: WB4FDT.



HF Equipment	Regular	SALE
IC-765 Xcvr/ps/keyer/auto tuner	3149.00	2699



IC-781 Xcvr/Rcvr/ps/tuner/scope 6149.00 **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**
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	**5999**
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	
SM-10 Compressor/graph EQ, 8 pin mic	149.00	**139.95**
AT-100 100W 8-band auto. ant. tuner	445.00	**389.95**
AT-500 500W 9-band auto. ant. tuner	589.00	**519.95**
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IC-375A 25w 220 FM/SSB *(Closeout)*	1399.00	**799.95**
IC-475A 25w 440 FM/SSB/CW w/ps	1399.00	**1199**
IC-475H 75w 440 FM/SSB/CW	1599.00	**1369**
IC-575A 25w 6/10m xcvr/ps *(Special)*	1399.00	**1129**
IC-575H 100w 6/10m xcvr	1699.00	**1499**
VHF/UHF/1.2 GHz Mobiles	Regular	SALE
IC-47A 25w 440 FM/TTP mic *(Closeout)*	549.00	**369.95**
PS-45 Compact 8A power supply	145.00	**134.95**
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25w 2m FM, TTP mic *(Special)*	469.00	**379.95**
IC-28H 45w 2m FM, TTP mic	499.00	**439.95**
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	46.00	
HM-16 Speaker/microphone	34.00	
IC-228A 25w 2m FM/TTP mic *(Special)*	509.00	**429.95**
IC-228H 45w 2m FM/TTP scan mic	539.00	**479.95**
IC-448A 25w 440 FM/TTP mic	509.00	**449.95**
UT-40 Pocket beep function	45.00	
IC-900A Transceiver controller	639.00	**569.95**

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UX-29H 2m 45w band unit	349.00	**319.95**
UX-39A 220MHz 25W band unit	349.00	**299.95**
UX-59A 6m 10w unit	349.00	**319.95**
UX-129A 1.2GHz 10W band unit	549.00	**499.95**
IC-901 Fiber Optic 2m/440 xcvr	1199.00	**1069**
IC-1200A 10w, 1.2GHz FM *(Closeout)*	699.00	**599.95**
IC-2500A 440/1200MHz FM mobile	999.00	**869.95**
IC-3210A 25w 2m/440 FM/TTP	739.00	**649.95**
IC-2400A 45w 2m/35w 440 FM/TTP	899.00	**789.95**
AH-32 2m/440 Dual Band antenna	39.00	
AHB-32 Trunk-lip mount	35.00	
Larsen PO-K Roof mount	23.00	
Larsen PO-TLM Trunk-lip mount	24.70	
Larsen PO-MM Magnetic mount	24.70	
RP-1510 25w 2m repeater	1849.00	**1649**
RP-2210 220MHz 25w rptr *(Special)*	1649.00	**1399**
RP-1210 1.2GHz 10w 99 ch FM rptr	1529.00	**1349**

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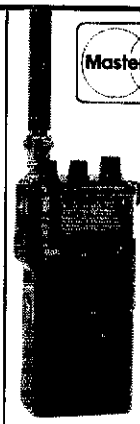

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IC-2AT 2m/TTP	319.00	**279.95**
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IC-04AT 440 HT	449.00	**389.95**
IC-u2AT 2m *(Closeout)*	329.00	**279.95**

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IC-u4AT 440 *(Closeout)*	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 *Special*	449.00	**399.95**
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	**569.95**
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	
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ARRL Affiliated Clubs enjoy a number of perks. 51% ARRL membership is all that is required. Clubs remain in an active status by completing a short Annual Club Report Form. The following Louisiana Clubs have renewed for 1989. Ascention ARC, Catholic HS Baton Rouge ARC, Central La. ARC, Delta DX Assoc., Fist & Mouth Contest Company, Iberia ARC, Jefferson ARC, Livingston ARS, Louisiana Tech ARC, New Orleans VHF Club, Ozone ARC, Southeastern Univ. ARC, St. Mary AR Transmitting Soc., Thibodaux ARC, and West La. ARC. Nine ARRL Affiliated Clubs have not sent in their 1989 Report Forms. Has your group renewed this year? How about asking your secretary? It's not too late to renew or affiliate. Call or send a note for a Report Form or a new appplication folder. An Amateur Radio booth or display at a local shopping center is an ideal way to show your community the public service and emergency communications provided by amateur radio well as introducing them to a hobby with many different pursuits and unlimited horizons. Several clubs reported this last month how enjoyable and successful their weekend venture has been. How about your club? It's the old story. Put a little effort in and the personal reward will stay with you for a long time. 73 & good luck de "Wondy"—K5KR.

MISSISSIPPI: SM, Butch Magee, KF5DE—ASM: Mark Henry, WD5GHW, SEC: Bill Fryer, N5DVR. STM: Jim Leist, KB5W, SGL: Richard Redd, KA5WRX. I had the pleasure of speaking to the Rankin County ARC the last Tuesday in August. A good and ambitious organization who have a great interest in emergency service to the area and state. Many thanks to Allan Clark, WD5IKD for inviting me. By the time you read this the Biloxi Hamfest and State Convention will be over and done, so I'll say now I had a great time there because we always do and look forward to it each year. Jim Leist, KB5W, is the Section Traffic Manager and has written several articles on traffic handling and procedures in the Magnolia Report. We are going to have him hold one or two training sessions on the Mississippi Section Phone Net when he has a chance to get away from the National Nets one evening. Traffic into and out of the state has grown and we thank all the guys who handle all the traffic for us. You're doing a great job. The following report shows it. Thanks again.

NET	NET MANAGER	SESS	QNI	QTC
MSPN	W5OXA	31	2038	71
MTN	KB5W	31	209	93
MSN	W5YRX	22	117	10
GCSBN	W5JHS	31	1291	21
COAST ARES	N5LLM	5	123	7 EMER
MAGNOLIA	N5HBB	31	692	6
MERIDIAN	KB5ASR	5	112	0
CAND	K5UPN	31	-	756
DRN5	WB5YDD	62	-	701

Mississippi represented 100% by: KT5Z, W5HKW, NS5M, WB7COQ, and KB5W. 73 from 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. Silent Keys this month are Roy T. Hardin, WA4GEC of Kingsport and Dalton Copeland, KB4RZD, of Memphis. It goes without saying that they will be missed by their many friends. The Delta Division Convention at Shreveport was excellent. It was held in the Civic Center, with excellent facilities including, would you believe, a pancake breakfast, complete with two sausages, syrup and coffee for $2.50. I wonder if I can talk them into coming to Memphis. The ARRL forum was well-attended, including President Price, Delta Division Director Harrison, the Arkansas Section Manager and the Tennessee Section Manager. A variety of subjects was covered, with a lot of pros and cons, but nobody even mentioned the possible $30 charge for renewing, modifying or issuing an amateur license! The following week, the Southeastern Division Convention was held in conjunction with the Huntsville, AL Hamfest. It was excellent. Everywhere you looked, there were Tennessee hams, which made it even more enjoyable. Finally, there was Lebanon, the most friendly hamfest in the state. It isn't commerical, but everyone you want to see is there, year after year, and I hope it continues forever. Hey, WB4LAL is doing a great job as CW Net Manager (as are all Net Managers)! Would you believe we are having as many as eight operators check into the net in a single night? I remember when we wouldn't have eight in an entire week! Traffic: WA4FMR 136, WA4GZZ 62, W4MI 53, WB4LAL 28, W4PFP 27, W4TYV 27, K4WOP 25, KA5KDB 24, W4DDK 24, WA4HKU 10, K4CXY 8, W4PSN 4.

GREAT LAKES DIVISION

KENTUCKY: SM, John Thernes, WM4T—Asst. SM: KC4WN. SEC: WB4NHO. STM: KA4MTX (August). Congratulations are in order for the KY Colonels ARC in Bowling Green for having obtained Special Service Club status. This is only the second club in Kentucky to receive this recognition. My thanks to B.A.R.S. of Lexington for another fine Georgetown Hamfest. The ARRL forum was packed and it was good to see so many appointees at the fest. If you are an appointee, please watch the expiration date of your ARRL membership. We would hate to lose you due to an oversight.

NET	QNI	QTC	SESS	MGR
MKPN	1368	117	31	WD4RWU
KTN	746	79	31	WD4RWU
KYN (BOTH)	298	117	62	K4AVX/KZ8Q
TSTMN	412	40	31	KZ8Q
KNTN	234	64	39	WA4EBN

SAR (Aug): WD4RWU 172, KC4WN 74, K4VHF 67, WA4EBN 55, KB4UJA 55, K4AVX 36, KI4QH 32, N4LAF 20, WA4HLW 18, WB4AUN 16, KA4MTX 13, N4PEK 11, W4TPB 11, WA4NOG 9, WD4CQF 7, KU4A-4. PSHR: KI4QH 99, KC4WN 81, KA4MTX 60.

MICHIGAN: SM, George E. Race—WB8BGY (@N8FTY). ASM-WA1LRL (@WA1LRL), STM-WD8KQC (@NT8R), SGL: N8CNY, TC-W8YZ, OOC-WA2AJQ, ACC-N8JVA, PIO-N8KBA. Silent keys with deep regret: WA8FXR, K8ZLB, N8EXX. —A MONUMENTAL TASK AHEAD FOR MICHIGAN AMATEURS— The 1991 ARRL Convention Planning Committee has announced plans for a monument, to be placed at ARRL HQ, honoring US Amateurs who have given their lives participating in public service events. Proposed is a granite 8' ARRL Diamond mounted on a 4' granite base. Names, Calls, and other pertinent information will be carved into the monument. This gift from MI Amateurs, in commemoration of the first National ARRL Convention in MI, is going to need your financial support. Estimated total cost will be around $20,000. Contributions can be sent to: Michigan Monument Fund, in care of Joe Turner, K8CQF. I am very pleased to announce the formation of the Northern MI Traffic Net. This VHF net will provide many new traffic outlets for Northern MI communities. The net is meeting daily on 147.12, the N8JCN repeater located near Gaylord. Proposed plans for linking to other Northern MI repeaters are in the planning as well. Net Manager is Dennis, N8JCL. Our STM, WD8KQC, has sanctioned this net as part of the MI National Traffic System. (Note Listing below) My thanks to retiring Jackson Co. EC, Dick, KA8VLN, for a job well done over the past 2 years. Welcome aboard to Scott Elliott, WD8IGK, new Jackson Co. EC. My thanks go to Tom, WI8W, retiring MI Bulletin Manager. Good luck in your college studies. Is there anyone out there that would like to take on the job of Bulletin Manager? Please let me know if you are interested. The 1990 Michigan State ARRL Convention will be held in Gaylord. For further details contact Dennis, N8JCL. A very last minute notice! Don't forget to take part in the SET. Be sure to get your final reports to your DEC by Nov. 6th. How quickly we seem to come to the end of a year. I hope everyone has a very nice Thanksgiving holiday. 73, WB8BGY Please support the following MI area Nets:

NET	FREQ	TIME/DAY	QNI	QSP	SESS	MGR
MITN	3953	7:00PM Dy	588	200	30	WD8EIB
QMN*	3663	6:00PMDy	471	121	62	WB8R
SEMTN	145.33	10:15PM Dy	416	113	31	N8HSC
MNN*	3722	5:30PM Dy	215	95	61	KA8BBY
MACS*	3953	11:00AM M-Sa	344	73	31	K8QCP
UPN*	3921	5:00PM Dy	941	71	35	WA8DHB
GLETN	3932	9:00PM Dy	1078	58	31	NW8M
WSSBN	3935	7:00PM Dy	620	43	31	W8NDI
NMTN	147.12	7:30PM Dy				

NEW NTS MI VHF NET! N8JCL VHF Net Activity NO REPORT NO8Q *QMN Fast-6:30PM Dy; QMN Late-10PM Dy.; MNN Late-8:00PM Dy.; MACS-1PM Sun.; UPN-12PM Sun. Traffic for August: KA8CPS-477, KF8AU-286, NJ8S-169, WD8KQC-142, N8JAT/BBS-117, N8FTY/BBS-90, WB8SYA-88, WB8YPG-77, K8GXV-68, NW8M-61, N8FPN-57, N8IIC-56, WA8DHB-52, K3UWO-52, NY8W-51, N8HFC-46, K8CQF-45, W7LVB-44, W8EOI-43, K8ZJU-43, N8HHH-40, K8HAP-39, N8CNY-37, WD8EIB-37, WB8BGY-34, W8RNQ-33, W8IHX-30, W8IHX-30, WB8YDZ-30, WD8MJB-30, K8OCP-29, K8UPE-28, KI8Q-24, N8IQS-20, WI8J-18, KA8BYK-16, N2IYA-16, WA8MVH-10, WD8AXB-8, W8VIZ-7, WT8J-7, W8BEZ-6, N6CRV-6, WB8WJV-5, N8EXS-4, N8FTY-4, KN8JDN-4, N8GGO-3, W8URM-1. July: NW8M-45

OHIO: SM, John Haungs, WA8STX Ph: (513) 563-7373—ASM: David Kersten, N8AUH, Ph: (216) 221-5740. SEC: WD8MPV. STM: KF8J. ACC: KJ3O. ACT.BM: W8PH. TC: KB8MU. OOC: WB8ZCE. SGL: N8CVK. PIO: K8QOE.

NET	QNI	QTC	Sess	TIME(local)	FREQ	MGR
8N(E)	211	98	31	1845 DY	3.577	WD8C
8N(L)	214	100	31	2200 DY	3.577	K8TVG
BNR	192	81	31	1800 DY	3.905	W8EK
OSSBN	1699	825	92	1030,1615,18453	3.9725	N8IBS
OSSN	186	100	31	0645 M-F	3.577	KD8HB
OSSN	---	---	---	0800 S-SU	3.577	KD8HB
OSN	231	70	28	1810 DY	3.708	WD8KBW
O6MN	---	---	---	2100 M-W-F	50.16	WD8CTX
OHIO SECTION ARES NET				1700 SUN	3.975	WD8MPV
OHIO SECTION WX NET				A/R	3.975	WD8MPV
BNR-JUL	188	68	31	-	3.605	W8EK

During August, the main Section activities evolved around ham gatherings, hamfests, parades, and charitable events to raise money. The question has come up as to whether a donation from a non-profit organization for the Amteur Radio services provided is acceptable? If the Amateur Radio services are not advertised for a fee, there is no pecuniary interest. If an organization feels the services provided are of value to the success of the event and care to make a contribution to the operation of Amateur Radio group, there doesn't seem to be any conflict of interest, as long as the record shows the transaction as a donation. Congratulations to the long-time Amateur Radio Pioneers of the Columbus ARA who were present at the September meeting. They are entitled to a salute for their years of service. Please note that appointmnet endorsement stickers are no longer issued. Your Field Organization appointment is valid as long as you maintain appropriate activity, report as required, and keep your ARRL membership current. If your appointment certificate is lost or shabby and covered up with endorsements, contact your SM for a nice new one. The club newsletter editors in Ohio do a lot to keep our clubs strong and growing, and it takes a true devotion to keep the monthly schedule. Please help your editor by having your articles in on time. If you would like to volunteer some of your free time to help out in your particular County with the local RACES or ARES group and don't know who to contact, call your SM or ASM. The Greater Cincinnati ARA interesting program on Amateur Radio and the Law by John Weiss, WB8KLO, who is an ARRL Legal Representative ad also a former recipient of GCARA scholarship funds. An ARRL Legal Representative will give an Amateur free initial contact service on an Amateur Radio related legal problem. Write ARRL for a contact in your area. Congratulations to those who have upgraded: Toledo ARC members: Pat Tendam, WS8T; Bob Wells, KB8GYT; Cheryl Hampshire, WI8H; and Alan Bossler, Gen. Centr. IARC-MASHER MEMBERS: Jim Pierce, N8HTC; David Freeman, KA8EEN; Fred Freeman, N8KVU; Wesley Lloyd, KA8ETB, Mark Yannitall, KB8EPG; Jim Norfleet, KB8HQM, Robert Freeman, Jr. and Aaron Howell II. Traffic: K8TVG 328, KD8HB 297, W8PMJ, KD8KU 264, W8DO 218, KA1S 175, K8JDI 173, WA8SSI 165, KE8CV 165, WD8IKC 161, N8IIP 127, WA8STX 122, KF8J 121, N8FWA 111, W8JLW 109, KC8TW/BB 102, W8QZK 98, WD8RAO 94, WB8DPZ 92, WD8FKN 88, KC8NM 78, WB8KWC 69, WB8VNV 69, W8SKP 66, W8RG 65, WB8JGW 64, KA8HBN 64, WB8FSV 63, WD8KBW 62, KA8CGF 62, W8LDU 61, K8DHD 55, W8EK 54, KA8YIT 54, NE8X 52, K8ALV 51, K8DXZ 51, WA8HED 50, KA8SON 50, WA8EYQ 40, NS8C

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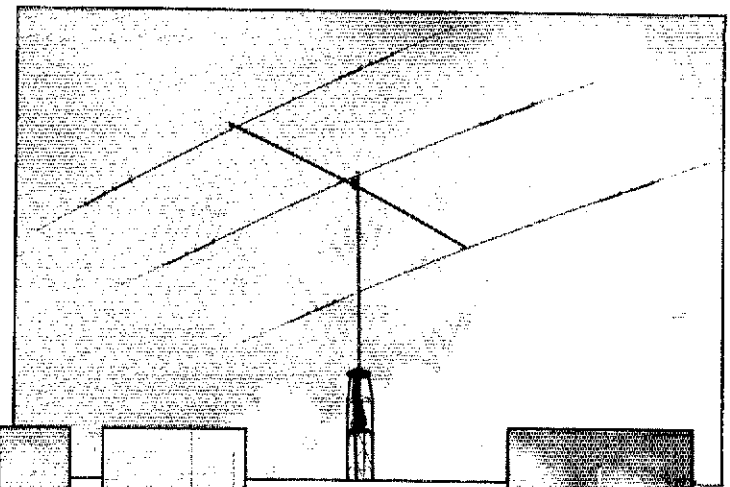

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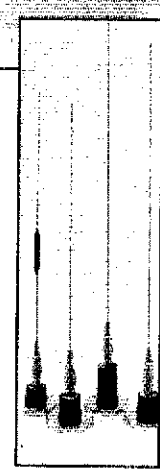

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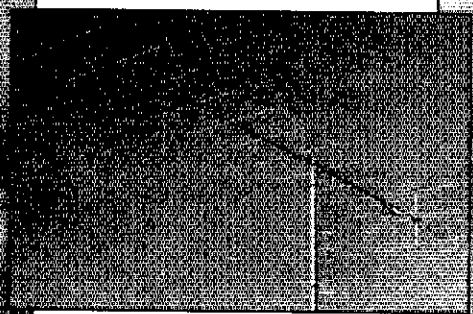

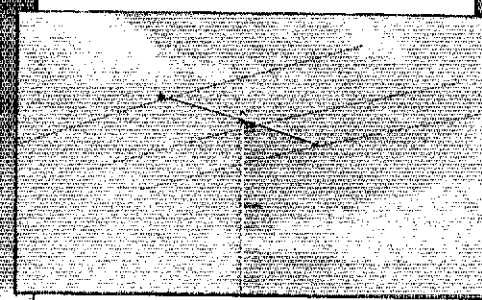

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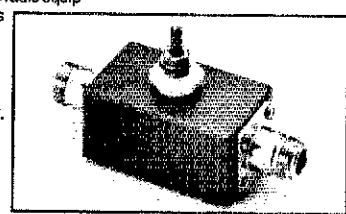

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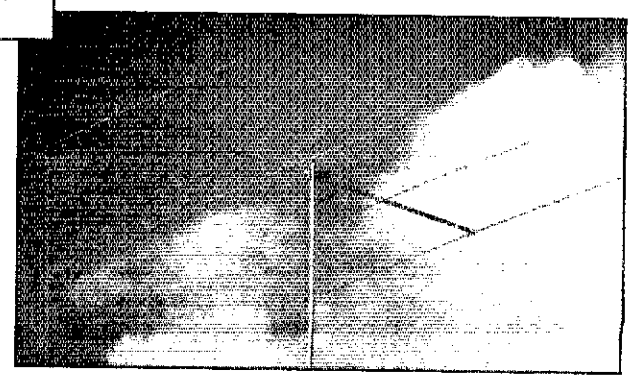

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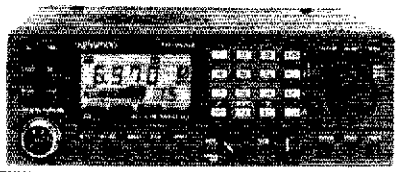
Regular $469.95 • ***Closeout* $299.95**



KENWOOD TM-3530A • 25/5W, 220MHz base/mobile FM transceiver. Keyboard entry, 16-key DTMF, DCL capability. 23 multi-function memories; linked to 15 telephone number memories. Frequency up/down control from microphone. 12V DC @ 6.5A, 2 ½"h×7"w×9¾"d.

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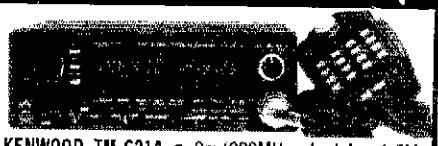

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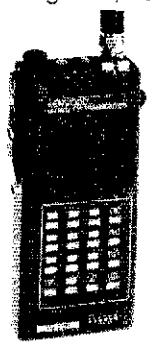
Regular $729.95 • ***Closeout* $599.95**



KENWOOD TH-31BT
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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×1¼"d, 0.6 lbs.

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plus • with **TH-31BT** purchase:
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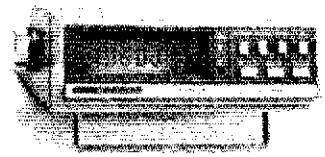
BC-6 2-pack charger - **$69.95**



KENWOOD CD-10 Call Sign Display

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HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—ASM: K2ZM. STM: WB2EAG. SEC: WA2ZYM. BM: WB2IXR. SGL: KB2HQ. PIO: KB2TM. OOC: N2DVQ. ATC: WA2VGM. ACC: KV2A. ASM/PACKET: N2FTR. ASM/NWSLTR: WB2NHC. NET REPORTS FOR AUGUST(QNI/QSP): CDN 622/85 ESS 367/62 HVN 282/38 NYP 103/71 NYPON 398/313 NYSE 310/250 NYSL 320/248 NYSM 275/228 SDN 290/89. CLUB NEWS: Albany ARA had a presentation from Hudson Division Director WA2DHF at Sep. meeting. Their joint RPT/AARA VE session included upgrades KE2AL N2JPF WB3CUF N2GAX KB2EMV KB2IDS K2UYK KB2EBE KB2BSE WB2UYR KB2HWM. Congrats to all. The Altamont Fair in August involved 37 hams total. Communications Club of New Rochelle is looking towards running a Novice or General course. Mt.Beacon reports the results of elections: Pres-N2GWC VP-K2DPL Treas.-K2LYE Cor. Sec-N2JBK Rec. Sec-KD2TZ Eng Dir-N2FZC Dirs@lge-KD2AK WA2WLN WA2LJM WA2RKN. Saratoga RACES had a very successful Hamfest on the 9th of Sept. The weather was perfect, seminars were interesting. WECA learned about 40 meter phased vertical antennas from W2KFB. The tri-county groups of Albany, Schenectady and Rensselaer assisted with a drill for the National Disaster Medical Service. Those assisting included WA3RKB WB2ZCM KA2VAR KB2EPR WB2PUH KA2AXN KA2NMP K2AYM N2JJJ KA2DVM K2BST WA2BUH KA2MCU WB2BEJ WA2GYY KB2CS WA2YBM KA2VAH KN2I KA2AQV WA2WNI. Hope everyone got involved in the SET. It is not too early to think of the holidays and the traffic that is generated at that time. Please pitch in and help. There are opportunities on local VHF nets in addition to the CW or SSB nets. Please get involved. Please send me copies of your reports as well as to WB2EAG. Aug. PSHR:N5MEA WE2G WB2VUK WB1BTJ Aug. Traffic: WB1BTJ 612, WB2VUK 271, N5MEA 236, WA2JBO 145, WB2EAG 107, KB2EPU 83, K2LYE 72, WB2IIV 40, WD2K 37, W2CJO 27, N2FTR 21, KA2O 18, WF2M 13, N2IQV 8.

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
SCVHF	145.370/R	2000	S-F	KA2JMA
NYPON	3913 kHz	1700	DLY	KA2UBD
NYS/M	3677 kHz	1000	DLY	N2EIA
NYS/L	3677 kHz	2200	DLY	KU2N
NLT	28450 kHz	2100	WED	N2IMP
ESS*	3590 kHz	1800	DLY	W2WSS

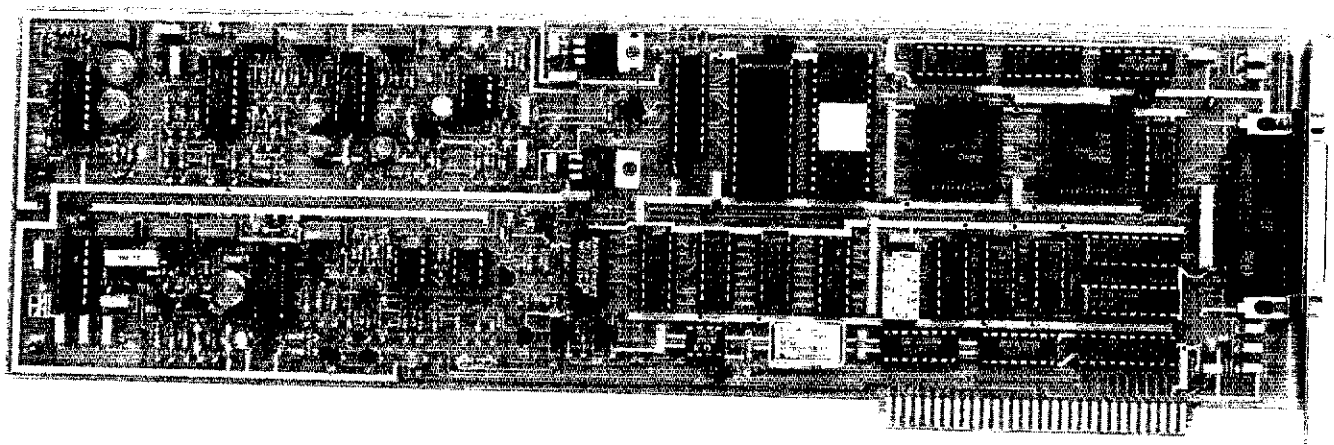
*Independent Net, recognized by NTS, local times.

*** PACKET NODE STATIONS ***

N2MH -4 Queens Village 145.010 New York City AI2Q -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 AI2Q-4 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 Sintchak, 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; MAARC - last Thursday each month at 6:00 except Dec., at the Robert Wagner JHS, Manhattan - contact Rubina Asti, KD2IZ 212-838-5995. If your group holds regularly scheduled license exam sessions and/or classes let me know so they can be added to this listing. Computer use in Disaster and Emergency Management Decision Making will be the subject of the November 15, 1989 Emergency Education Satellite Video Broadcast which is presented by FEMA. It sounds like it will be full of interesting information for those who are emergency communication minded. The results from the August NDMS National exercise are back and I want to pass on to all those that participated the thanks and appreciation for your efforts in bringing the Nassau - Suffolk Area of NDMS up on line. Last month a similar exercise was included into the SET and we are still evaluating that exercise. If you would like more information about ARES, RACES, NTS, NDMS, or any other facet of emergency communications within the NYC/LI area please contact me. We are still looking for an individual (or two) that lives in Manhattan to act as a liaison between the National Weather Service at Rockefeller Plaza and the Amateur Radio Services for the NYC Metropolitan area which includes Long Island, Northern New Jersey and Westchester.

NORTHERN NEW JERSEY: SM, Rich Moseson, NW2L—(@KD6TH) - ASMs: KA2F/Recruitment, W2VY/Youth, NW2S/NW, KY2S/SE, KC2ZA/SW. ACC:WA2QYX. BM:K2ULR. OO/AAC: KA2BZS. PIO:NW2L. SEC:WB2HBZ. SGL:W2KB. STM:K2VX. TC:KA9Q. HAM RADIO INFO LINE: 201-680-1585. This column exists for your benefit. As such, I'd like to tailor its contents to those items which are most important to the majority of readers. Please help by responding to the following mini-survey: Rank the categories of information below according to the priority they should receive for inclusion in the column (1 = most important to 10 = least important). I'll use the results to guide my writing. (My list is alphabetical): A. Club News (Programs, New Officers, etc.)

PC-COMPATIBLE AMTOR, RTTY, & CW... THE NEW HAL PC-AMTOR



Our new PC-AMTOR plugs right into your IBM-compatible PC and gives you super AMTOR, RTTY, and CW performance. We've combined the best features of many of our other products to give you an easy to use, low cost, and very high performance PC terminal card.

- **AMTOR:** We have an entirely new algorithm that is really great! No more long waits to synchronize, no more strange link failures. This AMTOR *works*! Want to try CCIR 625 AMTOR? It's now legal and HAL has it!

- **RTTY:** Baudot or ASCII with an optimized 170-shift two-tone modem; from 45 to 110 baud.

- **CW:** A new algorithm for CW—the best yet!

- **AUTO-MODE:** Yes, that's right—PC-AMTOR is intelligent. It knows the difference between AMTOR, RTTY, and CW. Tune the receiver and sit back—we do the work. PC-AMTOR automatically finds the correct speed, code, and polarity—no more guessing!

- **FRIENDLY SOFTWARE:** Split screen with status indicators and pull-down menu selections. No more confusing key combinations.

- **TWO CONTROL PORTS:** PC-AMTOR is unique. It has two control ports—one using the PC bus and the other for serial I/O control. Run HAL software for normal AMTOR/RTTY/CW operation; use the serial control port and run your APLink or mailbox software. Now you can have both worlds!

- **WHAT—NO PACKET?** That's right. We offer the RPC-2000 and ST-7000 for HF Packet. HF packet uses different data rates and has special requirements. It deserves special treatment: Also, your High Frequency AMTOR, RTTY, and CW deserves better treatment than a compromise "do everything" gadget.

THE PC-AMTOR (Model Number PCI-3000) from HAL..... $395.

HAL Communications Corp.
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Urbana, IL 61801
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FAX (217) 367-1701

*STEP UP TO THE **BEST**, STEP UP TO HAL!*

CIRCLE 134 ON READER SERVICE CARD

// B. Field Organization News (Programs, Appointments, etc.) // C. General News/Announcements // D. Leadership Official Activities (Club visits, etc.) // E. Leadership Official Listings (see top of column) // F. Names/Calls of new licensees/upgrades // G. Net Listings (Times, Frequencies, etc.) // H. Net Statistics (Sessions, no. of check-ins, no. of messages passed) // I. Traffic Statistics (Individual listings: see below) // J. Other (specify) // Please send me your responses (A-1, B-2, etc., will be fine) by mail, NTS or by packet. I'll report the results in a future column. Tnx. // Club news: SEC WB2HBZ and SM NW2L spoke at Cherryville in August; RATS heard from Div. Director WA2DHF, Bulletin Mgr, K2ULR, plus W2VY and KD6TH, who introduced new PBBS software. In September, WA2DHF, spoke at Sourland Mt. ARC and St. Barnabas ARC. Enjoyed meeting lots of you at Sussex ARC hamfest in July and Ramapo Mt. ARC test in August. Welcome to N2IXX, new NM of Hudson County Area Traffic & Emergency Net (HCATEN), and good luck to outgoing NM N2HNK in his new work assignment. I expect to have a new harmonic (no. 2) by the time you read this, do don't be too upset if I seem to take a while to reply to calls or letters. Next month: report on Section Cabinet meeting. // August net activity (numbers are for sessions during month, of check-ins and of messages passed).

Net	Freq.	Time	Sess	QNI	QSP
NJM	3695	1000	31	234	92
NJN/E	3695	1900	29	277	91
NJN/L	3695	2200	31	135	36
NJPN	3950	1800	35	290	98
NJSN	3735	1830	31	147	29
NJVN/E	146.895	1930	31	539	84
NJVN/L	146.490	2230	31	176	50
OBTTN	147.120	2000	31	238	86
NJTTTN	223.880	2100	31	201	25

Packet NTS 24 hr/day via WA2SNA-1 & other PBBSs Traffic (Call/Messages Handled/PSHR total): W2QNL/383/134 K2VX/212/70 WB2FTX/177/64 N2XJ/129/98 W2HRX/88/84 KE2JX/73/59 N2DXP/62/60 KA2INE/55/73 KA2KJF/40/63 WA2PAC-T/26/57 W2CC/22/- WA2EPI/18/- W2XD/15/-. 73 de NW2L.

MIDWEST DIVISION

IOWA: SM, Wade Walstrom, WØEJ—SEC: KDØBG. STM: WBØAVW. ACC: NUØP. OOC: WAØQMU. BM: KØIIR. TC: KØDAS. SGL: WRØG: The Central Iowa Technical Society will host the 20th Anniversary AMSAT Space Symposium and Annual Meeting in Des Moines on November 3 - 6. There will be feature papers on current and major topics dealing with amateur satellite activities as well as informal gatherings and a banquet. More and more information is available documenting the excellent job done by local amateurs following the United Airlines Flight 232 crash in Sioux City on July 19. An excellent article has been written by KAØVHV not only summarizing this activity, but also thoroughly critiquing of this major operation. This article is to appear in the November issue of QST. The magnitude of this disaster taxed the resources and excellent disaster planning of the Sioux City area. The lessons learned by our Sioux City compatriots in this disaster should be heeded by all of us. I am sure if you contact KAØVHV he will be glad to share those experiences. Over 60 amateurs from the Sioux City area are listed as assisting in the recovery from this disaster. Their efforts were largely ignored by the press outside Sioux City, but they deserve our thanks and congratulations for a difficult job well done! Traffic: WØSS 115, KØIPT 112, WØYLS 62, KØCNM 54, KAØADF 41, KØGP 40, WBØMCX 38, WBØAVW 38, KAØVBA 26, NØJL 22, KEØWO 2.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: NØBLD. STM: WØOYH. ACC: KØBXF. TC: KAØHEP. BM: KØJDD. SGL: NØBLD. Net Mgrs: CW- WØMYM; WBØZNY; Voice-WØFRC; RTTY-open. Slow Speed CW, WX Net- WBØYWZ. PIO: WBØWSG. DECs: WØOAG, WØEB, WBØYJT, WØFRC, NKØV, WBØMDF & WAØCVR. Packet coordinator WAØZBL. This has not been a good month for a few on the sick list, KØJDD, KØPFM and WØFDJ's sister Valeta. We also have the sad duty to inform you of another Silent Key, KØLHF, Cliff Shaver of Emporia. A word to the sick, get well—we miss you! Packet coordinator WAØZBL still needing to hear from all who are using packet radio, drop him a line. How about you RTTY guys and gals out there, is there a coordinator among you?? Contact your SM about the interest. Net activity for JULY 89 as follows KSBN QNI 1279 QTC 154 & KPN 420/28 mgr WØFRC. KMWN 620/496 and KWN 997/652 mgr WBØYWZ. CSTN-1982/62 Mgr WØDE. QKS 170/57 Mgr WBØZYN. QKS-SS 23/6 mgr WØMYM. Still missing a lot of club bulletins that I am sure are being printed out there. Do your SM a favor and check to be sure your club editor has me on his mailing list. I need a DX reporter each month also. Any one wanting to fill the slot?? What else would YOU like to see in this column??? Traffic: KAØRCH 220, WØFIR 220, KØBXF 209, NZØM 193, WØFRC 135, NBØZ 92, WØOYH 87, WØFDJ 67, WØQMT 64, WAØTJU 57, WTØE 26, KXØI 13, WØMYM 13, WAØYXK 9, WØRBO 5.

MISSOURI: SM, Bill McGrannahan, KØORB—August is always an exciting month for Ham Radio with two major hamfests and planning for the MS-150. The SW MO ARC hosted the biggest and best OZARK REGIONAL HAMFEST ever with outstanding seminars. The St. Charles Hamfest escaped being rained out and was great fun. ARRL Director Paul Grauer, WØFIR and Vice director Chuck Miller, WAØKUH, attended both hamfests and conducted ARRL forums. Mike Bellinger, KØUAA, was awarded the Robt. H. Lanyon award for Meritorious Community Service by the Kansas City ARC. ARRL Certificates of Merit (MO Section) were awarded to Royce Brown, WBØOPO; Jeannie Hahn, KAØJWW; and David Hahn, WBØUDM. All three are involved in many public service activities in the St. Louis area. The NW St. Louis ARC sponsored the 1989 QSO party on the 19th to the 21st, the Tri-Lakes and the Kimberling City ARC's sponsored a big bash for the departing KØPUE and his XYL. ATTENTION ALL CLUBS: Denise Hagerdorn, AJØE, is the new AFFILIATED CLUB COORDINATOR. Please put her on your mailing list. TYPOS: the STM is NDØN and the BM is WØDLG. Vicki Gooch, KAØSDJ is SK. My PBBS is KØORB-1, V KCMO or WBØOIZ's BBS.

NAME	MGR	FREQ	TIME (cdt)	DAY	SES	QNI	QTC
MON	AIØO	3.585	7/9.45	D	62	239	136
MOSSB	WBØWLU	3.963	6:00	D	31	659	66
MEOW	WØOELL	3.963	5:30	D	30	585	60
HBN	KØDSQ	3.880	12:05	M-F	23	408	28
KCARC	WAØITU	146.82-	6:30	Th	4	107	14
HARC	KAØSXY	146.94-	9:00	Th	5	136	11
CMEN	KØPCK	146.76-	9:00	W	5	84	11
PHO	WAØKUH	146.436	9:00	M	4	96	6
SWMSWN	KØKXC	146.91-	7:00	Tu	5	151	5
RBBN	WØNFI	146.79-	8:00	D	17	160	2
ZAEN	WØOELL	147.24+	8:00	W	5	68	2
SLARES	KØWEX	146.91-	8:00	M	4	238	1
P REVERE	WBØEJJ				4	245	0
QCWA35	KØCIQ	146.97-	6:30	Th	4	67	0
JCRC	WØORI	147.00-	8:00	W	5	68	0
SEDARES	WØENW	147.03-	9:00	Tu	5	64	0
KCARES	KØUAA	146.97	9:00 AM	Sa	2	59	0
CARL	WBØWLU	146.46s	8:30	W	4	42	0
LOZBC	NØHVO	146.73-	6:30 AM	M-Sa			
LOZFM	NØHVO	146.73-	9:00				
MOPAC-1	WAØUFT	145.01s					
ARESN	KØBACG	147.255+	9:00	Th			
ELDON	NØHIZ	146.895-	8:00	M	4	26	0

Traffic: WAØYJX 200, NCØN 199, AIØO 164, WAØHTN 99, KFØBM 49, WØOUD 49, WBØWLU 38, KØORB 31, KØPCK 19, WØRL 15, WRØR 14, WBØUCI 14, KEØAH 3.

NEBRASKA: SM, Vern Wirka, WBØGQM—Sixty four amateur radio operators assisted with emergency communications and transportation of needed supplies following the July 19 crash of United Airlines Flight 232 at the Sioux Gateway Airport in Sioux City, IA. Dakota County, Nebraska, EC, Mike Nicolaus, NFØN, and Woodbury County Iowa assistant EC, Doug Potts, KAØVHV, directed the amateur operations which totaled 1150 hours over a five day period. Amateurs handled traffic for the Sioux City Police and Fire Departments, Woodbury County EOC, 185th Air National Guard, Sioux Gateway Airport, Red Cross, Salvation Army, National Safety Transportation Board, also hospital, ambulance services and medical personnel. Amateurs provided communications between the temporary morgue and the Iowa State Medical Examiner at the crash site. Siouxland Amateur Radio operators also used their own private vehicles for delivery of clothes for crash survivors as well as food, beverages, water, and ice for several government agencies. Of the 296 persons on board the DC-10 that crashed, 185 survived and 111 died. Members of the Pioneer Amateur Radio Club of Fremont and Dodge County ARES sponsored a special events station during the annual "John C. Fremont Days" in August. Steve Narans, WBØVNF, Dodge County EC, reports 25 amateurs participated, making 40 contacts and handling one piece of priority traffic which assisted in locating some lost children. Leo Myerson, WØGFQ, founder of "World Radio," has put together a collection of antique and vintage Amateur Radio equipment for a display at the "Western Heritage Museum" in Omaha. Traffic: KØDKM 278, WØKVM 23, WBØGQM 20, KEØXQ 12, WAØBOK 7, WDØEWH 7, WCØO 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Caesar Rondina, Another Oyster Fest was here and gone. And what a fest. Amateur Radio has once again played an important part in the message and traffic handling portion of this festive event. But who are the people behind the scenes. Well Hoyt, W1WP, has done a great job of putting it all together. A job well done. Thanks also has to go to Tim, NU1W, Betsey, K1EIC (STM), and luck, KY1T, for there efforts in moving the traffic from the fest to the appropiate nets. Also, a super job by the net managers of WESTCON, NUTMEG, and CPN for holding the extra sessions to accommodate the large numbers of messages, and we must remember all the individual hams that receive and deliver these messages. A grand thanks to all. As a reminder, KY1T is the net manager of the CONNECTICUT SECTION TRAFFIC NODE, Which has been moved from KY1T BBS to my BBS, N1DCS-4. Access to the BBS is now on 145.05, and 145.07. Our section had 98.6% REP in 1RN cycle 3, and 100% REP in FRN/2. Let's face it gang, our Traffic people got it together. Great job. Bruce, N1FIQ from SCARA, sponsored a trip to the Paul Newman camp for kids with cancer. The purpose was to promote, introduce and demonstrate ham radio. Great for ham radio and the kids. Nice job Bruce. The WHARA supplied communications for the city of West Haven for the cities largest parade in its history, sponsoring the National Convention for fire chiefs. I've been told that their participation helped in making the communications move right along. Nice job WHARA. Congrats to Bob, WB1GYZ for his new role on the staff of Key Klix, the Meriden ARC newsletter. ZYGO ARC, has worked all ZARC award. Nice to see clubs sponsor internal awards. FARA also does the same, TNX to scrams for their help in the E. Lyme marathon. Natchaug ARC handled COMM for the cross country bike trek. We've been a busy section. Thanks to all for a job well done. 73

WESCOON	31	499	88	KA1GWE
KY1F	1RN			
NVTN	31	591	231	NM1K
CN	62	310	189	W1WCG
TMRCN	4	58	1	NM1K

PBBS Reports

BBS	Received	Forwarded	Total
Ct. Section Traffic Node N1DCS-4 BBS	474	402	876. KY1T

NM. Traffic: NM1K 516, W1WCG 215, W1EFW 206, KY1T 173, K1EIC 150, KA1GWE 143, KA1JAN 115, KY1F 87, N1FNN 72, N1GBP 52, N1API 42, KB1ZC 41, KA1UCU 37, W1WP 35, KC1OL 31, W1KYD 30, WA1YUA 25, KA1ROL 24, N1GKJ 21, WB1ESJ 18, W1BDN 13, W1YOL 12, W1CUH 10, N1BOW 9, W1QV 8

EASTERN MASSACHUSSETTS: 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	Freq	Time (EDT)	Day	Ses	QTC	QNI
EMRI	KA1GEP	3658	1900/2200	DY	60	159
EMRIPN	3880	1730	DY	30	42	105
EMRISS	3715	2100	DY	24	24	63
EM2MN	63/23	2000	DY	27	95	321
HHTN	04/64	2230	DY	31	117	229
CITN	745/045	1930	DY	31	88	510
NEEPN	3945	0830	SUN	4	9	

It's hard to believe that the summer is over and when this gets printed we will be worrying about snow. There will be a few emergency response drills this fall. One of the many functions Hams play in the overall emergency planning is to provide an outlet for Health and Welfare massages. In order to do this Hams need to know a little about handling message traffic. The above listed nets function to provide that training. If you are unfamiliar with traffic net operation why not listen in?? If

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1990 CATALOG

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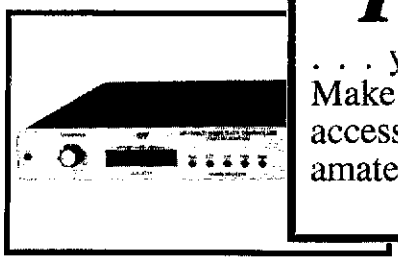
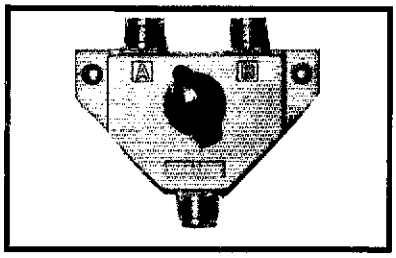


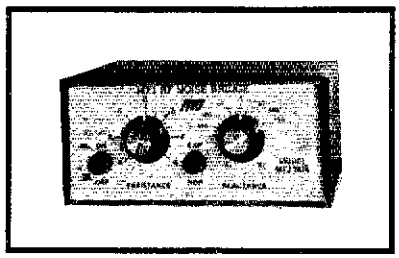
Multi-mode data controller

AC line monitor

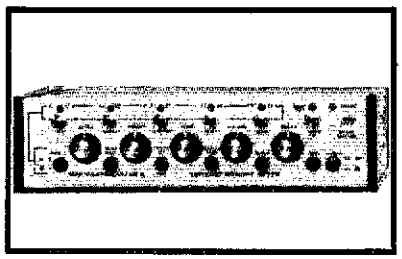
Digitized picture



Antenna Switches



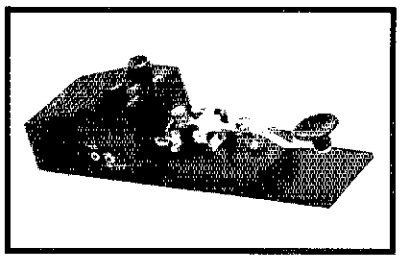
Noise bridge



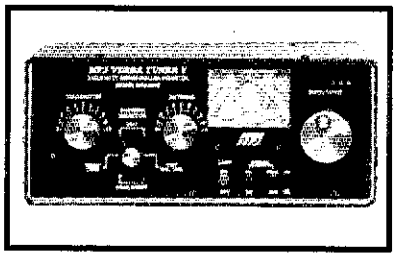
Memory Keyers

Keyers

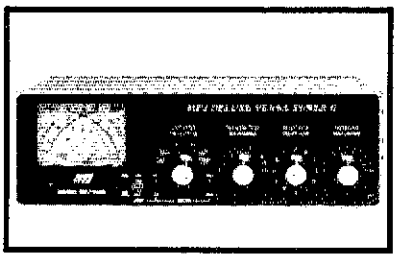
Dummy loads



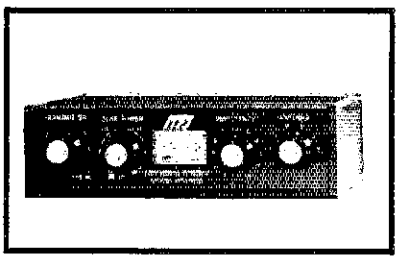
Code practice oscillator



3 KW Antenna Tuners



300 Watt Antenna Tuners



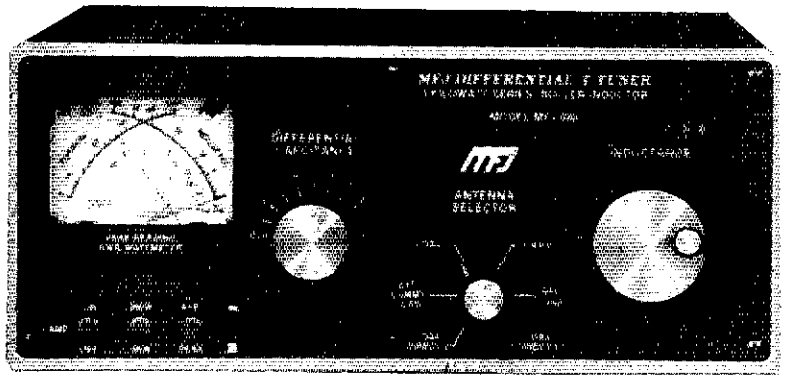
Mobile Antenna Tuner

MFJ Tuners give you the most for your money. Not only do you get a proven tuner at an affordable cost -- you also get a one year ***unconditional*** guarantee and *continuing* service. That's why more hams trust MFJ Tuners throughout the world than all other tuners combined.

MFJ 3 KW Roller Inductor Tuner

. . . lets you get your SWR down to *absolute* minimum -- something a tapped inductor tuner just can't do . . .

. . . plus you get a **peak reading** SWR/Wattmeter, 6-position antenna switch, balun for balanced lines and 1.8-30 MHz coverage . . . $269.95



MFJ-986

$269.95

Shipping Code E

- ***Peak reading meter***
- ***Easy to use 2-knob design***
- ***Covers 1.8-30 MHz***
- ***New directional coupler***
- ***New current balun***
- ***Made in U.S.A.***

MFJ's innovative new Differential-T™ Tuner uses a differential capacitor that makes tuning foolproof and easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only ***one*** setting.

The new MFJ-986 is a rugged no-compromise 3 KW PEP roller inductor antenna tuner that covers 1.8-30 MHz continuously, including MARS and all the WARC bands. The roller inductor lets you get your SWR down to the absolute minimum -- something a tapped inductor tuner just can't do.

A 3-digits turns counter plus a spinner knob gives you precise inductance control -- so you can quickly return to your favorite frequency.

You get a lighted cross-needle meter that not only gives you SWR, forward and reflected power at a glance -- but also gives you a ***peak reading*** function! A new directional coupler gives you even more accurate readings over a wider frequency range.

You get a 6-position antenna switch that lets you select two coax lines and/or random wires (direct or through tuner), balanced line and external dummy load.

A new current balun for balanced lines minimizes feedline radiation that causes field pattern distortion, TVI and RF in your shack. Ceramic feedthru insulators for balanced lines withstand high voltages and temperatures.

New Antenna Tuner Technology

MFJ brings you three innovations in antenna tuner technology: a new ***Differential-T***™ circuit simplifies tuning; a new ***directional coupler*** gives you more accurate SWR, forward and reflected power readings; and a new ***current balun*** reduces feedline radiation.

Differential-T Tuner™: A New Twist on a Proven Technology

By replacing the two variable capacitors with a single *differential capacitor*, you get a wide range T-network tuner that makes tuning easier thant ever, gives yolu minimum SWR at only one setting and has a broadband response that ends constant retuning. You'll spend your time QSOing instead of fooling with your tuner.

The compact 10¾ x 4½ x 15 inch cabinet has plenty of room to mount the silver-plated roller inductor away from metal surfaces for highest Q -- you get high efficiency and more power into your antenna.

The wide spaced air gap differential transmitting capacitor lets you run a full 3 KW PEP -- no worries about arcing.

A New Directional Coupler Accurate SWR and Power Reading

MFJ's Cross-Needle SWR/Wattmeter gives you more accurate SWR and power readings over a wider frequency range with n frequency sensitive adjustments.

That's because MFJ's new directional coupler gives you up t an order of magnitude higher directivity and coupling factor tha conventional circuits . . . plus it gives you a flat frequency respons that requires **no** frequency compensation.

The cross-needle meter lets you read forward/reflected powe in 2 ranges: 200/50 and 2000/500 watts. The meter lamp is fror panel switched and uses 12 VDC or 110 VAC with MFJ-1312 $12.95.

A switch lets you select peak or average power readings.

A New Current Balun: Reduces Feedline Radiation

Nearly all commercially built tuners use a "voltage" balun. Th "voltage" balun forces the voltages the be equal on the two antenn halves. It minimuizes unbalanced currents ***only*** if the antenna i perfectly balanced -- not the case with practical antennas.

The MFJ-986 uses a true **current balun** to force equal current into the two antenna halves -- even if your antenna is not perfectl balanced -- so you get minimum unbalanced currents.

The *current* balun gives superior balance over the "voltage" balun.

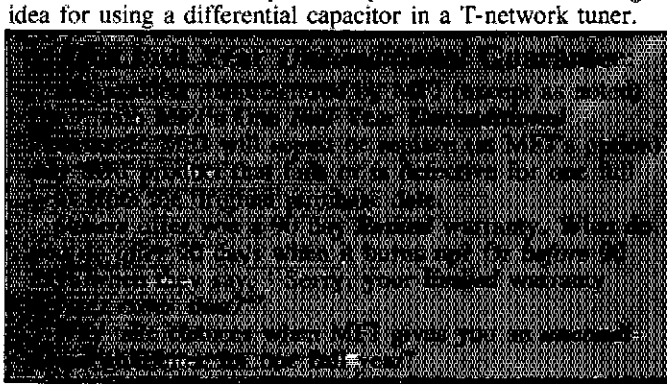
Minimum unbalanced current reduces field pattern distortio -- which concentrates your power for a stronger signal -- ***plus*** reduces TVI and RF in your shack caused by feedline radiation

The MFJ-986 Differential-T Tuner™: Get *absolute minimum* SWR

Get the tuner that incorporates the latest innovations by th world's leader in antenna tuner technology.

See your dealer today for the new MFJ-986 Differential-T™ KW Roller Inductor Tuner.

MFJ wants to thank Boyce A. Taylor, W5GZM, for sharing hi idea for using a differential capacitor in a T-network tuner.



MFJ's *Deluxe* 300 Watt Tuner

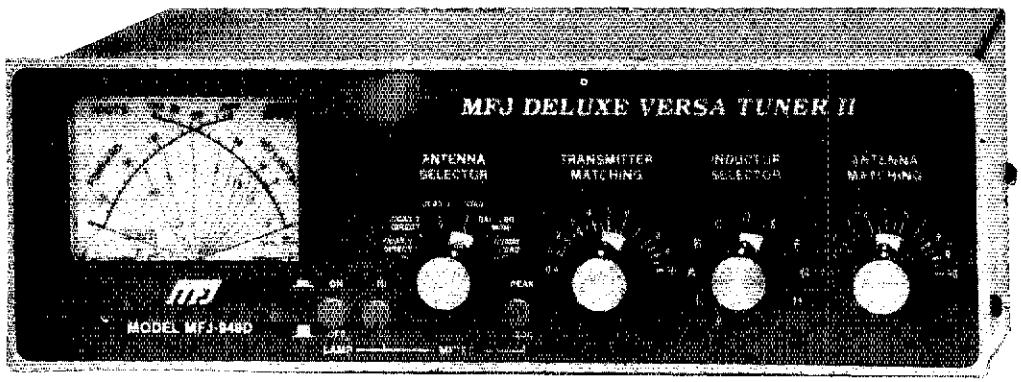
. . . gives you **full** 1.8-30 MHz coverage, a **peak reading** (and average) Cross-Needle meter, built-in **dummy load,** antenna switch and balun . . . all overed by a **full one year unconditional guarantee** . . . for only $149.95

MFJ-949D

$149.95

Shipping Code B

- ***Peak reading meter***
- ***Built-in dummy load***
- ***Covers 1.8 to 30 MHz***
- ***1 year guarantee***



You won't find all these useful features in any other 300 watt ner -- not even at twice the price.

New *peak* reading meter

The new ***peak*** and average reading Cross-Needle SWR/Watteter in the MFJ-949D shows you SWR, forward and reflected ower -- all at a single glance.

Without a peak reading wattmeter you just won't be able to tell your rig is putting out all the peak SSB power it's designed for. on't be without one if you want top-performance.

Built-in dummy load

A built-in 300 watt 50 ohm dummy load makes tuning up your g soooo easy. How do you tune up your rig without one?

An external dummy load will cost you about $30 more -- plus takes up valuable space at your operating position.

Full 1.8 to 30 MHz coverage

The MFJ-949D gives you full 1.8 to 30 MHz coverage.

Make sure the tuner you're considering covers all the HF bands.

Don't get a tuner that keeps you from operating all the frequenes you've worked for -- now or in the future.

What's really important? *precise* control for minimum SWR

What's really important is your tuner's ability to get your SWR wn to a minimum -- and the MFJ-949D gives you more precise ntrol over SWR than ***any*** tuner that uses two tapped inductors.

Why? Because the two continuously variable capacitors in the FJ-949D give you infinitely more positions than the *limited mber on two switched coils.*

This gives you the precise control you need to get minimum SWR d maximum power into your antenna.

After all, isn't that why you need a tuner

Plus more . . .

You get a versatile 6-position antenna switch and a 4:1 balun for balanced lines.

You can run up to 300 watts PEP and tune out SWR on coax, balanced lines or random wires.

Unconditional Guarantee

You get a *full one year* ***unconditional*** *guarantee.* That means we will repair or replace your MFJ-949D tuner ***no matter what*** happens to it for a full year.

Others give you a 90 day *limited* warranty. What do you do *after* 90 days? Or *before* 90 days when they say, "Sorry, it's your fault?"

High efficiency *and* a compact size *performance* is most important

The MFJ-949D uses a single airwound coil. Using only one coil takes up a minimum of space and there's no mutual coupling problems.

The excellent form factor of the short fat coil gives you highest Q. *Plus* you get plenty of inductance that gives you a much wider matching range than other designs.

This results in a highly efficient tuner that puts maximum power into your antenna ***and*** a compact 10 x 3 x 7 inch size that complements your rig and fits right into your station.

Competing tuners using two tapped coils require a large cabinet -- not just to house the coils but also to help reduce detrimental coupling between the inductors. The ***result?*** *A tuner that's* **bigger** *than your radio.*

Your very best value

The MFJ-949D gives you your very best value, first rate performance, proven reliability and the best guarantee in ham radio . . . all from the *most trusted* name in antenna tuners. Don't settle for less. Get yours today!

Why Choose an MFJ Tuner?

MFJ's *world famous* 3 KW Versa Tuner V

If you won't settle for less . . . here is the finest 3 KW tuner money can buy!

MFJ-989C

$349.95

Shipping Code E

Quite frankly, the MFJ-989C is not for everyone -- not everyone can afford it.

However, if you do make the investment, you'll get the finest 3 KW tuner money can buy.

The MFJ-989C is the perfect example of the old adage, "You get what you pay for."

For example, you get two massive transmitting capacitors that can pass amps of RF current. These variable capacitors can withstand 6000 RF volts with ease because they have the smooth polished plates and extra wide air gaps between plates. By beveling both the stator and rotor plates, you get an absolute minimum capacitance when the plates are fully unmeshed. This minimum and 250 pf maximum gives you an extremely wide matching range -- even on 160 and 10 Meters -- so you can match just about any antenna.

A roller inductor lets you tune your SWR down to the absolute minimum -- something a tapped inductor tuner just can't do. A 3 digit turns counter plus a spinner knob gives you precise inductance control -- so you can quickly return to your favorite frequency.

You won't have arcing problems with this roller inductor. That's because firm springs put considerable pressure on a silver plated contact wheel. This gives you excellent electrical contact with the roller inductor wire and eliminates arcing problem. By using more space between turns at low inductance you get smooth inductance control at high frequencies. Wide low inductance straps are used for high current connections. A new core gives you excellent RF properties for minimum loss. Ball bearings on both the front and back shafts give you a velvet smooth vernier feel. Steel end plates, steel shafts and ceramic insulators give you lifetime durability.

This High-Q roller inductor is mounted horizontally and centered vertically away from metal surfaces to maintain highest Q for maximum efficiency so you'll get full power out.

With three continuously variable components -- two variable capacitors and a roller inductor -- you get the widest matching range ***and*** the most precise control over SWR possible. You can tune your SWR down to the absolute minimum from 1.8 to 30 MHz, including MARS and the WARC bands. Plus you have complete control over Q. You can select a low Q when you want convenient broadband coverage or select high Q when you need an extra measure of harmonic attenuation -- it's your choice.

You get a new **peak** and average reading Cross-Needle SWR/Wattmet with 200 and 2000 watt ranges. It makes tuning quick and easy becau you can monitor forward and reflected power nd SWR all in a single glanc Its new directional coupler gives you accurate SWR and power readin over the entire 1.8 through 30 MHz range and there's no frequency se sitive adjustment to get out of whack.

You get a super heavy duty balun for balanced lines. It's made wi two giant 2½ inch ferrite toroid cores and wound with teflon wire co nected to high voltage ceramic feedthru insulators. It lets you operate hi power into balanced feedlines without core saturation and volta breakdown.

You get a two wafer ceramic antenna switch with extra large swit contacts to eliminate plugging and unplugging. It lets you select two co antennas direct or through the tuner, balanced line or random wire a dummy load.

You also get a built-in 50 ohm 300 watt dummy load that makes excit tuning fast and easy.

And there are small touches too. Like high voltage cerramic feedth insulators for balanced lines and random wires. Aluminim cabinet wi sub chassis that adds strength and RFI protection. Brushed aluminum fro panel. Beautiful knobs with brushed aluminum inserts. Lighted meter wi on/off switch (Light uses 12 VDC or 110 VAC with MFJ-1312, $12.95 A locking compound is used on all nuts and bolts that hold componer in place. A flip stand that tilts the tuner for your easy viewing.

It fits right into your station because it's a compact 10¾ x 4½ x inches -- it puts all your operating controls in front of you.

You get a one year unconditional guarantee. That means we will repa or replace your MFJ-989C (at our option) no matter what happens to for a full year. You can also rely on continuing service from MFJ Custom Service Technicians -- no matter how long you have it.

The MFJ-989C is not for everyone but if you want the finest 3 K tuner that money can buy -- one that will give you a lifetime of use, o that takes the fear out of high-power operation and one that lets you g your SWR down to the absolute minimum -- then the MFJ-989C *is* f you. Don't settle for less . . . get yours today!

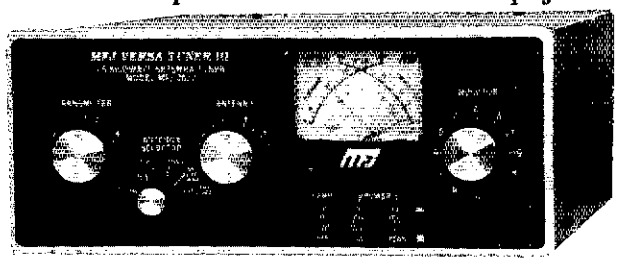
MFJ's *1.5 KW* Versa Tuner III

lets you use your barefoot rig now and add up to a 1.5 KW linear amplifier later

MFJ-962C

$229.95

Shipping Code E



Why settle for a 300 watt tuner when a few extra dollars lets you step up to the more powerful 1500 watt MFJ-962C?

Two continuously variable capacitors give you the precise control you need to get your SWR down to a minimum. Plenty of inductance gives you the widest matching range possible.

A new **peak** and average reading Cross-Needle SWR/Wattmeter makes tuning quick and easy. At one glance you can read SWR, forward and reflected power. A new directional coupler gives you more accurate readings over a wider frequency range and has no frequency sensitive adjustments. Meter light uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

A 6-position ceramic antenna switch lets you select 2 coax lines (irect or through tuner), random wire and balanced lines -- no more plugging and unplugging.

For balanced feedlines, a heavy duty 4:1 balun is built-in. It's mad with two giant 2½ inch ferrite cores, wond with teflon wire and connecte to ceramic feedthru insulators -- it lets you operate high power into balanc feedlines without core saturation and voltage breakdown.

A high voltage ceramic inductor switch with widely spaced contacts a two huge variable capacitors take the fear out of high power operatio

For highest Q and the most compact size, the wide range airwound i ductor is mounted horizontally away from metal surfaces for efficien and maximum power into your antenna.

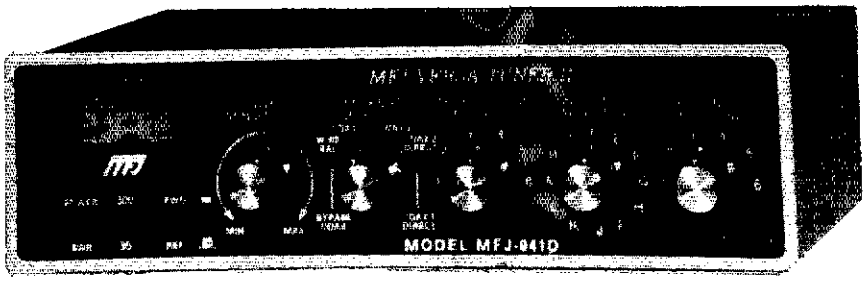
It fits right into your station because it's a compact 10¾ x 4½ x inches -- it puts all the operating controls in front of you.

Why not spend a few extra dollars for a lot more power. Get the mo for your money. Step up to the powerful MFJ-962C today.

MFJ's *Fasting Selling* Versa Tuner II

Covers 1.8-30 MHz plus you get antenna switch, built-in balun and SWR/Wattmeter

Best Buy!



MFJ-941D

$109.95

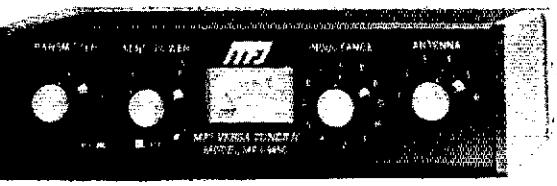
Shipping Code B

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, balanced and coax lines.

SWR/Wattmeter reads forward and reflected power in 30 and 300 watt ranges. Front panel mounted antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass. Efficient 12 position airwound inductor gives lower losses and more watts out. Has 4:1 balun, 1000 volt capacitors. A beautiful black aluminum cabinet with black brushed aluminum front panel matches your rig perfectly and fits right into your station. It measures just 10½ x 2 7/8 x 7 inches.

MFJ's *Mobile* Tuner



MFJ-945C

$89.95

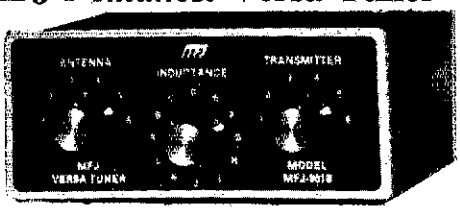
Shipping Code A

Don't leave home wtihout this ***mobile*** tuner! Have an uninterrupted trip as the MFJ-945C extends your antenna bandwidth and eliminates the need to stop, go outside and readjust your mobile whip. Handles 300 watts PEP.

Small 8 x 2 x 6 inch black aluminum cabinet uses little room. The SWR/Wattmeter reads power in both 300 and 30 watt ranges. The convenient placement of controls makes tuning fast and easy while in motion.

Back panel has binding posts for random wire and balanced line, SO-239 connectors for transmitter and coax and a wing nut post for your ground. Efficient airwound inductor gives you lower losses and more watts out. 1000 volt capacitors. 4:1 balun. Use it at home in your base station when you're not in your RV, boat or car. Mobile mount, MFJ-20, $3.00. Add $2.00 shipping for bracket if ordered separately.

MFJ's *smallest* Versa Tuner



MFJ-901B

$59.95

Shipping Code A

The MFJ-901B is our smallest -- 5 x 2½ x 6 inches -- (and most affordable) 200 watt PEP versa tuner -- when both your space ***and*** your budget is limited. You can operate anywhere in a band and get low SWR. You'll get maximum power out of your rig and it'll run cooler and last longer.

It matches dipoles, vees, random wires, verticals, mobile whips, beams, balanced and coax lines continuously from 1.8 to 30 MHz. Excellent for matching solid state rigs to linears. Efficient airwound inductor gets more watts out than a toroid.

You get SO-239 connectors for transmitter and coax, binding posts for random wire or balanced lines and a wing-nut ground connection. A 4:1 balun for balanced lines is also built into this sturdy, compact tuner. Works with solid state and tube rigs. Fits into your station and your car.

MFJ's Compact *Random Wire* Tuner

MFJ-16010

$39.95

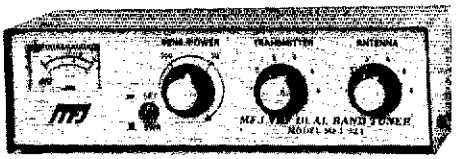
Shipping Code A

Operate all bands -- anywhere with any transceiver -- using a random wire and an antenna tuner small enough to carry in your hip pocket -- 2 x 3 x 2 inches.

Operate from your apartment with a wall to wall antenna or from a motel room with a wire dropped from a window. Throw a wire over a tree and enjoy ham radio on a camping or backpacking trip. Be prepared for an emergency: keep it ready in your glove box.

Handles up to 200 watts PEP output. Match high and low impedances by interchanging input and output. Has SO-239 connectors.

MFJ's *Dual Band VHF* Tuners



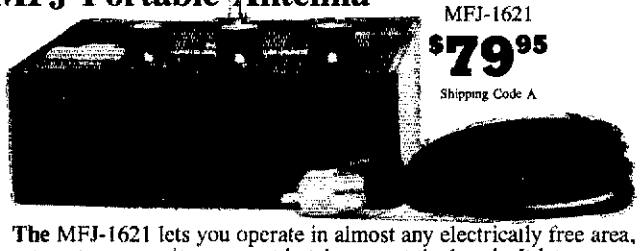
MFJ-921

$69.95

Shipping Code A

Get the new MFJ-921 Dual Band VHF tuner that covers both 2 meters and the 220 MHz bands and you also get the convenient built-in VHF SWR/Wattmeter. MFJ-921 handles 300 watts PEP and matches impedances from 5-600 ohms. It is excellent for mobile and base operation. SO-239 input/output connectors and wing nut post for your ground. Eggshell white and black aluminum cabinet. It comes with MFJ's full one year ***unconditional*** guarantee. and measures a compact 8 x 2½ x 3 inches..

MFJ Portable Antenna



MFJ-1621

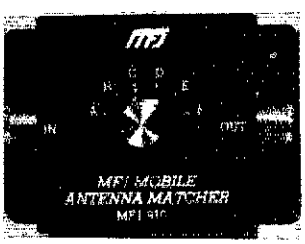
$79.95

Shipping Code A

The MFJ-1621 lets you operate in almost any electrically free area, an apartment, a campsite, a resort hotel, even at the beach. It lets you work 40, 30, 20, 17, 15, 12 and 10 meters by using a telescoping whip antenna that extends to 54 inches. The antenna is mounted on a self-standing 6 x 3 x 6 inch cabinet. It also features a built-in antenna tuner, field strength meter and 50 feet of RG-58 coax cable.

The MFJ-1621 is the complete portable antenna system. It can be used in practically any location. Just place the MFJ-1621 in an electrically clear location, set the bandwidth, tune the capacitor and operate!

MFJ Mobile Antenna Matcher



MFJ-910

$19.95

Shipping Code A

This MFJ compact Mobile Antenna Matcher conveniently lowers your SWR and provides more power into your mobile whip. Your solid state rig runs more efficiently, puts out more power with less heat.

Matches mobile antennas from 10 through 80 meters. Great for vacation ham operators. Easy plug-in installation. 2½ x 2½ x 1½ inches.

MFJ-931 Artificial RF Ground

How's your RF ground? Do you have RF "hot spots" that "bite" you when you transmit? Do you have RF feedback that causes your rig to quit working on some bands? Do you have TVI/RFI that makes your neighbors hard to live with? Do you get weak signal reports because of extreme ground losses or radiation pattern distortion?

These problems could be caused by poor RF grounding, especially if your rig is on the second floor or higher with no earth ground possible. Even if you have a good ground, a long connection wire can ruin its effectiveness by isolating true RF ground from your rig.

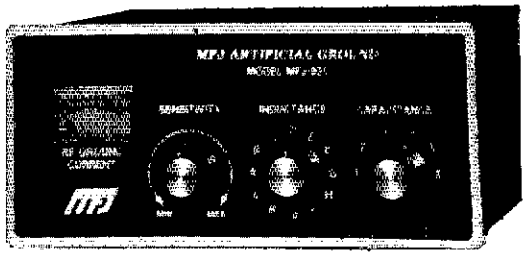
The new MFJ-931 creates an artificial RF ground! It resonates a random length of wire thrown along the floor and produces a tuned counterpoise. This artificial ground effectively places your rig near actual earth ground potential even if your rig is on the second floor or higher with no earth ground possible.

Also, the MFJ-931 electrically places a far away RF ground directly at your rig -- no matter how far away it is. The MFJ-931 reduces the electrical length of the ground connection wire to virtually zero by tuning out its reactance. It covers 1.8 to 30 MHz and measures 7½ x 3½ x 7 inches.

MFJ-931

$79.95

Shipping Code A

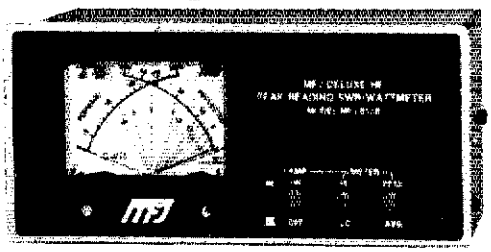


Lighted *Peak* Reading SWR/Wattmeter

MFJ-815B

$69.95

Shipping Code A



The MFJ-815B has a new ***peak*** (and average) reading function! It lets you monitor SWR, forward and reflected power -- all at a single glance!

Read peak or average forward and reflected power in 2 ranges (200/2000 watts forward and 50/500 watts reflected). The MFJ-815B simultaneously shows you SWR from 1:1 to 8:1. It covers 1.8 to 30 MHz. Accuracy is ±10% full scale. Mechanical zero adjustment for meter movement.

Push button selection of range, meter lamp and peak or average power. SO-239 connectors. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95. Black aluminum cabinet measures 7¼ x 4½ x 3½ inches.

VHF or HF SWR/Wattmeters

MFJ-812B

$29.95

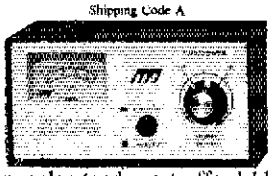
Shipping Code A

MFJ-812B is the world's most popular (and most affordable) VHF SWR/Wattmeter. Covers 144 MHz through the 220 MHz band. Read forward and reflected power in 2 ranges (30 or 300 watts). Also lets you read relative field strength from 1-170 MHz. SWR can be read from 2 meters in the HF band through the 220 MHz band. Two color meter

MFJ-816

$29.95

Shipping Code A



MFJ-816, $29.95. HF wattmeter lets you read forward and reflected power on 2 scales (30 and 300 watts) and SWR from 1.8-30 MHz. Has forward/reflected push button. Sturdy eggshell white and black aluminum cabinet. SO-239 connectors. 2-color meter scale. 4½ x 2¼ x 3 inches

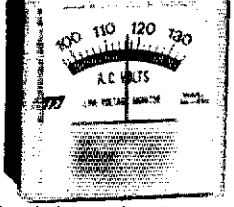
MFJ AC Line Voltage Monitor

NEW

MFJ-850

$19.95

Shipping Code A



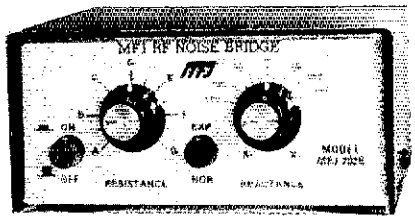
This new MFJ-850 Line Voltage Monitor is the easiest way for you to guard against low voltage "brown-out" conditions that can damage your expensive electrical equipment. All you have to do is plug it in and it tells you at a glance when the line voltage is at a low "brown out" level. Color coding of the same range makes across the room reading easy.

Just plug it into any AC outlet for a continuous, accurate reading from 95 - 135 volts. ± 2% accuracy. Measures 2¼ x 2¼ x 1½ inches.

Leave it plugged in permanantly for constant monitoring -- it comes with MFJ's unmatched one year unconditional guarantee.

You can use it anywhere -- at home, in your shack, on a boat or in an RV. Also useful to check temporary set-ups, portable generators or your valuable computer and periphiral set up. Get yours now.

MFJ RX Noise Bridge



MFJ-202B

$59.95

Shipping Code A

World's finest noise bridge! Hand calibrated resistance scale, expanded capacitance range (± 150 pf), built-in range extender gives accurate measurements and extended measuring range. 1-100 MHz. Easy to use

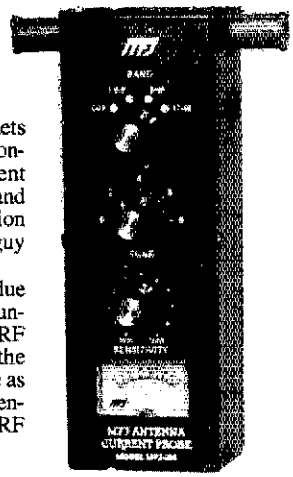
The MFJ-202B RX Noise Bridge lets you quickly adjust your single or multi-band dipole, inverted vee, beam, vertical, mobile whip or random wire for maximum performance. Tells resonant frequency and whether to shorten or lengthen your antenna for minimum SWR over any portion of a band. Works with any receiver or transceiver. 4¼ x 4½ x 2 inches

MFJ Antenna Current Probe

MFJ-206

$79.95

Shipping Code A



This MFJ Antenna Current Probe lets you monitor RF antenna currents -- no connections needed! Determine current distribution, RF radiation pattern and polarization of antennas, transmission lines, ground leads, building wiring, guy wires and enclosures.

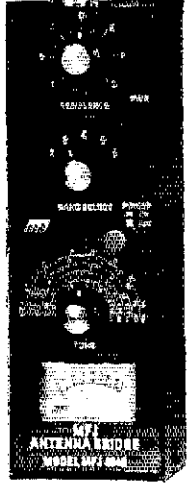
Indicate transmission line radiation due to high SWR, poor shielding or antenna unbalance. Detect re-radiation. Pinpoint RF leakage in shielded enclosures. Locate the best place for your mobile antenna. Use as field strength meter. 4 x 2 x 2 inches. Sensitivity, Band, Tune controls. Monitors RF current by sensing magnetic field.

MFJ Antenna Bridge

MFJ-204B

$79.95

Shipping Code A

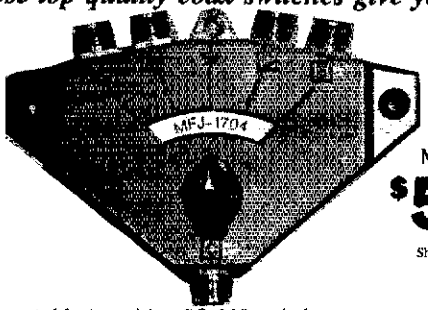


Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge. Your antenna coax lead connects directly to this unique Antenna Bridge.

No other equipment needed. Take it to 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-driver (1.8-30 MHz). Use 9 volt battery or 110 VAC with optional AC adapter, $12.95. 7½ x 2½ x 2¼ inches.

MFJ's Heavy Duty Coax Antenna Switches

These top-quality coax switches give you a center ground position and automatic grounding of unused postions

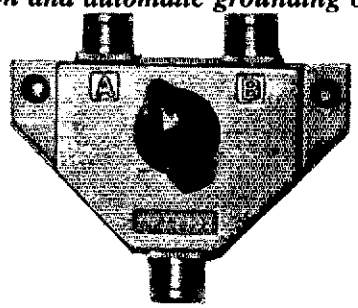


MFJ-1704

$59.95

Shipping Code B

Mount this 4-position SO-239 switch on your operating desk and you'll ave more than the convenience of being able to instantly select any of antennas or the center ground position -- you'll also get the replacable **ghtning surge protection device** that helps protect against distant lightning nduced surges and static.It handles a full 2.5 KW PEP. Extremely low WR. Isolation is rated from better than 60 dB at 30 MHz to better than 0 dB isolation at 500 MHz. Negligible insertion loss. 50 ohm.



MFJ-1702B

$21.95

Shipping Code A

The MFJ-1702B 2-position Coax Switch has a new Center Ground Position! It handles 2.5KW PEP, 1 KW CW. It has better than 60 dB isolation at 300 MHz and better than 50 dB at 450 MHz. 50 ohm.

The unused terminal is automatically grounded for static and RF protection. It has less than 0.2 dB insertion loss and SWR below 1:1.2. The MFJ-1702B has heavy cavity type construction and uses SO-239 connectors. Mounting holes. 3 x 2 x 2 inches.

VERSALOAD 1 KW Dummy Load

Complete with oil

MFJ-250

$49.95

Shipping Code D

MFJ-250 *VERSALOAD* KW dummy oad lets you tune up fast! Extends life f finals! Run 1-KW CW or 2 KW PEP or 10 minutees. ½ KW CW or 1 KW EP for 20 Minutes. Continuous duty ith 200 watts or 400 watts PEP. Comlete with derating curve. Quality 50 ohm on-inductive resistor. Oil cooled. Inludes high quality industrial grade ansformer oil (contains no PCBs). Low SWR to 400 MHz. Under 1.2:1 to 30 Hz 1.5:1 30-300 MHz., 2:1 300-400 Hz. Ideal for testing both HF and VHF gs. SO-239 connector. Vented for safe-. Removable vent cap. Carrying hanle. 7½ inches high by 6 5/8 diameter.

MFJ Antenna/Transceiver Switches

MFJ-1701

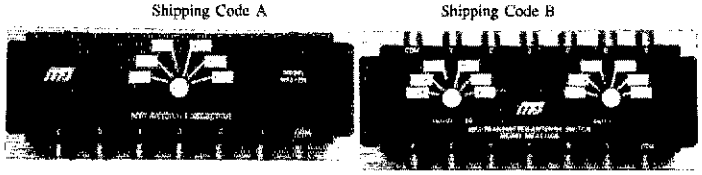
$34.95

Shipping Code A

MFJ-1700B

$64.95

Shipping Code B



This MFJ-1700B has two ceramic rotary switches that let you select 1 of 6 antennas and 1 of 6 transceivers in any combination. You can also plug in an antenna tuner, wattmeter, linear, etc. so it is always in the circuit. Handles 2KW PEP for 50-75 ohm loads. Unused terminals automatically grounded. SO-239 connectors. 10 x 3 x 1½ inches.

MFJ-1701, $34.95. Six position antenna switch. Unused terminals grounded. SO-239. Handles 2 KW PEP, 1 KW CW. 52-75 ohm loads.

.5 KW UHF/VHF/HF Dry Dummy Load

MFJ-264

$109.95

Shipping Code A

This versatile new UHF/VHF/HF "Dry" Dummy Load is another MFJ rst! It lets you tune up to 650 MHz and get extremely low SWR. It is sable to 750 MHz.

You can run 100 watts for 10 minutes, 1500 watts for 10 seconds. The oltage gradient is 10 kV/inch. SWR 1.1:1 at 30 MHz, below 1.3:1 to 50 MHz. Measures 3 x 3 x 7 inches.

Dry 300W VHF/HF and 1KW HF Dummy Loads

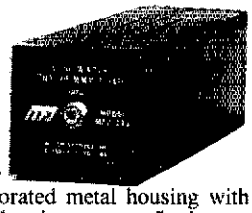
MFJ-260B

$28.95

MFJ-262

$69.95

Shipping Code A



Air cooled, non-inductive resistor in perforated metal housing with SO-239 connectors. Full load for 30 seconds, derating curve to 5 minutes. **MFJ-260B (300 W).** SWR: 1:1.1 to 30 MHz, 1.5:1 30-150 MHz. 2¼ x 2¼ x 7 inches. **MFJ-262 (1 KW).** SWR 1.5:1 to 30 MHz. 3 x 3 x 13 inches.**MFJ-10, $4.95.** 3 foot coax with connectors.

MFJ-701 RFI Free Choke Kit

Eliminates RFI

Package of 4 (4)

MFJ-701

$14.95

Shipping Code A

The new MFJ-701 RFI-Free Choke Kit makes it easy to eliminate comon RFI problems. It's based on the proven and highly effective techniue of winding the offending cable or wire around a ferrite toriod to choke ff and eliminate RFI.

The problem has been finding a toroid with the proper characteristics - one that actually eliminates RFI and has a big enough hole to pass through ie end of a power cord, microphone cord or speaker leads, etc.

You get four square toriods taht have the right properties for eliminating FI from .5 to 200 MHz. Each toriod separates into halves and mounts a tough snap-together plastic frame. This makes it easy to wind around ie toriod nearly any kind of wire or cable. For example, computer ribon able, coax cable or a power cord The individual toriods can also snap ogether into a stack. This increases effectiveness for large diameter wires.

"How to Eliminate RFI" instructions included.

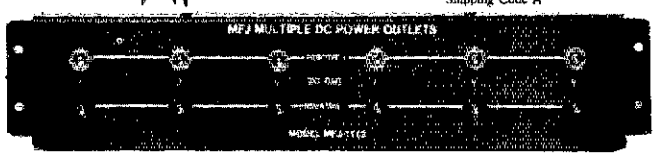
New MFJ-1112 Multiple DC Outlet

This new MFJ Multiple DC Outlet is another MFJ first! It reduces shack clutter by giving you 6 pairs of heavy duty binding posts for connecting your accessories.

MFJ-1112

$19.95

Shipping Code A



This new MFJ-1112 Multiple DC Power Outlet saves you space ***and*** money. Hook it to your 12 VDC power supply and get 6 DC outlets for connecting your accessories. You get 6 pairs of heavy duty binding posts for connecting the accessories in your shack. RF bypassing keeps RF out of power supply from the DC line outlet. Attractive black aluminum cabinet measures just 13½ x 2¾ x 2½ inches. You also get MFJ's famous one full year ***unconditional*** guarantee.

Every ham needs one of these. Get yours today!

MFJ Grandmaster Memory Keyer

More than user-friendly . . . it's really easy-to-use

NEW

MFJ-486

$189.95

Shipping Code A

Simple . . . intuitive . . . you instantly know which knob to turn, what button to press. It's unmistable. That's the MFJ Grandmaster concept -- more than user-friendly . . . it's really easy to use.

There's no keypad, no complex keystroke sequences to confuse you.

The new MFJ-486 Grandmaster Memory Keyer gives you the best of both worlds -- all the features you'll ever need ***and*** the easy-to-use MFJ Grandmaster concept.

Exclusive CW Word Processor ™

MFJ's exclusive CW Word Processor™ lets you change a message in memory without having to rekey it all in.

Special function keys make it simple to move around within any message, insert, delete and change your message until it's just the way you want it.

With other memory keyers you have to erase an entire message and rekey it all in to make even the smallest change.

Combine messages into other messages

The MFJ-486 lets you combine messages into other messages.

You can store QTH, rig/antenna, QSL info and other comments in separate memories.

Then you can easily build a new message by keying in memory numbers wherever you want that info in your message.

MFJ's Custom-Speed™ Control

Customize your speed control to fit ***you!***

By pressing the Speed Set button, you can set your slowest speed to start at 4, 5, 6 -- any speed up to 20 WPM -- and your fastest speed is 20 to 100 WPM.

Matching CW speed to a QSO is best done by ear adjust a ***knob.***

With keypads you have to figure out the exact speed of your contact and then go through an awkward keystroke sequence.

That's why matching speed with a keypad is so demanding.

Without MFJ's Custom-Speed, a wide range speed control is very hard to use because the ***slightest*** touch causes radical speed changes.

Built-in CW Course

The MFJ-486 gives you a well-organized three-step CW course for upgrading and teaching.

The first step gives you random five character groups. After yo learn the letters you can add punctuation.

The second step gives you random 1-8 character groups for rea world code practice.

The third step gives you an infinite number of random plain Englis QSOs in *the same format as FCC ham license tests.*

When you can copy these random QSOs, you're ready to pass you test and upgrade!

You also get Farnsworth option, answer-replay to check your copy punctuation on/off and earphone jack for private practice.

Remote Control . . . for memories *and* function keys

The MFJ-77 remote control lets you control your message memorie *and* CW Word Processor™ function keys at your key paddle.

Just $19.95, it's a lot more useful than a remote that gives you *n* editing functions and only lets you control a *few* memories.

More for your money

To make it really easy-to-use, it cost more to build the Grandmaste**r**

It just takes more hardware -- knobs to turn, buttons to press, LED to show you what's going on. Plus it takes more labor, more software more everything. It'a a real bargain compared to cheaper-to-build bu harder-to-use keypad keyers.

Plus More . . .

You get over 8000 characters in 10 soft-partitioned memories -- fa more than you'll ever need.

You also get . . . lithium battery backup, automatic serial numbe**r** ing, automatic message repeat, beaconing, A or B type iambic key ing, manual or automatic word spacing, speaker, earphone jack, easy to-use front panel controls for speed, volume, tone, weight and delay tune control, powerful Z-80 microprocessor plus much more. 9 x 2 x 6 inches. Use 12-15 VDC or 110 VAC with MFJ-1312, $12.95

Don't *struggle* with keypads -- *enjoy* the MFJ Grandmaster

Don't struggle with a hard-to-use keypad and complicated keystrok sequences.

Choose the memory keyer that's really easy-to-use and has all th features you'll ever need -- the new MFJ-486 Grandmaster. Get your today . . . you'll love it!

MFJ's *Original* Grandmaster Memory Keyers

MFJ-482B

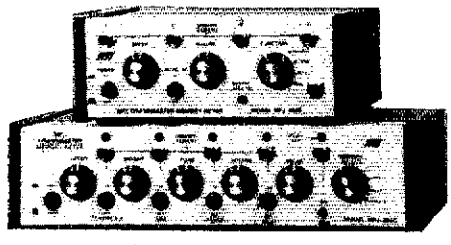
$109.95

Shipping Code A

MFJ-484C

$149.95

Shipping Code A



MFJ-484C is so easy-to-use that you can probably utilize all of its many features without reading the instruction manual.

Controls are logically positioned and clearly labled. Knobes are used for speed, volume, tone and weight because they are easy-to-use and remember your settings with power off. You can store up to twelve 25 character messages plus a 100, 75, 50 or 25 character message (4069 bits total). A switch combines 25 character messages for up to three 50 character messages.

To record, just pull out the speed control, touch a message button and send. To playback, let out record/send switch, select your message and touch the button. You can repeat any message continuously and even leave a pause between repeats. Insert in playing message by ser ding. LEDs show which 25 character memory is in use and when ends. 9 volt battery (not included) memory saver. 8 x 2 x 6 inches Speed from 8-50 WPM. Weight, tone control. Speaker. Use 12-1 VDC or 110 VAC with MFJ-1312, $12.95.

MFJ-75; $19.95. Wired remote control lets you control MFJ-484 memories at the key-paddle.

MFJ-482B, $109.95. You can own this MFJ Grandmaster Memor Keyer for the price of a keyer! Store four 25 character messages a 50 and two 25 character messages in 1024 bits of memory Repeat.Memory LED. Speed, volume controls on front. 8 to 50 WPM Weight control. Tone control for pitch. Speaker. All ICs in sockets Tune function keys transmitter for tuning. Solid state keying. 6 x x 6 inches. Use 12 to 15 VDC or 110 VAC with MFJ-1312, $12.95

Bencher Iambic Key Paddles

Ideal for MFJ Keyers and Memory Keyers

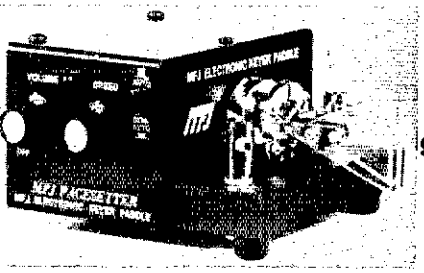
Bencher Iambic Paddles feature a full range of adjustments in tension and contact spacing. Gold plated solid silver contacts points almost never need cleaning. Shipping Code A.

Black BY-1 **$69.95**

Chrome BY-2 **$84.95**

MFJ Keyer/Bencher Paddle Combo

MFJ, Bencher and Curtis team up to bring you America's most popular keyer in a compact package for smooth easy CW . . .



MFJ-422B

$134.95

Shipping Code B

MFJ-422BX

$79.95

Shipping Code A

The best of all CW worlds -- a deluxe MFJ Keyer in a compact configuration that fits right on the Bencher iambic paddle! You can buy the combination or just the keyer for your Bencher.

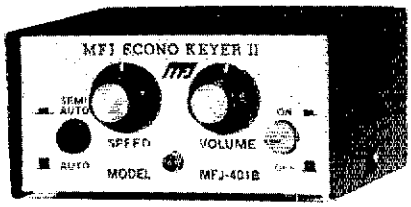
MFJ Keyer is small in size, big in features. It gives you the proven Curtis 8044 ABM IC, is adjustable in weight and tone and has front panel volume and speed controls (8-50 WPM). You also get built-in dot-dash memories, speaker, sidetone and push button selection of semi-automatic/tune or automatic modes. Ultra-reliable solid state keying: grid-block, cathode and solid state transmitter (-300V, 10 mA max, +300V, 100 mA max.). Fully shielded. Use 9 volt battery (not included) or 110 VAC with MFJ-1305, $12.95.

Beautiful functional engineering. The keyer mounts on the paddle base 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. You can buy the combo or just the MFJ Keyer (MFJ-422BX, $79.95) to fit on ***your*** Bencher.

The Bencher paddle is a best seller. Fully adjustable gold-plated silver contacts, lucite paddles, heavy steel base with non-skid feet, **BY-1,** Black Base, **$69.95; BY-2,** Chrome Base, **$84.95.**

MFJ Econo Electronic Keyer II

Economical MFJ keyer lets you send perfect CW with surprisingly good sound.



MFJ-401B

$49.95

Shipping Code A

The MFJ-401B Econo Keyer II is based on the proven Curtis 8044ABM IC Keyer chip. It lets you send iambic, automatic, semi-automatic or manual with your squeeze, single lever or straight key. **You** get iambic operation with squeeze key. Dot-dash insertion. Semi-automatic "bug" operation provides automatic dots and manual dashes. **Econo** MFJ keyer also features dot-dash memories, self-completing dots and dashes, jam-proof spacing. Instant start. RF proof.

Front panel controls. Smooth linear speed control selects from 8 to 50 WPM. Volume control gives you a wide range. A tune switch lets you key your transmitter for tuning.

Internal controls: Weight control adjusts dot-dash ratio, makes your signal distinctive to penetrate QRM. Tone control for desired side tone pitch.

Ultra-reliable solid state keying: grid-block, cathode, solid state transmitters (-300V, 10 mA max, +300V, 100 mA max.).

Use 9 volt battery (not included) or 110 VAC with MFJ-1305, $12.95. Measures a compact 4 x 2 x 3½ inches.

MFJ Deluxe Electronic Keyer

Deluxe MFJ Keyer gives you beautiful CW and a full array of front-panel controls

MFJ-407B

$69.95

Shipping Code A

The MFJ-407B Deluxe Electronic Keyer sends iambic, automatic, semi-automatic and manual. You can use squeeze, single lever or straight key to send your signal. The MFJ-407B features iambic operation with squeeze key, dot-dash insertion, semi-automatic dots and manual dashes. It also features dot-dash memory, self-completing dots and dashes, jam-proof spacing and instant start keying. A switch lets you select A or B type keying.

Solid state plus and minus keying is provided for use with tube or solid state transmitters. Front panel controls include linear speed, weight, tone and volume controls as well as on/off, tune and semi-auto/auto switches. Weight control provvides positive weight or negative weight. Adjust the dot-dash space ratio, thus making your signal distinctive to penetrate QRM. Tune switch keys transmitter.

The MFJ-407B is RF proof, has a built-in speaker and uses a 9 volt battery (not included) or 110 VAC with MFJ-1305, $12.95. This hard working unit comes in an attractive black aluminum cabinet with a black front plate. It measures 7 x 2 x 6 inches.

MFJ-557 Deluxe Code Practice Oscillator

Deluxe Morse straight key for code and sending practice features a heavy steel base, tone and volume controls and an earphone jack for just . . . $24.95

The new MFJ-557 Deluxe Code Practice Oscillator features a straight Morse key on a non-skid heavy steel base that stays put on your table. The MFJ-557 lets you practice sending code at home, work, riding in your car -- practically anywhere -- because it's so easy to take it along wherever you go. A volume control lets you adjust it from barely audible to blaring full sound. You can practice without bothering anyone. A tone control gives you a wide adjustment, from high "squeaky" to low "booming" tones. You even get an earphone jack for private listening. Or plug in an external speaker (like MFJ-280) for extra volume in the classroom.

It runs on a 9 volt battery (not included) or an optional AC power supply ($12.95) that plugs into a jack on the side. When you're finished cleaning up your sloppy fists with the MFJ-557 Deluxe Code Practice Oscillator, hook it to your transmitter and go on the air sounding just like you were born working QSOs.

Don't pass up this super buy. Built-in speaker. Adjustable contacts. Solid. 8½ x 2¼ x 3¾ inches. Black. It comes with MFJ's one year unconditional guarantee.

MFJ-557

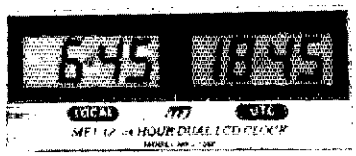
$24.95

Shipping Code A

MFJ 12/24 Hour Clocks

MFJ-107B
$9.95
Shipping Code A

MFJ-108B
$19.95
Shipping Code A



Read both UTC and local time at a glance with the MFJ-108B dual clock that displays 24 and 12 hour time simultaneously. Or choose the MFJ-107B single clock that shows you 24 hour UTC time.

Mounted in a brushed aluminum frame, they feature huge, easy-to-see 5/8 inch LCD numerals and a sloped face for easy across the room reading.

You can read hour, minute and second. Synchronize them to WWV for split-second timing. Both are quartz controlled for excellent accuracy.

Long life battery included. MFJ-108B measures 4½ x 1 x 2 inches. MFJ-107B measures 2¼ x 1 x 2 inches.

MFJ World Time Clock

MFJ-109
$19.95
Shipping Code A

The new MFJ-109 World Time Clock shows GMT and local time -- and it displays the time for 24 world cities.

Just set the Easy-slide indicator to any of 24 international cities and its dual display instantly shows you both the local time and the city time.

It features international 24 hour display and a local time display with 3/8 inch LCD digits, **GMT pointer,** alarm with snooze, night light, adjustment for daylight savings time, international date change indicators, suede-like carrying case and a flip stand -- all in an attractive gift box. Measures 2 x 4½ x ½ inches.

MFJ *Compact* Speaker/Mics

For Kenwood, Icom, Yaesu, Santec and others

MFJ-284 or MFJ-286
$24.95
Shipping Code A

MFJ's Speaker/Mics let you carry your handheld on your belt and never have to remove it to monitor calls or talk.

And you'll never have to turn up your audio annoyingly loud because the handy lapel/pocket clip lets you place it close to your ears for easy listening.

You get a wide range speaker and first-rate electret mic element for superb audio on *both* transmit and receive. Plus . . . earphone jack, PTT, lightweight retractable cord. Gray. **MFJ-284** fits Icom, Yaesu, and Santec; **MFJ-286** fits Kenwood.

MFJ *tiny Speaker/Mics*

Choose one of these tiny new handheld mics from MFJ

MFJ-285 or MFJ-
MFJ-285L or MFJ-
$24.9
Shipping Code A

These new MFJ speaker/mics give you everything -- first rate electret mic element and wide range speaker for superb audio on ***both*** transmit and receive, earphone jack, PTT, lightweight retractable cord and one year ***unconditional*** guarantee ***plus*** you get a swiveling lapel/pocket clip ***and*** you get all of these superb features in a ***tiny*** 2 x 1¼ x ¼ inch package. Order **MFJ-285 or MFJ-285L** for ICOM, Yaesu or Santec; order **MFJ-287 or MFJ-287L** for Kenwood.

L connector also available -- order "L" model!

Handheld VHF Converters

MFJ-313 or MFJ-314
$39.95
Shipping Code A

MFJ-313 turns your synthesized scanning 2 meter handheld into a hot Police/Fire scanner on 154-158 MHz with direct frequency readout. Plus you'll hear NOAA weather, maritime coastal and more on 160-164 MHz. **MFJ-314** turns your 2 Meter handheld into a 220 MHz receiver.

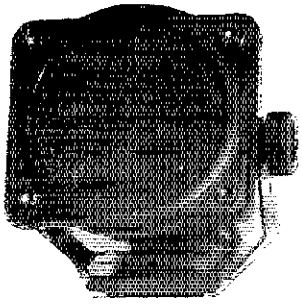
If you have extended coverage the MFJ converters will extend it more: Add 10 and 16 MHz to your handheld band limits to determine your expanded coverage with MFJ-313; add 77 MHz to determine your coverage with MFJ-314..

Feedthru allows simultaneous scanning of both bands. No missed calls.

Highpass input filter and 2.5 GHz transistor give uniform sensitivity over both bands. Crystal controlled. Bypass/Off switch allows transmitting (up to 5 watts) with convert on. Uses AAA battery (not included). 2¼ x 1½ x 1½ inches. BNC connectors.

MFJ-280 Compact Mobile Speaker

MFJ-280
$19.95
Shipping Code A



Enjoy crisp, clear audio and extra convenience with this tiny low cost mobile speaker. Just set the base on any magnetic surface, plug in the 3.5 mm phone plug and it's ready. Two auxiliary mounting plates with two sided tape allow mounting on a car dash or other non-magnetic surface (screws also included). A 30 inch cord and tilt bracket gives you extra versatility.

It works with 8 and 4 ohm impedances and handles up to 3 watts of audio. Military black color. Measures 2½ x 2 x 3 inches and weighs less than half a pound!

Telescoping "Pocket Linears"

increase your range with significant gain over a rubber ducky . . . break in from the fringe!

Shipping Code A

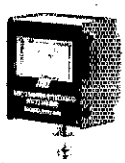
MFJ-1710, $9.95. When you're right on the fringe with a noisy signal, try on the MFJ-1710 "pocket linear". It's a 3/8 wave 2 Meter telescoping antenna. You'll get enough gain over a rubber ducky to bring you to full quieting so you can carry on a QSO. It only cost $9.95, has a convenient pocket clip and when collapsed is the size of a ball point pen -- about 5¼ inches -- and 24½ inches extended.

MFJ-1712, $14.95. This is a very convenient dual band telescoping antenna. It's a 1/4 wave for 2 Meters and a 5/8 wave for 440 MHz. It's 7¼ inches collapsed and 19 inches extended.

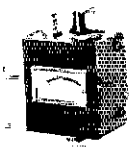
MFJ-1714, $16.95. For really long range using a 2 Meter handheld it's hard to beat the MFJ end fed halfwave. It's shorter, lighter has more gain and places less stress on your antenna connector than a 5/8 wave because a 5/8 wave requires a ground plane to function properly. There's no ground plane on a handheld and a 1/2 wave does not require one so it works properly and outperforms a 5/8 wave. When collapsed it performs like a rubber ducky.

MFJ Handheld 2 Meter Wattmeters

MFJ-840
$19.95
Shipping Code A



MFJ-841
$39.95
Shipping Code A



MFJ-840 reads the power output of your 2 meter handheld transceiver. 5 watts full scale. 50 ohm. BNC connector. 2 x 2¼ x 1½ inches. Black.

MFJ-841. Connects directly in line with your 2 meter HT. Read SWR from 1:1 to 6:1 and forward power to 5 watts. Expanded scale. 50 ohm. 2 x 2¼ x 1½ inches. Black. Switch: SWR, SWR set, power, SWR set pot.

New MFJ HT Holders

for your mobile or desktop rig!

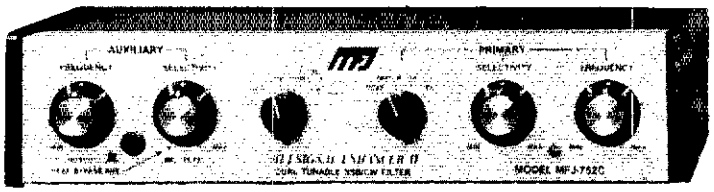
MFJ-24
$9.95
Shipping Code A

MFJ-25
$9.95
Shipping Code A

Handy new MFJ HT holders help you make sure your handheld stays where you put it -- in your car or on a crowded table or desk. MFJ-24 hangs from your car door, durable plastic bends to fit snugly; MFJ-25 stands on your desktop. An economical way to guard against dropping your expensive HT. Includes rings to fit both compact and full sized HTs.

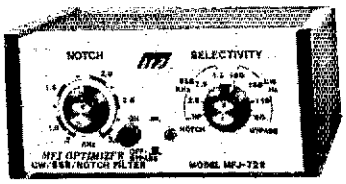
MFJ SSB/CW Audio Filters

Choose from the MFJ-752C Dual Tunable Filter or the MFJ-722 Super CW/SSB Switch Selectable and Notch Filter



MFJ-752C
$99.95
Shipping Code A

MFJ-722
$79.95
Shipping Code A



The MFJ-752C Signal Enhancer is a dual tunable SSB/CW active filter system that gives you signal processing, performance and flexibility that hers can't match! You can select the optimum **Primary Filter** mode for SSB signal, zero in with the frequency control and adjust the bandidth for best response. Then use the **Auxilary Filter** to notch out an inrfering heterodyne or peak the desired signal. For CW, peak both Primary d Auxiliary Filters for narrow bandwidth to give skirt selectivity that hers can't touch. Also, use the Auxiliary Filter to notch out a nearby SO. The Primary Filter lets you peak, notch, lowpass or highpass signals ith a double tuned filter for extra steep skirts. The Auxiliary filter lets ou notch a signal to 70 dB or peak one with a bandwidth down to 40 z. Tune both Primary and Auxiliary filters from 300 to 3000 Hz. Vary ndwidth from 40 Hz to almost flat. Notch depth to 70 dB.

MFJ has solved problems that plague other tunable filters to give you constant output as a bandwidth is varied. You also get a linear frequen- control and a notch filter that is tighter and smoother for a more effective notch. Works with any rig. Plugs into phone jack. 2 watts for speaker. Inputs for 2 rigs. Switch selectable. Switchable noise limiter for impulse noise through clipper removes background noise. Use for SWLing as well as SSB and CW. Speaker and phone jacks. Speaker is disabled by phones. OFF bypasses filter. Use 9-18 VDC or 110 vac with MFJ-1312, $12.95. Measures 10 x 2 x 6 inches.

MFJ-722, $79.95. The MFJ-722 "Optimizer" offers razor sharp, no ring CW filtering with switch-selectable bandwidths (80, 110, 150, 180 Hz centered on 750 Hz), steep-skirted SSB filtering, 300-3000 Hz tunable 70 dB notch filter.

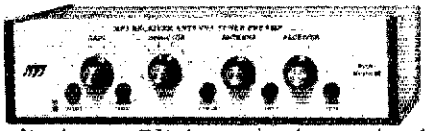
The 8-pole (4 stage) active IC filter gives superb CW performance. (80 Hz bandwidth gives -60 dB response on octave from center and up to 15 dB noise reduction.) The 8-pole SSB audio bandwidth is optimized for reduced sideband splatter and less QRM (375 Hz highpass cutoffs at 2.5, 2.0 and 1.5 KHz. 36 dB/octave rolloff). Plug into the phone jack. Speaker. Headphone jack. Use 9-18 VDC or 110 VAC with MFJ-1312, $12.95.

MFJ Deluxe Hybrid Phone Patch

MFJ-624C
$69.95
Shipping Code A

MFJ-624C deluxe phone patch gives you crisp, clear, hum-free audio. 's pre-wired for Kenwood and Yaesu rigs with 8 pin mic connectors. se VOX or PTT. RF pi-filters and PC board construction that eliminates F feedback. VU meter monitors phone line levels to prevent crosstalk. ou adjust null depth for maximum isolation between receiver and transmitr. Gain controls. OFF/ON/BYPASS switch, NULL adjust. Plug supied. Patch-in/patch-out jacks. Speaker, audio in/out. 8 x 2 x 6 inches.

MFJ Receiver Antenna Tuner/Preamplifier



MFJ-959B
$89.95
Shipping Code A

Don't miss rare DX due to signal power loss between your receiver and antenna. The MFJ-959B provides proper impedance matching so you transfer maximum signal from antenna to receiver. Covers 1.6 to 30 MHz. 20 dB preamp with gain control boosts weak stations. 20 dB attenuator prevents overload. Select from 2 antennas, 2 receivers. 8 x 2 x 6 inches. Use 9-18 VDC or 110 VAC with MFJ-1312, $12.95.

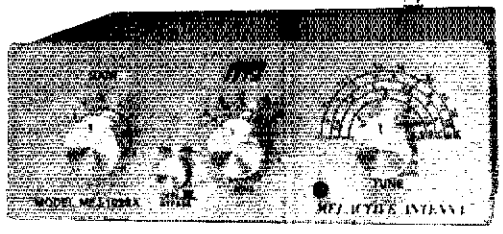
54" Outdoor Active Antenna

MFJ-1024
$129.95
Shipping Code B

"World Radio TV Handbook" says MFJ-1024 is a "first rate easy--operate active antenna . . . quiet . . . excellent dynamic range . . . good in . . . very low noise factor . . . broad frequency coverage . . . exllent choice." **Mount** it outdoors away from electrical noise for maxum signal, minimum noise. MFJ-1024 covers 50 KHz to 30 MHz. **Receives** strong, clear signals from all over the world. 20 dB attenuator, in control, ON LED. Switch selects two receivers and auxiliary or ac- antenna. Control unit measure 6 x 3 x 5 inches. Remote unit has 54 ch whip, 50 feet of coax and connector. Measures 3 x 2 x 4 inches. Use VDC or 110 VAC with MFJ-1312, $12.95.

MFJ Indoor Active SWL Antenna

MFJ-1020A
$79.95
Shipping Code A



Now you'll rival or exceed the reception of outside long wires with this ***tuned*** indoor active antenna. **"World Radio TV Handbook"** says MFJ-1020 is a "fine value . . . fair price . . . best offering to date . . . **performs very well indeed."** Tuned circuitry minimizes intermod, improves selectivity, reduces noise outside the tuned band. Use as preselector with external antenna. 0.3 to 30 MHz. Tune, Band, Gain, On-Off/Bypass Controls. Use 9 volt battery (not included), 9-18 VDC or 110 VAC with MFJ-1312, $12.95. 5 x 2 x 6 inches. Telescoping whip.

ll Band Transceiver/Preselector

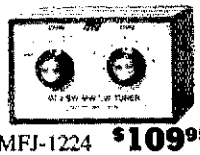
MFJ-1040B
$99.95
Shipping Code A

MFJ-1040B transceiver/preselector lets you copy weak, barely readable gnals. Rejects out-of-band signals, images. Excellent signal to noise ratio. overs 1.8 to 54 MHz. Up to 20 dB gain. Gain control. Dual gate OSFET, bipolar transistors for low noise, high gain, strong signal ability. ush button switches for 20 dB attenuator, ON/OFF/BYPASS, 2 antenas, 2 receivers. Dual coax and phone jacks for antennas, receivers, RF nsing relay automatically bypasses preselector when transmitting up to 50 watts input. Delay control. Jack for push-to-talk. 8 x 2 x 6 inches. se 9-18 VDC or 110 VAC with MFJ-1312, $12.95.

MFJ-1045B, $69.95. *(not pictured)* Like MFJ-1040B without attenuator, evr auto bypass, delay control or PTT.

LW/MW/SW Preselector/Tuner MFJ-956 $39.95

Shipping Code A



MFJ-956 lets you boost your favorite stations while rejecting images, intermod and other phantom signals from 1.5 thru 30 MHz, especially below 2 MHz. Has tuner bypass and ground receiver positions. 2 x 3 x 4 inches.

RTTY/ASCII/CW Computer Interfaces

MFJ-1224 **$109.95**
Shipping Code A

MFJ-1225 **$79.95**
Shipping Code A

Use your Commodore 64/128/Vic-20 and FREE MFJ Software to transmit and receive in 3 fun modes. IBM software, MFJ-1285, 19.95, also available. MFJ-1224 lets you transmit/receive and measures 8 x 1¼ x 6 inches. **MFJ-1225,** receive only. 4½ x 1¼ x 4¼ inches. **MFJ-1223, $29.95.** RS-232 Interface.

"Packet Radio is Made Easy"

let Buck Rogers, K4ABT, CQ Magazine** Packet Radio Editor, **hold your hand from the time you take your new pa radio controller out of the box until you're on the air operating!

New book by ***CQ Magazine** Packet Radio Editor* Buck Rogers, K4ABT, gets you on packet fast and easy.

Buck holds your hand from the time you take your new packet radio controller out of the box until you're on the air operating.

He tells you in his easy-to-understand style what packet is and how to get the most out of it.

Buck shows you how to successfully interconnect your transceiver, computer and packet radio controller.

By following Buck's smooth instructions your packet station will work the first time you turn it on.

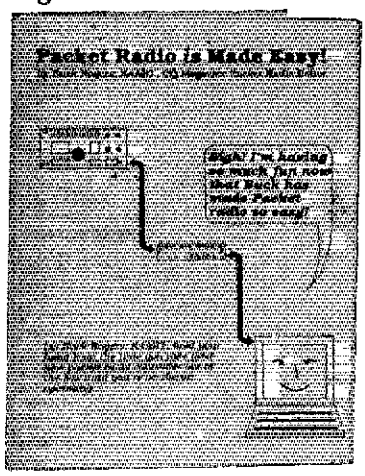
He discusses packet commands, shows you what they mean and how to use them.

Buck also includes a glossary or packet radio terms and definitions that'll have you talking like a true packeteer.

After Buck gets you on the air, he introduces you to Digipeating, Mailboxes, Networking, Local Area Networks and much more.

In a short evening of relaxed, easy reading, you'll learn enough to impress the experts and get on the air fast!

Take home Buck's latest book and let him get you on packet today!



MFJ-32

$9.95

Shipping Code A

"Golden Classics of Yesteryear"

by the famous author of over 300 articles and 12 books on ham radio, CQ Magazine columnist Dave Ingram, K4TWJ

MFJ-30

$9.95

Shipping Code A

Remember the 6L6 rigs, Heathkit DX-100, Collins KWM-1, Globe Scout, Hallicrafters, RME, Hammulard, National HROs, Eimac tubes, E.F. Johnson, WWII rigs -- ARC-5, BC-342/348, -- bugs by Vibroplex, McElroy, Dow Key . . .

All these famous names plus many more you'll recognize are in "Golden Classics of Yesteryear". It's all ham radio in content and it's jam packed with real-life tales, transmitters, receivers, favorite circuits, telegraph keys, bugs and other ham radio topics.

Easy-to-build weekend projects -- transmitters, receivers and other projects -- from the 1920s, 30s, 40s, and 50s are included.

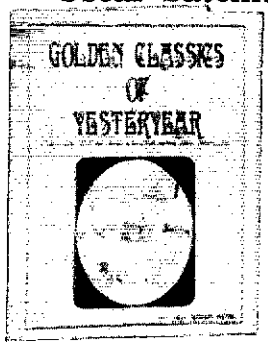
You'll see how you can build a classic "Tailender" -- an early DX memory keyer -- that requires no power supply or other electronic parts and works like a champ.

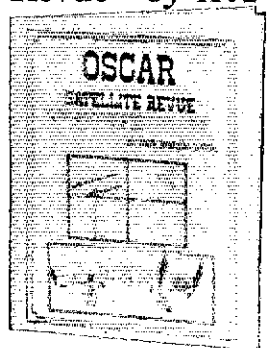
You'll learn how to collect, restore and operate classic gear.

"Golden Classics of Yesteryear" is written by Dave Ingram, K4TWJ -- one of amateur radio's most recognized and respected authors -- especially in classic gear. He has authored over 300 articles and 12 books on ham radio.

It'll be the most enjoyable $9.95 you'll ever spend. Order today!

"Oscar Satellite Revue" *by K4TWJ*





MFJ-31

$7.9

Shipping Code

"Oscar Satellite Revue" by Dave Ingram, K4TWJ, is an antholog of CQ Magazine articles on setting up various types or OSCAR statio and operating via the amateur radio satellites.

Each article is followed by a new updating addition, then ready-to-us frequency conversion charts for all satellite modes and tracking notes fo OSCAR 13, OSCAR 10, Japanese JO-12 and Russian RS-10/RS-11 amate radio satellites are featured.

There's also a quick-start guide for newcomers and a large equipme review section. Additionally, up-to-date Keplerian data for computerize satellite tracking programs are included.

This new guide takes you from set-up to success and every part is wri ten in non-technical easy-to-understand language. No confusing calcul tions or complex descriptions.

See how easy it is to join the fun via amateur radio satellites. Order toda

For your nearest dealer or to order:

For your nearest dealer or to order: Call Toll Free **800-647-1800** and charge it to your MasterCard or VISA, or have us send it COD within the continental USA. Inside Mississippi or outside of the continental USA call 601-323-5869. Call Monday-Friday from 8 a.m. to 4:30 p.m. CST. FAX: 601-323-6551. TELEX: 53-4590 MFJ STKV.

Order by Mail: Write: **MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762.** Please include all model numbers and check or money order for full amount (plus shipping/handling). Or you can pay by VISA or MasterCard (include card number and expiration date -- your account will not be charged until we ship your order).

Foreign Orders: Orders outside the USA and Puerto Rico must include payment in U.S funds, check on US bank, International money order or International VISA or Master Card. Orders shipped Airmail unless other instructions are given.

Unconditional Guarantee: All MFJ products (except as noted) manufactured by MFJ Enterprises, Inc. are ***unconditionally guaranteed*** for one year from the date of purchase. We will repair or replace (at our option) any of our products which are defective for any reason. 30 day ***Money Back Guarantee*** (less shipping) on direct orders from MFJ. **Computer Software** products are excluded from the 30 day return policy.

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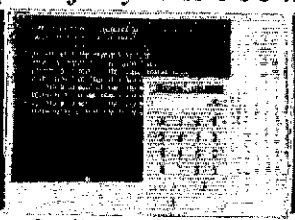
D	6.00	9.00	10.50	40.00
E	10.00	15.00	22.00	50.00

MFJ's new ham license upgrade Theory Tutor

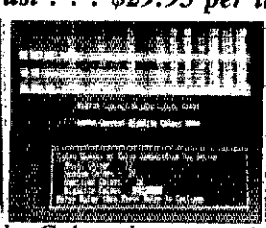
Get your ham license or upgrade with MFJ's new Theory Tutor! This fun new software practically guarantees you'll pass the theory part of any class FCC ham license exam for just . . . $29.95 per license class . . .

Opening screen

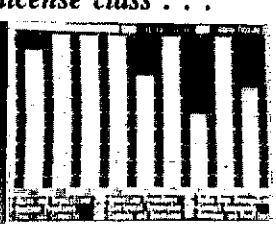


On-line calculator

Test diagrams included



Color change option



Bar Graph Score

- ***Take sample tests or print written tests***
- ***Concentrate on any area or entire question pool***
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- ***Color change and other utility options***
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- ***All graphics/diagrams included for color systems***
- ***The fun way to study -- a super gift***
- ***Get yours today for only . . . $29.95 per class!***

MFJ-1610-**Novice**
MFJ-1611-**Technician**
MFJ-1612-**General**
MFJ-1613-**Advanced**
MFJ-1614-**Extra**

$29.95 *per license class*
Shipping Code A

NEW

Get your ham license or upgrade with MFJ's new Theory Tutor! It practically guarantees you'll pass the theory part of any class ham license exam.

Versatile and fun new IBM compatible software is the best computer tutor ever tailor-made for ham radio.

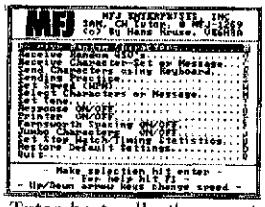
Why? Because you get much more than just the FCC question pool. At any time you can study ***either*** the entire question pool or selected areas - or try taking sample tests. Each study session is automatically saved -- and you can return to a previous session at any time. Or print a test (suitable for official testing) on your Epson/IBM compatible printer.

You also get excellent graphics with appropriate questions, explanations on hard questions, complete weighted scoring analysis, color change options, an on-line calculator plus much more.

Don't put it off! Get the most from ham radio *and* your computer. Get the new MFJ Theory tutor and upgrade ***now!*** You'll be glad you did.

"SAM" Morse Tutor for IBM Compatibles

MFJ-1269
$19.95
Shipping Code A



NEW

New Morse Code Tutor beats all others, gets your speed up *faster!*

Colorful "Jumbo" characters option makes your Morse Code classroom fun (SAM also works with mono graphics).

Set "Stop Watch" and copy code against the clock -- find out how well you ***really*** know your code. Set WPM or tone from opening menu or "dynamically" as code is sent -- increase the speed after you "warm up".

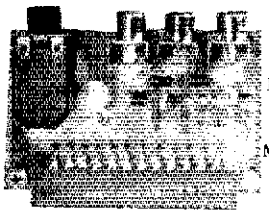
Unmatched sending practice flashes a character on the screen that you send using the shift keys as paddles -- it times your sending and shows what characters you sent correctly or incorrectly.

Timing analysis grades your progress, shows your speed and how many you get right and miss on each session.

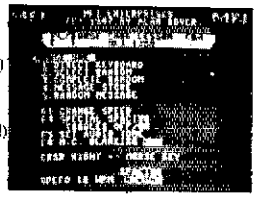
All this ***plus*** everything the other code tutors have: you can copy select or random characters, copy text files, prosigns, send from keyboard and more. You get Random QSOs with screen blanking. Farnsworth spacing option. Excellent manual includes sample FCC test, "Q" signals and common Morse abbreviations. On-screen help with function key.

Don't put it off. Let SAM help you get the ham license ***you*** want.

CW Code Tutor for Commodore 64/128



MFJ-1266 (disk)
$19.95
MFJ-1267 (Cartridge)
$29.95
MFJ-76 (Keyer Board)
$19.95
Shipping Code A



This full featured MORSE Code Tutor Program for the Commodore 64 and 128 not only teaches Morse code but it is also a full fledged iambic keyer and Morse keyboard! With the optional **MFJ-76 Keyer Interface, $19.95,** you can plug in an external key paddle and key a transmitter.

Excellent audio quality and a full menu of features make code learning easier than ever. ***Select Random*** -- lets you choose the letters you want to study. ***Complete Random*** -- sends all letters, numbers and punctuation randomly. ***Random Message*** -- sends a plain English message exactly as given on an FCC test or received on the air. ***Message Store*** -- lets you enter a message from the keyboard and store it for sending. ***Direct Keyboard*** -- lets you send code directly from your computer keyboard. Use normal or Farnsworth spacing. Sample test in manual.

It can be used with ARRL's "Tune in the World" course or with MFJ supplied code learning course. It is designed for both individual study or classroom use. You also get Screen Blanking for simulating actual tests.

MFJ-1286 Gray Line DX Advantage

super display software for your computer shows you when to snag rare DX for only . . . $29.95

Snag rare DX for only $29.95!

The MFJ-1286 Gray Line DX Advantage is a computerized DXing tool that predicts DX propagation. Even the casual DXer can work rare DX by knowing exactly when conditions are best for DX.

You get a high resolution world map that continuously displays the Gray line as a moving area of day and night that changes with time as it tracks the movement of the earth.

The Gray Line is the day/night divider line where the most amazing DX happens every day. With the new MFJ Gray Line DX Advantage you'll know exactly when to take advantage of the Gray Line.

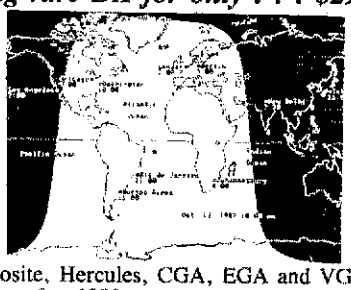
The MFJ-1286 Gray Line DX Advantage gives you a detailed world map that shows you the moving Gray Line, the position of the sun over the earth, UTC times, time zones and latitude/longitude markers.

You can customize the world map to display time and location for any of QTHs in the world. It makes DXing and SKEDs precise and easy.

This new MFJ DX software for your IBM or compatible computer gives you instant access to a Geochron® style world map.

You can run it by itself or memory resident in conjunction with your ham header, word processing, communications or other software. It works

MFJ-1286
$29.95
Shipping Code A



with all graphics: composite, Hercules, CGA, EGA and VGA.

You can enter any date after 1980 to set your Skeds for any time in the future. Or you can check solar/Gray Line positions from past QSOs to answer questions about particularly good or bad RST.

Or use it to Sked your next DX-pedition by determining Gray Line times at the QTHs you plan to work.

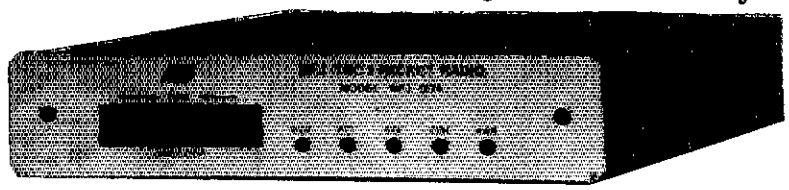
Get the most from your station ***and*** your PC. Get the MFJ Gray Line DX Advantage. You'll be glad you did.

MFJ VHF/HF TAPR Clone Packet Radio Controllers

You get more features than with any other packet controller -- the new Easy Mail Personal Mailbox, HF/VH Modems, WeFAX reception, KISS, a one year unconditional guarantee and more for only . . . $139.95

Now with:

- ***Easy Mail™***
- ***WeFAX***
- ***KISS***
- ***32K RAM***



MFJ-1274

$159.95

Shipping Code B

MFJ-1270B

$139.95

Shipping Code B

MFJ-1270B super clone of TAPR's TNC-2 gives you more features than any other packet radio controller -- for an affordable $139.95.

You can double your fun by operating both VHF and HF packet because you get high performance switchable VHF/HF modems.

You also get the new Easy Mail (tm) personal Mailbox with soft-partitioned memory so you and your ham buddies can leave messages for each other 24 hours a day.

In MFJ's new WeFAX mode you can print full fledged weather maps to screen or printer and save to disk using an MFJ Starter Pack.

A new KISS interface lets you run TCP/IP. They also come NET ROM compatible -- no modification needed.

You also get 32K RAM, socketed ICs, true DCD for HF, 256K EPROM, speaker jack, lithium battery backup, RS-232 and TTL serial ports, a cable to connect your transceiver (you have to add a connector for your particular radio), easy operation, a one-year unconditional guarantee plus much more. Use 12 VDC or the included 110 VAC power supply. Measures 9½ x 1½ x 7½ inches.

If you have a Commodore 64, 128, VIC-20, Macintosh, IBM or compatible you can use an MFJ Starter Pack to get on the air instantly

Your MFJ Starter Pack includes interface cable, software on dis or tape and complete instruction . . . everything you need . . . orde MFJ-1282 (disk)/MFJ-1283 (tape) for the C-64/128/VIC-20, MFJ-128 for IBM or compatibles, MFJ-1287 for Macintosh, $24.95 each.

IBM or compatible users can get a new Picture Passing Mode wit any MFJ TNC and new MFJ-1288 Picture Transfer Software, $9.9

For dependable HF packet tuning, the MFJ-1274 gives you a hig resolution tuning indicator that's accurate to within 10 Hz -- and it only $20.00 more.

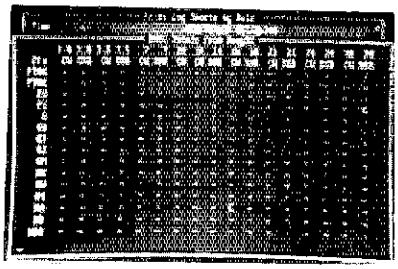
Don't settle for a limited single function TNC. Choose from the onl Packet Radio Controllers that give you everything and more at an af fordable price. Choose your MFJ-1270B or MFJ-1274 today!

MFJ-1272, $29.95. ***TNC/Mic Interface Box.*** Lets you connect you TNC and microphone simultaneously.

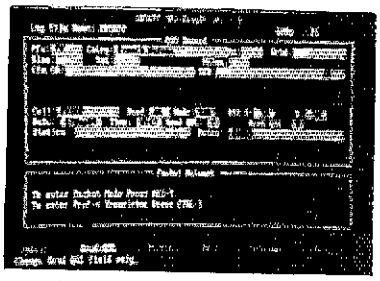
MFJ-1273, $49.95. ***20 LED Tuning Indicator.*** MFJ clone of TAP Tuning Indicator. Shows you which way to tune. Works with a TNC-1s, TNC-2s and clones with the TAPR tuning indicator connecto

MFJ Easy-DX™ DXCC Log/Terminal Program/PacketCluster™ interface

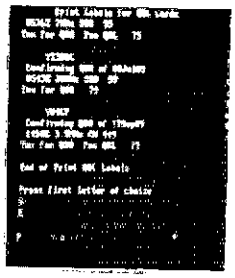
Earn your DXCC with new MFJ Easy-DX™ software. It's the only logging software that keeps up with you DXCC activity and helps you get new countries . . . plus you get a packet terminal program and PacketCluster™ DX spotting network interface for just . . . $39.95.



You can print your DXCC totals by band and mode



You can update any listing after a QSL is received



MFJ Easy-DX™ prints handy QSL card labels for you

NEW

MFJ-1281

$39.95

Shipping Code A

Get your DXCC award with this incredible new MFJ software for only . . . $39.95.

In a Digital Digest review of the beta version of this incredible new MFJ software, Peter G. Smith, N4ZR says that MFJ Easy-DX™ "has the potential of being ***the single indispensable program for any DXer with a computer.***"

Why? Because MFJ Easy-DX™ is a unique tool that instantly organizes all of your DXCC activity ***plus*** you get a packet terminal program and a **PacketCluster™** (Pavillion Software) interface so you'll get the ***latest DX*** information.

You can enter any call and it tells you at a glance whether you need that country on the band, the mode or both. It also tells you if you've worked the station before. Plus it gives you a list of contacts with the country, including bands, modes, and QSLs. -- so you can get the station to QSY to the band you need him on.

When you enter a call or prefix it tells you the country, azimuth to the (or a) major city and the sunset/sunrise times at that QTH.

You can import logs from the popular CT logging program so that you can easily bring your contest QSOs in for DXCC honors. It even keeps up with your QSL activity.

Packet radio users get a built-in terminal program. MFJ Easy-DX™ will monitor the PacketCluster™ DX spotting network, and send "DX" in Morse code through your computer speaker if a country you haven't worked on the band, mode or both is reported on the network. You don't even have to be at your computer -- so long as you're within earshot of the speaker.

You get two packet screens. One is a receive only screen that is displayed along with the MFJ Easy-DX™ program so you can monitor any packet channel while you log your SSB and CW contacts into the MFJ Easy-DX™ program. The other screen is a send and receive screen from which you use the packet terminal program that is built into MFJ Easy-DX™. You also get a built in utility to set your function keys for customized packet operation.

MFJ Easy-DX™ also prints QSL labels, keeps up with your outstanding QSLs, prints you a summary of DXCC activity by band and mode, prints out log sheets, lets you update your log as QSLs are received and more.

DXCC is within your grasp. Let MFJ's incredible new MFJ Easy-DX™ program help. MFJ Easy-DX™ comes on two 5¼ inch disks. It requires a 100% IBM compatible computer with 512K RAM. Hard disk strongly recommended.

Get new MFJ Easy-DX™ today. You'll be glad you did.

MFJ "Picture Perfect" Video Digitizer

. . lets you instantly create fascinating digitized snapshots of anything you can point your camcorder at . . .
. you'll quickly build an impressive collection of your very own digitized snapshots saved on disks that you can ansmit to your ham buddies with your MFJ-1278 or any other packet radio controller . . . $199.95

Here's Rob, MFJ Customer Service Manager, tuning up his MFJ-989C.

Here's Aimee playing with Rob's sunglasses. They look better on her.

Here's Aimee relaxing after a busy morning.

NEW

MFJ-1292

$199.95

Shipping Code A

he above unretouched pictures were shot directly from a VGA monitor. We digitized them with a amcorder, MFJ-1292 "Picture Perfect" Video Digitizer and an IBM compatible computer.

Create fascinating VGA, EGA, CGA and Hercules digitized snap-ots of ***anything*** you can point your camcorder at!

The MFJ-1292 "Picture Perfect" Video Digitizer connects your deo camera or camcorder to your IBM or compatible computer. It s you instantly capture fascinating digitized video snapshots on a ppy or hard disk.

Your MFJ-1292 package includes a plug-in card for your computer, mplete software package and instructions for only . . . $199.95. **As** an added bonus you get a handy Contrast and Brightness Con-l unit that you can conveniently place near your keyboard for fine ing your pictures.

You'll quickly build an impressive collection of your very own gitized video snapshots saved on disks.

Use your MFJ-1278 to transmit your digitized snapshots

Your MFJ-1292 software package includes the MFJ-1288 MFJXFER ogram that lets you transmit and receive high resolution EGA and GA pictures via packet radio.

When a picture is transmitted it is automatically received, saved to sk and "painted" to screen at the receiving station.

Pictures in other display formats supported by the MFJ-1292 – VGA d Hercules -- can also be transmitted using the binary file transfer ature. Pictures can also be captured in a "Raw Data" format for er conversion to a specific graphic format.

A Complete Software Package

Your MFJ-1292 "Picture Perfect" Video Digitizer comes with a mplete software package that insures you get the most from your-gitizer. In addition to your main digitizer program, you get a utility that lets you capture and save many EGA and CGA screen graphics from other programs, a program that lets you convert these graphics to PCX, SSTV and other graphic formats, and the MFJ-1288 MFJXFER Picture Passing Software (see below) that lets you transmit and receive packet pictures.

Enhance your digitized snapshots with drawing or paint software

Once you have a digitized snapshot saved on disk, you can use virtually any drawing or paint program to edit the picture, enhancing details, adding colors, lettering, other graphics, and more -- limited only by ***your*** own imagination.

You can "paint" red lips, blue eyes or other colors onto your digitized snapshots. Or you can import graphics and lettering and create your own QSL cards -- that you can transmit to your contacts via packet radio. You can also do fun stuff like putting your head on Mr. America's body, put yourself in a Rolls Royce, or just about anything.

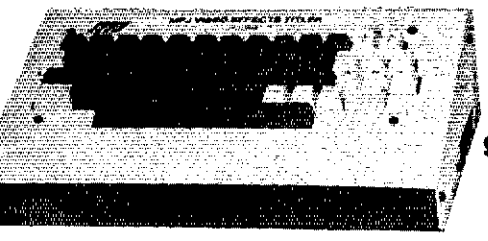
You can use your digitized pictures directly in your desk-top publishing program that uses the popular PCX format.

Unlimited Potential

Look around you . . . with the MFJ-1292, anything you can see could become an exciting computer graphic with your camcorder and the MFJ-1292. And you can edit, enhance, add color and more to your pictures with your drawing or paint software.

Now you won't be limited by the graphics that are available from other sources. Now you can use the new MFJ-1292 "Picture Perfect" Video Digitizer to create your own graphics -- graphics that are better than any others because they fit ***your*** special needs. Get a more versatile computer with MFJ-1292. You'll be glad you did.

IFJ Video Effects Titlers



MFJ-1480B

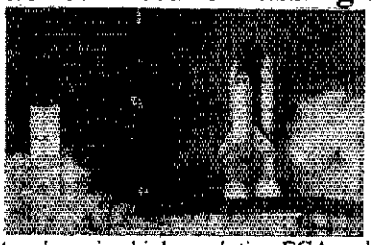
$599.95

Shipping Code D

The MFJ-1480B Video Effects Titler lets you superimpose color es over a camera image or add titles to existing video footage while iting. You can store up to 30 pages of titles in the VET memory. ch page will display up to 28 small or 14 large characters in upper d lower case. You get up to 15 vivid colors for each line and ckground page. You also get lithium battery memory saver, direct ge access, auto centering, object highlighting keys and scrolling. **Digitized** pictures created with the MFJ-1292 "Picture Perfect" deo Digitizer can be immediately titled with this MFJ-1480B Video fects Titler. The MFJ-1480B will provide power to your video camera you can simultaneously connect your camcorder, your MFJ-1292 gitizer, your MFJ Video Effects Titler and your computer.

The MFJ Video Effects Titler is the perfect addition to your deo/computer/digitizer set up. Get yours today!

MFJ Packet Picture Passing Software



NEW

MFJ-1288

$9.95

Shipping Code A

Transmit and receive high resolution EGA and CGA color pictures via packet with MFJ picture passing software.

Beautiful color pictures are automatically received, saved to disk and "painted" to screen.

Pictures are compressed as they are transmitted - so you get true high speed picture passing.

You can save to disk any CGA picture you can see on your screen.

You can set up your own picture bulletin board and exchange pictures with others -- even if you're not there.

Lets's help spread picture passing throughout the world and create a new world standard Get this ***powerful*** software for just . . . **$9.95.**

MFJ-1288 works with virtually any packet radio controller and IBM compatible computer. It's included ***free*** in the MFJ-1284 IBM Starter Pack. If you have an early version of MFJ-1284 you can get an upgrade MFJ-1284 disk for proof of MFJ-1284 purchase, $9.95 and $2 s/h.

MFJ gives you *all 9* digital modes

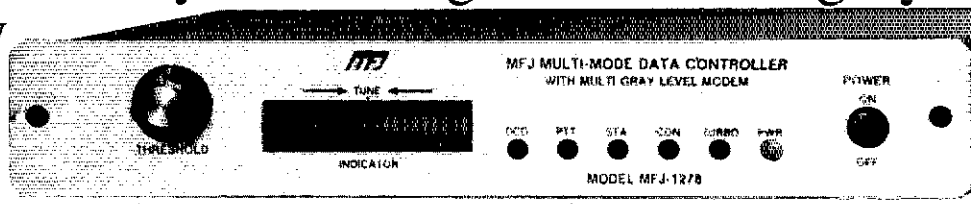
and *keeps on* bringing you state-of-the-art advances

. . . while others offer you *some* digital modes using 3 yea old technology

MFJ-1278

$279.95

Shipping Code C



No 3 year old "NEW" technology at MFJ!

Using the latest advances, MFJ brings you 9 exciting digital modes and *keeps on* bringing you state-of-the-art advances.

You get tons of features other multi-modes just don't have.

Only MFJ gives you *all 9* modes

Count 'em -- you get 9 fun modes -- Packet, AMTOR, RTTY, ASCII, CW, FAX, SSTV, Navtex and full featured Contest Memory Keyer.

You can't get all 9 modes in *any* other multi-mode at *any* price. Nobody gives you modes the MFJ-1278 doesn't have.

The best modem you can get

Extensive test in ***Packet Radio Magazine*** prove the modem used in the MFJ-1278 operation copies HF packet more accurately than all other modems tested.

The MFJ-1278 is the *only* multi-mode with a ***true*** DCD circuit for HF. This dramatically reduces sensitivity to noise and dramatically increases completed QSOs.

Built in Printer Port

Only the MFJ-1278 has a dedicated printer port that lets you plug in your Epson or IBM compatible printer. You don't need to buy an optional $40 cable just to plug your printer into your multi-mode.

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!

New MFJ technology prevents collisions: gets packets through faster

MFJ's new Anti-Collision technology gets packets through faster.

How? Automatic random transmit delays prevent packet collisions.

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.

Only MFJ can transmit FAX . . .

Most packet stations can *receive* FAX

But only the MFJ-1278 lets you *transmit* FAX without internal modifications that disable other modes.

So now you can send your own high resolution pictures, maps and diagrams by FAX to stations throughout the world.

Too bad they can't send theirs to you . . . *unless* they disable other modes

One FREE Upgrade!

When you buy your MFJ-1278 *today*, you don't have to worry about missing 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 interfac or dumb modem, independent transmit level for each radio port, random code generator, lithium battery backup, RS-2 *and* TTL serial ports, *standard* 850 Hz RTTY shift, socketed ICs, tune up com mand, peripheral I/O port, automatic serial numbering, programmable messag memories, dual radio ports (*each* HF o VHF), CW key paddle jack, speaker ja that lets you monitor CW sidetone, transmit and receive audio and packet connect bell, *Fast Start*™ instructions a much more -- all in a sleek 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 r any computer and a terminal program.

With an MFJ Starter Pack, $24.95, j just plug it all in, wire up your mic co nector and you're on the air.

Order MFJ-1282 (disk)/MFJ-1283 (tape) for C-64/128/VIC-20; MFJ-1284 for IBM compatibles (includes Picture Passing); MFJ-1287 for Macintosh.

No Matter What™ Guarantee

You get MFJ's full one year No Mat What™ Guarantee.

That means we will repair or replace your MFJ multi-mode (at our option) *n matter what* happens to it for a full yea

Others give you a *limited* warranty. What do you do when *they say*, "*Sorry your limited* warranty doesn't cover *tha*

Get 9 new ways of having fun

Don't settle for 3 year old technology

Choose the only multi-mode that give 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 check a 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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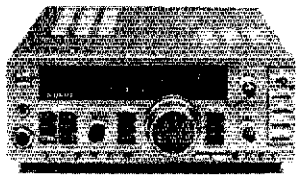
TS-440S TS-140S



TH-75A
2M/70CM DUAL BAND HT

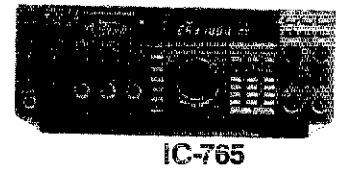
TEN-TEC

OMNI V

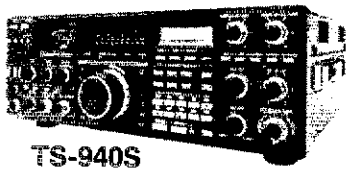
IC-32AT

IC-725

IC-2GAT
IC-4GAT



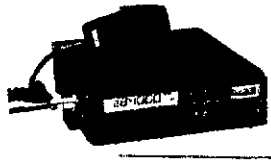
IC-765

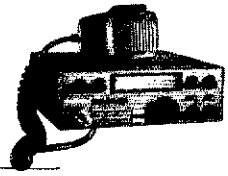


TS-940S

RANGER Communications, Inc.

uniden





RCI-2950 10-Meter Mobile Transceiver

IC-228A

Remote coax switch

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 8¾" W x 4½" D. **Kit HD-1481**

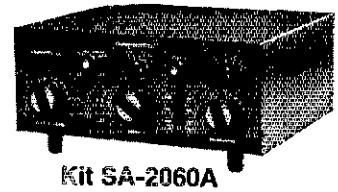
Heath Company

Heath cantenna dummy load

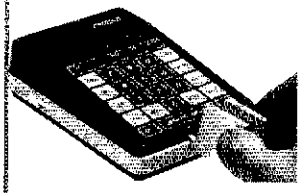
Eliminate unnecessary QRM during tune-up and minimize mistakes while performing hot gear maintenance or alignment. Handles 1 kW of RF with VSWRs less than 1.5:1 up to 450 MHz. Requires 1 gallon mineral or transformer oil.
Kit HN-31-A (3 lbs.) **$24.95**

DeLuxe antenna tuner

Power inputs up to 2000 watts PEP on SSB and 1000 watts CW.



Kit SA-2060A



Revolutionize your CW with the programmable Amatic memory keyer

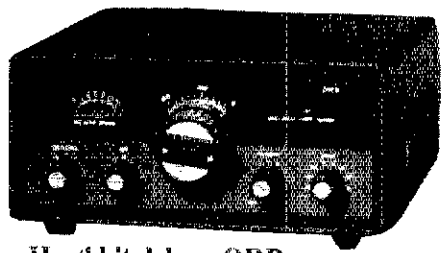
Add programmable excellence to all your CW. Patented command strings let you store text in buffer; select speed, weight, spacing or message repeat count for each; and link them together in any sequence. A special editing feature lets you correct programming errors. Enter text and send with any setting you wish. Text can be added into a buffer message being sent. CMOS memory with battery backup retains the buffer contents and last selected setting when the keyer is without power. 1¾" H x 4⅛" W x 6" D. **Kit SA-5010-A** (3 lbs.)

5W Dual Band Handheld Transceiver
Assembled HWS-24-HT

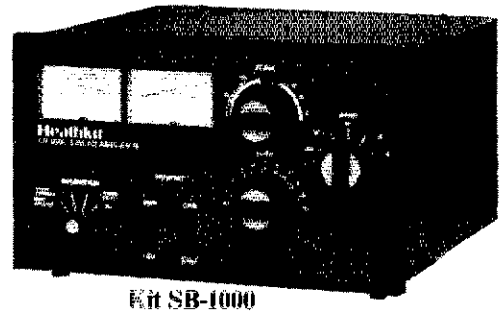
Pocket packet TNC

Assembled HK-21

Get high performance from the Heathkit 1000W linear amplifier



Heathkit deluxe QRP CW transceiver **Kit HW-9**



Kit SB-1000

YOU had to originate traffic in an emergency would you know what to do? An emergency is no time to learn.The area SKYWARN nets will be getting a revised training syllabus that should be ready for next spring. ACC N1GTB is planning to revive CEMARC, the coordinating club for clubs. Each club should have received info on this meeting by now. It is vital that someone from each club attend. WA1TBY is looking for a few good hams to check into the afternoon HF traffic nets. If you are around, contact Jim. This is also the flea market season. I will be at Deerfield, MIT and Framingham. Hope to see you there. The Boston Computer Society Ham Radio Special Interest Group is rolling right along. In December they will be the Host to Wayne Green. If anyone is interested in attending Wayne's talk, it will be on December 5th. The American Red Cross Club is also growing and has some interesting events planned. Welcome back to all the college students!! If any clubs are looking for speakers, The section cabinet is available. Contact N1GTB or myself if you are interested. If you are interested in satellites, but have not tried it yet, the launch of 6 "micro" Sats in November should be quite a motivation. If you are going to have classes this fall, please let N1GTB know so she can keep a data base to refer potential hams to a nearby class. 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: KA1PEP 30, KA1NOI 8, N1AJJ 25, AA1GEP 103, KA1RCY 55, KA1AMR 12, KA1MDM 24, N1FWV 16, K1ABO 34, K1UGM 824, W1CE 91, K1GGS 107, N1FLO 89, W1TBY 379, KA1DJV 24, WA1FNM 99, KB1EB 2, KB1AF 219, K1SEC 6, K1UEB 9, WA1CRE 18, KA1EDY 10, N1CVE 131, N1FWV 16, W1TC 107, K1BZD 18, KW1U 353, KA1KCU 1.

MAINE: SM, Ted Bonesteel, WA2ERT—The Maine Public Service Net meets 0900 Sundays 3940 kHz. It's now a full Section Net handling traffic, discussions, training, and possibly drills. The fourth Sunday will be the Maine On-the-Air ARRL Cabinet meeting. All of you are encouraged to participate in all sessions. There is now a monthly ARES Newsletter being sent to DEC/EC's, section officials, and club secretaries. All clubs are asked to publish the contents in your newsletters to provide maximum dissemination throughout Maine. The Pen Bay ARC provided comms for the New Hope for Women Bike Trek Aug 26/27. N1AKP and N1EXD participated at RR tank car acid spill in S. Portland on Jul 15. Station Act: W1KX 197, KA1REB 74, WA2ERT 73, W1JTH 70, NR1F 51, ND1A 39, K1UNQ 38, KA1ODT 32, W1VEH 31, W1BMX 23, WA1YNZ 20, KA2ZKM/1 11, N1BCF 10, and W1OTQ 5. Nets (Sess/QNI/QTC/Mgr): Pine Tree/31/313/118/W1KX; Sea Gull/27/830/107/K1GUP; Kennebec ARES/5/66/1/KA1LPW; Central Maine Emergency/9/213/16/N1DZI; Cumberland ARES/4/49/1/KA1ODT; Aroostock Emergency /5/108/9/ WA1YNZ. Register with your County Emergency Coordinator, get involved with ARES/RACES, and participate in the Section and local nets. Remember, Public Service is a major part of Amateur Radio.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE- PIO:WA2MBQ. SEC:K1ACL. Summer is behind us and Amateur activities are on the upswing around the section. GBRA announced a new net started by some of the new licensees on the 10M band. According to NCS, KA1CUC indicates that the net is designed to help new hams get familiar with procedures and terminology and to help with technical problems. They are also working on getting some CW training going. The net meets each night at 8 PM (local) on 28.405. The Lakes Region RA scribe W1LIM reports that the club had a great cookout at Hugh's camp with 35 people attending. Apparently, none of the hotdogs or hamburgs survived the event! A note to all who worked on the Tour de Sol solar car race this year—the race planning efforts for 1990 have begun and we have been asked to participate in planning the route and to address safety concerns. They are planning on 30- 40 cars next year, so it will be a much bigger event! If you are interested in working on the planning phase of this project, drop me a note. More summer fun—CVRC members and family enjoyed a family fun day at the QTH of NR1N. And Dale KW1I gave his award winning AM slide presentation to the club August meeting. IRS Pres WB1HBB reported that their annual "breakfast" outing was a lot of fun with lots of eggs, bacon, muffins and coffee disappearing in the process! And the IRS is resuming monthly fox hunts. Here is a good activity to involve new hams. They get experience in antenna building, DF techniques and mobile operations. Welcome to the new Ascutney Repeater Assoc officer: Pres-Cal W1JFP, Sec/ Treas- Carl N1CB. Twin State RC will be moving its meeting location as the Montshire Museum in Hanover is relocating to new quarters. For more information, contact club pres KA1CRP. And congratulations to Charles Wallace W1IIB and the T-9 club on their 50th year as an ARRL affiliated club! NARC board member WA1UXA reports on a cooperative project at the Nashua Red Cross which involved station installation, EMI reduction, and new antennas. Hams involved in the ongoing project include NARC board members WA1UXA, KA1OKQ, NO1V. Field organization OO KC3NG and Red Cross Disaster Chairman N1GSN. EC KA1GOZ says that NARC now has new status with local police and fire agencies in major HAZ-MAT situations. This will involve inter-agency communications via portable packet stations. Have you thought about helping us in the Field Organization in serving your fellow Hams? The FO provides a variety of services to the Amateur community in the areas of technical, operating, and club support. We have a wide range of appointments available and if you would like more information, contact me via telcon, mail or packet via KB4N. On the traffic front, the new VTNH combined net is rolling along with 225 check-ins in 31 sessions in August. W1ALE and W1PEX had the highest check-in rates for the month. The NH section had 100% representation on FRN/2 and 1RN/3. Thanks to the ops who expended the time and effort to make this happen! August 1989 NH NTS Summary: Nets: VTNH 288, GSPN 138, GSFM 87. Traffic: W1PEX 2329, KB4N 1347, N1CPX 415, W1FYR 286, K1TQY 196, KA1ROH 67, W1ALE 54, KK1E 51, N1ALM 32, KA1HPO 11, WA1YZN NU1A KA1SXM 6, KA1GOZ 3, NE1J KA1LMR 2, KA1KFX 1. BPL: W1PEX, KB4N. PSHR: N1CPX, W1PEX, W1ALE, KA1HPO/T.

RHODE ISLAND: SM, William Foss, KA1JXH—NRIRC provided communications for the big apartment fire in Cranston on Aug 26th. 6 ops from the NCRC furnished communciations for the "Velo" Bike Race on Aug 13th, thru Middletown and Portsmouth. 74 bikers in a 10.3 miles speed-timed race. On Aug 5th & 6th. OSARG provided communication for Shake-

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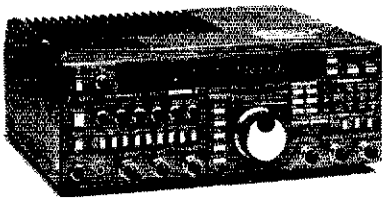
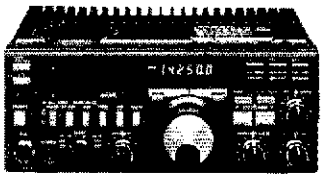
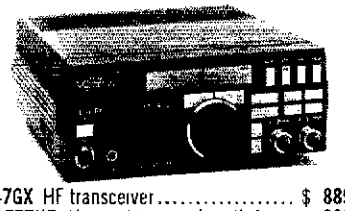


HF Transceivers	LIST
FT-767GX 160-10m xcvr/.1-29.99 MHz Rcvr	$2299.00
2M/767 2m module	239.00
6M/767 6m module	196.00
430/767 430-440 module	296.00
440/767 440-450 module	296.00
SP-767 Speaker w/audio filters	99.00
SP-767P Speaker/phone patch	136.00
FAS-1-4R Remote antenna selector	120.00
FIF-232C Interface	95.00
FTS-8 Encoder/decoder	55.00



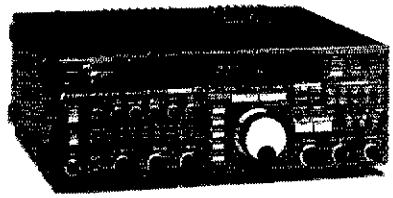
FT-757GX MkII 9-band xcvr/SW rcvr/mic	$1280.00
FP-757HD Heavy duty supply with fan	309.00
FP-700 Power supply	244.00
FC-757AT Automatic ant. tuner w/memory	429.00
FAS-1-4R Remote antenna selector	120.00
SP-767 Speaker w/audio filters	99.00
SP-767P Speaker/patch	136.00
FRB-757 External relay box	14.00
MMB-20 Mobile mount	26.00



FT-747GX HF transceiver	$ 889.00
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 Auto. tune HF linear amplifier $2279.00

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 full duplex xcvr	$2025.00
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-212RH 45w 2m FM w/autodial mic	$ 499.00
FT-712RH 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-4700RH/YSK 50/40W 2m/440 FM/TTP	960.00
AD-2 50w 2m/440 duplexer	48.00

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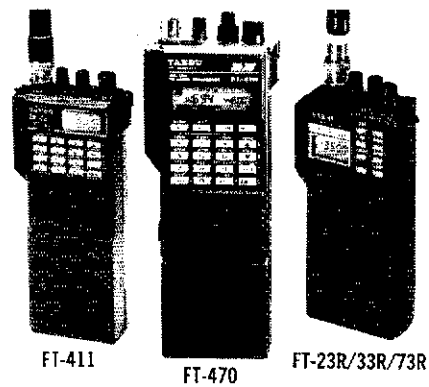
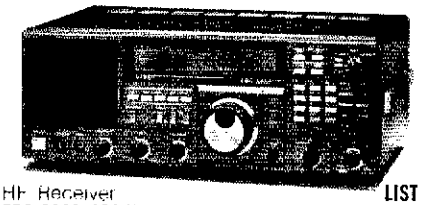
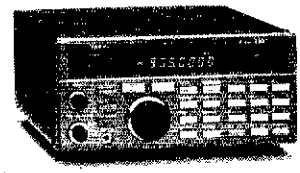


FT-411 FT-470 FT-23R/33R/73R

VHF/UHF Handhelds	LIST
FT-411 2.5W 2m FM HT/TTP/batt/cgr	$ 406.00
FT-811 440MHz FM HT	410.00
FT-470 2m/440 FM HT/batt/cgr/TTP	576.00
FT-23R 2.5w 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 compact HT w/TTP	355.00



HF 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
FF-5 500 kHz low-pass filter for VLF	40.00
DC-8800 DC kit	4.00
FM-W/8800 FM-wide kit	21.00



VHF/UHF Receiver	LIST
FRG-9600 60 to 905 MHz receiver	$ 609.00
VU-9600 NTSC video unit	25.00

Antenna Rotors	List
G-500A Heavy duty elevation rotor	$249.00
G-5400B Azimuth/Elevation rotor combo	473.00

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a-Leg foundation at Fort Adams in Newport for people with spinal cord and related nervous systems impairments. OSARG had its summer outing at Buttonwoods Park in Warwick. OSARG also manned an Amateur Radio booth at the Rocky Hill State Fair. Traffic: W1EOF 258, KA1KML PSHR 65, KA1JXH 165 PSHR 81. Wish everyone a nice Thanksgiving.

VERMONT: SM, Frank Suitor, W1CTM—SEC: K1LOO. STM: KT1Q. TC: W1AIM. SGL: WB1AJG. Old SMs don't fade away, they just keep coming back! I am very pleased to again represent you as your SM. I wish to thank N1CQE (Jon) for his service to all VT hams during his tenure as SM and wish him all the best in his new job assignment in 4 land (Tampa, FLA). I am pleased to announce that K1LOO (Tom) has been appointed as your Section Emergency Coordinator (SEC). Tom's service/experience as an EC/DEC under W1KRV (Joe) well qualifies him to assume this position. Tom's first issue of "The Communicator" should be out shortly and our section's participation in the October "SET" has helped to prepare us for any winter actual emergencies. The Border ARC picnic held at Newport's Prouty Beach provided an excellent opportunity to renw old friendships as well as make new ones. It was especially nice to visit with Quebec SM VE2BP (Harold) and his XYL VE2WH (Anne). VE exams were given by K1ADQ (Al) and his very able team of WA1HSG (Bob), WA1JVV (Tom), NK1A (Esther), NJ1Z (Henry) & K1WML (Bob). This same team also gave exams on a very short notice at the Burlington ARC hamfest when the WB2JSJ team was not available. Congratulations to the following new officers of the Border ARC- WB1DSD (Arnie) President, KA1QZR (Jim) VP, KA1KHA (Rachel) Sec'y/Treasurer. A new club has been formed in the North Central Part of the State. The club name is Amateur Radio Associates (ARA) and club info is available from KC1BT (Ray). They have already provided public service support for the Waites field bicentennial and other town parades—keep up the good work! The annual Burlington ARC hamfest held at the fairgrounds in Essex Jct. was attended by 600+ hams. ARRL was very well represented by our man at HQ KC1MP (Shel) who appeared to be doing a brisk business in ARRL publications all day! A familiar face in the crowd was our former SM/STM AE1T (Peter)—If you ever decide to come back, we have a job for you! The latest issue of the UNBARC news has been circulated in the Burlington area & rumor has it that the editor is none other than WB2JSJ. Tnx, Mitch, for bringing your Brooklyn sense of humor to us in the North Country! New officers for the Burlington ARC include N1EXY (Tom) President, KA1LEX (Randy) VP, WA1CZE (Phil) Sec'y WA1UVW (Jim) Treasurer. GMWS (Rutland) reports the possibility of a Soviet exchange student obtaining his ham ticket while attending Burr & Burton Seminary. Central VT. ARC's fall foliage hamfest held in Berlin on 9/24 gave us all a chance to leaf peek and look for that big flea market bargain at the same time. This first annual CVARC fest was very successful and adds another opportunity to share our hobby with fellow hams. The latest rank and file info on how you feel about the no-code license is running 3 to 1 against. Please let me know how you feel on this very critical issue so I may better represent you. Section gov't liaison (SGL) WB1AJG (Bob) has done an outstanding job on obtaining state legislative approval for special amateur auto license plates. Now all hams can have their calls on special plates. Bob has worked tirelessly to achieve this goal, and we all say thanks! Our section had 100% representation on 1RN/3, 98% on 1RN/2 & 3 during 8/89. Section traffic report: WA2SPL 1215, KT1Q 474, N1GMU 316, WA1JVV 236, N1DHT 220, KC1KI 192, NB1A 97. Section Net report: VTNH 31/225/288, VTPHN 4/67/5, GMN 27/520/37, CAR 27/534/42, CVFMN 4/65/6, TSFMEN (ASCUTNEY) 5/75/2, TSFMEN (KEENE) 6/69/9. Happy Thanks Giving To All!

WESTERN MASSACHUSETTS: SM, Bill Voedisch, W1UD—OO/RFI: N1CM. PIO: K1BE. SEC/SGL: WB1HIH. TC: KA1JJM. STM: W1KK. I've been asked by many members of this section why our traffic handlers are decreasing. Some traffic nets have little or no traffic. New amateurs that check in and receive no traffic after many tries lose interest and are suddenly gone. Their interest in traffic could have been nurtured and expanded. One solution to this problem would be an even distribution of traffic. I see the reports of multi-hundred totals and wonder what the totals would be if the "high rollers" and everyone in the system would have to handle traffic on a tri-mode basis. One third on CW, phone and automatic mode (PACKET, RTTY, AMTOR, etc.) I'll bet the traffic would flow just as well but it would accomplish a multitude of things. First, it would train more operators. Second, there would be more participants in the nets as there would be more traffic for each member. Third, packet channels would be less crowded and operate more efficiently with less "hits." Fourth, more newly licensed would get a chance to handle "live" traffic. Fifth, traffic handlers would be equally trained in all modes of communications. Sixth, the multi-hundred traffic counts would take on a realistic figure. Remember, we are not in competition with "Western Union." The live traffic we handle is supposed to be used for training for a backup national communications system. Drop me a line and tell me what you think of this idea. My PMS on .07 is on 24 hours a day. You can find me on phone and CW traffic nets. I am already tri-modal. Traffic handlers got away from their keys and mikes and attended a picnic at Look Park in Northampton. Even the weather was in our favor and everyone enjoyed the day. Under the able guidance of WB1HIH, the Yankee/Rowe Nuclear Emergency Test went off without a problem. There were 152 check in stations and 21 simulated emergency messages were passed in 5 1/2 hours. This exercise was held together by KA1IFC acting as NCS. Overview: A great job done. Congratulations all. Traffic: KA1IFC 762, W1SJV 273, KA1EXJ 162, KA1RVN 77, KA1QFV 75, W1KK 65, W1UD 212, WB1HIH 51. NX1K 41, K1JHC 25, W1ZPB 8, KC1DI 8, W1GQP 6, KA1TDL 6, WA1OPN 4.

NORTHWESTERN DIVISION

IDAHO: SM, Don Clower, KA7T—ASM: K7REX, SEC: N7MAL. STM: W7GHI. OOC: WB7CYO. ACC: N7BI. PIO: WG7E. Idaho hams have much to be proud of this month. The month of August brought many large forest fires to our state. We were asked to help with communications by the National Forest Service. Idaho hams responded by going to 4 of the largest fires in the state and staying at these fires for nearly 3 weeks. Tremendous effort and self sacrifice by these hams brought us a great deal of public recognition. Several hams really put forth a huge effort and I would like to thank them. Lem, W7JMH. Ken, W7NPO. Leona, KA7KPZ. Dave, N7MAL. Ron, KE7RT. Mike, K7QQP. Ron, KE7RT, made BPL with this

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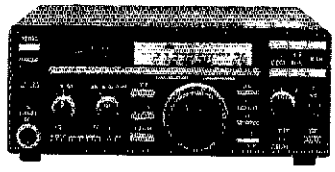

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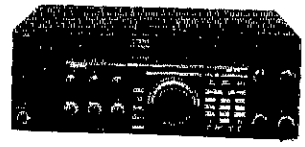

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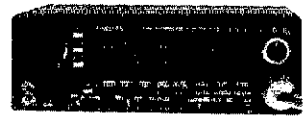

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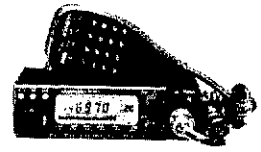
- 2 Meter Transceiver



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- 2 Meter Mobile

FT 747 GX
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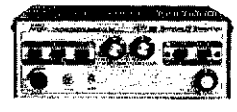

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tremendous effort from the Warm Lake fire. A story about the fires with pictures has been sent to the ARRL, hopefully they will publish it in QST. Again, TNXS to all who helped! 73s Don. Traffic: KE7RT 563, W7GHT 364, W7NPO 262, N7MAL 226, W7JMH 168, W7ASA 134, WS7U 118, KA7WZM 88, KA7T 37.

Net	Sess	QNI	QTC	Mgr.
FARM	31	2065	175	WA7GSM
NWTN	31	733	20	WA7VAO
ID CD	23	709	14	K7UBC
IMN	31	278	190	KA7EEE

MONTANA: SM, Pete Peters, KF7R—ASM: WB7QDN, WA7PZO. SEC: KS7R. STM: W7TGU. OOC: W7DEO. ACC: KC7A. SGL: KY7I. TC: K7YD. PIO: K7BFJ. BM: WA7TUW. DCM: KE7TB. New digipeater east of Kalispell, K7LYY. 2 Silent Keys, N7CHV, Joe Gates, K7CZN, Al Johnson. Congrats to Bob Lydiard on 50 year pin from QCWA Bob was first licensed June 13, 1939. Novice: Bob Monrow, Leo Skiorka, Patrick Kujawa, Regina Wumsch. Tec: KB7FWX, KB7HVK, KB7HFN, KB7FPK, K7HPA, KB7HPK, KB7HPV, KB7HRL, KB7HRD, KB7HSU, KB7HXB, KA7JMH and Bert Richerdson. Extra: N7NIN, KF7TM. Traffic: KA7YYR 123.

NET	SESS	QNI	QTC	NET MGR
MTN	31	1391	100	N7AIK
MSN	4	57	1	KF7R
IMN	31	278	190	KA7EEE

OREGON: SM, Randy Stimson, KZ7T—ASM: KM7R. ASM: W7FBP. STM: W7VSE. SEC: KV7F. PIO: KC7YN. SGL: KA7KSK. ACC: WF7Q. OO: WN7W. STC: N7ENI. Radio operators of Khabarovsk in Russia, a sister city of Portland, have invited radio operators of Portland to visit and participate in the Radio Sport Games. Six area hams are going - Kevin Hunt, WA7VTD, Dick Fredrickson, WAØDIM, Rena Berblinger, KX7Z, Larry Warner, K5SNA, Dave Wright, N7MYO and John White, K7RUN who is taking his wife, Rose, and daughter, Elizabeth. Randall Schaub, WA7AWJ will act as their QSL Manager. Our hams have permission to give the Russians the U.S. VE test and will issue special call signs. Lane County has been divided into two EC jurisdictions - East and West Lane County. The new Emergency Coordinator for the western section is George, WA7SMZ. Shortly after his appointment, there was a telephone outage and he had to activate his group. What a great way to get started. Congratulations George and welcome to the ARES group. Traffic (P) = Packet W7VSE 569, WT7A 549, WG7H 350, KA7EEE 312, WX7A 277, WB7VMS 246P, N7BGW 234, W7LNE 73, N7DRP 58, W7ODG 39, KA7AID 26, KA7DEF 14, KA7WFW 12, Late July WG7H 196, WT7A 154, WX7A 54.

EASTERN WASHINGTON: SM, Tom Plaisance, KC7PH—STM: W7GB. SEC: WA7CBX. OOC: W7LKR. ASM: KC7MM. ACC: NQ7M. SGL: KD7AC. TC: W7DBV. ASM: KE7WG. Who in the section operates low power UHF? Contact the SM with that info. Don't forget the SET, get involved with your local ARES. Sorry to report SILENT KEYS WA7RSQ Mac McKnelly and N7FWV Larry Shane from the Spokane area. Contact Jim Follansbee, NY7T, for VEC testing in the Tri-Cities area. Ron Smith, W7IGC, was presented a plaque in appreciation for service to WARTS by W7GB and KC7PH, among others, at the NW Division Convention. KB7PI and WA7QAX-1 are two personal bulletin boards in Moses Lake and Ephrata and can be accessed thru RLD node on packet. Don't think the FCC doesn't come around anymore. TC W7DBV reports that a representative was in Spokane in late August. If your repeater experiences unintentional interference, contact TC W7DBV. If it is intentional, contact OO W7LKR. SEC WA7CBX reports 382 public service hrs. 73, KC7PH @ N7HHU BBS. Traffic: W7GB 195, WA7YEN 22.

WESTERN WASHINGTON: SM, Ed Holloway, KA7INX (@N7HFZ). STM: KD7ME (@K7KNZ). SEC: NM7N (N7HFZ). OOC: (@ WØLVJ). SGI. KD7HC. BM N7CAK (@ WØLVJ, PIO n7zfkv. ASM K7CLL. (@K7IFG). ACC: KR7L (@WØLVJ). Congratulations are in order for Mary Lewis, W7QGP who will take over the position of Section Manager as of October 1, 1989. My thanks to those of you who supported me in this election and as your Section Manager for the past several months. Twas quite an experience! Have you noticed the activity on 7050/7052 MHz lately? Quite a few have begun to operate on the Mobile Side. Myself included. Try it, you'll like it! Tacoma Hamfair here and over and quite a success. Brad, KR7L, has resigned as ACC as has also Henry NK7E as DEC Pierce/Thurston County. Thanks guys for a job well done. Summer almost over and hope that all of your outside antenna work is done as a good winter QSO'ing can be accomplished. Radio Club of Tacoma manning a booth at the Puyallup Fair, which promises to be a dandy. Again, thanks to all of you who have helped me in the past with the work of SM. It's really appreciated. Public Service: 56 hours. Skagit County 89, Island County 19, King 292, Thurston 25, Cowlitz-Wahkiakum 131, Jefferson 12. Traffic: K7AJT 10, K7CLL 5, KA7CRN 22, WB7EJS 2, N7GGJ 42, W7IGC 540 (BPL). W7LG 211, KA7PMD 0, K7SUX 90, KA7TTY 43, W7TVA 154, K7UQH 46, WB7WOW 169, KR7F (July). PSHR: KD7ME 110, WB7WOW 107, W7TVA 85. 73, Ed, KA7INX.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, WB3FCV. SEC: W6LKE. STM: K6APW. OOC: K6TI. TC: N6AMG. Congrats to N6VMK/T for making the Public Service Honor Roll two months running, and to WB6DOB and W6VOM who qualify almost every month! The CCCC has reached 124 members with these new members: KA6HJV, N6VMK, KC6DXK & WA1HFN. Their repeater fund was the beneficiary of a raffle of fine household items donated by a local store. The NBARA is planning their participation in this years SET. "QRZ NBARA" editor, WD8JPA, has set aside page 2 of each issue for the membership to express their opinions on any subject. HRC may soon be running their Novice classes from the Kaiser Hospital facility in Hayward, with both day and evening classes being planned. MDARC's ATV repeater will soon be running a 100W xmtr on the 2.4 GHz downlink. Member (and Section Emergency Coordinator) W6LKE appeared on the program "The Informed Viewer" shown on channel 64, where he was able to describe Amateur Radio's role in emergency communications. The club also welcomed new members N6VEF, WA6KOK, N6VHS & David Vega. LARK members NF6S and KM4MF presented a program on the use of some of the latest keyers to make all CW operation, not just contests, more enjoyable. The latest recipient of the J. K. Murphy Award is KC6DTB; and Klutz-of the Month honors went to NF6S! EBARC had as their guest speaker Mr.

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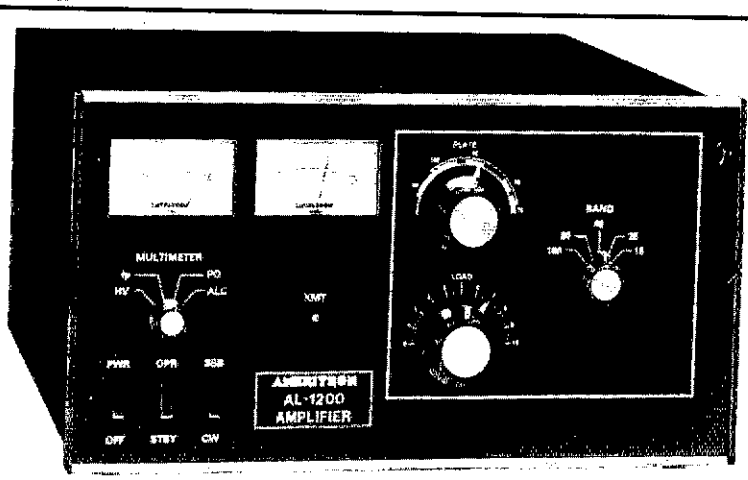

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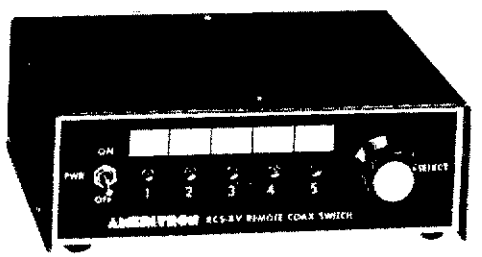

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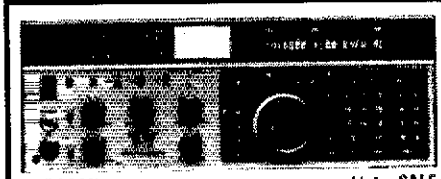

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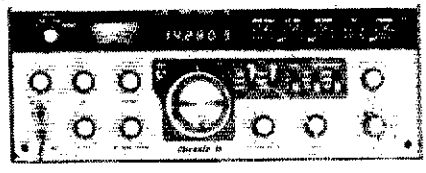
562 OMNI V 9-band xcvr/xtal mixed osc	2245.00	1899



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961 Deluxe 22A ps w/speaker	239.00	219.95
263G Remote VFO	269.00	249.95
282 250 Hz 6-pole CW filter	69.00	
285 500 Hz 6-pole CW filter	69.00	
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700C Electret hand microphone	37.00	
705 Electret desk microphone	69.00	
1140 18/24.3A DC circuit breaker	18.00	
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TITAN	List	SALE
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420 1KW Solid-State linear	1195.00	1049
9420 100A 12V p/s for 420 (air)	795.00	699.95

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2510B Mode B satellite conv *(Special)*	695.00	569.95
239 160-2m 300w dry dummy load	32.00	
238 2KW PEP 1.8-30MHz tuner	367.00	339.95
3180 80m mobile 78" high	37.00	
3175 75m mobile antenna	37.00	
3140 40m mobile antenna	37.00	
3130 30m mobile antenna	37.00	
3120 20m mobile antenna	30.00	
3115 15m mobile antenna	30.00	
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3101L 49" top section stinger	7.75	
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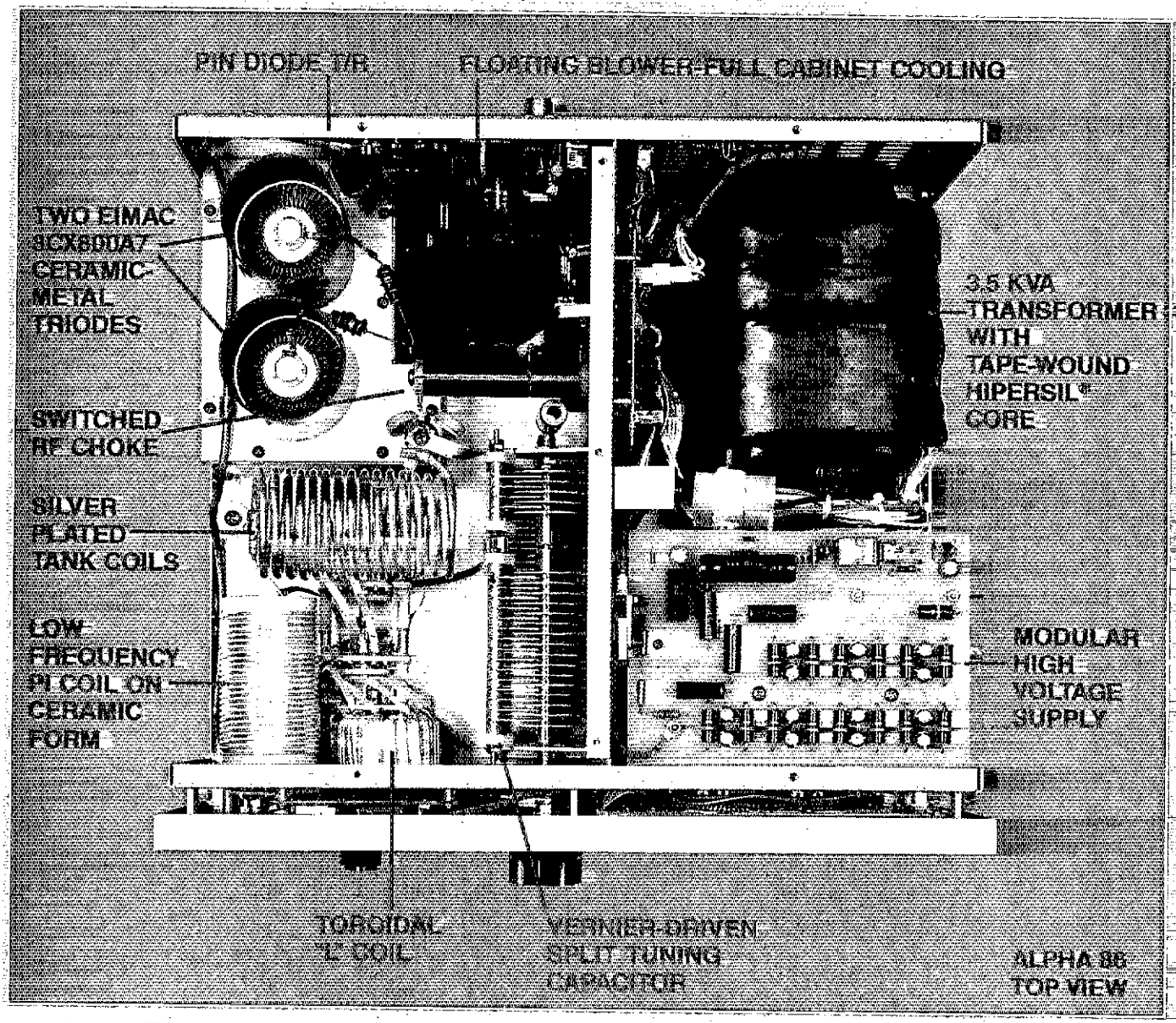

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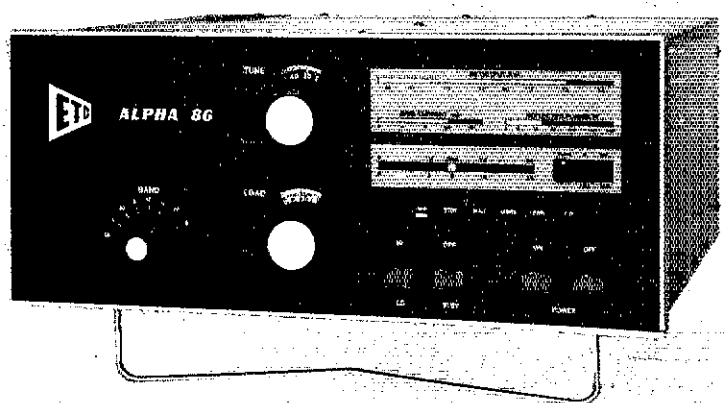

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S. Marti-Volkoff of the San Francisco office of the FCC. Aug tfc: WB6DOB/212, W6VOM/146, N6VMK/44, WB6UZX/43.

NEVADA: SM, Joe Lambert, W8IXD. ASM; Curly Silva, K7HRW. KF6GB has been appointed as Assistant RACES officer for Clark County. N7KLO is the new EC for Douglas County. QCWA Net in Southern Nevada is on the 145.39 repeater at 8 p.m., Monday evenings. KF7GB again conducting novice classes in LV. seems like all the clubs are fixing up their repeaters in preparation for the winter weather. SNARS has been providing communications for more races than I can count! If you can help, contact K7HRW. TARA has made magnetic car signs for ready identification at public service functions. other clubs may want to try this. I hope that by now everyone is sending traffic reports to KK4M. traffic counts for August: NOIA-79, KK4M-46, KF7GB-6, N7JMG-6, KK4M-qualified for the Public Service Honor Roll with 69 points.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—This is my next-to- last report to you and time to list and thank the Section Staff. Some have been with me the entire four years that I have been SM but most have joined more recently. Jettie Hill, W6RFF, who has been filling the Affiliated Club Coordinator and Technical Coordinator spots is your new SM and is asking as many as possible to stay on. I particularly want to thank Jack La Flesh, KF6KJ, Northern Counties Asst. SM and Man, N6JTJ, Asst SM for staff recruiting who got many of the present appointees to join or recruited the Senior Staff members who did fill out his staff. Notably those are former SEC Deane Coats, NR6A, and present OOC John Canaris, WY6O. They built great Emergency and Official Observer staffs respectively. The Section Traffic Manager deserves special mention; Al Beigler, WA6WJZ, has been doing a great job since he was appointed by one of my predecessors. In addition to managing the Section traffic, he has made the traffic report to QST each month. Also part of the Senior staff are Jim Pratt, N6IG as SGL, Mark Nelson, AA6DX, and Bob McClard, WA6OWH, as PIOs and Ron Murdock, WB5FIX, as BM. Although not part of the Bulletin Manager's regular duties, he has been copying ARRL bulletins and putting them on packet for most of the western US. The rest of the staff will be covered in my final report next month. Traffic: WA6WJZ 160, N6QAF 93, WA6ZUD 42, W6CFQ 32, W6RFF 27, N6DOJ 26, K6SRF 13, WB6SRQ 10, KB6WIJ 2.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—SEC: N6JQJ. TC:WA6PWW. STM: N6JLJ. PIO:N6HMO. ACC: W6MKM. BM:(vacant). OOC: KA6S. AUGUST - Gee, here we are in those lazy crazy daze of summer. The CDF/VIP group in Santa Clara county had an exercise, and what an exercise (I'm still puffing from climbing up that hill!)...The saga of the Foothill Electronics Museum continues. A number of clubs, including EMARC and FARS have met here for many years. While the potential for its conversion into something other than a museum still exists, current scuttlebutt suggests that things are not as dark as they once seemed...speaking of Foothill, the last Foothill Electronics Flea Market was a rousing success. There were so many potential sellers that there was no space for late comers! As always, a fine time was had by all... The Los Gatos/Monte Serino ARES newsletter continues to be an excellent newsletter. Their front page storey is the Los Gatos EC's (KJ6CW) description of how last months earthquake went for him and his family. He describes the 3AM shaker as "...room was simulating a boat in a violent ocean." Jim lives nearly at the epicenter and so received a very through shaking!. The August T-hunt had a rather unglorious ending when the "bunny" (WA6PWW & xyl KG6UI) were rousted out of their excellent hiding place by some non-Ham people. Too bad, it was an excellent challenge. Kit & Deb will be the bunny again in September. The monthly T-hunt occurs on the third Saturday of each month at 7:30PM local. The hunters meet at Cristo Rey Drive in Los Altos and procede to hunt for the 2 meter bunny (a VERY large rabbit indeed!)... The Naval Postgraduate School ARC in Monterey continues to be one of the most active groups in the section. They meet on the second Thursday of each month, have a breakfast on the first Saturday of each month, and seem to have even more nets and other activities than the more heavily populated Bay area!...The Stanford Linear Accelerator ARC is in the process of putting up a 6 meter repeater. . . . There is a telephone number that has information on Amateur radio License classes, (408) 971-1424. Well. . . it only has the info that I put on it, and I can only put on it what I know about. PLEASE, let me know about any classes your group or club is sponsoring so that I may include them on the recording. My phone number is on page 8 of this issue of QST. Phone numbers: Amateur Radio Classes (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: K4IWW. ACC: WC4T. TC: KM4OX. SGL: KE4ML. PIO: AB4FW. Congratulations and thanks to Tom KM4LB who did a superb job organizing Amateur Radio Public Awareness activities in Wake County, held on Sep 16. Tom recruited participation from Raleigh ARS and Cary ARC. Diane WB4INM was responsible for the RARS display in one shopping mall. Cary ARC set up an elaborate display of old and new Amateur Radio equipment in another mall. Jan N4UTT & Bill KB7LX were among the many Hams who provided major assistance. Hopefully there were other Public Awareness efforts in NC. Please let me know about similar activities so they can be reported in this column. [BT] Start final plans for a CHRISTMAS TRAFFIC BOOTH. Shopping malls usually welcome this type activity since we are providing a free service. The goal should be public awareness, not traffic count. Signs explaining our public service activities, schedules of Novice classes and local club meetings, and "free radiograms" should be displayed. Equipment displays and operating CW receivers are quite effective in attracting interest. Potential hams, inactive hams, and just interested observers are the audience. [BT] Hurricane threat from "Hugo" provided a good public relations opportunity for Amateur Radio. TV, radio, and newspapers featured many local operators monitoring traffic from Puerto Rico. On Sep 19 Tom KM4LB, Bruce KI4ME (Area B DEC) and AB4W (your SM) were featured on a two hour "talk show" about Amateur Radio on WPTF (a 50 kW regional AM). ARES, SKYWARN, HAM WATCH, licensing procedures, Novice classes, radio clubs and hurricane preparation activities were discussed. (We were given three hours notice to appear on this program.)

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TECH TALK from ICOM

ICOM's Tips for Great HF Mobiling

Our present era of high sunspot activity and outstanding signal propagation is once again inspiring widespread interest in HF mobiling, and with good reason. DX'ing on the open road is great, mountaintopping is terrific, and operating 6 meters or the WARC bands from your auto adds an exciting new twist to the action. HF mobile setups are also good traveling companions on lengthy trips, and they are an ideal alternative for amateurs living in antenna-restricting apartments or condos. Installing an HF setup in today's semi-plastic and "bumperless" autos is also a cinch when ICOM is on your side.

The basic steps to going HF mobile are installing a dependable and high performance transceiver in your auto and complimenting it with an automatic multiband antenna system. Think safety and convenience during installation, and you will be on the right track. Mount your transceiver in a location that is easy to reach and permits good air circulation for cooling. Use your ingenuity to determine that "ideal spot." Most autos have at least one. Since a 100 watt transceiver draws up to 20 amperes of current while transmitting, its DC power cable should be connected directly to your auto's battery. A plastic hole plug or unused firewall opening can usually be replaced or fitted with a rubber grommet for routing that cable.

Since a mobile setup is fully self-contained and uses a short vertical antenna, a low resistance metal ground system is vital for maximum efficiency with minimum RF feedback and good noise reduction. ICOM's helpful hints for proper and effective grounding are electrically connecting both the transceiver's rear ground terminal and the antenna's ground/coax shield directly to your auto's steel frame. Flexible copper braid removed from an unused length of coax makes good grounding strap. Remember to clean all body connection points before installation for low resistance. Adding an extra piece of that strap between the auto's frame and rear tailpipe also reduces ignition noise quite significantly. Your completed ground system should be checked with an ohmmeter after installation. Unplug the antenna's coax connector from your transceiver, connect one ohmmeter lead to its shell and the other lead to your transceiver's ground strap. You can then measure conductivity through the coax and your ground connections, on through the auto's body, and back to your rig. A total resistance of less than 5 ohms assures grounding and an impressive on-the-air signal.

A smooth operating transceiver of proven reliability and outstanding circuit design is a mobileer's greatest asset. **ICOM's new IC-726, go-anywhere IC-725 and deluxe IC-735** are rated tops **in those categories by thousands of radio amateurs worldwide.** Each transceiver works 160 through 10 meters with 100 watts output, full shortwave reception, 105db dynamic range, rugged power amplifier sections, and a fantastic array of advanced operating features detailed in ICOM ads.

In addition to working all HF bands and modes, ICOM's new IC-726 also operates the fascinating 6 meter band with 10 watts output on CW, SSB and FM modes. Separate rear panel coax connectors are employed for HF and 6 meters to make band and antenna changing easy. As numerous amateurs heartily agree, 6 meters is a super band during years of high sunspot activity. Long distance openings happen almost daily, operators are friendly and congenial, and you can work the world with only a few watts of power and a small antenna. Six is terrific.

ICOM's extremely popular IC-725 is very similar to the IC-726 except it does not include 6 meter operation or reception of the 46.2 to 61.2 MHz range, and FM operation requires ICOM's optional UI-7 module. Both the IC-726 and IC-725 fit anywhere (3.7 x 9.0 x 9.4 inches H,W,D), and feature ultra-low noise Direct Digital Synthesized dual VFO's like the IC-781 (great for mobiling as they minimize "buckshot intermod" from ignition noises). They also incorporate band stacking registers that retain last-selected frequencies and modes on each band, a direct feed mixer with panel-selectable RF preamp and attenuator, plus a built-in controller for their optional AH-3 automatic multiband mobile antenna tuner.

The AH-3 installs in your auto's trunk and connects to its mating AH-2b mobile whip for operating 80 through 10 meters. The AH-2b includes a hefty universal mount that bolts to an existing hole in your auto's frame and extends below the bumper area. Band switching and antenna tuning track automatically with your transceiver's operation for totally superb mobiling.

ICOM's deluxe featured IC-735 is a serious mobileer's dream rig. This all band and all mode HF transceiver sports passband tuning, audio speech compressor, and a DX record of phenomenal reliability. Seldom required controls are located behind a protective front access door for easy mobiling. The IC-735's optional AH-2/AH-2b automatic mobile antenna system also covers 80 through 10 meters in top style.

Adding the perfect finishing touch to your mobile setup is also a snap with ICOM accessories. The HS-15 mobile boom mic attaches near your auto's sunvisor, its matching HS-15SB P.T.T. box with up/down tuning buttons clamps to the gearshift lever, and you enjoy safe hands-free mobiling. Whether fixed, mobile or portable, ICOM transceivers and accessories are your key to outstanding performance and longterm enjoyment. They are also backed with the industry's best one year warranty. Ready to track in top style? Get rolling with ICOM and enjoy going first class all the way!

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News stories about Amateur Radio are becoming a standard item when a natural disaster threatens our area or a disaster elsewhere is a major story. Be prepared to respond to a request from a newspaper or broadcast station. Contact them and provide names and phone numbers of several knowledgeable local hams. [BT] Ninth Annual Greater Greensboro Hamfest is scheduled for November 25 & 26 [BT] August traffic: K4NLK 343, KI4YV 199, N9CGD 162, K4IWW 157, WD4HTE 151, NJ4L 127, KA4EYF 127, KB7LX 120, KB4FWL 74, AA4ZV 72, WA9NEW 71, N4LST 53, WD4MRD 46, N4SVZ 43, N4VHU 41, WB4WII 39, W4LWZ 39, N4SMS 35, N4JTG 34, WA4MNR 32, W4EHF 27, N4OIC 19, N4SHE 19, KF4NJ 17, W4EAT 17, K4YJB 16, AB4W 16, WD4LOO 15, N4UOE 15, N4MQU 14, N4UE 14, KC4GCK 13, KA4KGZ 11, W8KLF 10, WA2EDN 10, WD4LSS 10, KM4BN 6

SOUTH CAROLINA: SM, Ned Moeller, N4FVU—BM: K5CVD. OOC: W4NTO. PIO: AB4ID. SEC: K8AFP. STM: W4ANK. TC: WA4UNZ. Holiday Greetings to all of you! May the new year be as good to us as the past 12 months. I thank all of you for your support throughout my first year as SM. May we continue to grow. 145.01 MHz packet coverage has improved with WA4PHY's digipeater station GRAVES and his PBBS in North Augusta. Two meter coverage of the Savannah River Emergency Net includes 10 SC counties. The net meets 8:00 PM daily on 145.49 (-600) MHz N4JA Augusta repeater for purposes of traffic handling, swap shop & rag chew. Special thanks to all Net Managers, Net Controls & Liaisons. Keep up the good work! I appreciate all the reports, especially the monthly OO, EC & Public Service Activity reports. I endeavor to keep everyone informed which includes ARRL Hqs. COMMUNICATION IS THE NAME OF THE GAME. August traffic: WA2GYM 848, KI4FL 570, W4ANK 120, N4MEJ 54, KA4LRM 40, W4DRF 32.

VIRGINIA: SM, Claude Felgley, W3ATQ—There has not been any change in the section's net schedule or managerial assignments. A complete listing is in last month's QST. It appears that the Amateur Radio facilities at the Boy Scout Jamboree were very successful from a traffic handling and demonstration point of view. WBØTAX who was heavily involved in the Packet operation reports he handled over 700 NTS messages and without exception the messages were dispatched very rapidly throughout the 40 and 20 meter Packet nets. He reports that the average sitting time for messages on his board was no longer than 2 or 3 hours. A fine example of the proficiency of Packet in clearing bulk traffic from the originating point. I understand approximately 2040 messages were passed from the Jamboree site via Packet. SEC, WB4ZTR sez N4SCK is a replacement for WB4WZZ as Fairfax county EC. The training & information sessions following the Monday VSBN net instituted by our STM, N4GHI, have been well attended. This is your opportunity to improve your traffic handling procedures and to seek info on the section and ARRL activities. Thanks to the Albermarle and the Massanutten clubs for joining those clubs that are sending me copies of their newsletter, they are very informative and helpful in keeping me abreast of the section's club activity. A special commendation to WB4LNT who masterminded the communication arrangements so vital to the arrival and dispersal of the scouts at the Jamboree and to the Woodbridge Wireless members who were responsible for providing and putting into operation the amateur stations for use by the scouts. Some upcoming VE exam sessions: Nov. 4, Portsmouth ARC contact AA4AT - Nov. 4, Shenandoah Valley ARC contact NC4B - Richmond, Va. contact N4RPI - Nov. 11 contact KB4WOM - Nov. 18, Manassas contact W4PVA - Dec. 2, Va. Beach contact KA4UNC. A REMINDER—Nominations are being solicited for the office of Section Manager. Nomination forms can be obtained from League Headquarters or the SM, W3ATQ. As stated before it is not my intention or desire to seek re-election as Section Manager. It was good seeing and talking to many of you at the Va. Beach hamfest. It is still not too late to get your antennas and equipment ready for an active period of DXing and traffic handling. Traffic: WBØTAX 3072, N4GHI 523, K4DOR 434, N4HOG 432, WB4D 348, N4EXQ 324, W3ATQ 306, KJ4VT 209, WB4PNY 196, WB4VMX 159, K4MTX 152, KB4OPR 113, W4TZC 113, WD4MIZ 102, WY7U 98, WB4KSG 81, W4JLS 78, N4TE 73, AA4AT 72, KK4FV 62, WD4MIS 61, KK8L 59, KI4ZR 59, N6ANQ 58, WB4ZTR 56, WB4FLT 55, WB4KIT 50, KB4CAU 47, KB4PW 45, K4JM 44, K4BGZ 42, N6GVG 36, WB4EDB 35, N4KSO 31, WB4ZNB 31, N4UWX 28, AA4GL 27, K4GR 27, K4MLC 26, KD4NH 26, WS8A 20, N4FZA 15, KB4WT 14, WA4TVS 13, KI4W 10, N4FNT 6, WB4DQZ 4, WB4UHC 4, W4HU 2, W4YE 2, KØGYK 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: N8FXH. SGL: K8BS. TC: K8LG. ACC: WA8FLF. Repeater Coord. WB8GDY. Matt, WT8L has been appointed ORS. Ollie, WD8V is new OBS for Charleston area. John Davies, W8HZA, is recovering nicely after surgery for a broken hip. N8FQN is new EC for Marshall County. Remember to join "Slow" L- WVN at 10:00 each night on 3567.

NET	FREQ	TIME	QNI	QTC	SESS	NM
WVFN	3865	6:00	831	150	31	WD8DHC
WVN	3567	7:00	223	99	31	KZ8Q
WVMD	7235	11:45	724	76	31	WD8V
WVRN	3840	6:30	166	19	31	K8LG
WVNN	3730	7:30	104	40	31	KA8ZGY
HILLBILLY	14290	NOONSU	131	12	4	W8YP
WVN-L	3567	10:00	192	53	31	KZ8Q

Traffic: WT8L 685, KA8WNO 320, WD8V 291, W8YP 160, K8QEW 75, K8TPF 72, KE8FI 69, WD8DHC 69, KA8ZGY 51, K8KT 41, N8FXH 35, NS8U 15, NC8G 11.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Edie Sheffield, KAØMQA—SEC: K4UBU. STM: KBØZ. ACC: WBØDUV. PIO: WBØFQB. OOC: KAØCDN/WØJR. TC: WØLJF. SGL: WDØHNQ/WDØHNP. BM: KAØVKM. I would like to thank everyone who voted for me in the recent SM election, for myself and my section staff, we appreciate your vote of confidence for the next two-year term of office. The Colorado section carries approximately 100 appointees, however, we would like to extend this opportunity to anyone in the section who might like to join the field organization as an ORS, OO, OES, PIA, ATC, OBS, and a few openings for ECs. If you are interested , please drop me a line for information. Congrats to KØZL, EC and Dist 23 ARES for the recent SET held in Jefferson County, this was a simulated mass casualty & hazardous material exercise, which involved 8 agencies in Jeffco Co. Amateur Radio Awareness Day, had participation from DRC & Dist. 13 ARES with WUØN & WRØS with a demo at Denver's City Park Family Day. Next week, Dist 14 in Colo Springs is planning a drill with several of the area hospitals. Nov 5th will be the RMRL Swapfest held at the Jeffco Senior Center, 6842 Wadsworth, Arvada. Contact KBØJ or NØFIK. Nets: CWN. QNI 52, QNF 255, QTC 52, 26 Sess. CWXN; QNI 1327, QNF 2790, QTC 1309, 31 sess. Col: QNI 969, QNF 659, QTC 69-183, 31 sess. HNN; QNI 1756, QNF 967, QTC 144-676, 31 Sess. NCTN: QNI 329, QNF 531, QTC 168, 33 sess. SCTN: QNI 392, QNF 495, QTC 88, 30 Sess. Traffic: KØHOA 1076, NØBQP 1058, KØYFK 866, KØSN 344, KAØWIE 282, WØLVI 274, WTØG 216, WØGVT 206, WØLJF 200, WBØVET 192, NØGVC 180, NØHFZ 97, NØCYR 70, KBØZ 28, NØKIA 20, KØCNV 16.

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 77 msgs with 127 checkins. NM Roadrunner Net meets daily, 3939 @ 0100 UTC, handled 87 msgs with 991 checkins. NM Breakfast Club meets daily, 3939 @ 6:30AM, handled 175 msgs with 894 checkins. Yucca 2-mtr Net, 78/18 handled 15 msgs with 303 checkins. Caravan Club 2-mtr Net, 66/06 with 112 checkins. SCAT Net, 66/06 handled 7 msgs with 519 checkins. Info Net 12/72, with 85 checkins. Sunday Noon Packet Net on ZIA with 46 checkins. Alamogorgo Hamfest was a roaring success as it grows better each year. My pleasure following the Alamo Hamfest to go to El Paso and on Monday afternoon to present a "75 YEAR QCWA AWARD" to Jerry McTernan, ex 2BL, W3BM & now W5YV. Jerry retired from Bell Labs and has worked with Raymond A. Heising, who invented plate modulation, with Colpits & Hartley, who invented the Colpits Oscillator, with Curt Sturba, Charley Litton and Jerry played guitar and sang with Fred Waring!!! Traffic: KF5VF 106.

UTAH: SM, Rich Fisher, NS7K—SEC/STM: Jim Brown, NA7G. PIO Lon Stuart, WM7E. The Utah Amateur Radio club had a booth at the Utah State Fair. Every club was invited to help man the booth. Good show. the Ogden Amateur Radio Club have a new controller on the 146.90 machine and plan to link it to 146.82 soon. This is an open autopatch. To use it, * then the number to close # Good job. I would like to know how the Section feels on having a Utah ham fest. This would be using all the clubs to work the thing up. Please let me know how you feel. 73 de NS7K. Traffic: WA7MEL 76, N7JLC 73, KO7H 4.

WYOMING: SM, Jim Raisler, N7GVV—KC7AR reports Cowboy Net held 23 sessions with 530 QNI and 10 QTC. Traffic: W7TZK 160, W7SQT 207, NN7H 445. 15 Sheridan hams provided communications support for the Aug. 20 Triathalon, including packet stations relaying race progress from Lake De Smet to race Headquarters. The Casper ARC's quarterly newsletter had a report about Mike's NS7Z, experience the night of June 3 operating BY1QH. Who said hamming was a dull hobby? The 1990 Hamfest will be held in Cheyenne on June 2-3. Wil, WB7RRZ, wants to have suggestions from hams as to what YOU would like to see, and have, at YOUR hamfest. Send any suggestions to Wil Sellner, 930 Western Hills Blvd., Cheyenne, WY 82009.

SOUTHEASTERN DIVISION

ALABAMA: SM, James Spann, WO4W—ASM: W4XI. SEC: KB4GDN. STM: W4PIM. PIO: KB4KCH. ACC: AA4BL. OOC: KF4VS. SGL: N4FRQ. BM: KA4ZXL. As many of you have heard by now, I will not be a candidate for Alabama SM for the next two year term. I have had a number of great experiences during the past two years meeting amateurs from all over the state, but my family and business must come first and I don't have the available time to do the type of job I would like to do. The candidates running for SM (at the time this is being written) are Mildred Cullen, AA4XF, and Joe Smith, WA4RNP. I suggest you look closely at these two candidates and then take the time to vote (your ballots will arrive in the mail). In Mobile, the N4PRQ BBS system is now on line on 145.01 MHz. New packet nodes in the Gadsden area include GAD2 on 145.61 MHz, and GAD4 on 433.60 MHz. The Gadsden ARC sponsors the Alabama Emergency Net "Y" Tuesdays at 8:30 p.m. on their 147.16 MHz repeater. The Birmingham ARC sponsored a SKYWARN training class October 21 at the studios of WVTM-TV. I hope all other ARES groups in the state follow this great example - we must have more trained severe weather spotters! BPL: WA4JDH. PSHR: WA4JDH, W4PIM, W4CKS, W4QAT, WA4RNP, W4IBU. Traffic: WA4JDH 706, W4PIM 200, W4CKS 151, W4QAT 82, W4DGH 18, WO4W 12.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM: KC4MJ. SEC: NC4E. STM: WB4WQL, PACKET: W4QO, ACC: KM4IH. BM: AA4UA. OOC: W4TG: PIO: WA4LLE, SGL: WB4UVW. TC: W4ZTL. If u noticed the Section staff is once again complete. The new bulletin manager is Jim Oates, AA4UA of Blythe, WA4LLE, Archie McKay of Valdosta assumes the Public Information Officer post & Tom Ingle, W4ZTL, of Stone Mt is the new Technical Coordinator. If u or ur club need any help in any of the above areas, please contact them. At the annual meeting & election of officers of the GA SSB ASSOCIATION held in Macon on Aug 26th the GA AMATEUR OF THE YEAR AWARD was presented to Jim Foust, WB4LBM, of Decatur. He was also elected Pres for the 1989-90 year. N4OTC was elected VP, W4HON Sec/Treas, Directors are: WB4ZMH & WA4EPK. The Atlanta ARC (320 members) and the US) elected a YL as its Pres, Sharon Foster, KM4IH. VP: KM4KB, Sec: N4MNR, Treas: KI4Y & N4UCK as Act Mgr. Only one Silent Key to report WA4IOL of Savannah. Our sympathies to his family & friends. ARC of Aug elected N4TUM as Pres, N4JA as VP & WB4AIU as Sec/Treas. As usual the gang down at Colquitt County did a FB job with their annual SUNBELT EXPO '89. K4SEX was a SPECIAL EVENT STATION during the '89 POWERS CROSSROADS ARTS & CRAFTS FESTIVAL. Y'ALL come to Lawrenceville on Nov 4 & 5 for a big week-end at the HAMFEST-COMPUTER FEST. The bone yard is worth the price. Athens ARC has the foll leadership. Pres: AA4AT, VP: WA4IML, Sec: KC4BDT, Treas: N4CUA, Editor: N4ULL. I have noticed that the Ol' timers are giving our newer hams an opportunity for leadership in their clubs & organizations. This is a way to get new blood with new ideas etc. Let's all see if we can't generate some traffic during the forthcoming holidays & keep the traffic people busy. A HAPPY THANKSGIVING TO U AND YOUR FAMILIES. 73 and GOB BLESS, EDDY.

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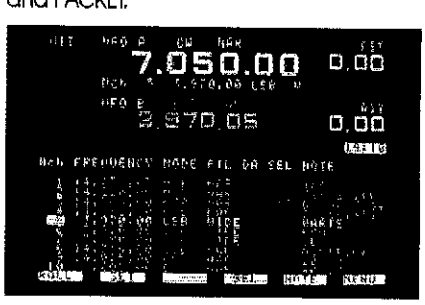

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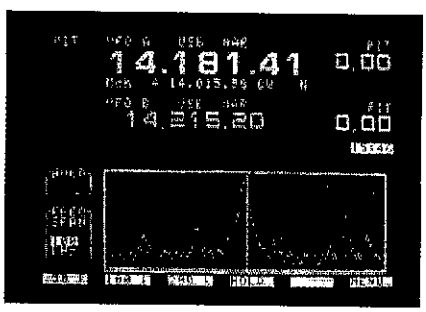

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NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—ACC: Dick, WA4BIH. OOC: John, AB6I. SEC: Rudy, WA4PUP. STM: Cotton, KB9LT. ASM: Bill, KB4LB. SGL: John, KC4N. PIO: Petey, WA4POU. BM: Dave, N4GMU. TC: Ed, WØRAO. As this is being written, the Region II IARU meeting is being held in Orlando and local hams are helping to make the meeting a success. W1AW/4 has been set up and arriving delegates are being greeted and assisted at the airport. The Orange County ARES members who have helped are: KF4WS, KB4RTG, WA4HYJ, N4OYA, N4TRN, KJ4DG, N4OWZ, N4MWL, WB4NTI, WD8BOY, and WB4HXS who organized the group and spent many hours at the 2 meter station in the Airport. Thanks, Bill and the rest. Also KL7IV and W7JIE were part of the greeting group. The Antenna crew, under the direction of our TC, Ed Cox, WØRAO, put up a tri-bander 3-element beam as well as an all band vertical so two stations could be operating on different bands. In the 90 + degree heat, the following finished the job by 2:30 PM Sept 2nd: WB4HXS, W4MCV, N4NVW, NE4H, KB4QKB, N4OZD and N4ADI. At 3:00 PM (1900 Z), W1AW/4 was activated with K1ZZ, making contacts on 21 MHz. The station plans to be active thru Sept 8th, with numerous local ops at the controls. The visiting delegates will have many opportunities for operating when they are not in conference or committee meetings. W1AW/4 QSL cards are being signed by the station operators and will become a cherished possession for the stations lucky enough to be at the right place at the right time! Hil It will be a busy week and a once in a lifetime event! We're all pleased to be a part of this IARU Region II event! 73, N4ADI.

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. Congrats to W4DPH and KG2FF, two PBBS in Clearwater, who were recommended for the new National Traffic System Service Award by K4SCL. The certificates were forwarded to K4SCL for presentation. I am very sorry to report that W4ILE is now a Silent Key. Regis was well known in both Dade and Hernando counties through his association with Amateur Radio. He was the editor of the first Florida Traffic Routing Guide, served as SCM for Southern Florida, the first editor of the Florida QFN traffic bulletins, and instrumental in the establishment of the Cloverleaf ARC and the QCWA Chapter 148. The Motorla Repeater located in Sunrise will be presented the National Traffic System Service Award at the Melbourne Hamfest in recognition of their support of the Southeast Florida Traffic Net. WB4WBK reports that during the past two months the Highlands ARC has provided communications for the TOMOKA ROWING SPRINTS, HARDER HALL GOLF CLASSIC, SEBRING 4TH OF JULY PARADE, WORLD WATER SPEED RECORD ATTEMPT, NATIONAL SECURITY EXERCISE as well as ARRL Field Day. Sadly the speed record attempt ended in tragedy with Craig Arfons dying from injuries received when his boat flipped near 375 mph. On the bright side a 13 year old boy passed the Novice exam while Field Day was in progress. N4ORZ reports that N4SMY has been elected Dade Emergency Net manager for a six month term. The Motorola ARC, *Marconi* reports that a study is being made to replace the field day tower. The Englewood ARS is setting up a table at a local Publix in September to let the public know that an evening Novice class will be offered. The Englewood club celebrates their first anniversary of ARRL affiliation this September - Congrats. The Martin County, *Common Emitter* says the club is starting a General class this September. The Everglades, *Beam* indicates that KD4BU suggests that they can start up a 10-10 chapter if there are enough interested. News from N4PBF, PIO, reports that the Hollywood ARC will have an exhibit of Amateur Radio at Pioneer Day at Port Everglades during September. He also said that the Eastern Airlines Radio Club is reorganizing, changing its name and relocating its 2M and 440 repeaters—nothing definite as yet. KA4FZI was presented THE OUTSTANDING SERVICE AWARD FOR 1989 at the August meeting of the Fort Myers ARC. At the same meeting WA4PFK presented Certificates of Merit to the Fort Myers ARC for their outstanding assistance in the Amateur Radio class taught by KA4FZI. Certificates of Merit were also presented to K4KKP and KC4EGO who gave one day per week the past school year in assisting KA4FZI in her work with Amateur Radio students at Caloosa Middle School. At this same Fort Myers ARC meeting WA4HDH, Doc, a TWENTY SIX YEAR member of QFN and Tuesday night NCS for almost that long was given a Certificate of Merit for his labor of love in writing and having printed QFN - The History of the All Florida CW Traffic Net. Be sure to contact Doc for your copy. KB4KXV reports that 142 messages were sent during a 22 hour operational period while the aircraft carrier, USS John F. Kennedy, was at Port Everglades. Amateurs assisting were K4BUG, W4DWN, WA9VND, WD4BWC, KB4THK, WA4PWT, and KB4KXV. The South Brevard ARC, *Spark* indicated that the club once again provided 2M communications support for the eighth annual BARGAIN BEACH RUN, a 10 kilometer run on the beach. They also printed a traffic handling tip that should be of interest to beginning traffic handlers-DO NOT END A RADIOGRAM WITH AN X-RAY. A copy of a letter to ARRL was received from AB4BC, President of the Racal Milgo ARC. It was quite interesting-included was info that since the club had not participated in Field Day in several years they decided to rekindle interest by challenging three neighboring company clubs. This became known as the "South Florida Challenge". The Racal Milgo ARC against Motorola Plantation ARC, IBM Boca Raton ARC and the Motorola Boynton Beach ARC. The outcome is uncertain at this writing but a great time was had by all. The letter was so interesting I wish I could include all of it - but too long for here. The company gave permission to use one of the several Spanish style tiled roof "gazebos" at the rear of the property in Sunrise. It is located in a bird sanctuary on company property and sits astride a small lake about one mile east of the Everglades. The lake includes bass, turtles and a couple of alligators. The site sounded just beautiful! The setup of antennas using slingshots, the rain, mosquitoes, the minor foulups, and the 3.5 kW gasoline generator which surged to an overvoltage completely destroying all of the surge protection devices certainly contributed to a memorable Field Day for all! K4FQU noted in the Southwest Florida Traffic Net stats that WA4EIC was liaison to FMTN for 22 of the 27 sessions. WD4KBW said there were 51 bulletins received and 89 transmitted by WA4EIC 72, WT4F 22, K4IEK 22, WD4KBW 16 and WA9VND 8. The ARRL Information Net meets on 3940 kHz each Saturday morning at 8 AM. 73 de WA4PFK. Traffic: W3CUL 3356, W3VR 909, WA9VND 522, WA4PFK 419,

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VIRGIN ISLANDS: SM, Ron Hall, KP2N—ASM: KV4JC. SEC: NP2B. STM: NP2E. NM: VP2VI. We all have been busy tracking tropical storms coming across the Atlantic into our area. Local nets have kept the boating community informed of any possible danger with up-to-date weather information. St. Croix ARES reports 4 sessions QNI 50. St. Thomas/St. John ARES reports 4 sessions QNI 22 with 1 training meeting. We now can receive/send NTS traffic via KP4GY. HF Packet station. This is a backup to the 3710 traffic net that KP4DJ runs everyday. We can now run third party amateur to amateur traffic between the US and the BVI starting 8sept 1. VP2VA is working on full third-party agreement. The KP2A 6 meter beacon is on full time 50.110 and ready to give out a VI QSO. John also reports no multi-multi operation at his station this year, just multi-single. The VI QSL Bureau has received over 75 lbs of cards this year so far. Traffic: NP2E 8, KP2N 7. 73 from "America's Paradise" de KP2N.

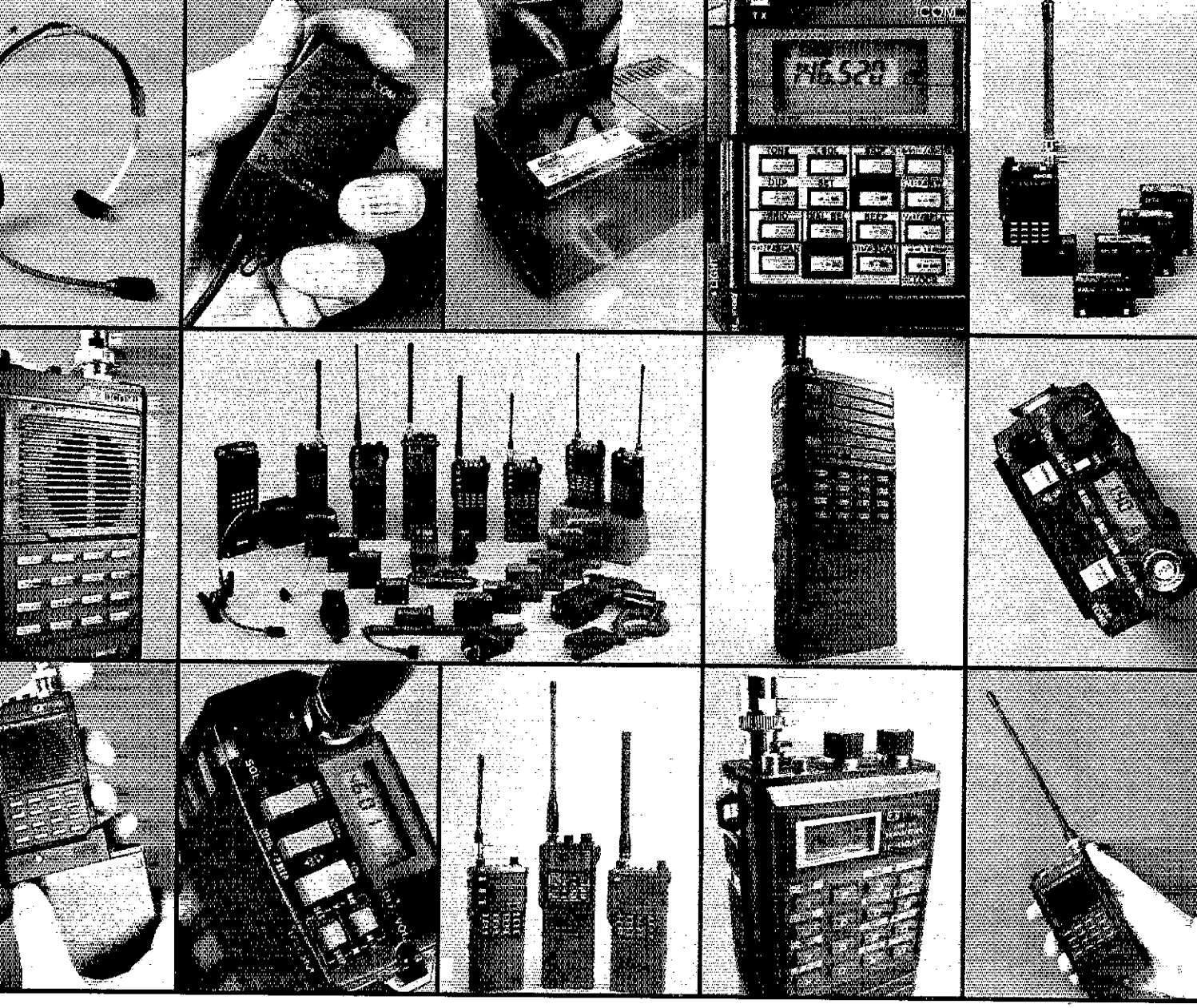
SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP. NM'S: K7POF, K6LL, KI6ZH. Saw several familiar faces at SW Divn Convention in L.A. Janet, N7JWM and Bill, N7JWN from Flagstaff; Gary, W7GH and Cameron, W7OIF from Phx., and Merrill, W7HT from Tucson were on hand as well as others from our section. Vallery, RA9YD from Siberia was introduced at the convention banquet. He had just left Flagstaff where he was entertained by Coconino ARC after rafting trip on Colo. river. Hope to have more details on this project next time after W7YS, NN7A and NN7D return from their exchange trip to U.S.S.R. Banquet keynote speaker was Ken Cameron, KB5AWP who is a NASA astronaut and command pilot. Ken gave interesting and informative data on Space Shuttle missions. He is scheduled to fly on STS-29 as Capsule Communicator early next year and plans to QSO with hams when time permits on this mission. Alan, WC7R Prescott sent in FB report on ARES activities there. Included were a simulated air crash drill with WF7J and KA7YCI handling emerg. comm. with FAA, County, City and Embry Ridder Univ. A Fourth of July parade was covered using their EOC and HT's at various positions. Participants were: W7KEE, K7DW, N7GTK, WF7J, N7NBK, W6UMV, and WC7R. Also covered in similar fashion was the Prescott Triathlon/Biathlon with additional stns W7HWX and KB7FRV joining in. Thanks, Alan and keep up the good work. Through the joint efforts of TRA, RACES, ARES and other various clubs in the Tucson and Pima Co. area, 829 amateur operators donated a total of 9,004 hours of various public service events in 1986, 87 and 88. (Tnx, Solid Copy). Clubs and nets please take note. We need more documentation of our public hearings for justification of amateur rights such as antenna ordinance restrictions, etc. The 2nd annual SOWP/QCWA Christmas lunch will be held Dec. 2 starting at 11:30 A.M. at the Holiday Inn, 2532 W. Peoria Ave., Phx. Barry Goldwater, K7UGA will be guest speaker. For further info and reservations contact Wm. T. Jackson, SOWP, 4247 N. 82nd Dr., Phx. 85033, or fone 602-849-9411. Also, don't forget annual Superstition ARC Swapmeet Dec. 2 - 3 in Apache Junction. Summer activity reports are down. Now that fall and winter activity is picking up, how about sending in some reports? I can only print what I get from you. 73 and CUL. JIM.

Net	Abbrev	QNI	Traffic	Sess	Liaisons
SouthWest Net	SWN	NO REPORT			TWN
Arizona Cactus Net (HF)	ACN	NO REPORT			TWN
Arizona Cactus Net (VHF)	ACN	No Report		ACN	(HF)
Arizona Tic& Emerg Net	ATEN	875	140	31	TWN

Traffic: W7AMM 277, W7EP 126, K7RLL 83, W7OIF 61, K7POF 34, W7KXE 30, N7ETP 10, WW7P 9.

LOS ANGELES: SM, Phineas J. Icenbice, Jr. W6BF—HAMCON-89 is over and it was a big success thanks to all the dedicated help and our Chairman Joe Circa, KB6AXK. Sixteen of our outstanding local clubs invested money and ran this ARRL Division Convention. Members of these clubs are the real winners. They now have experience, knowledge, publicity and money. More of the first three and less of the latter. We had 450 at the banquet and a great guest speaker Astronaut Ron Cameron, thanks to Bev. WA6TIU. N6MAD, Kathleen reported TRAFFIC for August 362 with a new leader KD6CK, 111, N6NYK, 89, 46 for N6AHT and 44 for KC6BCC.—WW7K Dave Morse our new OOC is looking for more good OO's- Volunteers who want to work! Call Dave on (818) 893-2817 if you think that you qualify. Dave also needs workers who speak Spanish and/or read code at 25 wpm or better.—Capt. Keith Bushey, LAPD, KF6UJ, called last week with some facts on Emergency Antenna Towers. The General Services Files of Los Angeles show (not counting mountain tops) thirty—(30) towers over 100 feet. —ANYONE SEEKING ANTENNA ORDINANCE relief from a city should point out city contracts with ARRL Section Managers for emergency services. In LA County, the ARRL Sec Mgr has a contract with the City of Los Angeles, Long Beach, and we are working on more. Since ARRL has an emergency communications contract with the City of LA, it only seems fair that most licensed Amateurs also need EQUALLY adequate towers.—The City Police have 10 towers over 120 feet tall! ARES members fight for your right to have adequate ANTENNA HEIGHT for that big Emergency. Our great ARES group under the direction of Ron Boan, AK6Y, is available for your call at (213) 596-7449, if you can help. Ron is also coordinating Emergency Operations for the SW Division as well as the Los Angeles Section. Foreign license information is available from ARRL HQ. (They keep up to date)—Several have asked about the HANDI-HAM organization. The HANDI-HAM address is 3915 Golden Valley Rd, Golden Valley, MN 55422.—(612) 520-0520—They provide a quarterly publication, cassette



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ORANGE: SM, Joe H. Brown, W6UBQ—ASM: Riv Co, Bob K6LKN (714 686 3823). ASM Org Co, Ralph WB6JBI (714 776 9272). ASM SB Co, Ken WA6ZEF (714 983 1272). ACC Sandy reports the MVARA new officers, Pres Larry KA6GND, VP Bob N6MYZ, Tre Robert KC6EOS. Orange Co ARC Officers Pres Frank WA6VKZ, VP John WA6KAB, Sec Bob KD6XO, Tre Mark KJ6JC. Views, it is time again to start thinking about what office you would like to run for in 1990. There will be openings. de KI6KV (BPARC). What direction do you want your club to go? Helping to manage a club is time consuming, but it is fun, so think about getting involved. de KN6U (ROARA). Victor Valley ARC officers and supporters have been meeting to formulate a new public service comm plan to provide support for public activities by improving coordination and increasing safety at many local events. This will increase the public awareness of Amateur Radio and improve its image. de K7YCI. The Mile High ARC, San Jacinto Mt. area, a new club (new kid in the block meets 1st Wed of each month). Pres. George KD8OI, VP Dick, KC8EOC. STM Dan WF8O sez Jerry AD8A will be stepping down as NM of SCN on Nov. 1. Jim, N6NLW, NM of SCN2 will be taking over. SCNV has moved to the Crestline rptr (146.85-) 9 PM local. Many tnx to that group for making the rptr available on short notice. Tune in, take a msg for delivery or send one, they go all over the world. Traffic info. BPL WF8O. PSHR WF8O, W6SX, KA6HJK, N6ADV, KA6TND. Totals WF6O 570, W6SX 202, K6ZCE 123, KA6HJX 112, AD8A 82, KA6GND 41, KA6TND 34, W6CPB 33, KB6VPI 14, BBS TFC N6IDV 31, N6KZB 94, NR6P- 1 44, KD6SQ-2 400. ASM: Mike N6KZB, packet racket. N6KZB andKD6BQ-2 now on AX4 RE software to better handle NTS and routine msgs. Riv. Co RACES provided new ants and cavity for the 223.42 mini mode system in SOCAL. Tnx to Orv WB6WEY. The 4800 node link at 51.12 will be a reality soon at Elsinore peak. Riv. Co. Fire/CDF supporting this project.

SAN DIEGO: SM, Arthur R. Smith, W6INI—STM: N6GW. PIO: N6PKY. TC: N6JZE. SEC: W6INI. The Southwestern Div Conv for 1990 will be held in San Diego Aug 24-26. Led by K7DCG and KA6PXD, 100 S D Amateurs provided emergency medical comm at annual Blue Angels air show, Aug 12-13. For info on SANDARC volunteer exams call 619-465-3926. Food for thought: Would our PR improve if we called ourselves Amateur Operators rather than Hams? Upgrades: AA6PN to Extra; KJ6PH, W6ROW to Advanced; KC6ADV, KC6FEF to Tech. KF6BB, EC Southern Dist, made following appts: N6QJM NCS 2m, N6QLN NCS 10m, AA6JE Opns Asst, K6SJA Red Cross Ln, KA6OMK Publicity. ARC of El Cajon sponsors a swap meet monthly, on 1st Saturday, at the Santee Drive-in theatre. Time: 0700. Escondido ARS runs a T-hunt monthly on 3rd Saturday at 0930. Talk-in 0900 on 146.88 (-). KF6BB won first place in S D Section in 10m fone contest. NCTN: (Jul) 30 sessions, 113 msgs, 404 ck-ins; (Aug) 30 sessions, 75 msgs, 428 ck-ins. Traffic: (JUL) KI6ZH 290, KI6ZM 94, N6RVO 51, KB6PCF 45, N6GW 27, N6TEP 18, WA1ZEN 17; (AUG) KI6ZH 552, N6GW 36, KC4IRP 35, KI6ZM 33, N6DSC 17.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA— ACC-KB5AH; ASMs: N.Vntra-N6MA, S.Vntra-W8AKF, Sbar-WB6BYU; BM-N6TNG; STM-N6WP; OOC-W8AKF; TC-W6KFV; SEC-WB6IIY; DECs: Vntra-WB6RVA, S.Sbar-KA6KGF, N.Sbar-KI6XG, SLO-WB6IIY. The Santa Barbara Amateur Radio Club held another very successful hamfest on August 13th. The event was attended by hams from all over the Section and even a couple of "DX" amateurs. Our Division Director Fried Heyn, WA6WZO, and his lovely wife Sandi, WA6WZN, joined in the festivities and took the opportunity to congratulate SBARC on their election as a Special Service Club - a designation most thoroughly deserved by this public spirited group. It wasn't all speeches though, as there were games and activities to keep everyone happy until the BBQ was ready. WB6BYU even staged another of his infamous "Handheld T Hunts" and then entertained us with song after the meal. Don't miss this fun event next August... it gets better every year. The month ended with the Southwestern Division convention which featured an interesting series of technical sessions, including a seminar moderated by N6NB who was joined by some of the country's foremost experts on biological effects of electromagnetic radiation. The convention highlight for many was the Saturday night banquet which featured a presentation by Lt. Col. Ken Cameron, KB5AWP, who will be Capsule Communicator for STS-29 and subsequent Space Shuttle missions. Ken gave us an insight into life aboard the Shuttle from the astronaut's viewpoint - an interesting and entertaining program for all. Of special interest to our Section was the presentation of a new award by our Division Director. Fried presented the Santa Barbara ARC with a plaque naming them "Outstanding Club in the Southwestern Division," citing the ARES Van, training and technical advancement programs, the club station at the Santa Barbara Red Cross building and "Key Klix" which must surely be the best Amateur Radio club magazine in the country. SBARC President Don Fuller, KA6KGF, proudly accepted the award on behalf of the members. The SSC designation and the award are both more than deserved, being just recognition for many years of dedication and teamwork. Herewith a hearty "WELL DONE" to Don and the members of SBARC. HOW TO GET MENTIONED IN SECTION NEWS: Some of you have commented that news coverage in this column seems unbalanced - those in the south seem to think the north is better represented, those in the north say the same about the south. This is natural and understandable, since we all tend to look for news about our own communities. What follows is presented with a view to helping you get the coverage you want - please bear in mind that I will not overlook accomplishments in any area in order to provide more "balanced" coverage, and that I can only print what I know about. This column is written in the first week each month. My deadline to ARRL is the 10th of the month. YOUR deadline to me is, therefore, the 5th. This will allow me to compose and edit the column for transmission to Newington. The column appears in QST two months after it is submitted, thus the May column was written in early June and appeared in the August issue. It should be apparent that most "news" in your club magazine is too old to be newsworthy in a QST column - the time lag from event to publication might be four months or more. Keep these timelines in mind, particularly for announcements about upcoming events, send me the information you want published by packet (W2KVA @ N6AZD) or by mail (see QST page 8) and you stand a very good chance of getting a mention in this column. I'm always happy to report on the accomplishments and successes of our Section amateurs, and more than happy to support your club's events with advanced publicity. Finally, if there are things about this column that you DO or DON'T like, please let me know - that's the only way we can tailor the column to meet your desires. We note with sadness the passing of George Maki, "CW," 6GF, W6BE. George's 55 years of hamming spanned the age of spark to the age of satellites. His delightful tales of wireless, part fact, part fiction, will be missed by us all. Our condolences to his wife, Vi. August testing successes: SMRA VE (ARRL): To Extra - WA6AHX; to Advanced - W6MPR, KC6EBP, KB6ULB, KB6UMZ; to General - KB6AED; to Technician - KB6WIP, Steve Vasconcellos (Turlock, callsign pending); to Novice - Ron Loper (Simi Valley); VEs - N6SR, K6JTJ, WB6CNO, W6HW, WD6BKF, W6MUL, K6VK, AA7AA, W6TKF; Non-VE assts - Laura Schroeder, Margaret Myers, KA6WZR, WR6S. SBARC VE (ARRL): To Extra - KB6YNY, K6KME; to Advanced - KB6UXI, KB6YGH, Truett Thach (unl), N6OXW; to Technician - KC6AYP, KC6EJC, KA6YAE, KC6AVJ, Karl Metzger (unl); VEs - KB5AH, AA6OT, WR6V, KB6ILQ, WA6VNO, N6PIM, AB6S, N6NLW, AA6JG. Congratulations to all and thanks to the VE and Non-VE volunteers. 73 for now, de W2KVA. Traffic: W8AKF 4934, N6NLW 123, VE3AWE/W8 83. (Jul) W8AKF 3959, (Jun) W8AKF 3546.

WEST GULF DIVISION

NORTH TEXAS: SM, Dan Dansby, W5URI—The North TX Section Amateur of the Year Award will be presented next year at the Arlington Hamfest in June. Rules are being written now and will be published in the Section Quarterly Newletter. Any individual or organization would like to sponsor this award may contact the SM for details. Congratulations to KA5NGG for being appointed the RACES Coordinator for FW/Tarrant Co. Good luck, Lamar. Once again, K5UPN and KF5BL have made BPL for the month. Congratulations to both of you. Traffic: K5UPN 983. KF5BL 541, W5TNT 343, K5MXQ 183, KD5RC 128, KC5NG 103, N5NZH 100, KM5L 95, KB5JVU/T 94. N5KCL 91, W9OYL 58, AC5Z 22, KB5BNU 18, WA4DZT 14, W5VMP 8.

OKLAHOMA: SM, Joe Lynch, N6CL—The exciting news this month is the link of the Tulsa AAARC UHF repeater with the Oklahoma City MORI UHF repeater. With the MORI UHF repeater already linked to the 146.94 repeater this gives access for Tulsans to Oklahoma City on VHF. Plans exist for a VHF input in Tulsa on 147.00 and other repeaters around the state to have a feed into the MORI UHF repeater. A statewide link of repeaters is becoming a very real possibility. Other news: Your SM visits the Ice Cream Social put on by the various Tulsa Clubs along with the Broken Arrow ARC. Your SM also attended a meeting of the Enid ARC. Their Hamfest will be on Nov 4 with talk-in on 145.29-. Your SM attended the Amarillo Hamfest and met with Milly Wise, W5OVH, WTX SM concerning mutual aid and crossover communications. A tentative meeting is set for sometime in the Spring with Millie, her and hams from the panhandles of Oklahoma and Texas. Ham classes are under way around the state. Check with your local club for the one nearest you. 73, Joe. Traffic: N5IKN 123, K5CXP 99, K5GBN 61, WA5OUV 60, N5FEM 54, WB5OHK 54, AA5GI 39, WA5OGC 36, WA5ZOO 30, NQ5Y 8.

SOUTH TEXAS: SM, Art Ross, W5KR— STM, WD5GKH. SEC, K5DG. PIO, WA5UZB. ACC, WB5YDD. BM, WA5WCY. TC, NZ5U. OOC, K5SBU. SGL, K5KJN. ASM, all of above plus N5TC. Big news in the Section remains KB5AQV having been selected for one of Amateur Radio's most prestigious prizes: The Hiram Percy Maxim Memorial Award; full details elsewhere in QST, but Clear Lake ARC is real proud of Kevin. CLARC also turned out for Hurricane Chantal; EC WD5EEV, KH6FHS, K5BY, WA5LOO, KA5GLX, WD5EFC, W5CLW, K5HV, PIA KB5AWM, KB5AQV, KA9WKK, N5JVV, N5GIN, N5GFS, WD5EEU and N5OLU helped the cause; KB5AQV and KB5IEQ taught, KA5GLK and KB5AWM tested the Novice class and 9 new Novice class amateurs emerged. PIA KA5EEQ, Brenham ARC, doing excellent job getting club coverage in local media. "Scrambled Scribblin'," bulletin of the Hams 'n Eggs Societe' of La Grange, rprts KF5ZL is newly appointed DEC for Harris County and 5 surrounding counties, plus RACES Officer for Harris and 13 surrounding counties; gives kudos to WB5QPR and N5GZV for upgrading to Advanced class. Central Texas Traffic Net (CTTN) NM N5NAV rprts 224 messages in 62 August sessions; 572 ck-ins; NTS liaison for all sessions. OBS W5KLV rprts 4 propagation fcsts, 4 bulletins given 31 readings on 7 nets. The Hill Country ARC, Kerrville, rprts club again provided communication for July 4 VFW sponsored canoe race; W5CFK, N5ASQ, KC5ZT, W5NTJ, K5TR, W5RKI, WB5TCB, K6AQV, KA5ONN, KA5SOX and N5NOY helped keep every-safe and informed. 7290 Traffic Net Secy NF5T rprts 340 messages in 50 August sessions; 3277 ck-ins; NTS liaison 2 per session; NM W5YQZ. Johnson Space Center ARC rprts fair results on Apollo 11 20th anniversary commemorative station operation, with 239 total contacts; also rprts parade operation used 2 nets in successful operation. DRN5 NM WB5YDD rprts 701 msgs in 62 August sessions; STX represented 100% by W5KLV, W5CTZ, WB5HZQ, N5ILI, NZ5U, WB5YDD. PIA NZ5J, Seguin, is newly appointed OES and rprts N5OEO is new EC for Guadalupe County, has upgraded to General Class and his wife passed Novice exam and awaits new call; CTTN hit new traffic record in August; Comal County ARES, under guidance of EC N5NAV, participated in emergency practice exercise, a first for Comal County officials; K5TK and KB5FUH "Elmering" several elementary school students and new Novices expected soon. WA2VJL reports San Benito ARC donated 2 videotapes to local library: "Tune in the World," and "Big Bird" from from Sesame Street, the latter teaching children how to

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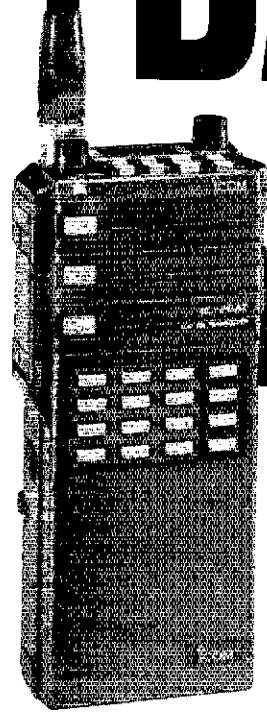

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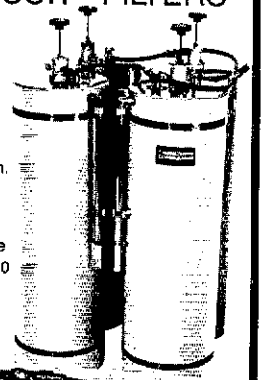

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prepare for hurricanes. B-VARC Bulletin, Brazos Valley ARC, rprts KB5JPX upgraded to General Class; KB5HMF, KB5ISX and 3 unlicensed went to Technician Class; 7 others passed various elements on road to upgrade (VERY NICE!); WB5IGG is ramrodding organization of new Novice Class. AARC-OVER, Austin ARC, announces beginning of Novice course.

WEST TEXAS: SM, A. Milly Wise, W5OVH—At the June meeting of the El Paso Amateur Radio Club, the following officers were elected: Pres. Clay Emert K5TRW. Vice-Pres. Tony McLean KB5HQE; Secretary Bill Holcombe, W5TFT; Treas. Milly Wise, W5OVH; Trustee Mel Levenson, WA5ELG. Congratulations to Ken, KB5HQJ, of Big Springs who upgraded to General class. Big Springs ARC has a ten-meter net on Tuesday night at 7:00 on 28.454 Central Standard Time. Grant, N5GOM, of Dalhart, TX has completed his WAS. Sandy McKean, W5MVJ, reports he has finally gotten Randell County in West Texas assigned with an EC and now we have 390 ARES members now signed up. The EPARC and K5WPH ARC along with QCWA members are going to hold a hamfesta in El Paso on Oct 21 & 22. It will be at Western Playland. On September fourth, Jerry McTernan, W5YV, was presented with a seventy five year certificate from QCWA. Due to unforseen circumstances, Hugh Winter could not make it so Joe Knight, W5BDY, who is Section Manager of New Mexico of the Rocky Mt. Division presented Jerry with the honor. At the W5ES clubhouse with sixty friends and WCWA members attending. W5ES El Paso Amateur Radio Club had about forty persons sign up for the new classes at the clubhouse. Alpine and the Big Bend ARC have a contest every Field Day with the San Angelo ARC and it looks as though the "Hallicrafters boat anchor" will be headed back to Alpine. Friendly competition may be the way we can get more participation in the clubs. 73, Milly Wise, W5OVH. Traffic: AE5I 144, WB5OXE 91, K5KKO 30, K5UYH 29, W5ERT 20. (Jul) AE5I 10.

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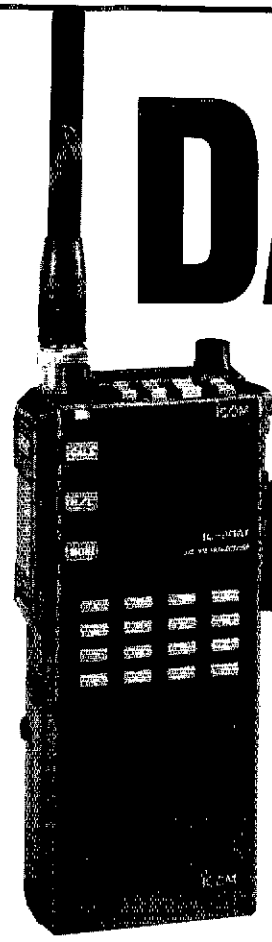

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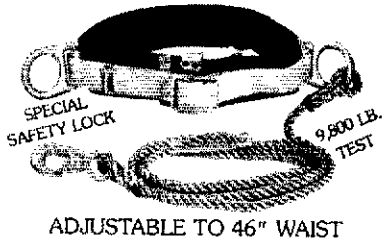

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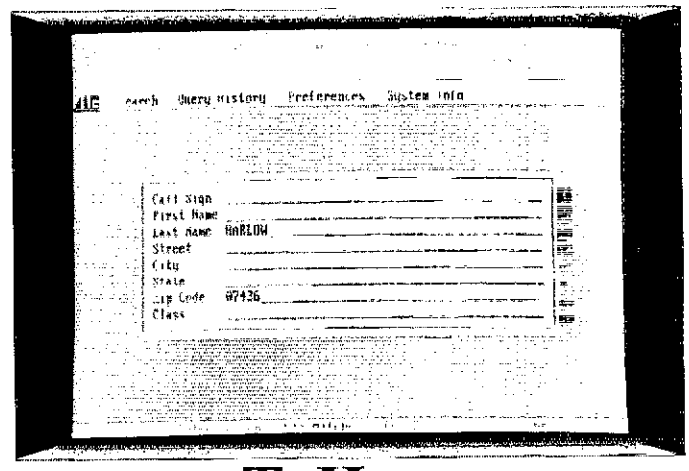

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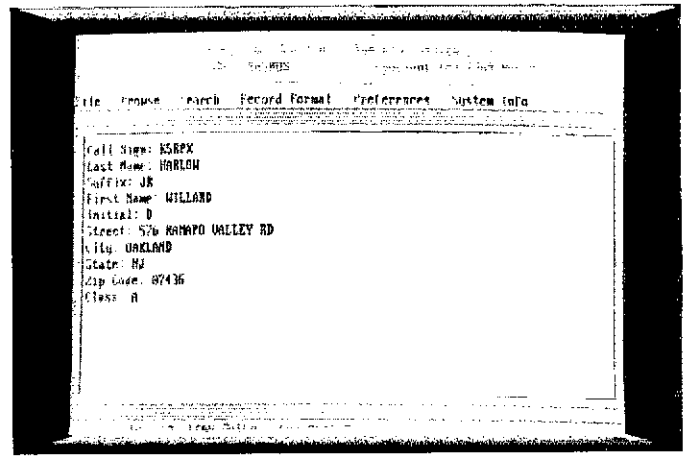

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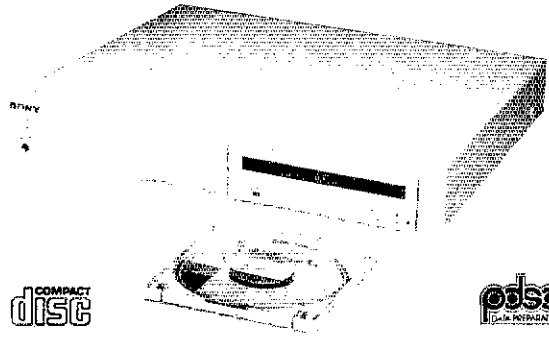

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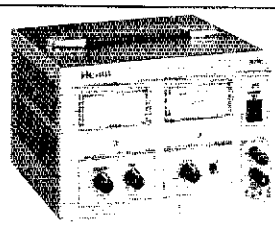
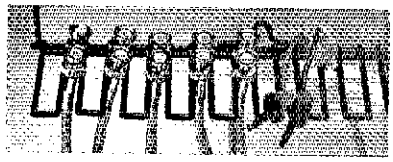


Here's an excellent value in an all-around bench power supply. Dual meters let you continuously monitor voltage and current, and 0-30 volt 3-amp output fills most common power supply needs. Use the constant current mode to charge rechargeable batteries, limit power to circuits under test, and operate devices that are current dependent.

SP-2762 ..... $169.95

Specifications: Output voltage: 0-30 VDC continuously variable. Coarse and fine controls. Output load: 0-3 A continuous. Output impedance: Typically less than 0.2 Ω to 10 kHz. Ripple: To 10 kHz, less than 5 mV p-p (0.5 mV rms typical). Load regulation: ±0.25%±3 mV, 1-100% of rated current. Line regulation: ±0.25% ±2 mV for ±10% line variation. Current limiting: 0-3 A, variable. Power: 120 VAC/240 VAC, ±10%, 50-60 Hz, 180 watts.

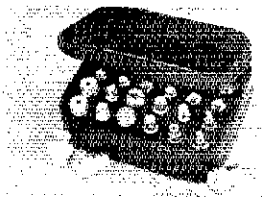
HANDY BNC CABLE SET



Our new BNC cable set provides you with 10 handy coax cables for connections to instruments and other equipment. Included are two 3 ft. BNC male/dual E-Z hook connectors, three 1-1/2 ft. BNC male/BNC male connectors, two 2 ft. BNC male/BNC male connectors, and a rack that you can mount on your workshop wall for convenient cable storage. An outstanding value at less than $3.00 a cable.

HCA-5002 ..... $29.95

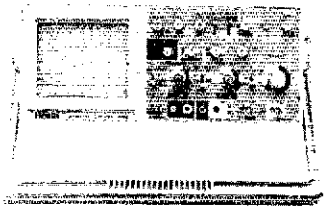
PREMIUM QUALITY COAX CONNECTORS



Make different types of coaxial connector adapters with gold plated pins and Teflon insulation. Just screw the required connector onto one of the interfaces — no crimping or soldering is needed. In just seconds, you'll have that special coaxial connection you require. Kit contains male and female N, F, RCA, BNC, UHF, SMA, TNC, and mini UHF connectors. A handsome, padded, zippered case is included with your deluxe kit to protect your connectors and to keep them looking new after years of service.

HCA-3001 ..... $79.95

DELUXE SCOPES ARE A PLEASURE TO USE

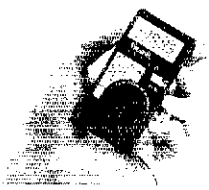


These oscilloscopes offer the measurement capability you need, plus luxury features that make them a joy to own. TV triggers, 1 mV/div sensitivity, differential and X-Y measurements, plus beam finder, component tester, graticule illumination, and other features many manufacturers omit. Enjoy a top-quality 25 or 40 MHz scope backed by a reliable name, full warranty, and complete specifications.

25 MHz: SO-4552 ..... $399.95
40 MHz: SO-4554 ..... $599.95

Specifications: Vertical: 1 mV/div-5 V/div. Bandwidth less at 1 mV/div. Accuracy ±3% at 1 kHz, ±5% at 1 mV/div. Overshoot: less than 5%. Max input: 400 V. Modes: CHA, CHB, dual, add. Horizontal: .2 s - .1 µs/div, plus X10 magnifier. Trigger: CHA, CHB, Line, Ext, Auto, Norm, TV-V, TV-H, +/-. Power: 90-132/198-264 VAC, 50/60 Hz, 45 W. Weight: 16.7 lbs.

HALF PRICE SPECIAL!



ONLY $12.47

Order any product from this ad and get our popular shirt pocket miniature DMM, Model SM-2300-A, for only **$12.47** — half our regular price.

Specifications: Autoranging 3-1/2 digit DMM. DC volts: 2000 mV to 450 V, ±1.3% ±4 counts. Approx. 11 MΩ input resistance. Max input, 450 VDC. AC volts: 2000 mV to 450 V, ±2.3% ±8 counts, 50 to 400 Hz. Approx. 11 MΩ input resistance. Max input, 450 V. Resistance: 2000 Ω to 2 MΩ ±2% ±4 counts.

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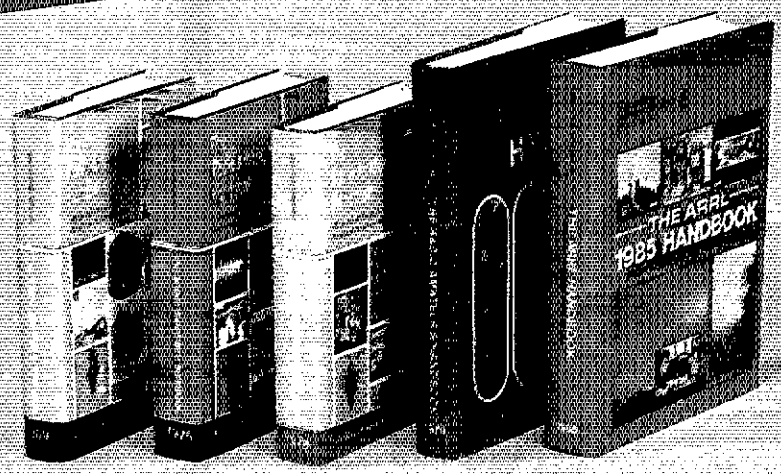
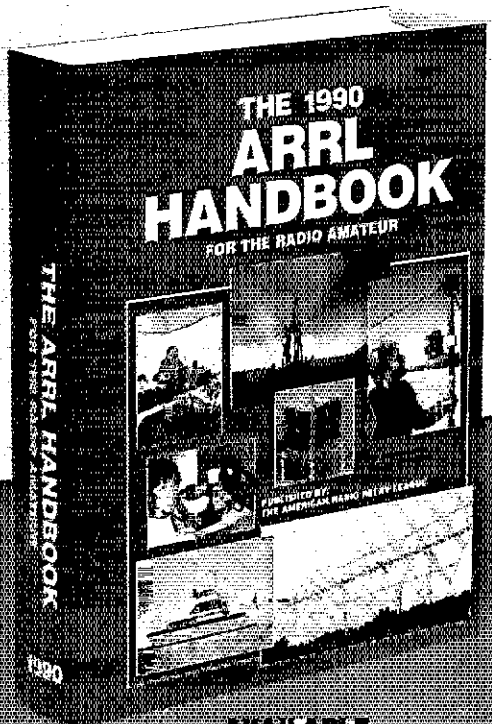
Heath Instruments

When was the last time you bought a new Handbook?





INTRODUCING THE GREAT...

AVAILABLE IN NOVEMBER

If you bought one of the Handbooks pictured above, you're not alone. These represent over 485,000 of the 5.3 million copies of the Handbook purchased since 1926! ARRL's premier publication is successful because it is updated every year. The new sixty-seventh edition is no exception. With over 1200 pages and over 2100 tables, figures and charts, **the 1990 ARRL Handbook for the Radio Amateur is better than ever!**

Every ham is interested in antennas, and we've added a host of new antenna projects including three high-performance Yagis for 144, 220 and 432 MHz designed by Steve Powlishen, K1FO. Dick Jansson, WD4FAB, has completely revised the space communications chapter, which includes his innovative helical array for AO-13 Mode L.

But that's not all. You'll find many other popular construction projects that can be built in a weekend, such as power supplies, keyers, measuring devices, QRP transmitters and VHF/UHF preamps. For the more ambitious builder, there are projects like a high-performance communications receiver, high-power HF and VHF amplifiers, a 1296-MHz transverter or digital audio memory keyer.

The **Handbook** has always been famous as a reference for component data. You will find an entire chapter devoted to everything from tube and transistor specifications to aluminum tubing sizes. Also featured is the most up-to-date information on digital techniques and operating practices.

At $23, the **Handbook** remains an exceptional value for a hardcover technical publication. For shipping and handling in the US, please add $3.50 ($4.50 for UPS), elsewhere add $5 for shipping by surface mail. Save on shipping charges by visiting your favorite ARRL dealer!

Here is a description of what is covered in the **Handbook**.

The first five introductory chapters cover basics of Amateur Radio, electrical fundamentals, radio design technique and language, solid state fundamentals and vacuum tube principles. Next are 12 chapters devoted primarily to these topics: power supplies, audio and video, digital basics, modulation and demodulation, RF transmitters, receivers, transceivers, repeaters, power amplifiers, transmission lines and antenna fundamentals. Another four chapters cover voice, digital, image and special modulation techniques. The RF spectrum, propagation and space communications are covered in two chapters. The construction and maintenance section offers 12 chapters of useful projects ranging from power supplies and antennas through digital equipment. You'll also find up-to-date component data that the **Handbook** is famous for. The final five chapters cover obtaining your license, station design and operation, interference, monitoring and direction finding. An abbreviations list and huge index make up balance of the book.

The American Radio Relay League, Inc, 225 Main St, Newington, CT 06111 USA

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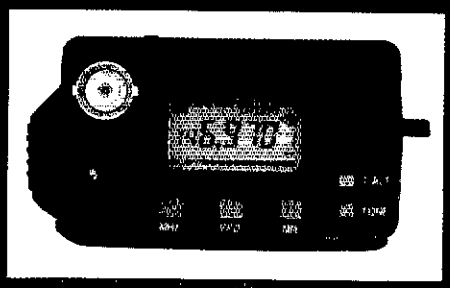
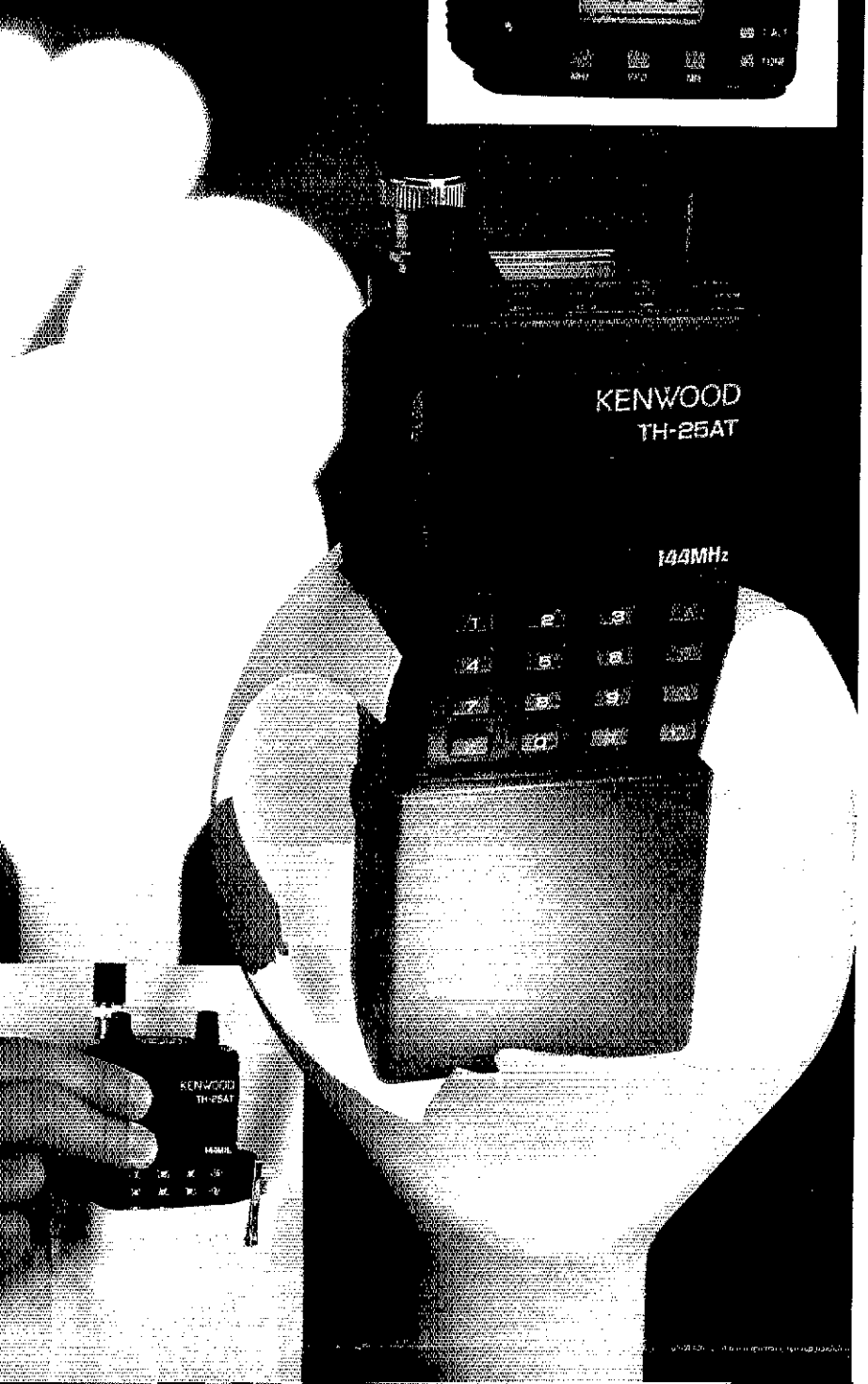
TH-55AT 1200 MHz Here Now!

Compact Breakthrough!



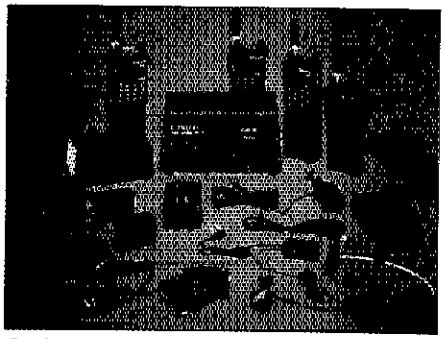


TH-25AT/45AT

New Pocket Portable Transceivers

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

- Frequency coverage: **TH-25AT:** 141-163 MHz (Rx); 144-148 MHz (Tx). (Modifiable for MARS/CAP. Permits required.)
  TH-45AT: 438-450 MHz.
- Automatic Power Control (APC) circuit for reliable RF output and final protection.
- 14 memories; two for **any** "odd split" (5 kHz steps).
- Automatic offset selection (TH-25AT).
- 5 Watts from 12 VDC or PB-8 battery pack.
- Large multi-function LCD display.
- Rotary dial selects memory, frequency, CTCSS and scan direction.
- T-ALERT for quiet monitoring. Tone Alert beeps when squelch is opened.
- Band scan and memory scan.
- Automatic "power off" circuit.
- Water resistant.
- CTCSS encoder/decoder optional (TSU-6).
- **Supplied accessories:** StubbyDuk, PB-6 battery pack for 2.5 watts output, wall charger, belt hook, wrist strap, water resistant dust caps.



Optional accessories:

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

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

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

WHAT'S NEW ON THE ARRL BOOKSHELF?

The 1990 Handbook and Tune in the World with Ham Radio

The new editions you've been waiting for. You'll find more information about them elsewhere in this issue.

Conference Proceedings: 8th Computer Networking and Microwave Update, 1989

Here are two conferences that are on the cutting edge of Amateur Radio technology. *The 8th Computer Networking Conference Proceedings* (#2510) has papers submitted for the conference held October 7, 1989 in Colorado Springs, and *Microwave Update, 1989* (#2529) has papers submitted for the conference held on the same weekend in Arlington, Texas. Other recent conference proceedings booklets available are *Proceedings of the ARRL National Education Workshop* (2405) and *Proceedings of the 23rd Central States VHF Conference* (#2413). Price of each conference proceeding booklet is $12 plus postage and handling.

N6RJ Second Op and N6RJ Second Op Software

Here in one place is all of the DX information you need about a particular country: Prefix, Continent, CQ Zone, Beam Heading, Postage Rates, ITU prefix. The software version (requires IBM PC, 640K installed memory, 2 DSDD 5-1/4" floppy disk drives or 1 DSDD 5-1/4" floppy disk drive and hard disk highly recommended) is packed with applications: comprehensive country data, bearings (long and short path) logging system, summary displays of DXCC/WAZ, extensive printing functions (like DXCC need-list by band, band-mode, worked-not confirmed etc), GMT clock with WWV propagation forecast timer, *N6RJ Second Op* (#243X) $9; *N6RJ Second Op Software* vers. 2.0 (#2421) $60 plus postage and handling.

What's going on between our HF ham-bands?

The 1990 edition of *Passport to Worldband Radio* (#2537, $15 plus postage and handling) is hot off the press. In it you will find listings of shortwave broadcasts from over 150 countries. *Ferrell's Confidential Frequency List* (#2206, $20 plus postage and handling) has over 370 pages listing, HF, CW, Coast, Fixed, Embassy, Military, FAX, Aircraft and Aircraft Weather, plus Time transmissions.

The FCC Rule Book

Here are the new rules with important interpretations in the style that has made the "Washington Mailbox" column in *QST* so popular. Find out what you can and cannot do under the new regulations. These are the most sweeping changes in the Amateur Radio rules in decades, so you'll need to have a copy close at hand. 8th Edition (#0453) $9 plus postage and handling.

The Technician Class License Manual

On November 1, 1989 the new element 3A—Technician Class exam becomes effective. We've written this book around the new question pool to provide an understanding of key concepts and to make passing the exam a snap! At the beginning of each chapter, you will find a list of key words that appear there, along with a simple definition for each word or phrase, and as you read the text you'll find these words printed in **bold type** the first time they appear. At the end of the book you'll find the complete question pool with distractor questions, answer key (with page references showing where you can check the text for a quick review) and there's also a glossary of all the key words used in the book. (#2375) $6 plus postage and handling.

The General Class License Manual

There won't be a change in the General Class exam until November 1, 1990, but we've taken this opportunity to break out the element 3B material from the *Technician/General Class License Manual* and put it in a separate book. The description above of the *Technician Class License Manual* also fits the new *General Class License Manual.* (#2383) $6 plus postage and handling.

Amount of order/shipping and handling: less than $20/$2.50, $20.01-30.00/$3.50, $30.01-40.00/$4.50, $40.01-50.00/$5.50, $50.01-75.00/$6.50, Over $75/$7.50. Add an additional $1 for UPS.

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KENWOOD

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All mode tri-bander!

Warp Drive!

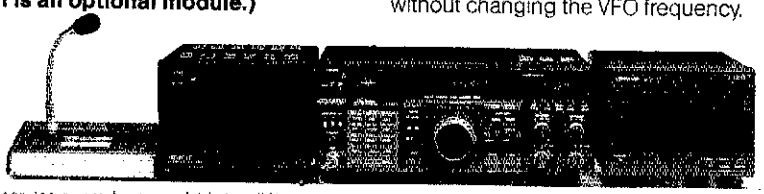
TS-790A

Satellite Transceiver

The new Kenwood TS-790A VHF/UHF all-mode tri-band transceiver is designed for the VHF/UHF and satellite "power user." The new TS-790A is an all-mode 144/450/1200 MHz transceiver with many special enhancements such as automatic uplink/downlink tracking. Other features include dual receive, automatic mode selection, automatic repeater offset selection for FM repeater use, VFO or quick step channel tuning, direct keyboard frequency entry, 59 memory channels (10 channels for separate receive and transmit frequency storage), multiple scanning and multiple scan stop modes. The Automatic Lock Tuning (ALT) on 1200 MHz eliminates frequency drift. Power output is 45 watts on 144 MHz, 40 watts on 450 MHz, and 10 watts on 1200 MHz. (The 1200 MHz section is an optional module.)

- **High stability VFO.** The dual digital VFOs feature rock-stable TCXO (temperature compensated crystal oscillator) circuitry, with frequency stability of ±3 ppm.
- **Operates on 13.8 VDC.** Perfect for mountain-top DXpeditions!
- **The mode switches confirm USB, LSB, CW, or FM selection with Morse Code.**
- **Dual Watch allows reception of two bands at the same time.**
- **Automatic mode and automatic repeater offset selection.**
- **Direct keyboard frequency entry.**
- **59 multi-function memory channels.** Store frequency, mode, tone information, offset, and quick step function. Ten memory channels for "odd split."
- **CTCSS encoder built-in.** Optional TSU-5 enables sub-tone decode.
- **Memory scroll function.** This feature allows you to check memory contents without changing the VFO frequency.
- **Multiple scanning functions.** Memory channel lock-out is also provided.
- **ALT—Automatic Lock Tuning—on 1200 MHz eliminates drift!**
- **500 Hz CW filter built-in.**
- **Packet radio connector.**
- **Interference reduction controls:** 10 dB RF attenuator on 2m, noise blanker, IF shift, selectable AGC, all mode squelch.
- **Other useful controls:** RF power output control, speech processor, dual muting, frequency lock switch, RIT.
- **Voice synthesizer option.**
- **Computer control option.**

Optional Accessories:
• **PS-31** Power supply • **SP-31** External speaker • **UT-10** 1200 MHz module • **VS-2** Voice synthesizer unit • **TSU-5** Programmable CTCSS decoder • **IF-232C** Computer interface • **MC-60A/MC-80/MC-85** Desk mics • **HS-5/HS-6** Headphones • **MC-43S** Hand mic • **PG-2S** Extra DC cable



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

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P.O. BOX 1075, 959 Gana Court
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New 220 MHz

220: FM for All!

Kenwood brings you a wide range of 220 MHz gear designed for every need. Choose from two types of mobile and two types of HT. The TH-315A is a full-featured HT covering 220–225 MHz. Ten memory channels and 2.5 watts of power. (5 W with PB-1 or 12 V DC.) Uses the same accessories as the TH-215A for 2 meters or TH-415A 440 MHz. For truly "pocket portability," choose the TH-31BT, a thumb-wheel programmable, 1 watt unit. For mobile use, select the TM-321A or TM-3530A.

The TM-321A is the 25 W, 220 MHz, 14-memory version of the super popular, super compact TM-221A. The 25-watt TM-3530A has 23 memories, a 15 telephone number memory and auto dialer. Direct keyboard frequency entry and front panel DTMF pad enhances operating convenience. Novice to Amateur Extra, these transceivers will put everyone on the air "Kenwood Style"!

TH-315A
Full-featured HT

TM-321A
Compact mobile transceiver

TH-31BT/31A
Pocket-held HT

New

New

TM-3530A
Full-featured mobile transceiver

The TM-321A comes with 16-key DTMF mic.
A complete line of accessories is available for all models.

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

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THE *New* PCS-6000

BOLDLY GOES WHERE NO OTHER TRANSCEIVER HAS GONE BEFORE!!

AZDEN

RECEIVE 118 TO 173.995 MHZ.

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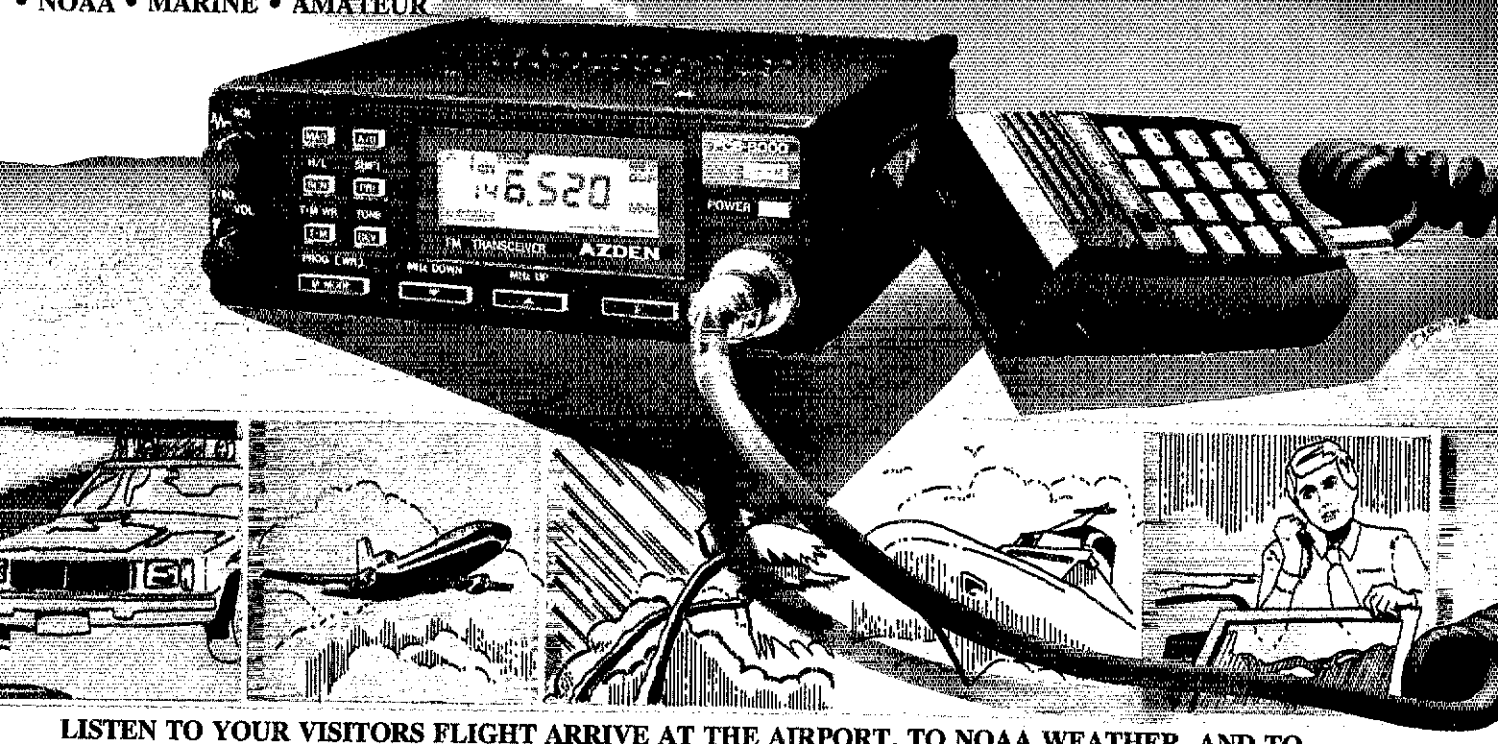
• NOAA • MARINE • AMATEUR



LISTEN TO YOUR VISITORS FLIGHT ARRIVE AT THE AIRPORT, TO NOAA WEATHER, AND TO PUBLIC SERVICE, POLICE, FIRE, FORESTRY AND MARINE FREQUENCIES

MODELS: PCS-6000H 50 WATTS!! *Also coming soon PCS-6200 220MHZ, PCS-6300 70CM and PC-10 10 Meter FM Handheld.* **CMOS AND ADVANCED SURFACE MOUNT TECHNOLOGY PROVIDE UNPRECEDENTED COMMERCIAL QUALITY AND RELIABILITY.**

UNPRECEDENTED WIDE REQUENCY COVERAGE: The PCS-6000 receives 118.00 to 135.995 MHZ AM Aircraft/136-173.995 MHZ FM and transmits 140.100 to 150.000 MHZ. Modifiable to ALL MARS and CAP frequencies (proof of authorization/license required)

TINY SIZE: Only 2 inches high, 5½ inches wide and 7⅛ inches deep!! Easily fits anywhere, even in the smallest car!

20 CHANNEL MEMORY IN TWO BANKS PLUS 1 TEMPORARY CHANNEL (TM): Two memory banks, A and B have 10 memory channels each. The memories store frequency, shift width, offset information, and PL tone frequency as programmed. *An extra memory channel (that we call TM-temporary memory) is provided to allow you to store any operating condition instantly again and again!!*

UP TO 21 NONSTANDARD SPLITS: Program any split in any channel.

VERSATILE SCANNING FUNCTIONS: Dual memory scan, programmable band scanning, hold scan and delay scan functions are provided, with selectable delay time. ALL memory channels are tunable independently.

PRIORITY CHANNEL MONITORING: Memory Channel B0(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.

WARRRANTY: 1 YEAR LIMITED.

EXCLUSIVE DISTRIBUTOR:

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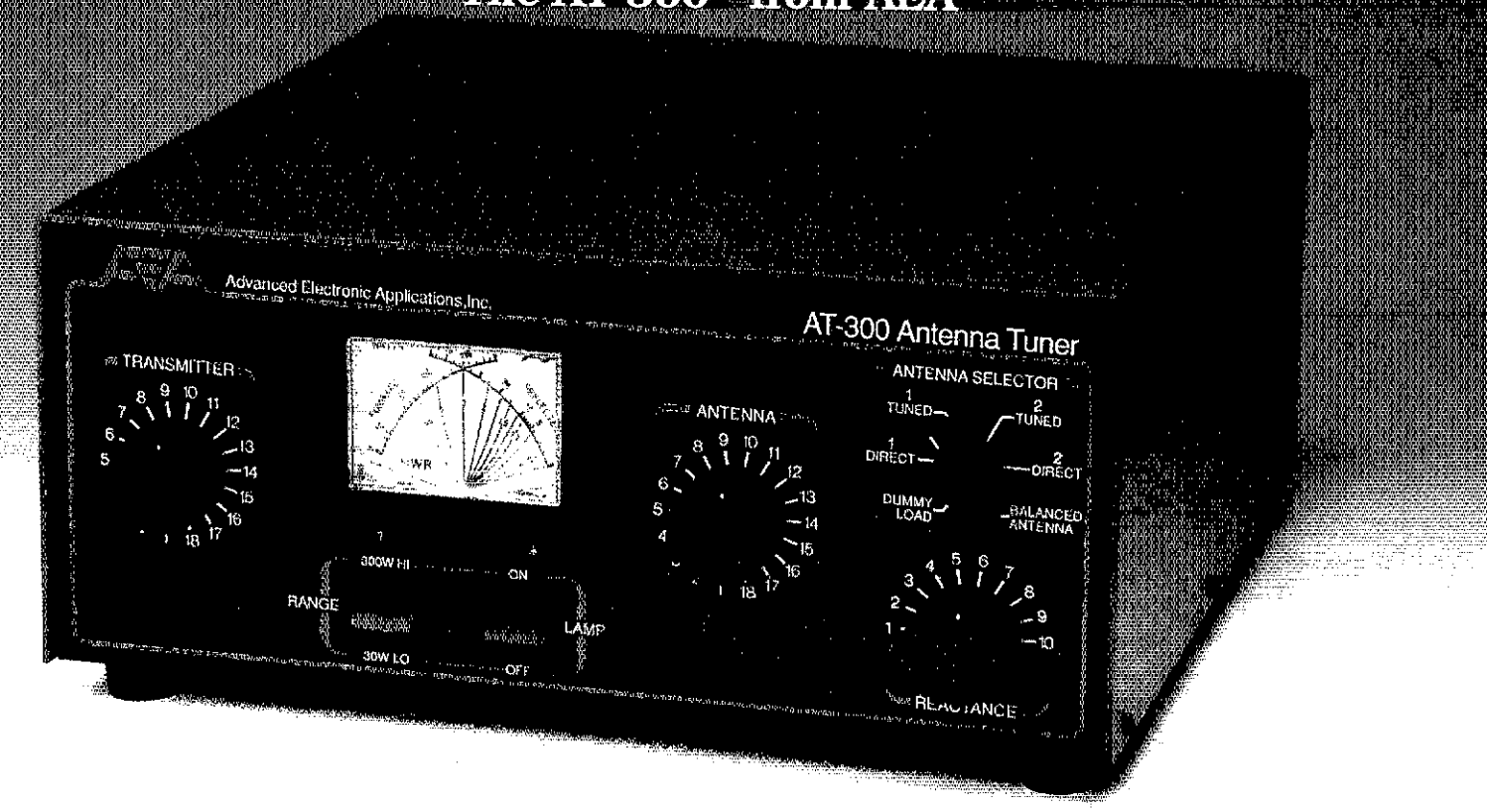
An affordable antenna tuner from a name you can trust

The AT-300™ from AEA



Low Pass Design

The low-pass design of the AT-300 is what you would expect from a company where Engineering Makes the Difference. The low-pass design of this AEA tuner means harmonic attenuation for lower TVI potential. This design also allows matching a much wider range of antenna impedances than the common high-pass designs.

Larger Size

One look at the AT-300 lets you know this tuner is different, it's bigger. While some manufacturers promote the small size of their tuners, AEA knows that performance is most important. The simple reason for the larger size is that smaller sizes degrade the inductors' Q (Quality factor), which results in less efficiency. Less efficiency means that for a given power output from your transmitter, less power will actually get to your antenna.

Easy Operation

The AT-300 tuner features a precision frequency compensated dual- movement SWR meter for ease of tuning. The high and low power front panel switch selects the proper range for the SWR meter. The AT-300 is rated for 300 watt operation. The internal balun and front panel selector switch allows for balanced and unbalanced outputs.

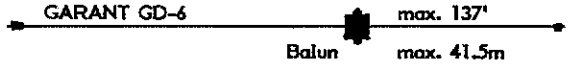
Get maximum performance from your transceiver and antenna by using the AT-300 antenna tuner from AEA. See your local AEA dealer today or contact:

Advanced Electronic Applications, Inc.
P.O. Box C-2160
Lynnwood, WA 98036
206-775-7373

AEA Retail $249.95
Amateur Net $219.95

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?



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.

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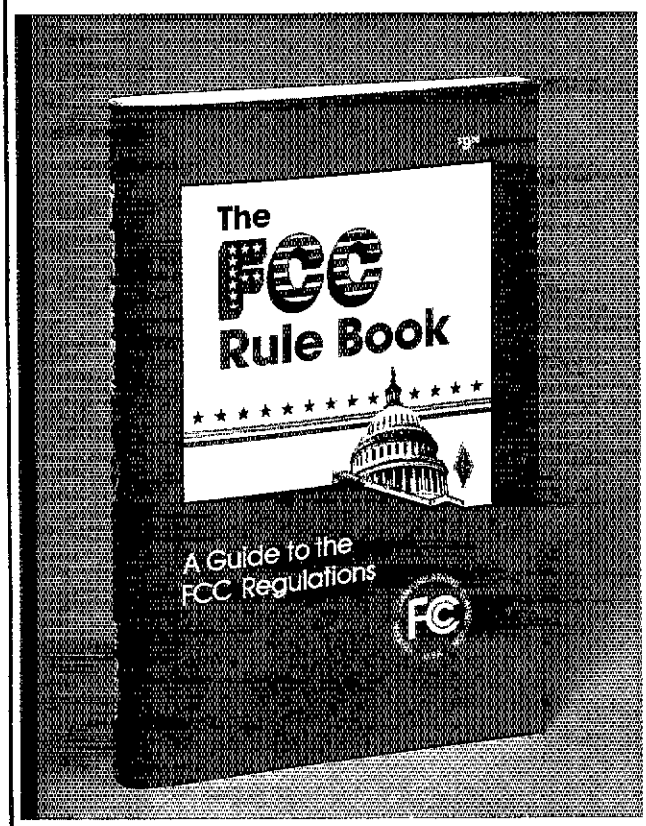
YES, THEY REALLY DO WORK! READ WHAT OUR CUSTOMERS WRITE:

WØHBE, 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, Clavis 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.**



Team efforts: Here's the new 288-page *FCC Rule Book*, the culmination of work done by the ARRL Board's Part 97 committee and a team of editors headed by Rick Palm, K1CE. Other *new* editions along the licensing front are *Tune in the World with Ham Radio* and separate *Technician* and *General Class License Manuals*.

Tune in the World with Ham Radio New edition for exams given on or after Nov. 1, 1989:
Kit with Book and Cassettes ..... **#2472 $19**
Book only ..... **#2464 $14**
Technician Class License Manual New edition for exams given on or after Nov. 1, 1989 ..... **#2375 $ 6**
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See the ARRL Bookshelf page elsewhere in this issue for ordering information.

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neter and 2-meter moonbounce installation. Four 6M-2WL, four M-5WL and one 432-13WL antennas in array on self-supporting 89-foot US tower at N7ML.

The superior engineering designs, quality and high performance that AEA built its reputation on are now available in its dynamic new line of antennas. Developed and manufactured by Mike Staal K6MYC, president of M² Enterprises and co-founder of KLM antennas, the product line includes an assortment of 2-meter, 6-meter and 440 MHz antennas and accessories for fixed or portable applications. AEA/M² antennas are already recognized for their superior performance by many moonbouncers.

Features. AEA's new antenna line features computer-optimized antennas with the highest gain for boom-length attainable.

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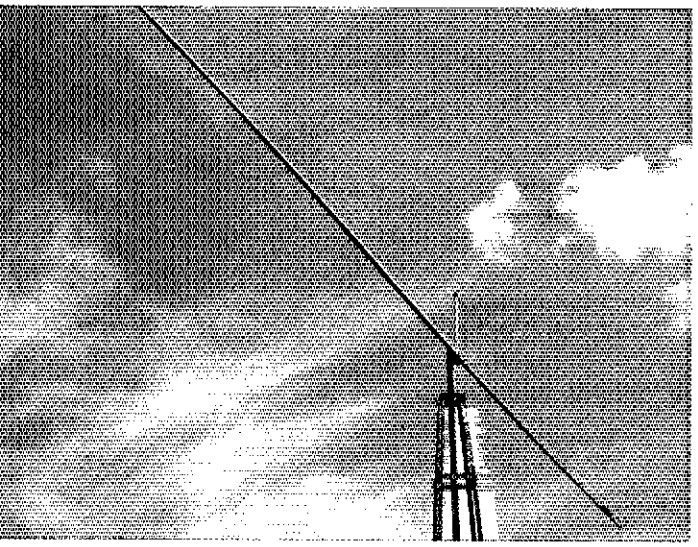
Accessories. To compliment the antenna line, AEA also offers various "H" frame support packages. The MT-3000 heavy-duty elevation mechanism and controller for tilting up multiple yagi arrays. Also welded aluminum power dividers for coupling multiple antennas.

For further information, see your local AEA authorized dealer, or call AEA at (206)775-7373.



2M-18XXX installation at N7KQK.

Model	6M-5	6M-2WL	6M-2.5WL	2M-5WL	2M-18XXX	2M-6WLHD	2M-CP14	2M-CP22	EB-144	430-16	432-13WL	EB-432
lements	5	9	11	17	18	20	14	22	N/A	16	39	N/A
oom	15'9"	39'6"	50'4"	33'	36'	41'4"	9'10"	18'	N/A	10'	30'3"	N/A
Veight	11/14	31/40	38/47	13/15	14/16	30/37	6/8	12.5/15	1.5/3	4/5	12/13	1.3/3
Windload	2.0	5.0	5.9	2.7	2.9	6.1	1.1	2.5	N/A	0.82	2.5	N/A

om - Length, feet and inches.
ght - Weight in pounds, antenna weight/shipping weight.
dload - Windload area in square feet.
- Six meters, **2M** - Two meters, **WL** - Wavelength,
- Heavy-duty, **CP** - Circularly polarized, **EB** - Eggbeater.

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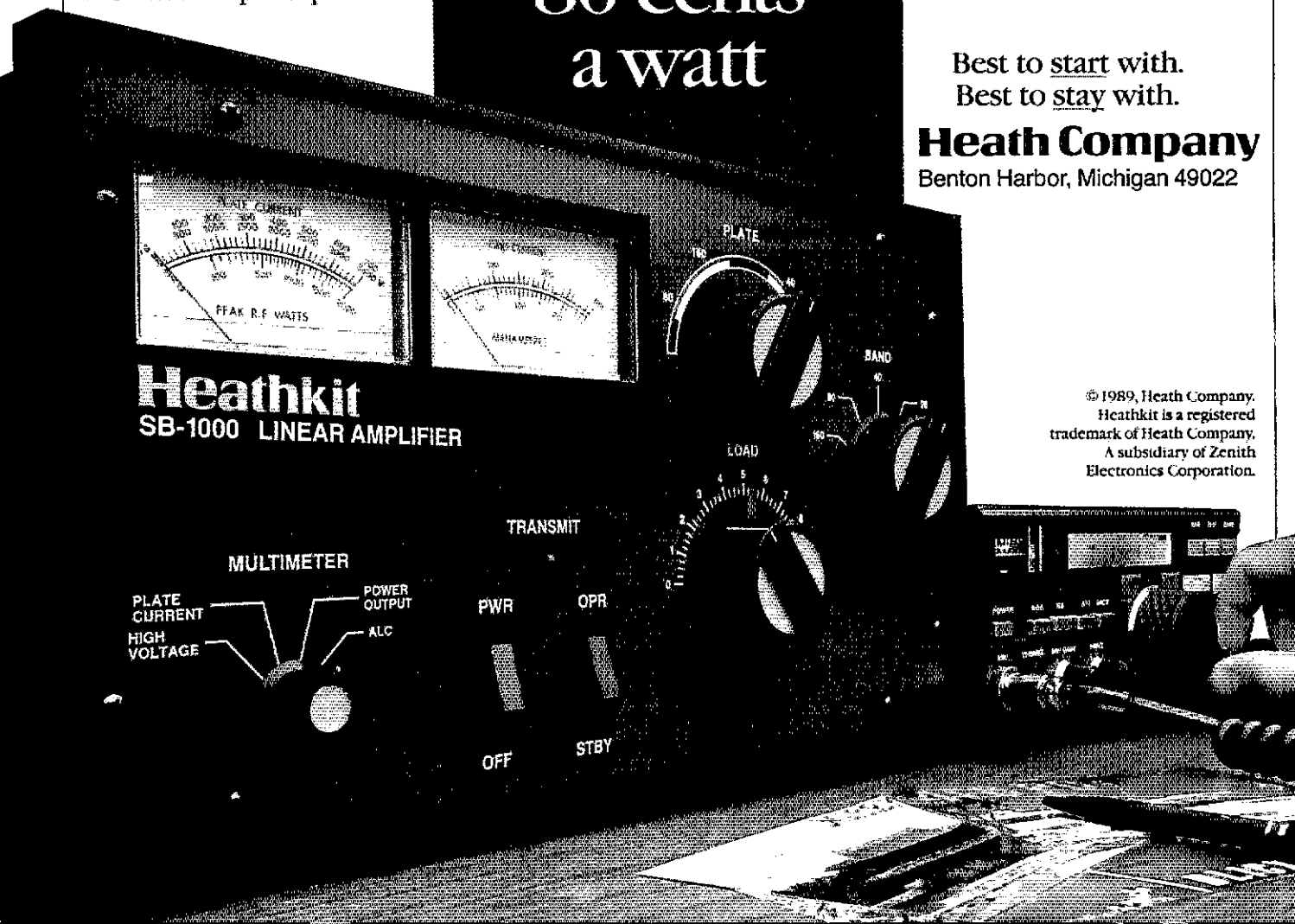
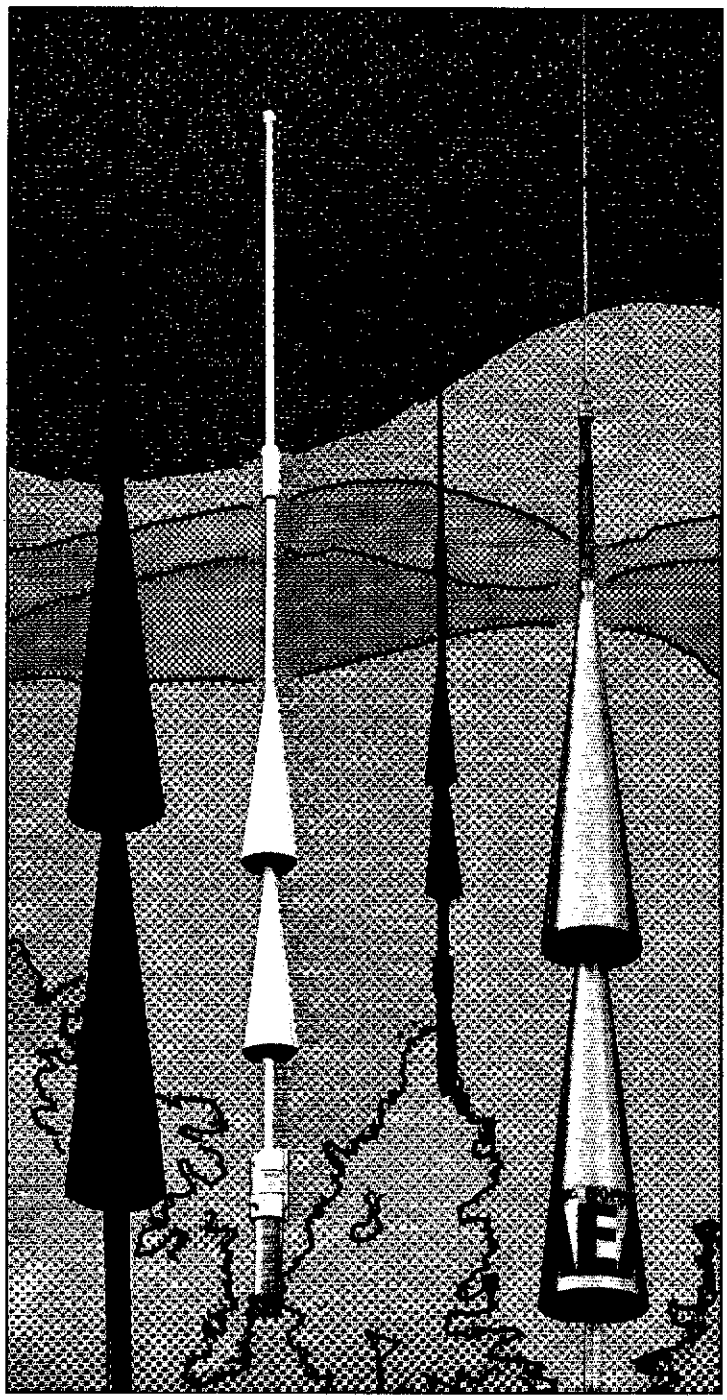


Improve Your Performance



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IsoPoles.™ Available in 144, 220 or 440 MHz, all IsoPole™ antennas yield the maximum gain attainable for their respective lengths, and a zero degree angle of radiation. Exceptional decoupling results in simple tuning and a significant reduction in TVI potential. Cones offer greater efficiency over obsolete radials which radiate in the horizontal plane. Plus the IsoPoles™ have a broad frequency coverage. This means no loss of power output from one end of the band to the other, when used with SWR-protected solid-state transceivers. Experience a typical SWR of 1.4 to 1 or better across the entire band!

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(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is $1.00 per word. This includes firms or individuals offering products or services for sale. A special rate of 30 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

(3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 13th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received November 14th through December 13th will appear in February *QST*. If the 13th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawing, games of chance, etc. is not permitted in *QST* advertising.

(6) New firms or individuals offering products or services for sale must submit a production sample (which will be returned) for our examination. Dealers are exempt, unless the product is unknown to us. Check with us if you are in doubt. You must furnish a statement in writing that you will stand by and support all claims and specifications mentioned in your advertising before your ad can appear.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

The League reserves the right to decline or discontinue advertising for any reason.

CLUBS/HAMFESTS/NETS

PROFESSIONAL CW operators, retired or active, commercial, military, gov't, police etc. invited to join Society of Wireless Pioneers—W7GAQ/6, 146 Coleen Street, Livermore, CA 94550.

IMRA—International Mission Radio Association helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1:00-3:00 PM Eastern Time. Rev. Thomas Sable, S.J., University of Scranton, Scranton, PA 18510.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed F. Pleuler, Jr, Secretary, 46 Murdock Street, Fords, NJ 08863.

FCC EXAMS. Novice-Extra Class, Walk-in's only. Sunnyvale VEC ARC, POB 60142, Sunnyvale, CA 94088-0142, 408-255-9000, 24/hr. Gordon, W6NLG, President. Flea Market, March-Sept, Foothill College, Los Altos Hills, CA.

MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically-oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information, write MARCO, Box 73's, Acme, PA 15610.

JOIN The Old Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C., 1409 Cooper Drive, Irving, TX 75061.

LITTLE Big Horn Nets Sundays: 14.057-2200Z, 21.150-2230Z. Native American Indians and Others Welcome. Info WA2DAC.

SCARA Indoor Ham Radio and Computer Flea Market. Sunday, November 12, 1989 at the North Haven Park and Recreation Center, 7 Linsley Street, North Haven, CT. Sellers admitted at 7 AM. Buyers from 9 AM to 3 PM. Tables are $12 in advance, $15 at the door. General admission $3 per person. Talk-in on 146.01/61. Reservations for tables must be received with check by November 2, 1989, and no reservations by phone. For information or reservations, SASE to: SCARA Fleamarket, PO Box 81, North Haven, CT 06473 or call etween 7 PM and 10 PM Brad at 203-265-8478.

INTERESTED In Public Service? Join your Local Radio Emergency Associated Communications Team. In Pennsylvania call 717-938-6943 or write REACT, 1180 Old Trail Road, Etters, PA 17319.

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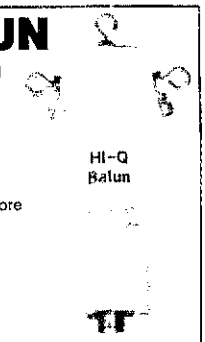
HI-Q BALUN



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D-15	15	22'	26.95
D-10	10	16'	26.95
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SD-80	80/75	90'	36.95
SD-40	40	45'	33.95
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PD-8010	80,40,20,10/15	130'	43.95
PD-4010	40,20,10/15	66'	37.95
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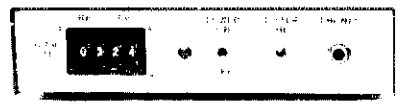

SuperSCAF is a versatile switched-capacitor filter for eliminating interference and noise on CW, SSB, RTTY, AMTOR, PACKET and other narrow band modes. Extremely steep filter skirts remove adjacent clutter and noise to enhance weak signal reception and greatly increase intelligibility and listening comfort.

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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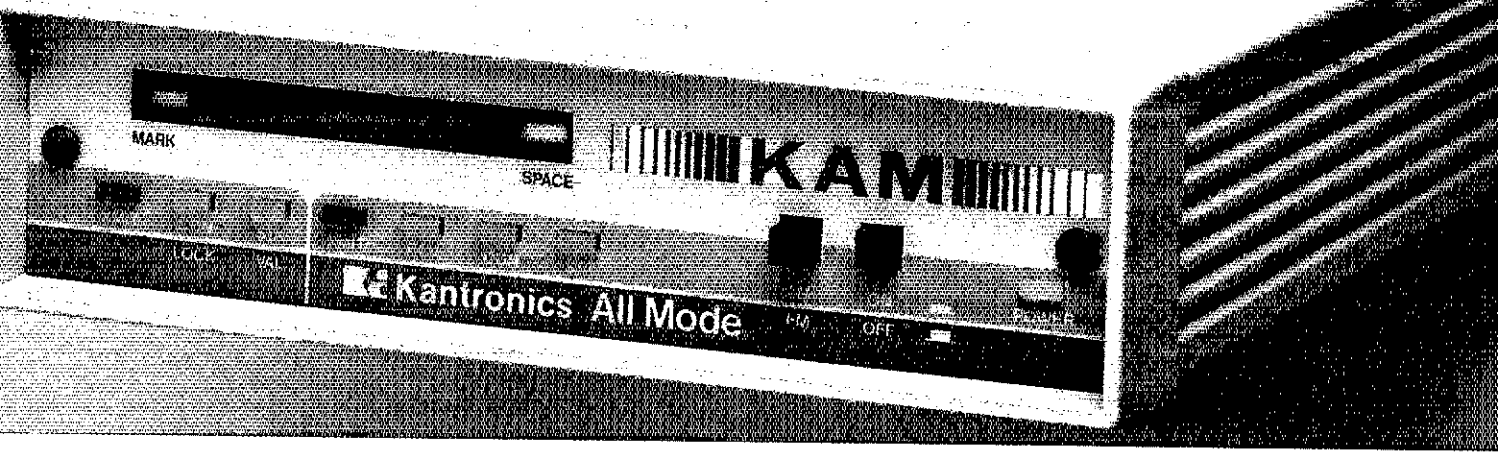

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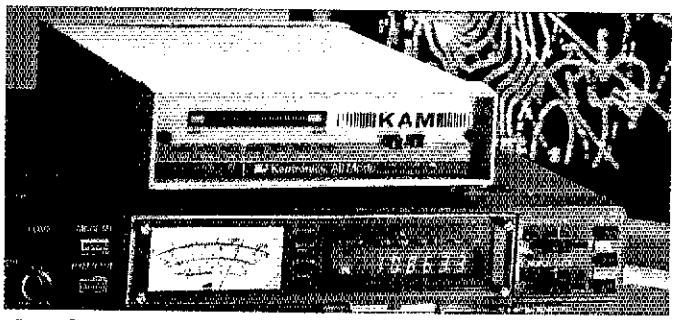

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WANTED Books: Pre-1900 Electricity and Telegraphy, Pre-1925 Radio, Pre-1940 Television. Books, Magazines or any other related literature. Jim Kreuzer, N2GHD, 6270 Clinton Street, Elma, NY 14059, 716-681-3186.

WANTED: The entire 1934 "Z" and "H" line of Silver-Marshall Radios, any condition. Chuck Dachis, WD5EOG, The Hallicrafter Collector, 4500 Russell Drive, Austin, TX 78745.

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WANTED: Pre-1930 *QST*s. Richard Titus, NV2C, 231-9 Lucas Lane, Voorhees, NJ 08043, 609-772-0316.

WANTED: Pre-WW2 Pan American Airways aircraft transmitters/receivers and schematics/manuals for same: Pre-WW2 Speed-X bugs. Conly, 819 Henrietta Avenue, Sunnyvale, CA 94086.

TELEGRAPH BUGS, early American keys, mid-century paddles wanted. Write John Hensley, WJ5J, 5054 Holloway Avenue, Baton Rouge, LA 70808.

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WANTED: Hallicrafters SX-28. Larry Greisel, 318 17th Avenue, Seattle, WA 98122.

COLLECTORS Item! Radio Amateurs Handbook. First edition-1926. Good condition-make offer. W6VZ, 206-488-4792.

HAMMARLUND Equipment Wanted. I am looking for a HX50A, HX500, HXL-1, HQ-88, HQ-215, HQ-150, HQ-200. Pse drop me a note on your QSL card stating condition and price. KD4AJ, 1968 Huntington Hall Court, Atlanta, GA 30338. All responses will be answered.

QST COLLECTION—absolutely complete from issue #1 through 1954. Issues prior to 1920 were packaged and sealed in 1962. Entire collection in locked safe since 1972. I will reluctantly sell this collection for the highest offer. Serious inquires only please. Phil Nelson, (ex-W4OFF), 419 Woodlawn Avenue, Greensboro, NC 27401, 919-273-8981.

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WANTED: Johnson Ranger II. Don Bishop, N8EA, Box 4075, Overland Park, KS 66204-0075.

BOOK WANTED: History Of Wireless Telegraphy by J. J. Fahie reprinted Arno Press 1971. Write John Taylor, G8AKN, 89 Lion Road, Twickenham TW1 4HT ENGLAND with price and phone number.

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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
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- *16-KEY DTMF MICROPHONE*
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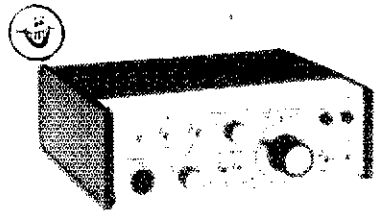

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(For more information, see QST Magazine, Oct. 1988, page 36)

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Suppressor Retrofit-Kits are available from the author of this article. All materials, MOF resistors, capacitors, instructions, diagrams and a 430°F silver-solder kit are supplied, nothing else to find. Retrofit-kit for a (1) or a (2) 3-500Z amplifier: standard duty-cycle, $12, delivered; increased duty-cycle option, add $2. ☛Suppressor retrofit-kits are also available for HF-amplifiers that use 572B, 8122, 8873, 8874, 8875, 3CX800A7, 3-1000Z, 3CX1200A7, and 8877 tubes.

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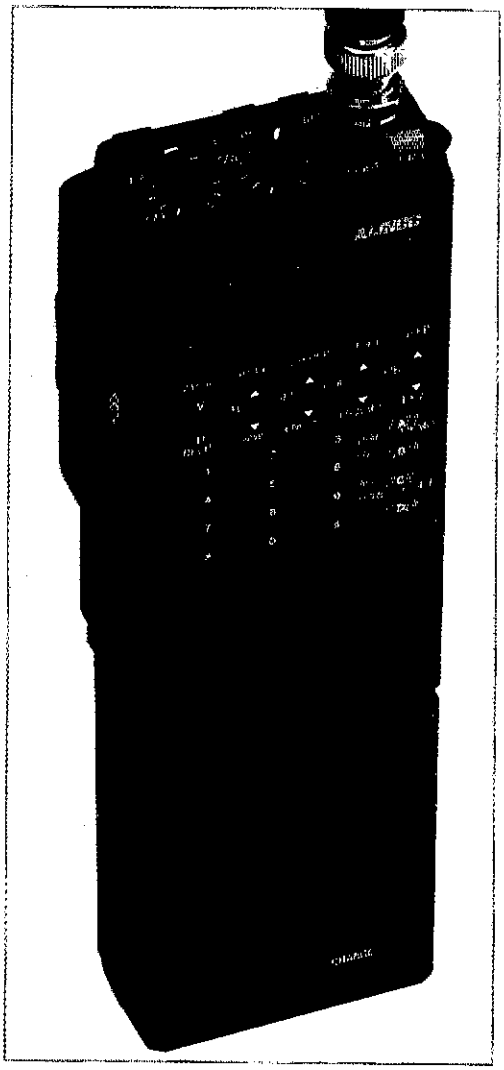

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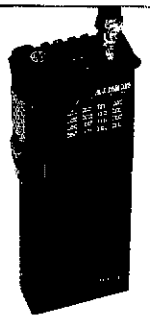

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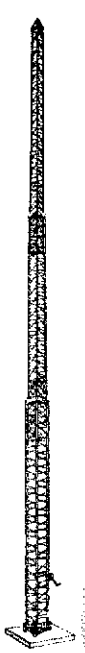

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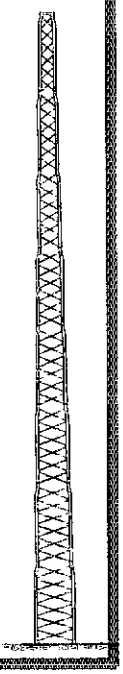

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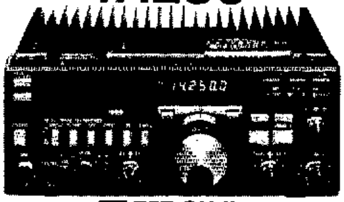

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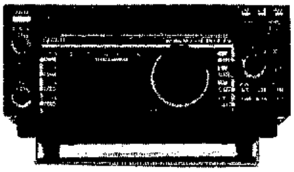

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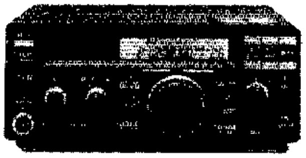

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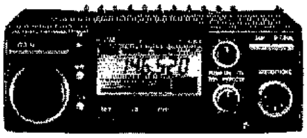

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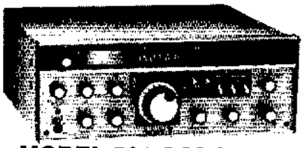

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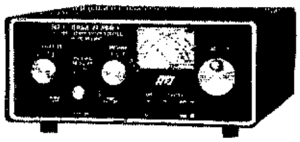

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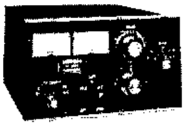

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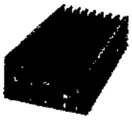

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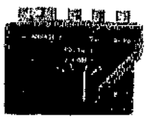

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A noise blanker and audio speech processor are standard equipment as is the cw sidetone and speech monitor. The rear panel has a full complement of inputs, outputs and controls for the convenience of the all-mode operator, including an auxiliary RX 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.

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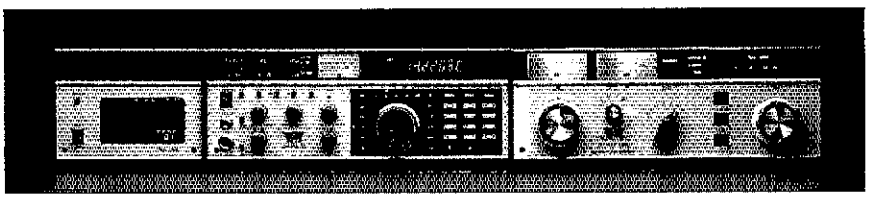
If you do not need a general coverage receiver in your HF rig, the elegant OMNI V is a great choice. If you are also a serious DX-er and/or contester, the OMNI V is the best choice.

The OMNI V Station with Model 961 Matching Power Supply, and the Mighty Titan Amplifier.

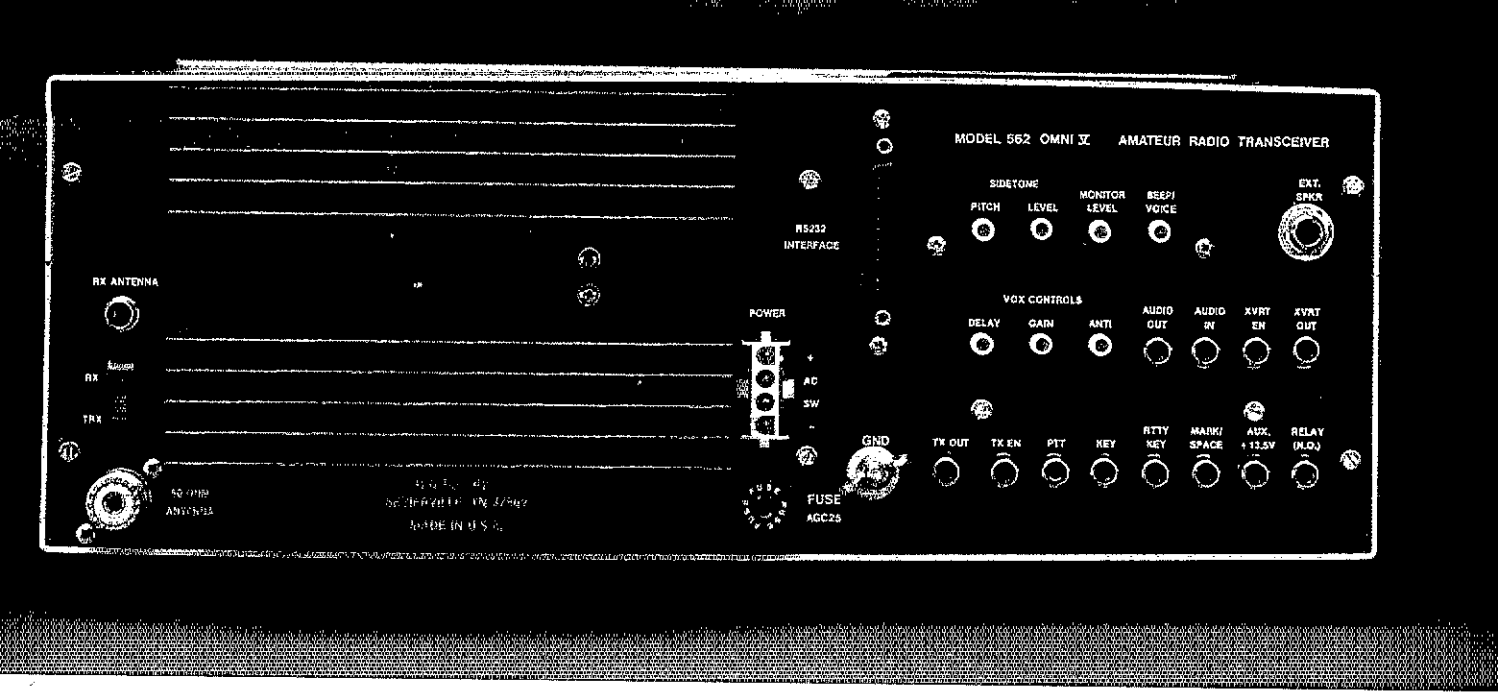


GENERAL SPECIFICATIONS

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.

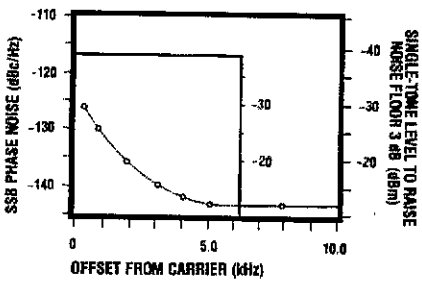
RECEIVER
Modes: LSB, USB, CW and FSK. FM with optional board.
Sensitivity: .15 uV for 10 dB signal to noise ratio at 1.8 kHz bandwidth. With FM option, .3 uV for 12 dB SINAD at 15 kHz bandwidth.
Selectivity:

	-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.

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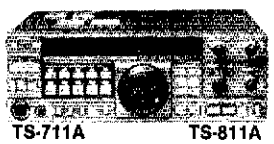

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TM-721A
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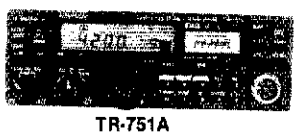

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TM 2530A (25W)

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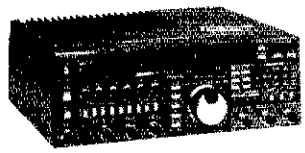
RS7A	5	7	59
RS12A	9	12	79
RS20A	16	20	99
RS20M	16	20	119
RS35A	25	35	159
RS35M	25	35	179
RS50A	37	50	229
RS50M	37	50	249

YAESU



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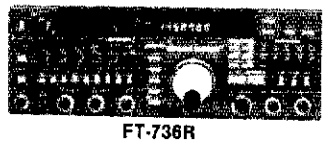

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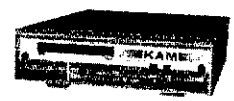

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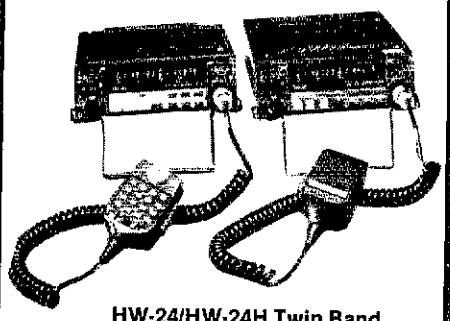

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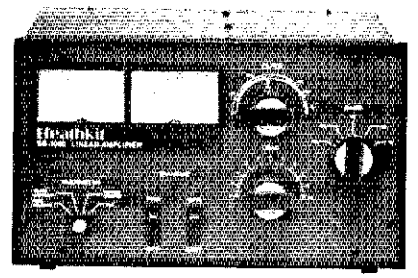
HN-31-A Cantenna Dummy Load (Kit)



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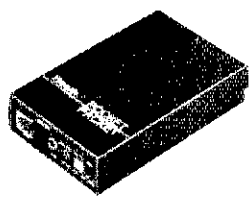

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WANTED: Collins 51S1 Receiver. Carter Elliott, WD4AYS, 1460 Pinedale Road, Charlottesville, VA 22901, 804-979-7383.

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COMMUNICATIONS Receivers: The Vacuum Tube Era. Book covers history, specs on 700 receivers, 51 companies, 123 photos. $14.95 plus $2 p/s. Details SASE. RSM Communications, Box 218-Q, Norwood, MA 02062.

WANTED: Yaesu FT-680R 6M Xceiver, any condition, QSL w/price or call collect. (Best time 7-11 PM EST.) Bob, KI4MB, 6608 N. 18th Street, Arlington, VA 22205, 703-533-0650.

KWM-380 Keypads. Custom made, very high quality. Matches Collins perfectly, $100. Call for nice color picture. W3ALZ, 301-384-2969.

WILL PAY $65 plus shipping for working Azden PCS-3000 Control Head with Mic. John, WB8KLO, 513-632-5338, 606-331-4464.

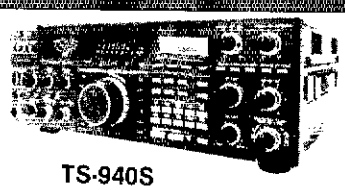
WANTED: Eprom Programmer for 2716+; Heathkit/others OK. K3LLH, 609-455-6838.

DIGICOM>64 Technical Operations Manual. Painless Operations. Now on 5¼ C64 disk. $5 ppd. Fuller, N3EFN, RD 2, Box 40-31, Guy Mills, PA 16327.

ICOM KENWOOD YAESU

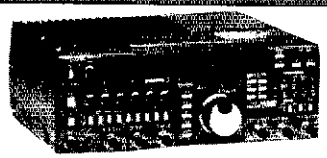
IC-781

HF Equipment	List	Jun's
IC-781 Super Deluxe HF Rig	$5995.00	Call $
IC-765 New, Loaded with Features	3,149.00	Call $
IC-735 Gen. Cvg Xcvr	1099.00	Call $
IC-751A Gen. Cvg. Xcvr	1699.00	Call $
IC-725 New Ultra-Compact Xcvr	949.00	Call $
IC-575A 10m/6m Xcvr	1399.00	Call $
IC-726 HF/50 MHz All Mode	1299.00	Call $
Receivers		
IC-R9000 100 kHz to 1999.8 MHz	5459.00	Call $
IC-R7000 25-1300 + MHz Rcvr	1199.00	Call $
IC-R71A 100 kHz-30 MHz Rcvr	999.00	Call $
VHF		
IC-228A/H New 25/45w Mobiles	509./539.	Call $
IC-275A/H 50/100w All Mode Base	1299./1399.	Call $
IC-28A/H 25/45w, FM Mobiles	469./499.	Call $
IC-2GAT, New 7w HT	429.95	Call $
IC-25AT Micro Sized HT	439.00	Call $
IC-901 Remote Mount Six Band Mobile	TBA	Call$
UHF		
IC-475A/H 25/75w All Modes	1399./1599.	Call $
IC-48A FM Mobile 25w	509.00	Call $
IC-4SAT Micro Sized HT	449.00	Call $
IC-4GAT, New 6w HT	449.95	Call $
IC-04AT FM HT	449.00	Call $
IC-32AT Dual Band Handheld	629.95	Call $
IC-3210 Dual Band Mobile	739.00	Call $
IC-2500A FM, 440/1.2 GHz Mobile	999.00	Call $
IC-2400 144/440 FM	899.00	Call $
220 MHZ		
IC-3SAT Micro Sized HT	449.99	Call $
IC-375A All-Mode, 25w, Base Sta.	1399.00	Call $
IC-38A 25w FM Xcvr	489.00	Call $
1.2 GHz		
IC-12GAT Super HT	529.95	Call $



TS-940S

HF Equipment	List	Jun's
TS-940S/AT Gen. Cvg Xcvr	$2499.95	Call $
TS-440S/AT Gen. Cvg Xcvr	1449.95	Call $
TS-140S Compact, Gen. Cvg Xcvr	949.95	Call $
TS-680S HF Plus 6m Xcvr	1149.95	Call $
TL-922A HF Amp	1749.95	Call $
Receivers		
R-5000 100 kHz-30 MHz	1049.95	Call $
R-2000 150 kHz-30 MHz	799.95	Call $
RZ-1 Compact Scanning Recv.	599.95	Call $
VHF		
TS-711A All Mode Base 25w	1059.95	Call $
TR-751A All Mode Mobile 25w	669.95	Call $
TM-231A Mobile 50w FM	459.95	Call $
TH-215A, 2m HT Has It All	399.95	Call $
TH-25AT 5w Pocket HT NEW	369.95	Call $
TM-731A 2m/70cm, FM, Mobile	749.95	Call $
TM-621 2m/220, FM, Mobile	729.95	Call $
TM-701A 25w, 2m/440 Mobile	599.95	Call $
TH-75A 2m/70cm HT	TBA	Call $
UHF		
TS-811A All Mode Base 25w	1,265.95	Call $
TR-851A 25w SSB/FM	771.95	Call $
TM-431A Compact FM 35w Mobile	489.95	Call $
TH-45AT 5w Pocket HT NEW	389.95	Call $
TH-55 AT 1.2 GHz HT	524.95	Call $
TM-531A Compact 1.2 GHz Mobile	569.95	Call $
220 MHZ		
TM-3530A FM 220 MHz 25w	519.95	Call $
TM-321A Compact 25w Mobile	469.95	Call $
TH-315A Full Featured 2.5w HT	419.95	Call $



FT-767GX

HF Equipment	List	Jun's
FT-747 GX New Economical Performer	$889.00	Call $
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FT-767 4 Band New	2299.00	Call $
FL-7000 15m-160m Solid State Amp	2279.00	Call $
Receivers		
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FRG-9600 60-905 MHz	808.00	Call $
VHF		
FT-411 New 2m "Loaded" HT	406.00	Call $
FT-212RH New 2m, 45w Mobile	499.00	Call $
FT-290R All Mode Portable	610.00	Call $
FT-23 R/TT Mini HT	351.00	Call $
FT-33R/TT 220 MHz HT	373.00	Call$
FT-73R/TT 70cm HT	355.00	Call $
UHF		
FT-712RH, 70cm, 35w Mobile	536.00	Call $
FT-811 70cm built-in DTMF HT	410.00	Call $
FT-790 R/II 70cm/25w Mobile	681.00	Call $
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FEX-736-220 220 MHz, 25w Module	322.00	Call $
FEX-736-1.2 1.2 GHz, 10w Module	589.00	Call $
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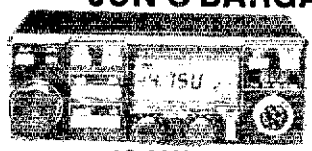

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MACMORSE V3.0. Lear code easily on your Macintosh computer! Select any ham character(s). Send randomly or type, send, store, and resend any text. Variable speeds: 5 through 22 wpm. The computer reads aloud what was sent! Mac 512k's to SE's make learning easy! Send $29.95 to: Kall, #314 700 Marine Parkway, New Port Richey, FL 34652.

WANTED: CW Filter for Heath SB101. 400 cycle. SBA 301-2. Frank, 700 N. 117th, Seattle, WA 98133.

THRUST Bearings, Plans Changed, No Longer Needed. SASE with needs. Nick G. Lash, 458 W. 900th S, Hebron, IN 46341.

450 MHz SPECTRUM ANALYZER—Adapted from Nov 85 QST article by Al Helfrick, K2BLA. Use your low frequency scope for the display portion. Log output calibrated in 10 db steps. For complete kit, order #450-KIT $459.95. For a assembled & tested unit, order #450-ASY $799.95. Add $4.50 for S/H. CA residents add 6% sales tax. Foreign orders add 15% for shipping. For additional information send a legal size SASE to: A & A Engineering, 2521 W. LaPalma, #K, Anaheim, CA 92801, or call 714-952-2114.

COLLINS KWM-380 SN1238. Original owner. 6, 1.7, 360 filters, most upgrades. $2000. WB5JMA, 214-349-8819.

15GP CRT Tube Wanted, Dead or Alive. Steve Antol, 4249-1/2 Orchard Street, Philadelphia, PA 19124.

DRAKE C-4 Console, $350. K3KD, 215-754-6286.

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IBM CW keyboard program and interface circuit. Menu makes program extremely easy to use. No setup required. Sends perfect code on any compatible with serial port. 5¼ or 3.5 disk $25. Interface kit $30. SASE for info. Electrosoft, 1656 South California Street, Loveland, CO 80537.

KENWOOD TS140S, $695. W6XM, 619-459-5527.

AYN RAND NET sked to discuss ideas presented in her novels "The Fountainhead" and "Atlas Shrugged". Send address to K1UKQ, 222 Wm. Henry Road, Scituate, RI 02857.

WANTED: IC-735/725; Trade Complete IBM System/23, 100MB, Terminal, Printer, Manuals. K3LLH, 609-455-6838.

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SUPERFAST Morse Code Supereasy. Subliminal cassette. $10. Learn Morse Code In 1 Hour. Amazing new supereasy technique. $10. Both $17. Moneyback guarantee. Free catalog: SASE. Bahr, 1196-G2 Citrus, Palmbay, FL 32905.

TEN-TEC Argosy II (Model 525D-digital) transceiver with 500 Hz CW filter, two-stage audio filter, noise blanker, power supply, microphone. Variable 0-100 watts PEP. Mint condition with cartons/manuals. Purchased new for $900 three years ago. Sell for $700. Mike Ryder, KA9N, 503 S. 5th Street, Oregon, IL 61061.

WANTED: Johnson Ranger-II or Valiant-II, Dow-Key Relay #DK60-G2C. W1QD, 120 Derby Road, Revere, MA 02151, 617-284-4644.

DRAKE TR4 with FF1, AC4, MS4, reconditioned by Drake $250; Drake 7000E RTTY Terminal and 7030 Monitor $300. WA8ZRK, 313-584-2066.

HAM, Commodore Computer, and Stereo Stuff. All new or in very good condition. Many parts. PC assemblies. 15 year accumulation. SASE for list. N7DG.

KENWOOD TS-820, $375. KB4KCS, 218-327-2647.

RC-12900 AM/FM/CW 10 Meter Mobile Transceiver, 28.0000 MHz-29.9999 MHz. New in orig. ctn. Asking $219. Will ship. WB3KSP, 904-365-2274, Leesburg, FL.

WANTED: Manual for Knight KG-2000 Scope. K8MAJ, 32359 Oxford Court, Fraser, MI 48026.

DX HOME For Sale. Simi Valley California, 6 years new. Five bedrooms, 3 baths, living area 2739' corner lot. 55' Rhon Tower with TH6DXX. No CC&R or home owner association. Call KB6OOE, 805-522-8323 home, 805-525-6626 work.

WANTED: DG1 Digital Display for Kenwood TS820. Joe Deleo, KI4VT, 217 Central Avenue, Frostproof, FL 33843, tel 813-635-4734 collect.

WANTED: Bandswitch For FT101B or Basket Case FT101B For Parts. Joe, WA2QZP, 609-585-9011.

ICOM AT500 Automatic Antenna Tuner, new, $450. WD2AER, Box 18, RD 2, Selkirk, NY 12158, 518-767-9449.

WANTED: Drake TR72 2 Meter Trans'cvr. W.G. Strauch, W5VBX, 2238 Lake Oaks Pkw., New Orleans, LA 70122.

ATTRACTIVE Call Sign Pins-Handy for displaying on lapel or shirt. Chrome plated raised letters approx. 3/16" square on small black background. Reliable stick pin attachment. Send call sign and ten dollars to W1PNH, 5 Chicatabut Drive, Walpole, MA 02081.

WANT—Swan Cygnet Model 270B. K5JGU, 713-864-7435.

TS820S Transceiver s/n 710349 mint $575, MFJ1270 Packet unit $100, IC25A 2mtr. Transceiver $100, Amerltron RCS8 remote coax switch new $105, B108 Mirage 2M 10-80 watt linear $115, Swan WN6200 watt meter $60, all above with org. cartons and manuals. Checks payable to Mrs. W. L. Anderson, contact WB5USV, 1604 Crabb River Road, Richmond, TX 77469, 713-343-0487.

RADIO EXCHANGE. Latest way to buy, sell, or trade radio gear. Published twice monthly, $12 annually. Free ad with subscription! Special event station information published free! Rate: $0.25 per word. Free insertions: 50 words. Radio Exchange, Box 50, Rockton, IL 61072.

SELL: Wilson 3 El. 20 Mtr. Beam $80, Create CR-18 Roof Tower $75, 5 El. 15 Mtr. Beam HB $65, TRS-80 Computer, Disk Drive, DCM-3 Modem $140, 4CX3000 Tube $50, TR40 B/W 40 Mtr. Baluns (2) $15, PSM-2 Meger 0-1000 Mohms $25, 75 Feet RG-58 Coax $5, R-390 Receiver $125. John, KBØC, 317-842-8998.

WD4BUM Mobile Antennas And Accessories. For two meters; quarter wave magnet mount $13, five-eights wave magnet mount $22.50, Collinears $16. Ten meter magnet mount antenna complete $22.50. HF "Ham Stick" antennas $15. Many other bargains in our free catalog. Add $3 per order for S&H. Lakeview Co Inc, Rt. #7, Box 258, Anderson, SC 29624, 803-226-6990.

KENWOOD TS-940/AT, excellent condition, 7 million serial number, $1,600. Hal ST-8000 commercial HF (RTTY) modem, variable bandwidth and baud rate (packet with card), $2,900. Hal packet card, $250. Cashiers check, you ship. Bruce Palmer, KØWM, 405-359-0608.

WANTED: C1750 512K RAM Expansion for Commodore 128. Etienne Olivier, WB1DQU, 324 Vernon Avenue, Vernon, CT 06066, 203-871-2180.

AMIGA, Macintosh, Atari XL/XE/ST Amateur Radio public domain software for $4 disk. SASE for catalog. Specify computer! Kinetic Designs Hamsoft, Box 1646, Orange Park, FL 32067-1646.

SWAN 350 and PS $125, Heath SB-200 Linear $100 all with manuals, excellent condition. N8EAB, 923 Jewell Road, Milan, MI 48160, 313-429-4231.

WANTED: Brown Brothers CW Paddles. NCØN, 316-421-8458.

6 AMPEREX DX489 X-Band Doppler Radar Modules, Gunn Oscillator and Mixer Cavity with Detector Diode. $20 each. Zima, 1360 Reed Road, Churchville, NY 14428, 716-477-1391.

WANTED: Manual, Schematic for ARR-52A. N7NI, 2540 S 133rd, Seattle, WA 98168.

WANTED: Used Buttemut Verticals, HF6VX and HF2V. Send description to Vern, c/o Unisea, Pouch 500, Dutch Harbor, AK 99692.

SELL: 10 Mtr. FM Mobile Xcvr, brand new, $50. Cordless FM Mic, new, $20. Kenwood TR7400 2 Mtr. Xcvr, needs work, $40. Pair 220 MHz Mobile Xcvrs, mint, $245 each or $450 for both. Auto Patch, Private Patch III, used only as back up for similar unit, $350. All plus UPS. K1JVJ.

HAMSOFT—Public Domain Software For Amateur Radio. Hundreds of titles, lowest prices, satisfaction guaranteed! IBM, C-64, MAC, more. Catalog $1 refunded first order. Hamsoft, PO Box 2525, Morgan City, LA 70381.

HEATH HW-2XL 2-meter handheld with speaker/mic., rechargeable battery pack, charger, mobile charger. Mint condition. Six months old. Cost $360. Sell for $240. Mike Ryder, KA9N, 503 S. 5th Street, Oregon, IL 61061.

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COLLINS New Tube Sets, 75S3 $60, 75A4 $80, KWM2 $90 and 32S3 $50 without finals. WE2T, 65 Aleta, Rochester, NY 14623, 716-334-1103.

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KENWOOD TS830S $650, TS820 $425, TS511S Classic 500 Watt Transceiver w/PS Spkr. $575, TS520 $345, TS930S/AT #5 Mil.+ $1350, TS120S $450, TS140S $675, TS430S #7 Mil.+ $650, TS700SP 2 Mtr. All Mode AC/DC $425, TS700A $325, DFC230 $225, AT200 Matching 520/820 Tuner $155, VFO520 $155, VFO820 $165, SP520/S $65, SP830 w/Filters $85, SP930 $90, SP940 $95, TR7800 $235, TR7950 $325, MC50 $55. I pay shipping. Most units mint or new, money back guarantee on all. 73 from WA2V, John Korona, 1117 Dewitt Terrace, Linden, NJ 07036, 201-486-0039.

SELL—Kenwood TS-440S-AT, SM-220, MC-85, Astron RS-20A, MFJ-949C, D-104. All mint. Best offer for all. Alan Guy, 301-956-3256.

YAESU FT901DM accepts AC/DC with SP901P Speaker Patch $600, Heathkit SB200 $350, Drake MN2000 Tuner $100. Richard, N5LZU/2, 914-778-1250.

COMMODORE 64 Ham Programs—16 disk sides over 200 Ham programs $16.95. 25 cent stamp get unusual software catalog of Utilities, Games, Adult and Ham Disks. Home-Spun Software, Box 1064-Q, Estero, FL 33928.

WANTED: tech manual for military ZM-11B RCL test set. FT-250 mounting for SCR 509, BC-620. Wanted PE-97 pwr supply, no modification except sig corps MWO. No holed or drilled cases. Exc to mint condx. Pay $75. Must be operable. Sell B&K Mod 177 Multimeter or Trade for PE-97. Meter is in original box never used. Cost over $239. Sell $100. T. North, 3161 W. Calle Cisne, Tucson, AZ 85746.

KENWOOD TS120S, PS30 Power Supply, MC35S Mic, Power Cords, Manuals, Excellent, $375. WB3CBD, 904-761-3628.

WANTED: Ten-Tec Argonaut in good condition. No modifications please. Contact, Richard McMahon, VQ9IF/KG5IF, PO Box 9-801, NCS Diego Garcia, FPO San Francisco, CA 96685.

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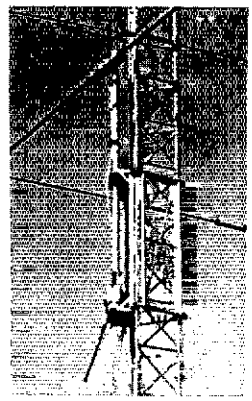

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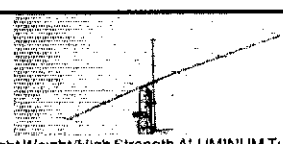

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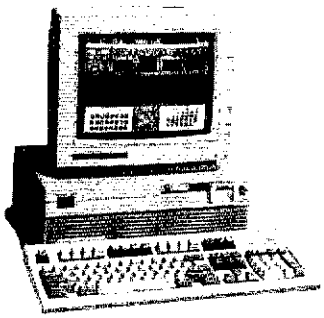

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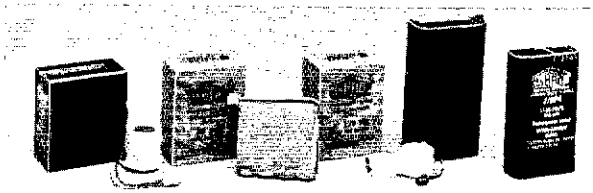

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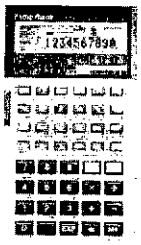

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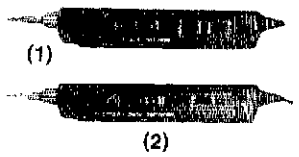

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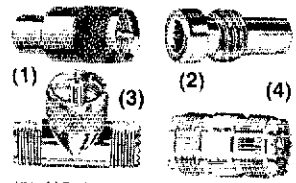

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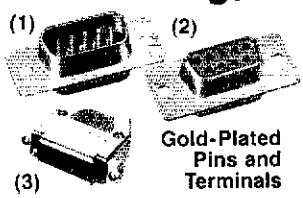

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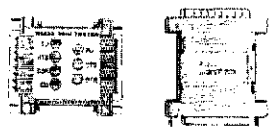

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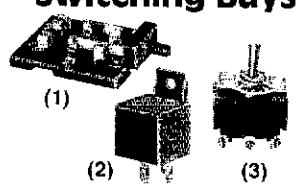

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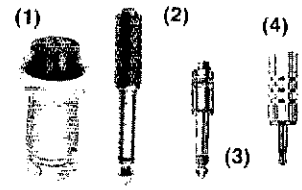

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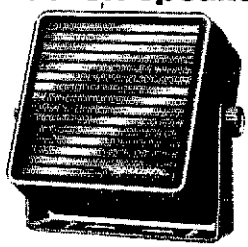

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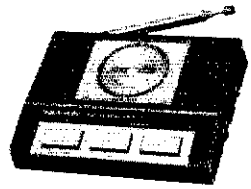

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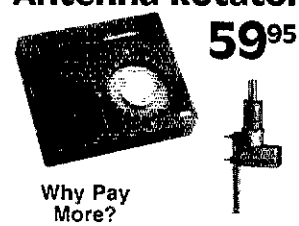

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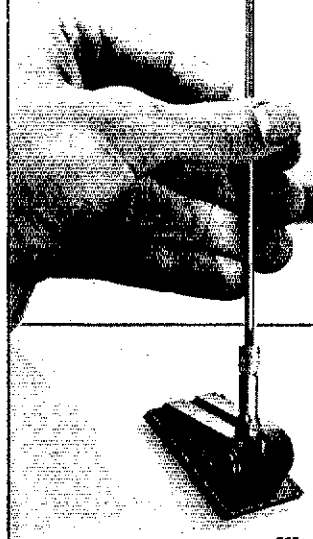

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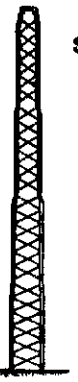

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***Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.**

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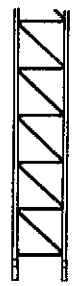

- World Famous Rohn Quality and Dependability
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80'	1199	1869	2369
90'	1289	2039	2579
100'	1369	2199	2989
110'	1449	2459	3209
120'	1669	2819	3429

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TX472	23'	72'	16 sq ft	2279
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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

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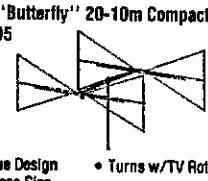

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FK2568	68 ft.	11.7 sq. ft.	
FK4544	44 ft.	34.8 sq. ft.	
FK4554	54 ft.	29.1 sq. ft.	
FK4564	64 ft.	28.4 sq. ft.	

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.

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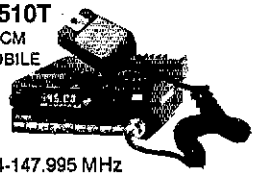

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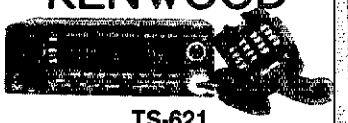

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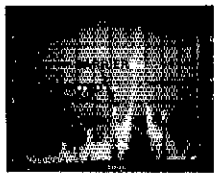
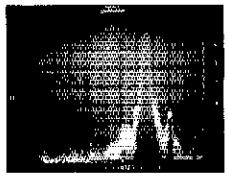


Without DSP



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- **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 are used in the 150 W final section, resulting in minimum distortion and higher efficiency. Full-power key-down time exceeds one hour.
- **New! Built-in microprocessor controlled automatic antenna tuner.** 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 incredible performance from 100 kHz to 30 MHz. The intermodulation dynamic range is 105 dB.
- ***Multi-Drive Band Pass Filter* (BPF) circuitry.** Fifteen band pass filters are available in the front end to enhance performance.
- **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!
- **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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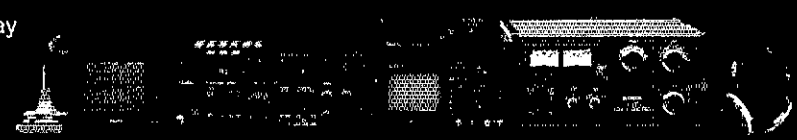
Optional Accessories
- VS-2 Voice synthesizer
- SP-950 External speaker w/AF filter
- SM-230 Station monitor w/pan display
- SW-2100 SWR/power meter
- TL-922A Linear amplifier (not for QSK)



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