QST

September 1990 $3.00

devoted entirely to Amateur Radio



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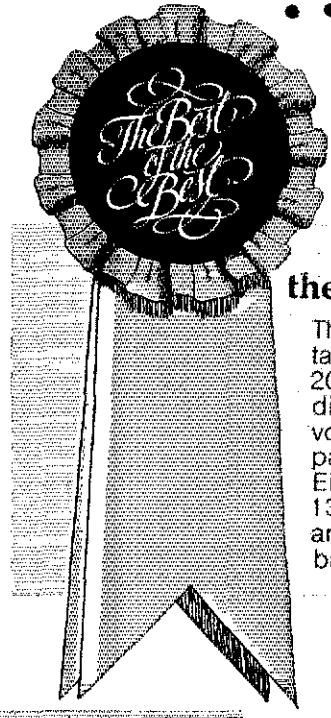
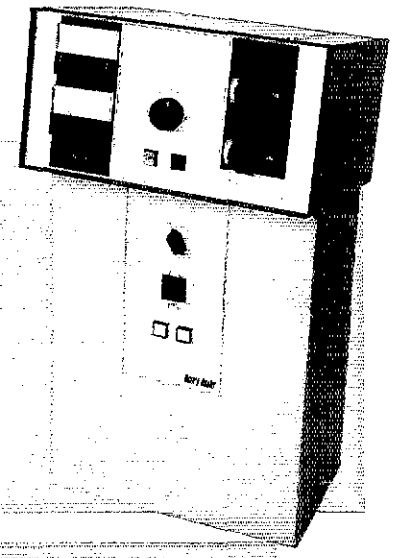
YAESU & HENRY

...a winning team

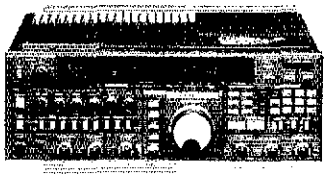






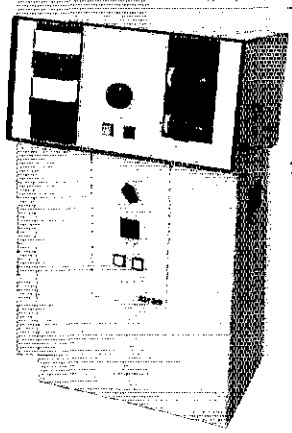
the FT-1000 the 3K Classic X

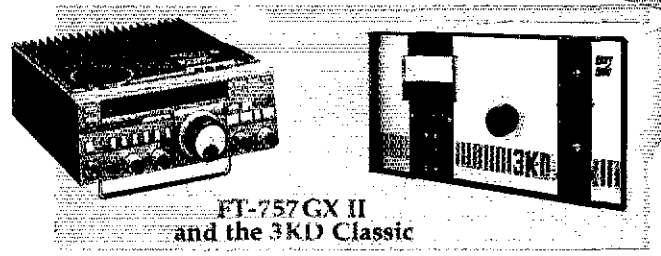
The FT-1000, Yaesu's finest, features Direct Digital Synthesis, continuous adjustable output from 20 to 200 watts, simultaneous reception of two different frequencies, 100 memories, digital voice storage, and so much more. A wonderful partner, the 3K Classic X, Henry's finest, uses Eimac's superb 3CX1200A7 tube. . .more than 13 db gain. It's an absolute workhorse and every amateur's dream. Operates on all amateur bands*. Loafs along at full legal power all day.



FT-767GX and the 2K Classic X

The FT-767GX, a wholly new concept in convenience, control and reliability. Receives from 100kHz to 29.99999 MHz continuously and transmits on all amateur bands. The 2K Classic X is a rugged, durable 2000 watt amplifier that was designed and built to push your signal to the limit. . .with almost no effort.*





FT-757GX II and the 3KD Classic

A substantial upgrade of it's predecessor, the FT-757GX II offers easier operation and more features. It includes dual VFO's and ten memories with programmable memory scanning. Yaesu's CAT system and all accessories are built in. The 3KD Classic is destined to become a true "classic". It employs Eimac's remarkable 3CX-1200D7 ceramic triode, a Pi-L plate circuit with silver plated tank coil. 1500 W PEP nominal output SSB and CW. 1000 W ICAS, RTTY and FM.*

the 747GX and the 2KD Classic

The FT-747GX computer aided HF all mode transceiver is extremely compact and light weight. It provides 100 watts of PEP output on all amateur bands and coverage continuously from 100kHz to 30 MHz. The 2KD Classic is a time proven desk top linear providing full legal power. It uses a pair of Eimac 3-500Z glass envelope triodes operating in a grounded grid circuit. A silver plated rotary tank coil creates a simple and very reliable circuit.

These are all superb combinations. However, all Yaesu transceivers will operate with any Henry amplifier up to their design capabilities just as Henry amplifiers will operate with any transceiver.

And, of course, Henry carries the full line of fine Yaesu HF, UHF, and VHF amateur radio gear. Please call, write or stop in for complete information on these and our complete line of amateur equipment.

---

*10 meters available on Henry Amplifiers export model only.

63 YEARS OF SERVICE

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KENWOOD

Compact Champion!

TH-27A/47A

2 m and 70 cm Super Compact HTs

Here is a great new addition to Kenwood's HT family – the all new TH-27A for 2 meters and TH-47A for 70 cm! Super compact and beautifully designed, these pocket-sized twins give you full-size performance.

- **Large capacity NiCd battery pack supplied.** The standard battery pack is 7.2 volts, 700 mAh, providing extended transmit time with 2.5 watts. (TH-47A: 1.5 W.)
- **Extended receive coverage.** TH-27A: 118–165 MHz; TH-47A: 438-449,995 MHz. TX on Amateur bands only, (TH-27A modifiable for MARS/CAP. Permits required. Specifications guaranteed for Amateur bands only.)
- **Multi-function scanning.** Band and memory channels can be scanned, with time operated or carrier operated scan stop.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- **Built-in digital clock** with programmable timer.
- **Dual Tone Squelch System (DTSS).** Compatible with the TH-26AT Series and the TM-941A Triple bander, as well as other Kenwood series transceivers, this selective calling system uses standard DTMF to open squelch.
- **Five watts output** when operated with PB-14 battery pack or 13.8 volts.
- **T-Alert for quiet monitoring.** Tone Alert beeps when squelch is opened.
- **Auto battery saver, auto power off function, and economy power mode extends battery life.**
- **DTMF memory.** The DTMF memory function can be used as an auto-dialer. All characters from the 16-key pad can be stored, allowing repeater control codes to be stored!

- **41 memories.** All channels store receive and transmit separately for "odd split."
- **DC direct in operation.** Allows external DC to be used (7.2 – 16 volts). When external power is used, the batteries are being charged. (PB-13 only.)



Optional accessories:
• **BC-14:** Wall charger for PB-13 • **BC-15:** Rapid charger for PB-13, 14 • **BC-16:** Wall charger for PB-14 • **BH-6:** Swivel mount • **BT-8:** Six cell AA Alkaline battery case • **HMC-2:** Headset with VOX and PTT • **PB-13:** 7.2 V, 700 mAh NiCd pack • **PB-14:** 12 V, 300 mAh NiCd pack • **PG-3F:** DC cable with filter and cigarette lighter plug • **PG-2W:** DC cable • **SC-31:** Soft case • **SMC-31:** Standard speaker mic • **SMC-32:** Compact speaker mic • **SMC-33:** Compact speaker mic with controls • **WR-2:** Water resistant bag.

- **Automatic offset selection (TH-27A).**
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **CTCSS encode/decode built-in.**
- **Supplied accessories:** Rubber flex antenna, battery pack, wall charger, belt hook, wrist strap, dust caps.

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court
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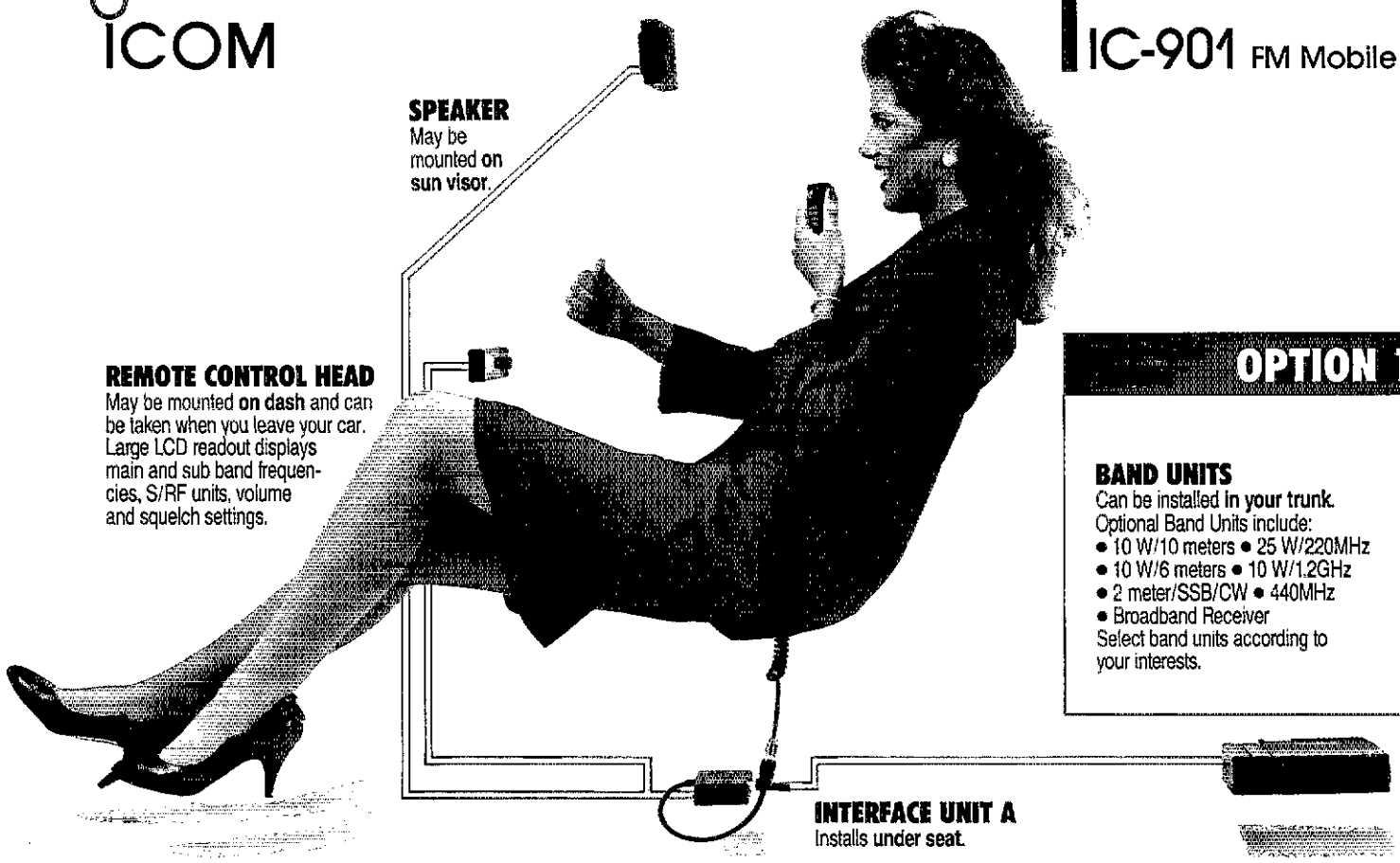
KENWOOD

...pacesetter in Amateur Radio

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

ICOM

IC-901 FM Mobile



OPTION 1

BAND UNITS
Can be installed **in your trunk.**
Optional Band Units include:
- 10 W/10 meters • 25 W/220MHz
- 10 W/6 meters • 10 W/1.2GHz
- 2 meter/SSB/CW • 440MHz
- Broadband Receiver

Select band units according to your interests.

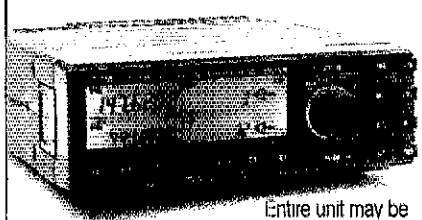
THE WORLD'S MOST VERSATILE MOBILE

ICOM'S NEW IC-901 OFFERS THREE EASY-TO-OPERATE TRANSCEIVER CONFIGURATIONS

The IC-901 can be (1) field-combined as a fully separated and fiber optic-linked system with multiple trunk-located band units, (2) a single-cabinet transceiver for dashmounting or (3) a remote-controlled unit for underseat installation. (OPC-243 cable not included.)

OPTION 2

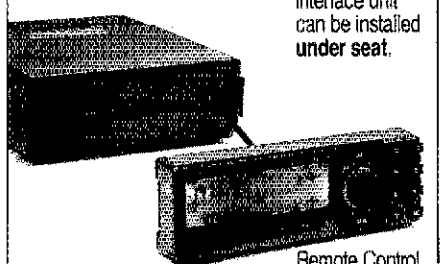
Control head is installed directly to the interface unit, making one compact unit.



Entire unit may be mounted **in dash.**

OPTION 3

Dual band and interface unit can be installed **under seat.**



Remote Control **on visor.**

The IC-901 is supplied with 50 watts 2-meter and 35 watts 440MHz FM band units covering 138-174MHz Rx and 140-150MHz Tx plus 440-450MHz Rx/Tx. Adding more band units is a snap. They install easily out-of-sight in your trunk for security!

Outstanding Features Include: Full duplex operation, simultaneous dual band reception, ten memories per band, programmable band and memory scanning with skip function, any Tx offset, and much more.

The IC-901 also features a clever new **DTMF Calling System** which silently monitors a busy frequency or repeater for stations calling you. Squelch automatically opens when a signal with the same DTMF code you present is received.

Optional Pager Function. When activated, your IC-901 transmits a six-digit DTMF code to call others. Its last three digits identify you as the calling station.

ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004
Customer Service Hotline (206) 454-7619
3150 Premier Drive, Suite 126, Irving, TX 75063
1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
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First in Communications

QST

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OUR COVER

This is everything you need for a laser-communications station. To find out how you can get on the highest ham frequencies, see the article by Bryan Bergeron, NU1N, on p 19. *(NU1N photo; Map from the Road Atlas © 1990 by Rand McNally, R.L. 90-S-179.)*

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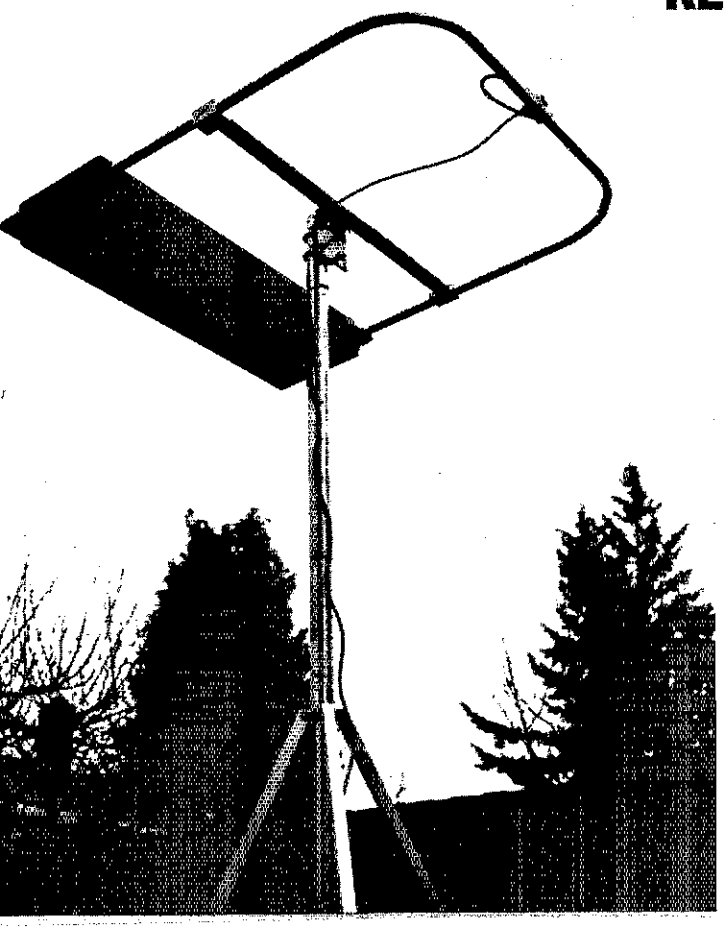
AEA's IsoLoop™ HF ANTENNA

REVOLUTIONARY COMPACT DESIGN

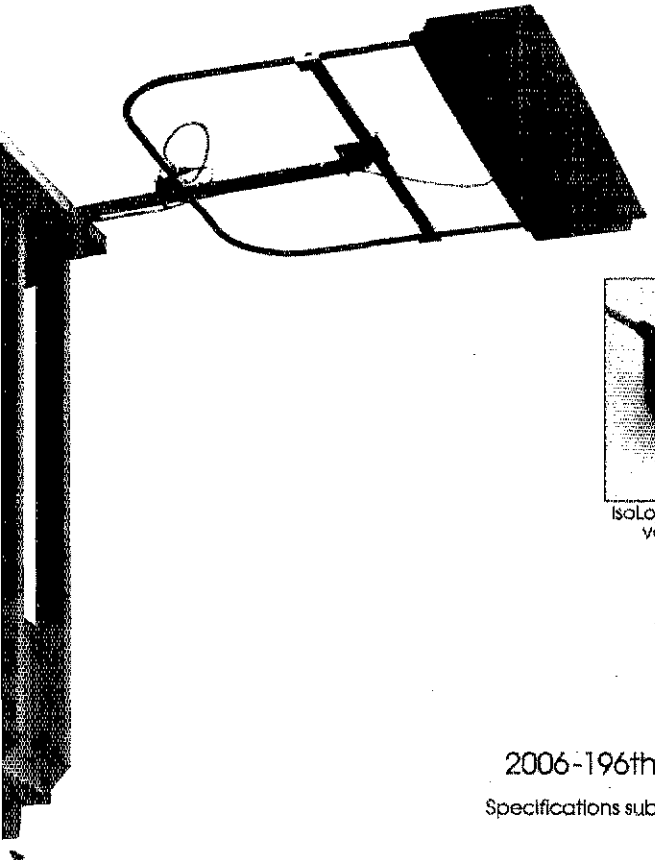


Once again AEA has achieved a significant engineering breakthrough with its high-performance, low profile HF IsoLoop antenna. Performance isn't compromised by its small size. Operate your favorite HF band (14 to 30 MHz frequency coverage) from areas with restrictive zoning ordinances or apartments and condos. Or take it with you on vacation. . . it's the ideal go-anywhere portable antenna. And it's the only antenna you need to cover 14 to 30 MHz. ONE antenna instead of numerous dipoles and without any traps!

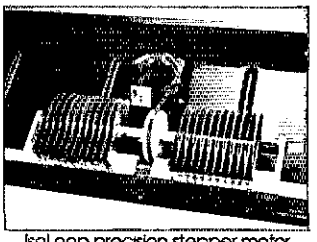
150 Watts. Rated up to 150 watts, the IsoLoop transmits and receives on any frequency between 14 to 30 MHz. When mounted with the loop in the horizontal plane, the radiation pattern is omni-directional and horizontally polarized. Maximum radiation is at low angles which is ideal for DX operation. The IsoLoop may also be mounted with the loop in the vertical plane to provide a null in a desired direction. Tuning is provided by a precision stepper-motor and a small remote control box, the LC-1.

The IsoLoop does not need ground radials and its balanced, shielded feed-loop isolates the feedline from the antenna. The IsoLoop is well-isolated from the feedline. Like AEA's Isopole antennas, your signal is radiated by the antenna and not the feedline. With end-fed antennas, the outside of the coax becomes part of the antenna, resulting in noise and computer hash pickup and increased TVI problems.

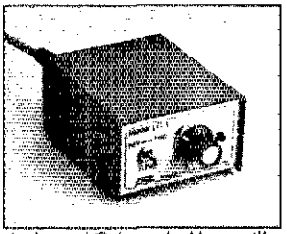
High-Q Design. One of the unique features of the IsoLoop is its inherent High-Q. The IsoLoop can be considered a very sharp tunable filter that radiates. The narrow bandwidth suppresses harmonics from your transmitter reducing TVI problems. It also attenuates out-of-band signals from nearby transmitters that could overload your receiver.



Compact. The IsoLoop is square, with rounded corners, and measures 32 inches on a side and weighs only 12 pounds. Because of the IsoLoop's small size, it makes a perfect attic or balcony antenna. It's also excellent for portable operation, recreational vehicles or camp-site use. A rotator is not necessary when used in the omni-directional, horizontally polarized mode.



IsoLoop precision stepper motor provides accurate tuning.



IsoLoop LC-1 control box with variable speed tuning.

Revolutionary. The AEA IsoLoop antenna represents years of research and development. Others may try to imitate the IsoLoop, but none can match the patent-pending design.

AEA also provides technical support from the factory or through your personal computer and modem on CompuServe's HamNet. If you are already a CompuServe member, just type GO HAMNET at any CompuServe prompt. For a free introductory CompuServe membership, call 1-800-848-8199 and ask for representative #48.

AEA Brings You A Better Experience

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NEW DUAL BAND RINGO

cushcraft

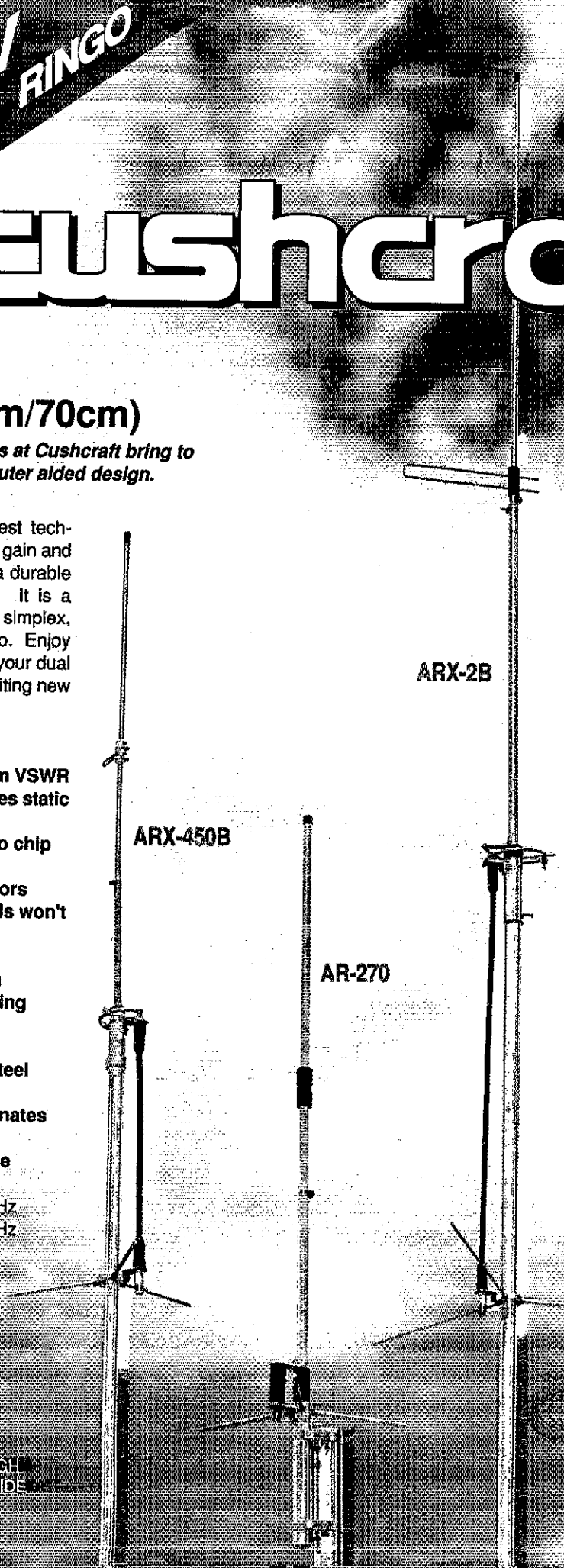
AR-270 (2m/70cm)

The engineering hams at Cushcraft bring to you an all new computer aided design.

AR-270 uses the latest technology to give excellent gain and low angle radiation in a durable all aluminum antenna. It is a perfect choice for FM simplex, repeater or packet radio. Enjoy the full performance of your dual band radio with this exciting new antenna.

- **Excellent gain**
- **Broadband, minimum VSWR**
- **All aluminum - reduces static build-up**
- **No painted surface to chip peel or crack**
- **UV stabilized insulators**
- **Precision wound coils won't detune**
- **SO-239 connector**
- **Less than 4 feet high**
- **DC ground for lightning protection**
- **Mounting flexibility**
- **Rust free stainless steel hardware**
- **RF de-coupling eliminates TVI**
- **Amazing performance**

AR-270	144-148 MHz
	435-450 MHz



RINGO RANGERS

The world's most popular 2 meter, 1 1/4 meter and 70 cm antennas.

They stand tall to give you more performance and wider area coverage. Ringo Rangers are your best single band antenna choice for FM repeaters, simplex or packet radio. There are many imitations, but none equal the value of a Ringo Ranger.

- **Excellent gain and bandwidth**
- **Optimum low angle radiation**
- **Broadband with low VSWR**
- **Highest power rating**
- **Built in lightning arrester**
- **RF de-coupling radials**
- **All weather performance**
- **SO-239 connector**
- **Rust free stainless steel hardware**
- **Slim profile for better appearance**
- **Durable static free aluminum**
- **Traditional Cushcraft value**

ARX-2B	135-160 MHz
ARX-220B	220-225 MHz
ARX-450B	435-450 MHz
ARX-450BN*	435-450 MHz

* N connector

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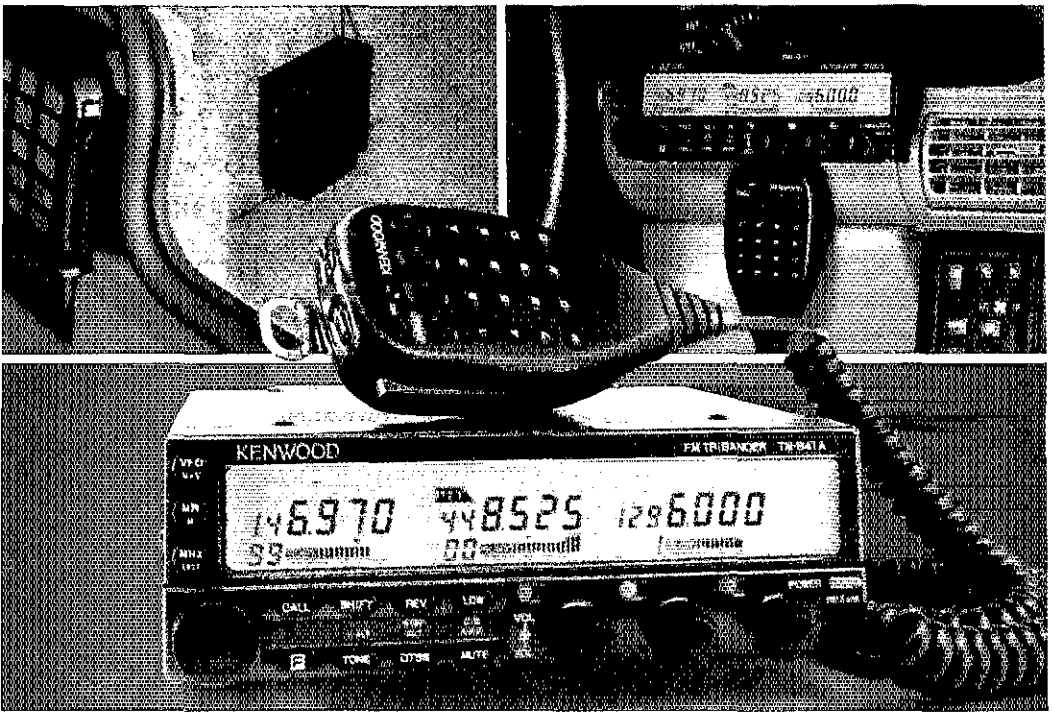
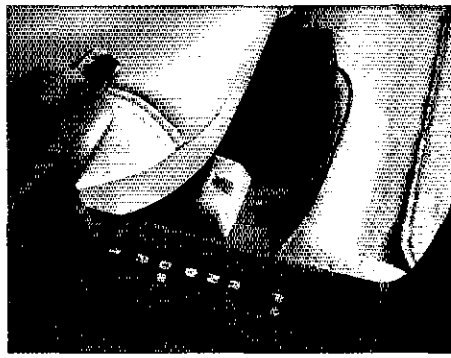
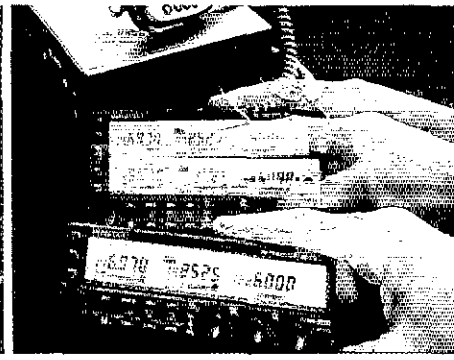
KENWOOD

Triple Play!







TM-941A

TRI-BAND FM Transceiver

Kenwood brings you yet another breakthrough — the TM-941A *TRI-BAND* FM TRANSCEIVER. Now you can operate on *three* bands — 144, 450, or 1200 MHz — with one radio! This rig even gives you full duplex, cross-band, triple-band repeat!

- **High power output.** 50 W on 144 MHz, 35 W on 450 MHz, and 10 W on 1200 MHz. (Selectable low power: 5 and 10 W, 1 W on 1200 MHz.)
- **Wide band receiver coverage.** 118-174, 438-450 (400-475 after modification), 1240-1300 (1210-1330 after modification) MHz. TX on Amateur bands only. Modifiable for MARS/CAP. Permits required.
- **CTCSS encode/decode built-in.** 38 sub-tones selectable from the front panel.
- **Cross-band repeat function.** Selectable single or dual input! Offset function on output, allows simplex to repeater repeat!
- **Simultaneous tri-band receive.** Individual volume and squelch controls help you "sort out" the signals.
- **Detachable front panel.** Use the optional PG-4K or PG-4L to mount the front panel remotely.
- **Selective calling option (DTU-2).** Selectively call a single station,or call a group with DTMF tones.
- **303 memory channels.** Store everything you need for efficient operation. All channels allow you to store "odd split" repeaters.
- **Versatile scanning functions.** Band scan, memory scan and programmed scan with carrier or time operated stop.
- **NEW! Auto memory scan.** Automatically memorizes a busy frequency while scanning the band!
- **Automatic repeater offset on 2 m.** Plus or minus 600 kHz for 144 MHz, ±5 MHz on 450 MHz, and ±12 or 20 MHz for 1200 MHz. (Manual offset for 450 and 1200 MHz.)
- **Fixed detect output.** For packet operators!
- **Multi-function DTMF mic supplied.**
- **Auto power off and time-out timer.**
- **4-step dimmer control.** Selectable 4-step dimmer control.
- **Three separate antenna and speaker connectors.** For maximum performance.

Optional Accessories:
- **DTU-2** Digital paging (DTMF) unit
- **PG-4K, PG-4L** Front panel cable kits
- **MC-45** Multi function mic.
- **MB-11** Extra mounting bracket
- **SP-41, SP-50B** External mobile speakers
- **PG-3B** DC line noise filter
- **PS-430** Power supply
- **PG-2N** DC power 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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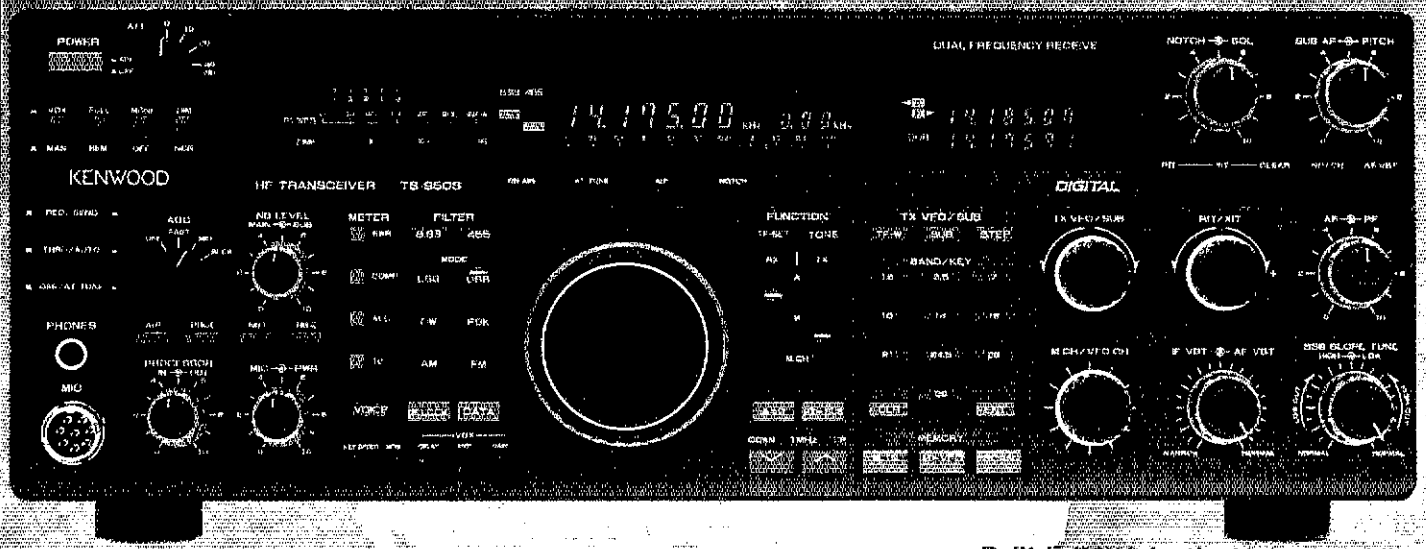

TS-950SD

"DX-clusive" HF Transceiver

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

The Ultimate Signal.

• **Dual Frequency Receive Function.** The TS-950SD can receive two frequencies simultaneously.

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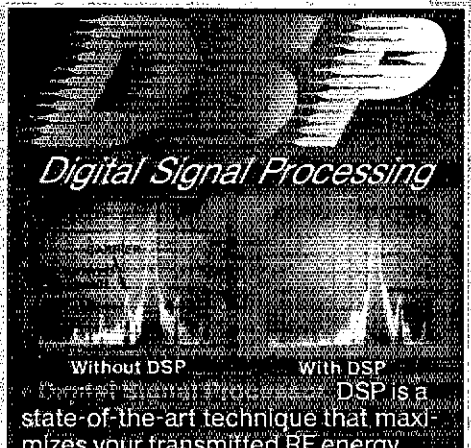
• **New! Built-in microprocessor controlled automatic antenna tuner.**

• **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.

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



• **High performance IF filters built-in.**† Select various filter combinations from the front panel. For CW, 250 and 500 Hz, 2.4 kHz for SSB, and 6 kHz for AM. Filter selections can be stored in memory!

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

• **Built-in TCXO for the 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 • 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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- SO-2 TCXO* • VS-2 Voice synthesizer
- YK-88C-1 500 Hz CW filter for 8.83 MHz IF*
- YG-455C-1 500 Hz CW filter for 455 kHz IF*
- YK-88CN-1 270 Hz CW filter for 8.83 MHz IF
- YG-455CN-1 250 Hz CW filter for 455 kHz IF*
- YK-88SN-1 1.8 kHz SSB filter for 8.83 MHz IF
- YG-455S-1 2.4 kHz SSB filter for 455 kHz IF*
- 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)

* Built-in for the TS-950SD
† Optional for the TS-950S

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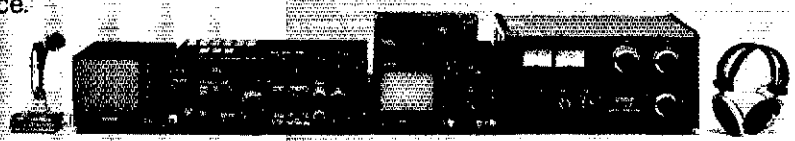

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"Of, by, and for the radio amateur," ARRL numbers within its ranks the vast majority of active amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs.

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

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"It Seems to Us . . ."

Confrontation

A lot of good things are happening in Amateur Radio. There are technical advances: new satellites being launched, new frontiers being explored with digital signal processing. We're helping bring down the barriers that too long have separated East from West, with people-to-people initiatives that contribute to global understanding at a very personal and meaningful level. There are new opportunities for public service. And there are thousands of newcomers joining us every month, including the young people who tomorrow will be our leaders. As we go forward to WARC-92 we have much to be proud of.

But there are also some disturbing trends. One of the most troubling is an increase in on-the-air confrontation. It's hurting us; it has to stop.

At any given time, about 98% of the communications in the ham bands are going along just fine. There are no big problems, and if little ones develop—two stations finding themselves on the same frequency, for example—they're resolved amicably and without fanfare. QRM? No problem—just move up or down the band a nudge. Like two lanes of traffic merging into one, if there's mutual respect and everyone behaves the bottleneck is soon past and forgotten.

Unfortunately, there's the other 2%.

Sometimes it's caused by two groups having different plans for the same frequency, at the same time. Sometimes the reason is that one group questions whether the other's purpose is as important, or whether it even has the right to exist in Amateur Radio. However it gets started, a confrontation develops: I'm not going to move, and you're not going to get through if I can help it. The result? Use of a part of the spectrum is denied to everyone. A few hams and would-be hams listening to this nonsense decide to go back to watching television. Spectrum regulators are given cause to wonder whether Amateur Radio is worth the trouble.

Just like gridlock in a busy intersection, it doesn't much matter who's right and who's wrong. Anyone who could have avoided the confrontation is at fault, and the innocent people who end up suffering are right to want them held accountable.

We know how to deal with traffic problems. We require that drivers know the rules of the road, and we pay taxes so police will be around to enforce them. If someone thoughtlessly cuts us off or passes us going a few miles an hour over the speed limit, we don't chase after them and try to force them to the side of the road; that behavior would be too crazy even to contemplate, and more of a hazard than what provoked it.

Of course, there are the downright dangerous drivers: the drunk drivers, and the ones who seem to have utter disregard for everyone else on the road. With the help of autopatches and cellular telephones, good citizens can aid in their apprehension without endangering themselves or others.

Why don't we do the same on the ham bands? Why don't we shrug off the occasional discourtesies, leave the minor infractions to the routine "traffic patrols," and deal with what we believe to be major violations by alerting the authorities? Why, instead, do we end up with on-the-air confrontations where everyone loses? There are several reasons.

First, some of us don't realize that there *are* routine patrols of the ham bands. But there are. Hundreds of ARRL Official Observers carry on a sixty-year tradition by calling attention to operating discrepancies in a friendly, constructive manner—but to avoid a defensive response, *never on the air.*

Second, some of us have lost faith in the ability of the authorities to maintain order. If drunk drivers were never arrested, vigilantes would crawl out of the woodwork to fill the void. That's a prescription for disaster in a civilized society, but it's also a natural human response.

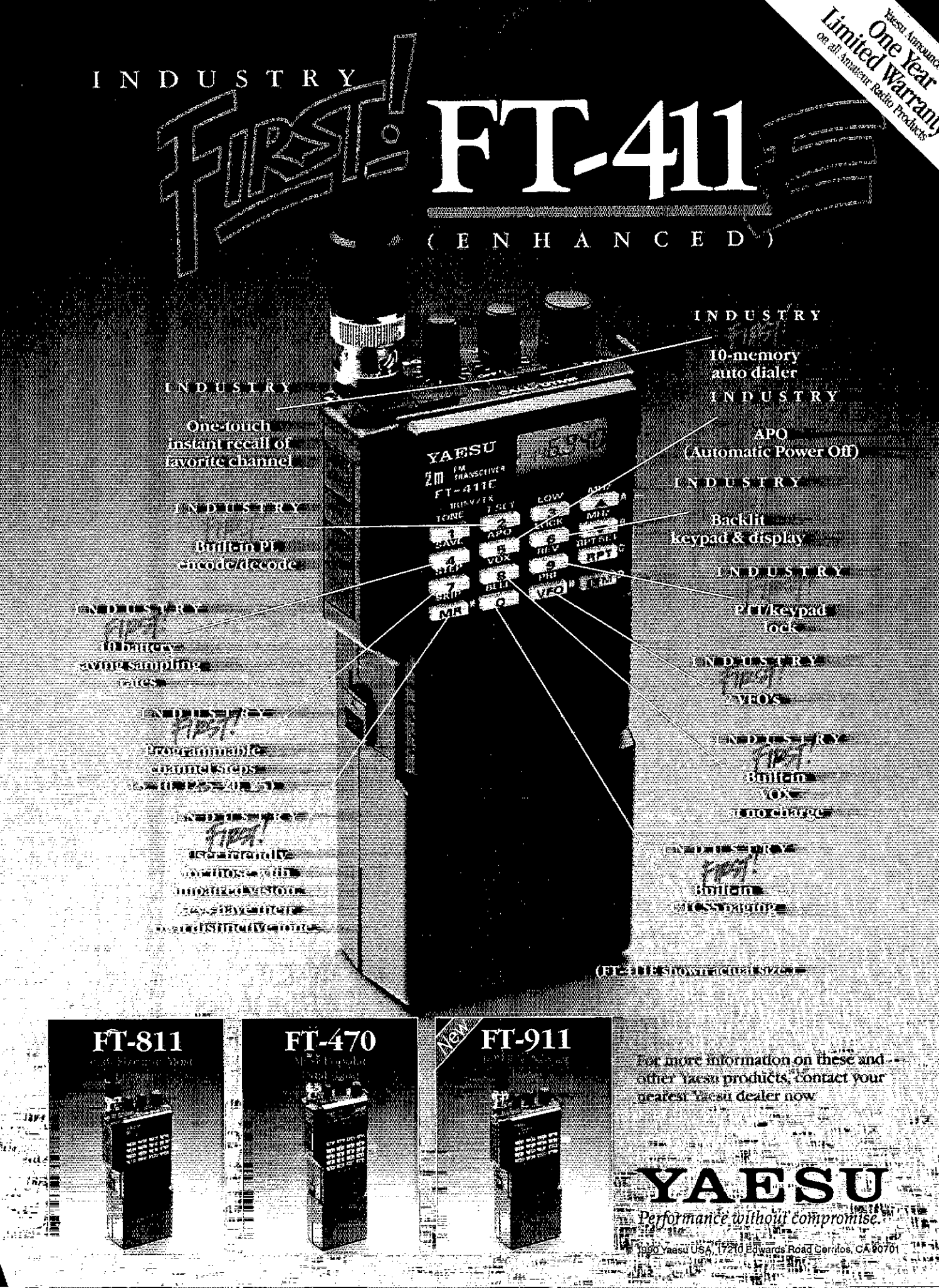
Radio amateurs who have lost faith should take heart from the record of FCC Chairman Alfred Sikes. In his first year in that post, Mr Sikes has made it very clear that he is committed to enforcement. What had been a trickle of news releases detailing FCC enforcement actions has become a steady stream.

They should also take heart from the performance of our own Amateur Auxiliary to the FCC's Field Operations Bureau. While the Commission's monitoring resources are limited by budgetary constraints, well-trained members of the Amateur Auxiliary help plug the gap by providing evidence good enough to be used in Commission enforcement actions. And it *is* being used; patient work is reaping dividends.

A lot of what people do that upsets and disgusts us isn't illegal. Like it or not, it comes with the territory in a free society. You can bet that telling these folks you don't appreciate what they're doing will simply inspire them to new depths. Friendly advice doesn't work with people who think they're right and everyone else is wrong, and enforcement doesn't work when the violation is of reasonable standards of behavior rather than of an actual rule. And *neither will confrontation.*

Think about what these people are trying to achieve. In most cases, don't they simply want to provoke a reaction? Deny them the satisfaction. Surely you can find another frequency to use, and if they follow you there—bang! They've met the definition of willful interference, and that *is* a violation.

At the very least, let's *not* be guilty of compounding the problem. When the authorities do draw a bead on the guys in the black hats, we want them to have a clear field of fire.
—*David Sumner, K1ZZ*



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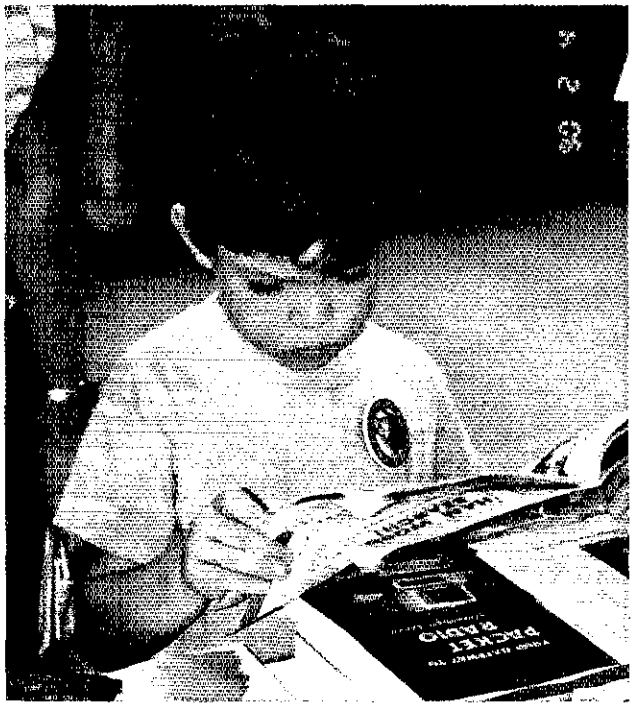
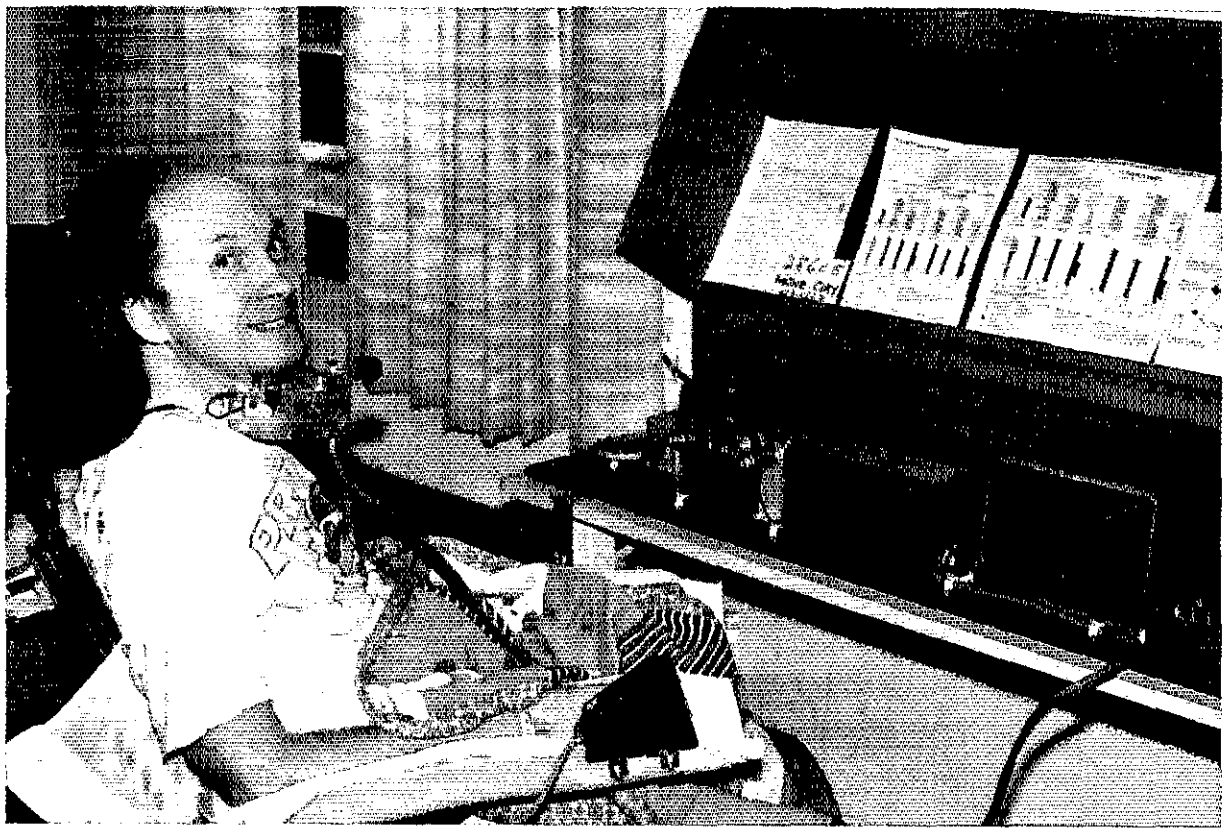
QSL direct: Mr and Mrs Edgar F. Johnson of Waseca, Minnesota, sift through a small portion of the deluge of QSL cards sent by hams all over the world. The founder of the pioneering E. F. Johnson Company thanks all the amateurs who wrote him to help celebrate his 91st birthday June 13 (see *Strays, June 1990 QST, p 55*).
The Johnsons also celebrated their 66th wedding anniversary June 6. *(WBØKEK photo)*



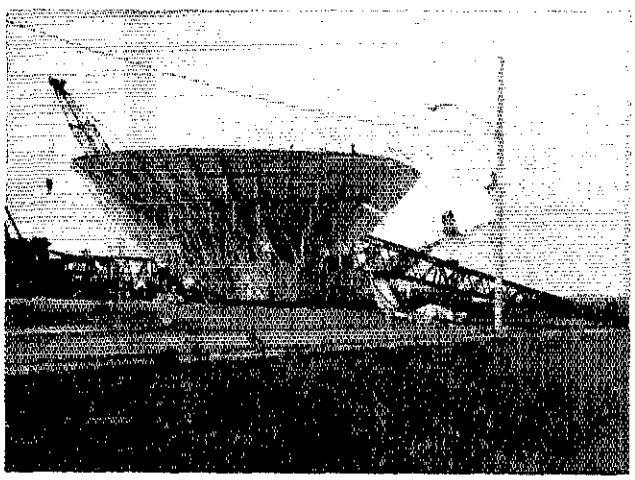
Start 'em young: Ben Ferrarini, son of Steve, KJ4BX, and Lillian, KC4AYH, of Delray Beach, Florida, is absorbed in the *Archie's Ham Radio Adventure* comic book at the February 1990 Miami Hamboree. Would you like to introduce a youngster to Amateur Radio like this? Copies are available from the ARRL Educational Activities Department. *(W1YL/4 photo)*



Moving target: Jerry Seefeld, WA9O, of Milwaukee, Wisconsin, is a serious mobile operator. His car sports high-gain antennas for 144, 432 and 1296 MHz and he's used them to work 100 grid squares while in motion within 15 miles of his home. Perhaps he could park on an embankment and work OSCAR? *(photo courtesy of W3XO)*



Ham radio gets him around the world: Although paralyzed from the neck down, Rob Michon, WD8OTI, uses a specially built neck "console" to operate his Yaesu FT-757 transceiver. Rob is a member of Handi-Hams and although he can't write to copy code, he's working on upgrading from Advanced to Extra. His custom-engineered control system was designed and built by Roger Place, W8ZRF/VP2MDP, of Ypsilanti, Michigan, and friends. Rob is a resident of the VA Medical Center in Ann Arbor. *(W8ZRF/VP2MDP photo)*



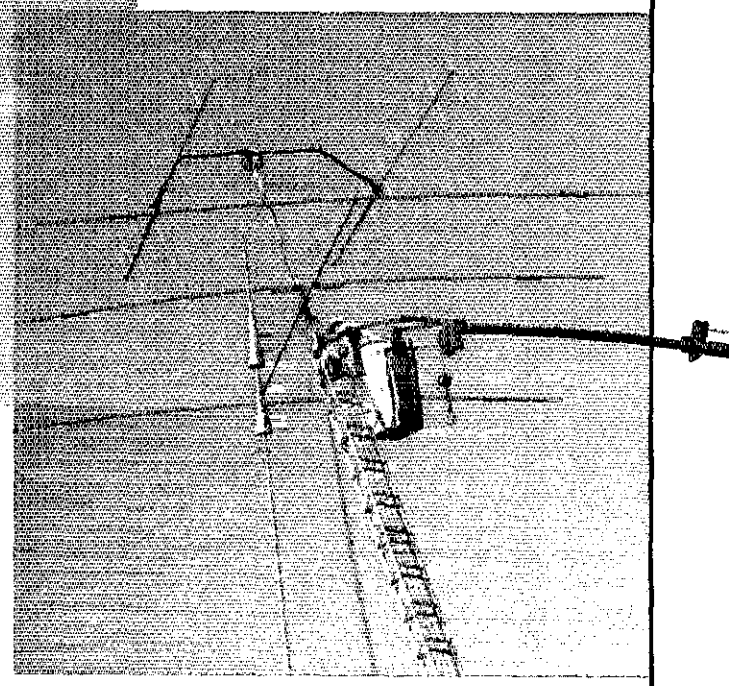
Careful with those dishes: As TV Channel 4 "Telesistema" in Ecuador was placing its brand-new parabolic array, the cable snapped and the crane fell, slicing the dish neatly in two. Fortunately, there were no injuries. *(HC2GE photo)*



The ham channel: Bob Jones, W5TU, of Richardson, Texas, was guest operating at W1AW on May 30, when a camera crew from WTNH-TV News visited. The news hounds asked whether he had been in contact with Europe and had heard anything about the previous day's earthquake there. They videotaped his report and broadcast it on channel 8 from New Haven, Connecticut, that evening. Bob snapped this picture from the TV in his hotel room. *(W5TU photo)*



Sure beats climbing: Jim Bartlett, KA5PSF, of Edmond, Oklahoma, uses an 85-foot crane with a bucket and a sling to repair a tower belonging to Larry Davis, KF5JN, Oklahoma City. Larry's tower was damaged in recent 100-mi/h winds. *(W5MEL photos)*





Code runs in his family: Samuel F. B. Morse III, W6FZZ, age 87, can reportedly copy code at 60 WPM, have breakfast and hold a conversation—all at the same time! He and fellow members of the Clairmont Repeater Association of Orange, California, operated special-event station W6FZZ to celebrate the 199th birthday of his great-grandfather, the man who started it all for CW fans. Looking on is future ham Joseph Adling, age 11, of Garden Grove, California (son of Paul, N6JII). When in southern California, give Sam a call on the N6SLD repeater on 145.20 MHz (PL 1A). *(KF6PF photo)*



Why wait? Within five hours of giving birth to eight-pound, five-ounce Jamie Rachael Norton on May 1, proud mommy Mechelle Norton, KB2GJS, was on the air. She used the conveniently located NE2S repeater atop St Barnabas Medical Center in Livingston, New Jersey, to ragchew with friends and OM John Norton, N2IOB. *(N2IOB photo)*

League Lines

The ARRL Board of Directors held its second meeting of the year July 20-21 in Farmington, Connecticut. ***The Board reaffirmed the League's position on a codeless license and stated that the Novice and Technician licenses should be retained.*** For the full Board proceedings, see pp 54-59 of this issue.

At press time, ARRL HQ learned that ***STS-35 is tentatively scheduled for launch around September 1,*** according to ARRL SAREX Working Group Chairman Roy Neal, K6DUE. Payload Specialist Dr Ron Parise, WA4SIR, will be aboard and the shuttle transmit frequency will be 145.55 MHz, with a primary receive frequency of 144.95 MHz.

STS-37 is scheduled for launch later this year. Four of the astronauts on the mission have ham licenses: Pilot Ken Cameron, KB5AWP; Mission Specialist Jay Apt, N5QWL; Flight Commander Colonel Steven R. Nagel, N5RAW; and Mission Specialist Linda Godwin, N5RAX. These two missions will provide a golden opportunity to show Amateur Radio to the public, particularly to school-aged children.

The FCC has clarified its position concerning testing for disabled persons. The FCC also released instructions to Volunteer Examiners on July 18. On August 1, the FCC decided to issue a Notice of Proposed Rule Making in this matter and it should be released in early August. See Happenings on p 60 for more information.

On July 27, the ARRL filed its legal brief with the US Court of Appeals for the District of Columbia Circuit in the matter of the proposed reallocation of the 220-222 MHz band to the private land mobile service. Oral arguments in the case of *ARRL v FCC* are scheduled for November 16, 1990.

Thanks in part to the expert legal testimony of ARRL Volunteer Counsel James Altman, N4UCK, ***DeKalb County, Georgia, which includes metropolitan Atlanta, has adopted an antenna ordinance with no height restrictions.*** Antennas must, however, be located at least one-third the height of the tower from property lines.

The World RadioSport Team Championship was held July 20 in conjunction with the Goodwill Games in Seattle. Shortly before the games, the FCC authorized a temporary waiver of Section 97.501, giving ham participants who reside in countries with which the US has not yet entered into a reciprocal operating agreement special permission to operate for the duration of the games. For the team standings, see Happenings on p 61 of this issue.

The ARRL Outgoing QSL Service has mailed out more than 2 million cards so far this year to overseas QSL bureaus. That represents a 25% increase over cards sent out at this time last year.

The ARRL/CRRL 9th Computer Networking Conference will be held on September 22, 1990, at the London Regional Art Gallery and Museum in London, Ontario, Canada. Topics are expected to include HF packet investigations, packet satellite, network development, hardware, protocols, software, packet services and future systems. For registration information contact Harry MacLean, VE3GRO, 500 Riverside Dr, London, ON, N6H 2R7 Canada, or telephone CRRL at 519-660-1200.

The Jamboree on the Air will be held the weekend of October 20-21. Contact local Girl or Boy Scout councils listed in your telephone book and invite Scouts to your station. For more information on how you can get youngsters involved in this fun and rewarding activity, see "JOTA Needs You" on p 52 of this issue.

The New World of Amateur Radio, ***a videotape for students and adults, is available to schoolteachers and evening instructors on a free-loan basis from ARRL Educational Activities Department.*** Teenagers Kelly, N6PNY, and Nathan, KB6PLH, join former NBC Science Correspondent Roy Neal, K6DUE, to present ham radio in action. The full spectrum of operations are demonstrated and explained, from amateur television and packet radio to space shuttle and satellite contacts. The video introduces emergency communications, public-service events, DXing, celebrity hams and the all-around fun and satisfaction of our rewarding hobby.

The W1AW multioperator effort in the 1990 IARU HF Championship contest July 14-15 produced more than 4 million points. Operators N2KW, NQ2D, KZ2S, KR2J, NI8L, KQ2M and KA2AEV used the three W1AW visitor operating studios and a medley of new antennas to rack up some 5500 contacts.

Visitors to W1AW may now use the full complement of 15 Cushcraft and two Telrex Yagis, eight of which are rotatable (nine are fixed west for bulletin transmissions).

Attention Net Managers: September 7 is the registration deadline for the **1991 ARRL Net Directory**. If your net is not listed in the current directory, please complete a net registration card (FSD-85) and return it to ARRL HQ.

Call for Papers: Previously unpublished articles are now being solicited for **The ARRL Antenna Compendium, Volume 3.** *Volumes 1 and 2* contain noteworthy papers about antennas, transmission lines and radio propagation. Contact Jerry Hall, K1TD, or Chuck Hutchinson, K8CH, at ARRL HQ. *Volume 3* is tentatively planned for publication in early 1992. The deadline for submissions is March 1, 1991.

Parasitics Revisited—*Part 1*

VHF parasitic oscillations can boil gold, destroy amplifier tubes and blow meter movements out of their cases. Here's more on how to identify and stop them—*before* they stop your amplifier.

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

During the summer of 1988, I wrote an article about improved means of reducing intermittent parasitic oscillations in MF/HF amplifiers. The article, "Improved Anode Parasitic Suppression for Modern Amplifier Tubes," appeared in October 1988 *QST*. In the 12 months following its publication, that article generated more than 1400 letters and telephone calls. Parasitic oscillations were more pervasive than I had assumed!

Because of space constraints, some finer points didn't make it into the already-too-lengthy October 1988 article. And, thanks to reader response and further R and D, I've since learned more about the subject. What follows is a review of the mechanism and effects of VHF parasitic oscillation, updated information on parasitic suppression, and some of the overflow from the October 1988 article. Included are some photographs of the unique damage that VHF parasitic oscillations can inflict on amplifier tubes. Part 2 of this article will describe parasitic-oscillation damage to tuning capacitors and band switches, and how to build better and more effective parasitic-suppression networks than those described in the October 1988 article.

VHF-Parasitic-Oscillation Mechanics

The RF portions of a typical grounded-grid RF-power-amplifier circuit are deceptively simple (Fig 1). A relatively weak signal is applied to the input. This signal is applied to the tube's cathode via a tuned input network (Z1). The input network transforms the **INPUT** impedance (usually 50 Ω) to a level suitable for driving the tube's cathode (typically 45 to 130 Ω).

As the input signal varies the potential difference between the cathode and grid, the tube's anode current varies in step with this cathode-voltage variation. Because a relatively small change in cathode voltage results in a relatively large change in the tube's anode current, the tube *amplifies*. (In effect, the tube acts as a power converter, converting its dc anode supply into RF ac.) Properly applied, modern amplifier tubes are capable of gains on the order of 13 dB or more—*even at VHF*.

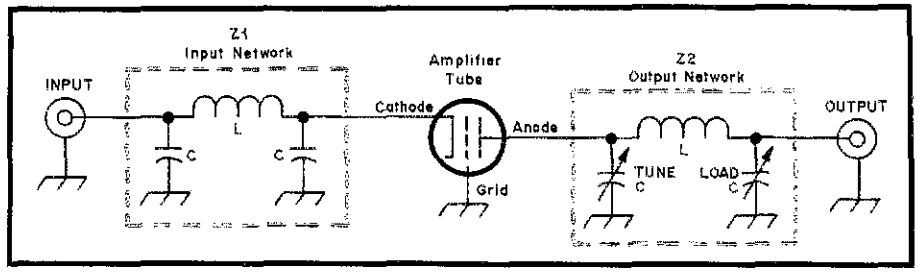


Fig 1—The basics of a grounded-grid-power-amplifier. Bias, filament/heater, metering and anode-supply circuitry is not shown.

Extracting the tube's RF-output energy entails little more than another impedance transformation (from the several-kilohm level at the tube anode to 50 Ω or so at the amplifier output). This is accomplished by the amplifier output network (Z2 in Fig 1). In a practical amplifier, Z2, which is usually a π or π-L network, also suppresses *harmonics*—unwanted multiples of the desired operating frequency that all amplifiers generate to some degree.

Z1 and Z2 consist of inductances (L) and capacitances (C) chosen to resonate at, and only at, the amplifier's operating frequency—say, 14.05 MHz in an Amateur Radio application. Because of this, you'd think that power-amplifier operation would be relatively simple: Tune Z1 and Z2 to the operating frequency, attach an antenna, apply filament, anode and RF-drive power,[1] trim Z2 for proper amplifier operation, and away you go. The problem is that *VHF resonances are present in the amplifier's input and output circuitry—regardless of where Z1 and Z2 resonate.*

Amplifier tubes exhibit reactances—element inductances and interelement capacitances—and self-resonances arising from these reactances. Careful amplifier designers take many of these factors into account, especially the characterizable reactances between and in series with device elements. *Uncharacterized* circuit reactances, however, can cause unexpected and unpleasant effects, especially in high-power circuits with active devices capable of high gain. Fig 1 of the October 1988 article illustrates these reactances.

For instance, a vacuum-tube-based MF/HF amplifier contains electrical conductors—wires or straps—that connect its tube's anode terminal ("plate cap") to a dc-blocking capacitor, the anode RF choke and the tuning capacitor in the amplifier output network (Z2 in Fig 1). These conductors are unavoidably inductive, and exhibit perhaps 200 nH (0.2 μH) of inductance in a typical Amateur Radio amplifier. Combined with the tube's out-

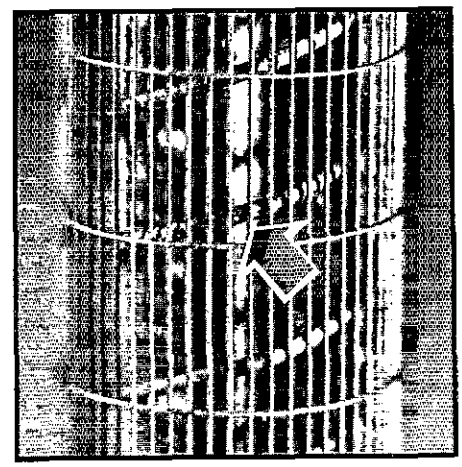


Fig 2—A VHF parasitic oscillation caused this filament-to-grid short circuit in a 3-500Z triode. The filament helices are concentric with the grid cage in a normal 3-500Z. The cage is approximately 5/16 inch in diameter.

[1]Notes appear on p 18.

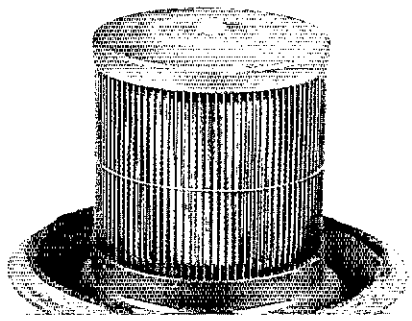


Fig 3—The grid cage and cathode of a normal 8877. The grid, gold-plated to reduce secondary-emission phenomena, is about 1-1/16 inches in diameter. (Tube courtesy of Lon Cottingham, K5JV/KH6, and Katashi Nose, KH6IJ.)

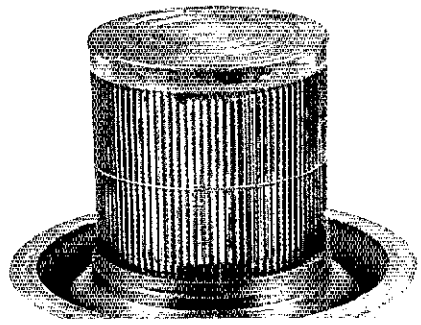


Fig 4—Excessive grid current—only one of the possible by-products of VHF parasitic oscillation in a vacuum tube—boiled away this 8877's gold grid plating. (Tube courtesy of Joe Funderburg, W6IHA.)

put capacitance (in a grounded-grid-triode amplifier, this is anode-to-grid capacitance, or C_{AG}), anode-to-chassis capacitance, and the inductance of the chassis path between the output-network tuning capacitor and the grounded grid, this parasitic anode inductance parallel-resonates the anode circuit at a frequency determined by the total L and C in the parallel circuit. *The output-network component values have almost no effect on this frequency* because the network's tuning capacitor—which, at any setting, exhibits considerably more capacitance than C_{AG}—is virtually a VHF short circuit and *bypasses* the output network for VHF.

In a typical 1.8- to 30-MHz, 1.5-kilowatt amplifier, anode-circuit self-resonance usually occurs between 85 and 150 MHz. A pair of 3-500Zs, for example, exhibits about 10 pF of output capacitance. In parallel with a parasitic inductance of 200 nH, this results in an anode-circuit self-resonance at 112.5 MHz. (Frequency = $1 \div 2 \pi \sqrt{LC}$.) Investigating a given such resonance with a dip meter usually reveals the sharp and well-defined dip indicative of a high-quality (high-Q, which equates to *low loss* in this context) resonant circuit—just the thing for the tuned circuit in a VHF *oscillator*.

Such a self-resonance may be all that a tube capable of high gain well up into the VHF region—a tube kept stable at MF/HF by the shielding action of its grounded grid—needs to oscillate *vigorously* at VHF, where its grid provides insufficient shielding between its cathode and anode.[2,3] Output-network component values suitable for MF/HF couple little, if any, of the resultant VHF energy to the amplifier load. (After all, the output network is usually configured as a low-pass filter, and thus tends not to pass signals significantly above the amplifier's operating frequency.) As a result, the parasitic-oscillation power has nowhere to go, and develops high VHF-RF voltages between the amplifier's anode circuitry and ground. This causes arcing in the output-network band switch and/or tuning capacitor. The amplifier tube is subjected to a pulse of *very* high grid and anode currents as the oscillation drives the grid much farther into conduction than the tube was designed to survive.

How VHF Parasitics Damage Amplifier Tubes

Excessive grid current is the principal reason for failure in amplifier tubes subjected to intermittent VHF parasitic oscillations. Often, however, the large anode-current pulse, which is fed by the energy stored in the HV-supply filter capacitor(s), damages other components. For example, the pulse creates a powerful magnetic field that can pull a 3-500Z's hot, thoriated-tungsten filament wires off center. This can cause a filament-to-grid short in the amplifier tube, and may damage the amplifier's current-metering circuits and Zener cathode-bias diode. Fig 2 shows a grid-to-filament short in a 3-500Z that was subjected to several parasitic oscillations. The hot filament wires were pulled horizontally by successive electromagnetic pulses until they intermittently touched the grid-cage wires. (The best way to find the bulge point is to hold the grid and filament assembly in front of a light source and rotate the tube. I have opened four other 3-500Zs that suffered from the same problem. The filament misalignment in these tubes was essentially identical to that in the tube shown in Fig 2.[4]) In a healthy 3-500Z, the filament wires are centered in the grid structure.

The damage typically inflicted on ceramic-metal tubes by VHF parasitic oscillation is spectacular. These amplifier tubes have the following in common: indirectly heated oxide-coated cathodes, high gain and gold-plated grids. Their cathodes' oxide coating is an efficient electron emitter. Their gold grid plating helps to reduce grid *secondary emission*—unwanted electron emission that results when the grid is struck by electrons flowing from cathode to anode. Fig 3 shows an 8877, the cathode oxide coating and grid gold plating of which are intact. This is what the insides of a mint-condition 8877 are supposed to look like. (Why did I remove the anode of this uncheap amplifier tube? Because broken spot welds between the cathode assembly and the base of the tube rendered it inoperable. This was due to a rare manufacturing defect.) Gold-plating the grid involves a trade-off, however: If the

Testing for Errant Gold

You can detect the existence of loose gold particles without sawing open a suspect amplifier tube. The only piece of test equipment needed is a high-voltage breakdown tester (HVBT).† The principle behind the test is that like charges repel and unlike charges attract.

Test procedure: Leave the tube filament or heater *unpowered.* The positive and negative dc test voltages you apply between the anode and the grid should be about three times the tube's operational anode-voltage rating. This may sound like a risky undertaking, but it will not damage an amplifier tube with an unheated cathode. The gold particles can be moved around by changing the polarity of the anode voltage. If the anode is positive, the gold particles are attracted to the anode insulator. This causes the indicated leakage current to increase. If the anode is made negative, the gold particles are repelled and the leakage current decreases. If the leakage current is equal with either polarity, the presence of air molecules is indicated; in other words, the tube is *gassy.*

Another method of confirming the presence of gold particles is to apply positive anode voltage and record the leakage current. Shut down the HVBT and, with the tube vertical and its anode cooler up, vigorously rap the anode cooler—with something that won't make dents—vertically and horizontally. This action causes some of the gold particles to fall to the bottom of the tube, where they will be away from the positive, attracting influence at the anode insulator. Keep the tube vertical. To test the results, reapply the same anode voltage. If the leakage current decreases enough, the tube may be usable. This procedure has been used by some amplifier owners to get more operating hours out of gold-sputtered tubes that have low emission and/or have suffered anode insulator flashovers.—*AG6K*

†HVBTs are easy to build and use. See R. Measures, "A High-Voltage Breakdown Tester," *QEX*, Aug 1988, pp 5-7, and Feedback, *QEX*, Jun 1989, p 11. Unedited-version copies of this article are available from this author for $2 or eight first-ounce, First Class US postal stamps, delivered. (The ARRL and *QST* in no way warrant this offer.)

Cathode Overdrive: Expensive, Senseless and Discourteous Abuse

If the gold plating on an amplifier tube grid is missing in places, a VHF parasitic oscillation was the most likely culprit. If a VHF parasitic has occurred, *it's also common to find that some of* the cathode coating has been dislodged. This leaves dark patches on the cathode surface. If the grid's gold plating is completely intact, and the cathode coating has been damaged, a parasitic oscillation was *not* the reason for the tube failure. Instead, the tube was destroyed by *cathode overdrive.*

Cathodes Cook . . .

Fig A shows a kaput 8873 tube, from a two-tube amplifier, that was damaged by too much drive power. Its gold grid plating is undamaged, indicating that excessive grid current (and, by implication, a VHF parasitic oscillation) did not occur. Further inspection reveals, however, that the cathode's oxide coating has been stripped away—in some spots it's still falling off in flakes—by excessive drive. *Both* 8873s in the amplifier containing this tube were destroyed by overdrive.

A common misconception among radio amateurs is that it's okay to overdrive an oxide-cathode tube as long as the grid current is held to a safe level. I don't know how this idea got started, but Fig A demonstrates that this notion is a thick slice of some very expensive bologna. The specious statement that "protecting the grid from excessive grid current is the *only* concern" is false because most of the drive power in a grounded-grid amplifier is applied to the tube *cathode,* and only a small fraction of the resulting cathode current flows into the grid. Thus, overdrive abuses the frangible oxide cathode.

In a tube with a directly heated (filamentary) cathode, such as the 3-500Z, the filament's electron-emitting tungsten-dicarbide coating is atomically bonded into the tungsten/thorium-oxide-alloy filament wire. This coating cannot be dislodged by cathode overdrive. (True, it can be slowly wasted by applying too much filament voltage to the tube, but it cannot be stripped away outright.)

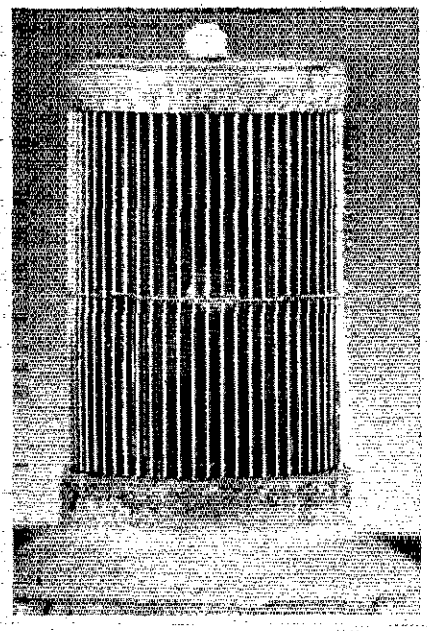


Fig A—Overdrive, not a VHF parasitic, damaged this 8873's cathode. Parasitics usually strip the grid of gold while barely changing the cathode's appearance; overdrive tends to blacken the cathode while leaving the grid unchanged. This grid cage is *in good condition,* but the coating of the cathode inside it is falling away in flakes. (Tube courtesy of Lon Cottingham, K5JV/KH6, who was *not* the amplifier owner.)

In a tube with an indirectly heated cathode, however, the cathode structure consists of a nickel cylinder coated with a mixture of barium oxide and strontium oxide. Nickel is a very poor electron emitter, but when the oxide coating is heated to the right temperature, the cathode becomes a superb emitter of electrons.

At the recommended drive level—as *stated in the tube manufacturer's* specification sheets—the tube's maximum anode-current rating will not be exceeded, and the nickel-to-oxide bond is strong enough to keep the oxide coating in place. Overdriving the cathode pushes the tube's anode current beyond its rated maximum—a current level sufficient to dislodge the cathode's oxide coating no matter what the tube's grid current happens to be.

The amplifier tube shown in Fig A was removed from a Henry Radio 2K Ultra amplifier. The 2K owner's manual clearly states that applying more than 75 W of drive can damage the amplifier's two 8873 tubes. Despite this, the tube shown in Fig A was driven with more than 95 W. This was an $810 mistake. Eimac recommends ≈26 W of drive power per 8873 at 30 MHz.

. . . and Linearity Suffers

Another popular misconception about overdriving amplifier tubes is that a tube will amplify linearly as long as its grid current is controlled by heavy loading. Although heavy loading reduces grid current and usually improves linearity, *it does not linearize the amplifier if the amplifier tube is overdriven.* A tube cannot be made to operate linearly when it is severely overdriven because its cathode emission *saturates*—fails to increase with further increases in drive—causing the tube's anode-current waveform to run out of steam at its peak and flattop. During SSB voice operation, this distor*tion causes splatter—interference on* frequencies outside of the necessary bandwidth of the transmitted signal, making the operator quite unpopular among those with whom he/she shares the band.—*AG6K*

gold evaporates, migrates and condenses elsewhere in the tube, it can render the tube useless.

Evaporating the gold from the grid might seem to be a very unlikely possibility. In a good vacuum, gold cannot begin to evaporate unless it is heated to around 1832 °F (1000 °C). To establish a rapid gold-evaporation rate, the temperature would have to be increased substantially. Heating the entire mass of the grid to 1832 °F would take considerable energy. Even in an underloaded tube with full drive power applied, the grid temperature could not even approach this level. Thus, even operator error should cause no problems with a gold-plated tube grid.

Unfortunately, VHF energy is capable of heating the grid's gold plating while leaving the underlying grid cage relatively cool. *Skin effect*—the tendency for ac flow in a conductor to be greater toward the surface of the conductor—becomes more pronounced as frequency rises. Because of skin effect, RF energy at VHF-parasitic-oscillation frequencies travels almost exclusively in the grid's thin gold plating. Even though gold is a good conductor, it is resistive enough to be heated to evaporation temperature by the high grid current that accompanies a VHF parasitic oscillation. The resulting hot gold cloud can then move about freely in the tube's vacuum. As the gold cools, it condenses into tiny droplets. Some of the gold lands on the cathode, which is (relatively) much cooler than the grid. (This process—evaporating metal and redepositing it in a vacuum—is known as *sputtering.*) When this happens, the gold *poisons* the cathode and impairs its ability to emit electrons. This reduces the tube's cathode emission, and impairs the tube's ability to amplify. Migrating gold can also find a new home on the inside of a tube's ceramic anode insulator. This may cause flashover between the anode and the adjacent grounded grid ring.[5]

Fig 4 shows an 8877 that sustained at least one VHF parasitic oscillation. Most of its grid's gold plating has evaporated and left for other parts of the tube. Some of the gold found its way to the anode's ceramic insulator, causing multiple internal flashovers across the insulator between the anode and the grounded grid.

Some of the gold vapor also landed on the cathode and solidified. In some places, the cathode coating appears to have been damaged by arcing to the grid. These arcs may have occurred during the time that the vaporized gold was mobile and RF voltage existed between the grid and the cathode. Another possibility is that a cathode-to-

grounded-grid flashover occurred. Here's why:

During a flashover, when the anode arcs to ground—the grid ring, in this case—*the HV-positive circuit is virtually grounded.* This causes the HV-negative circuit to try to rise above ground by the charge stored in the HV filter capacitors. In most grounded-grid amplifier circuits, the only current path between HV-negative and chassis ground is the grid-current metering circuit. Because the HV-positive line is virtually grounded by the anode-to-grounded-grid arc, *the HV supply is temporarily connected across the grid-current metering circuit during a flashover.*

The peak amplitude of the resultant discharge depends on several factors. For example, if the anode and grid-current meter-shunt resistors are 1 Ω each, and the HV filter capacitor is charged to 3 kV, the discharge current is approximately equal to 1000 A—*serious* current! (Derivation: 3000 V ÷ 3 Ω [the total resistance of the meter-shunt resistors and anode-supply RF choke, which are all in series].) This is why it's not unusual for the grid-current meter and its shunt resistor to be burned out during a flashover. (One amplifier builder told me that the guts of his grid-current meter *blew out of the meter case and landed on the floor* when a bright flash and a loud bang—the other signs of a VHF parasitic oscillation—occurred. The considerable energy that caused this was supplied by a 100-μF capacitor charged to 6 kV.)

If the grid-current metering circuit is blown away, the other components in the amplifier's HV-negative and cathode circuits may be subjected to a negative spike of several kilovolts, which—obviously—can damage these components.

Typically, one victim is the heater in an indirectly heated amplifier tube (such an 8877, 3CX800A7 or one of the 8874 family). One side of the heater in such tubes is normally grounded. In a cathode-driven amplifier, this means that the RF-drive voltage appears between the heater and cathode. As the drive voltage is typically less than ±100 V, peak—well within the tube's heater-to-cathode rating—the tube's heater-to-cathode insulation is not overstressed. If, however, a flashover occurs between the anode and the grounded grid, and the grid-current metering circuit opens, a few kilovolts may temporarily appear between the cathode and the grounded heater, causing an arc through the insulation between the heater and cathode. The energy stored in the HV filter capacitor zaps the heater, which may fail open. (The open heaters that amplifier users typically blame on tube-manufacturing defects are often accompanied by indications that an intermittent parasitic oscillation occurred just before the heater was found to be open.)

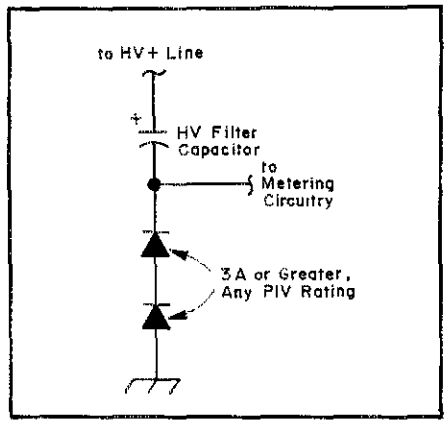


Fig 5—Two diodes can provide anode-flashover overvoltage protection for the cathode circuit of a grounded-grid power amplifier by limiting the potential across the cathode circuit to about 3 V during an anode-to-ground flashover.

Flashover Protection

Cathode circuit: A simple overvoltage protection device for an amplifier's entire cathode circuit is a series pair of ≈3-A, any PIV, silicon rectifiers connected between the negative terminal of the HV-supply filter capacitor and chassis ground (Fig 5). During an anode-flashover fault, the maximum voltage drop across each diode will be about 1.5, so the potential across the cathode circuit will be safely limited to about 3 V during any fireworks. (If the current pulse during a glitch is large enough, these diodes, which are considerably less expensive than the tubes they protect, will short-circuit and continue to protect the valuable parts in the cathode circuit.)

Anode-supply fuse resistor: Amplifier tubes need protection from the large anode-current pulse that accompanies a VHF parasitic oscillation. Such protection—merely a wire-wound resistor connected in series with the positive HV lead—is easy to install. For anode currents up to about 1 A, a 10-W, 10-Ω resistor works well. For anode currents up to about 1.4 A, a 5-Ω, 10-W, or a 10-Ω, 20-W, resistor can be used. The resistor acts as a fuse by trying (and failing, usually somewhat explosively) to dissipate the brunt of the energy stored in the HV filter capacitors. Because the fuse resistor may shatter rather violently during a glitch, don't mount it near a glass-envelope amplifier tube!

Summary, Part 1

The VHF parasitic oscillations common in Amateur Radio power amplifiers damage the tubes used in predictable ways. Relatively simple safeguards can be installed to limit the damage that can happen when a VHF parasitic oscillation occurs. In Part 2 of this article, I'll describe parasitic-oscillation damage to amplifier tuning capacitors and band switches, how to repair it, and how to build and install components capable of keeping VHF parasitics from happening in the first place.

Danger: High Voltage

WARNING: Lethal voltages may be present in an amplifier *whether or not it is plugged into the ac line.* This is true even for many amplifiers that contain safety interlocks because the interlock may disable only the amplifier HV circuit and leave the ac line connected. Under some conditions, 120 or 240 V ac can be more lethal than 3 kV dc because 3 kV is capable of causing a violent muscle contraction that may knock the operator loose from the HV source, whereas 120 or 240 V may cause a gentler muscle contraction that prevents the operator from letting go of the shock source. This often results in death unless another person pulls the plug posthaste. It's better to *pull the plug yourself*—before putting your hands inside the amplifier. Next, be sure the amplifier's HV-filter capacitors are fully discharged before proceeding. Failing to do so may result in your premature appearance in Silent Keys.—*AG6K*

Notes

[1]Control-grid bias, and, for screen-grid tubes, screen power, may also be necessary in a practical amplifier.

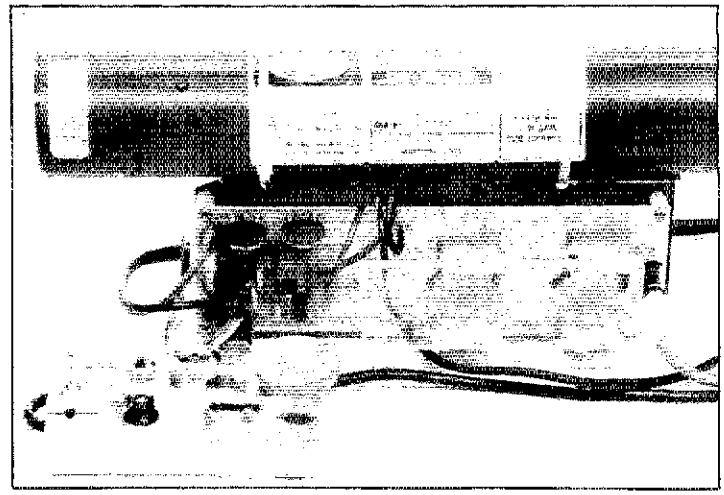
[2]Self-excited oscillators start oscillating when small input-signal variations—random variations (noise) in the tube electron stream can be enough—are amplified by the active device and repeatedly reamplified through feedback. Experience suggests that some VHF parasitic oscillations start in response to voice or keying transients; operating the amplifier at a subharmonic of its parasitic anode resonance may also be a factor. Any disturbance capable of shock-exciting the parasitic anode resonance may also be able to start a VHF parasitic.

[3]In addition to parasitic VHF resonance in its anode circuit, an amplifier may be affected by VHF resonance in the metal enclosure that houses its RF deck. Well-sealed, the amplifier box may act as high-Q, VHF-resonant cavity similar to those used in repeater duplexers. Since the cavity and the anode circuit are likely to couple to each other, the cavity may become involved in an intermittent VHF parasitic oscillation.

[4]With the right technique, some common tools and a little knowledge, opening *out-of-warranty,* inoperable tubes can be easy, safe and educational. An information sheet describing this process is available from this author for an SASE bearing postage sufficient for one ounce. (The ARRL and *QST* in no way warrant this offer.)

[5]Flashover is most likely during the crest in the (sine-wave) anode voltage when the tube is not conducting, as the voltage across the output network swings to its positive peak. At this instant, the peak anode voltage is typically within about 200 to 300 V of *double* the anode supply voltage. This is not a rare occurrence: It happens over 14,000,000 times per second when an amplifier operates at 20 meters.

A Laser-Communications Primer—*Part 1*



Been looking for a new frontier in Amateur Radio? Give *optical* communications a try!

By Bryan P. Bergeron, NU1N
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Brookline, MA 02146

Few technologies developed less than 30 years ago have permeated our lives as much as the laser. The most obvious applications of the now-commonplace laser range from bar-code scanners used in neighborhood grocery stores to CD (compact-disc) players, high-resolution printers and high-capacity computer disk drives. Less widely known, but perhaps even more significant, are the many varied commercial applications of lasers, including the fabrication and testing of ICs and precision resistors, geographical distance measurement, circuit-board drilling, eye surgery, motion detection for surveillance, high-temperature spot soldering, telecommunications and image digitization.

For the radio amateur interested in experimenting with optical communications, there has never been a more opportune time to enter the field. This article, the first in a two-part series, provides a modest introduction to the fundamentals of optical communications, including a discussion of laser light, laser-light sources and detectors, and optics, and includes a glossary of optical-communications terms. Part 2 builds upon this knowledge, describing how, with a small investment in time and money, you can build your own voice or CW optical communications system.

Optical Versus RF Communications

Although present-day, free-space optical communication suffers from atmospheric attenuation and is constrained to line-of-sight paths, it has a number of advantages over conventional RF communications. Perhaps the most notable feature of optical communications media—especially when you consider the current state of the crowded HF bands—is its practically unlimited bandwidth. Given the appropriate hardware, one could transmit the contents of the entire amateur MF/HF spectrum over a single beam of light! For example, laser diodes have a potential bandwidth in excess of *10 GHz*.[1]

From the radio amateur's perspective, optical communications represents a largely unexplored frontier. And, unlike microwave communications, it is currently free of FCC restrictions and license requirements. As was noted in several New Frontier columns in *QST*, laser-based optical communication using surplus, inexpensive components is not only challenging, but can also be fun and educational. In order to become proficient at optical communications—especially if you plan to design and build your own equipment—you need to adequately appreciate laser light and how it can be generated, modulated, directed and detected. This article contains an introduction to these concepts, including practical examples of their applications.

Laser Light

As any 5-year-old who has seen Saturday morning cartoons can tell you, one of the most significant characteristics of laser (an acronym for *light amplification by stimulated emission of radiation*) light is its intensity. Laser light is able to burn holes through metal bulkheads (whether real or imaginary) because it can deliver a large amount of light energy to a very small area. Even the most powerful laser beams can be focused on a spot of a size that's limited only by the wavelength of the light used. As shown in Fig 1, lasers can operate not only in the visible spectrum, but well below (infrared—IR) and above (ultraviolet—UV) this range as well.

In addition to intensity, laser light has a number of characteristics that make it useful for communications. First, laser light is usually generated at a single wavelength, or color. Although single-color—monochromatic—light can be generated from nonlaser sources such as monochromatic spectrum lamps containing cadmium, mercury, potassium or sodium, the light from these nonlaser sources does not share other significant

[1]Notes appear on page 24.

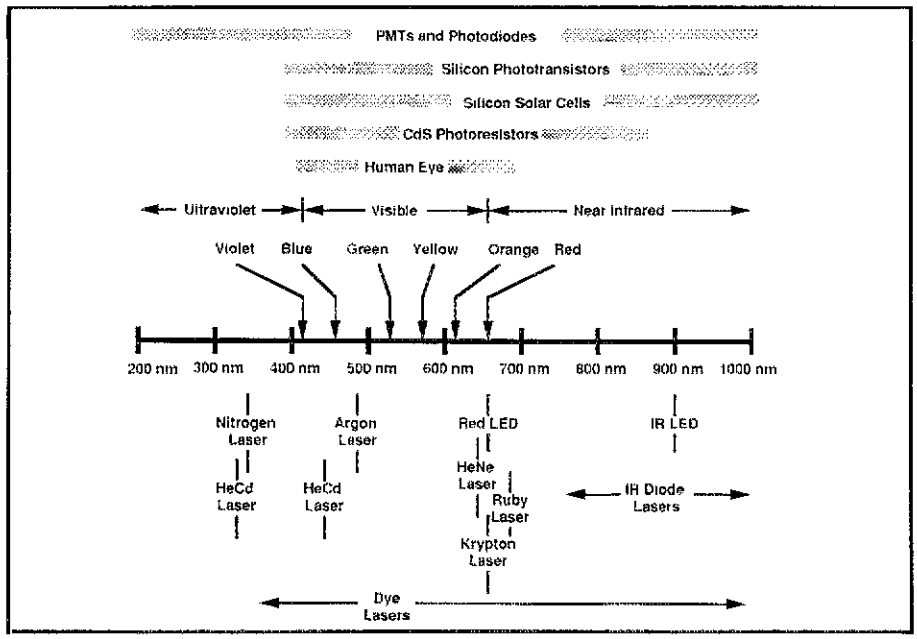


Fig 1—Spectral sensitivities (top) for common photodetectors and characteristic output wavelengths for selected laser sources (bottom).

Table 1

Center for Devices and Radiological Health (CDRH) Laser-Device Classifications†

Class	*CDRH Criteria*
I	Emits energy in the UV, visible or IR spectrum (400-1400 nm) at levels below which biological hazards have been established. Up to 0.39 μW output.
IIA	Low-energy emissions in the visible spectrum (400-710 nm), but not intended for direct viewing, eg, bar-code scanners. No hazard from direct viewing for less than 1000 seconds. Up to 3.9 μW output.
II	Visible emissions only (400-710 nm). Beam must not be on or motionless for more than 0.25 second. Potential chronic hazard. Up to 1 mW output.
IIIA	Visible emissions only (400-710 nm). Potential acute (immediate) or chronic hazard. Up to 5 mW output. (Most NeHe lasers fall into this category.)
IIIB	Emits energy in the UV, visible or IR spectrum (400-1400 nm). Acute eye and skin hazard on direct exposure. Maximum output between 5 and 500 mW in the visible spectrum, less in the IR and UV regions.
IV	High-power lasers that are extremely hazardous to eyes and skin upon direct or scattered exposure. More than 500 mW in the visible and IR regions and more than 1.5 mW in the UV region. (Heavy duty, commercial cutting and soldering lasers fall into this category.)

†The classification criteria are for continuous lasers only; pulsed lasers are subject to different requirements. For more information on CDRH classifications, see the *Federal Register*, Vol 50, No. 161, Aug 20, 1985, pp 33688-33702.

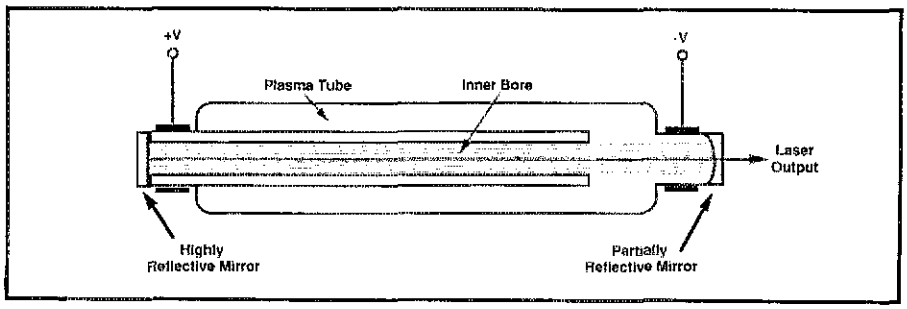


Fig 2—Cross-sectional view of a typical HeNe laser tube. Note that the partially reflective output mirror is curved inward slightly to provide a more parallel output beam. Although direct HV-supply connections are shown, a series ballast resistor is usually inserted in one power-supply lead to limit current.

properties of laser light. For example, unlike other types of light, laser light is both spatially and temporally *coherent*. That is, its component waves are all unvaryingly *in phase*.

Lasers and laser light are classified based on a variety of factors, but the most common classification schemes are based on the composition of the lasing medium (gas, dye, chemical, solid state, semiconductor), the output wavelength (IR, visible, UV), tunability (fixed or variable wavelength) and output power. Whatever the scheme used for classification, all commercial lasers are additionally classified according to standards established by the Center for Devices and Radiological Health (CDRH).

As shown in Table 1, the six categories of laser devices are defined as functions of output power, wavelength, maximum exposure time and potential for biological damage. Most lasers useful to amateurs fall into categories IIIA and IIIB, as classes I, II and IIA devices are useful only for relatively short distances, and class IV devices are simply too dangerous for communications use. (Carbon-dioxide lasers, with output powers in excess of 5 kW, as well as tunable titanium-sapphire solid-state units with more than *25 kW* output, are examples of class IV lasers.)

Whatever the CDRH classification, laser light, like all forms of radiation, is potentially very dangerous. Although the unfocused beam from a typical 1- or 2-mW gas laser is not likely to cause any injury to your hair or skin, it can damage your eyes, especially the retinae. *Treat a laser as you would the sun: Never look directly at a laser beam or a reflection of the beam, and always wear appropriate eye protection.* Even for low-power visible laser work (a 1- or 2-mW, unfocused beam), I wear high-quality dark sunglasses.

Laser-Light Sources

Although over 200 types and models of lasers are commercially available, you are far more likely to encounter a surplus visible-light helium-neon (HeNe) gas or IR semiconductor laser than, for example, a solid-state ruby laser. Because of their relative abundance on the surplus market, I'll describe HeNe lasers and semiconductor (diode) lasers in detail.

Helium-Neon Gas Lasers

Helium-neon lasers (known as "heenees"), with their characteristic bright red output at approximately 633 nm (see Fig 1), are the most abundant visible-light laser devices on the surplus market. HeNe lasers are especially attractive to the experimenter. Unlike many of the higher-power gas lasers, such as krypton units, low-power (1-5 mW) HeNe lasers are physically compact (see the title photograph) and do not require forced-air or liquid cooling.

HeNe lasers, like many gas lasers, are energized by passing a current through a gas-filled tube with highly reflective ends (see Fig 2). This current, nominally in the range of 3 to 8 mA with a 2- to 4-kV supply, imparts energy to the helium-neon mixture, which in turn releases the energy in the form of red light. Although 1 or 2% of this light escapes through the less reflective output mirror, most of it is reflected back into the gas mixture, where it stimulates the emission of additional "particles" of light (photons) from other gas atoms. That is, a single photon may excite a gas atom already in an excited state as a result of the current passing through the gas, producing an additional photon, of the same energy content (wavelength) as the first. These two photons can similarly excite two additional gas atoms, producing four photons, and so on.

The result is an avalanche effect that generates large numbers of photons, all of the same wavelength. In this environment, out-of-phase waves (light has properties of both particles and waves) tend to cancel, so the resulting laser output is coherent. In addition, the reflective surfaces ensure that the photons traverse a parallel course within the laser tube, resulting in a parallel output beam (low beam divergence).

Because of their construction, HeNe lasers produce a bright red, cylindrically symmetrical output, without additional optics. The diameter of this cylinder is nominally 0.8 mm, with the exact value determined by the inner diameter of the laser-tube bore (see Fig 2).

Although mean-time-before-failure (MTBF—a catchphrase for service-life expectancy) figures for HeNe tubes range from only 10 to 20 thousand hours, a surplus tube with even 1% of its expected life remaining can be a good buy. Even a few hundred hours of tube life will go a long way in a communications system in which the laser is turned on for only a few minutes at a time.

Semiconductor (Diode) Lasers

Largely because of the electronics industry's need for compact, efficient laser-light sources, the gas laser is being supplanted by the semiconductor-diode laser (see Fig 3). The CD player, for example, would not be feasible without solid-state lasers.

A major advantage of diode lasers over HeNe lasers is their efficiency. Whereas typical HeNe lasers have efficiencies of only 1 or 2%, semiconductor laser diodes can be more than 60% efficient.[2] In addition, the power-supply requirements of a laser-diode system can often be satisfied by a compact low-voltage supply or battery, as the typical power consumption of a diode laser at room temperature is a mere 179 mW (2.1 V at 85 mA).[3]

In addition to their greater efficiency (and

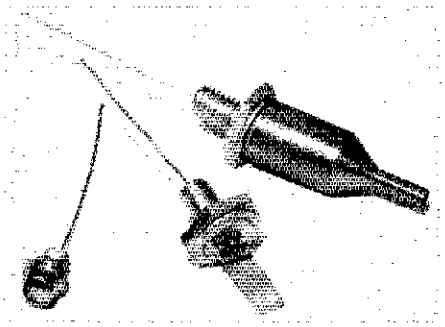


Fig 3—Gallium-arsenide (GaAs) IR laser diodes are both extremely compact and efficient laser-light sources. The small unit on the left, manufactured by RCA, is rated at 9 W output, and the two larger diodes on the right, manufactured by Laser Diode Laboratories, can provide up to 7 W of output power. The protective cover has been temporarily removed from the center diode to expose the GaAs substrate. *(NU1N photos)*

therefore cooler operation), semiconductor laser diodes offer additional advantages over their gas counterparts. Not only are they more mechanically rugged in general, but semiconductor diode lasers also offer greater reliability. For example, red-light semiconductor diode lasers have MTBFs in excess of 250 thousand hours—10 to 20 times that of typical HeNe lasers.

Although the composition of a diode laser is responsible for its compact size and reliability, it also introduces an important difference in the nature of the output beam, compared to the HeNe laser. Semiconductor laser-diode structures are rectangular, rather than cylindrically symmetric like those of an HeNe laser, and therefore produce a rectangular beam with two divergence angles. That is, over distance, the beam spreads more in one axis than in the other. The nearer the relative divergence angles (aspect ratio) is to unity, the better, for optical reasons.

In general, although the larger beam-divergence angle is temperature independent, the smaller divergence angle is affected by temperature. Typical initial spot (or rectangle) size for the output of a semiconductor diode laser is 2 μm × 5 μm, compared to a symmetrical 0.8 mm—800 μm—for a HeNe laser. Although optional on HeNe lasers, *collimating lenses* must be used with semiconductor-diode lasers to obtain a parallel beam.

Unlike HeNe lasers, with their fixed-wavelength, 633-nm outputs, the output wavelength of semiconductor diode lasers is temperature-dependent. Higher temperatures result in longer output wavelengths.[4]

Although the Japanese electronics firm NEC announced the first room-temperature visible light GaAs-diode laser in 1985, the majority of diode lasers in use today are silicon IR units. Market pressures are likely to change this situation in the near future. In fact, most of the major laser-diode manufacturers, including Toshiba, Sony, Hitachi and Philips, have announced production of visible-light diode lasers. Regardless of manufacturer, the current generation of visible-light laser diodes come in three-lead packages and include internal monitor photodiodes used in controlling output power.

An interesting characteristic of visible-light diode lasers is that, unlike gas lasers, output wavelengths vary considerably from device to device.[5] The result, from a communications perspective, is that filters and detectors have to be carefully matched to individual laser diodes. For example, replacing a defective visible-light laser diode with a new one may require modifications in the optical systems of the transmitter *and* receiver in order to compensate for the wavelength difference.

Other limitations of current visible-light diode lasers include relatively low maximum output power. For instance, 680-nm GaAs laser diodes are available with output powers up to only 5 mW, compared to the 100 mW achievable with silicon IR laser diodes and HeNe lasers.[6] In addition, diode lasers with shorter wavelengths, eg, 670 nm (yellow), have somewhat shorter MTBFs than IR lasers, but still many times that of a typical HeNe laser.[7] Semiconductor-diode lasers are also less forgiving of voltage transients and overheating than their gas counterparts. As with the semiconductor finals in your radiocommunications gear, good voltage regulation and heat dissipation will prolong the life of your laser communications system.

Laser Modulation

In order to carry information, a light beam must be modulated. The most appropriate form of modulation to employ is a function not only of the information to be communicated, but also of the type of laser system being used. For example, commercial IR laser-diode systems are available with modulation limits in excess of 90% with a 500-MHz bandwidth (Edmund Scientific Co, 101 E Gloucester Pike, Barrington, NJ 08007, tel 609-573-6250). HeNe lasers, however, have a modulation limit of only 15%, and a narrower bandwidth.

Although CW is by far the simplest mode to implement in conventional RF communications, it can be difficult to achieve with laser systems. HeNe lasers, for example, cannot be reliably switched on and off more than a few times per minute. Like fluorescent room lights, HeNe lasers require a brief stabilization period after power is applied. In addition, the thermal shock associated with each start and stop can eventually lead to a cracked laser tube.

Perhaps the best way to use an HeNe laser in CW work is to modulate the beam, after it has been generated, with a liquid-crystal shutter. For example, I have used the liquid-crystal display (LCD) from an inexpensive watch to successfully modulate a 5-mW HeNe laser beam. Unfortunately, there are both information-rate and communications-distance penalties associated with this approach. First, light transmission through an LCD in the clear state is at best only about 70%. In addition, LCD response time, a function of applied voltage and cell thickness, is on the order of 100-200 ms at room temperature, and considerably longer at lower temperatures.[8] You therefore end up with an attenuated beam that might, at best, support a 5-WPM CW QSO. Using more than a few milliwatts of laser energy is not advisable, because LCD failure occurs if the maximum operating temperature (near 120 °F) is exceeded.

The most practical means of working CW with an HeNe laser is to modulate the tube's supply voltage at a fixed audio-frequency rate. In modifiable switching power supplies, this is most easily done by changing the switching rate. Laser power-supply kits are most amenable to this approach, because they typically have a means of varying the switching rate to suit the needs of a particular laser tube.

Optics

Lenses, mirrors, fiber-optic cables and other optical devices are to light energy as antennas and coax are to RF energy. And like a radio antenna system, the quality and efficiency of the optical system can make the difference between a solid communications link and a worthless one, regardless of what signal generation and detection devices are employed. Given this scenario, you should have a good grasp of the types of optics available, and how they are best utilized in communications work.

Conventional Glass Lenses

The most basic optical element in laser communications is the common glass magnifying lens. For example, a simple magnifying glass, with its double convex lens, makes an excellent receiving lens. Simply mount the light detector (more on these later) at the lens's focal point and align the lens-detector axis with the target. A good rule of thumb is that doubling the receiving lens diameter doubles the maximum range of the receiver. You can easily determine the focal point of a lens by using the lens to focus a distant light source, such as the sun, on a sheet of white paper. When the distant object is in focus, the lens's focal length is the distance between the center of the lens and the paper.

Most inexpensive lenses, such as those used in hand-held magnifiers, display some degree of *chromatic aberration* (see Fig 4). That is, light of different wavelengths has different focal lengths, in part because light at each wavelength is refracted to a different degree by the glass that composes the lens. Expensive lenses, such as those used in better telescopes and binoculars, are coated to correct for this chromatic aberration. However, as shown in Fig 4, chromatic aberration can actually be of great benefit, because the optical detector can be positioned such that it encounters predominantly one segment of the spectrum, eg, primarily red light in a receiver system optimized to detect HeNe-laser light. Chromatic aberration increases nearly exponentially with increasing lens aperture,[9] so larger lenses provide more chromatic aberration, and therefore potentially better selectivi-

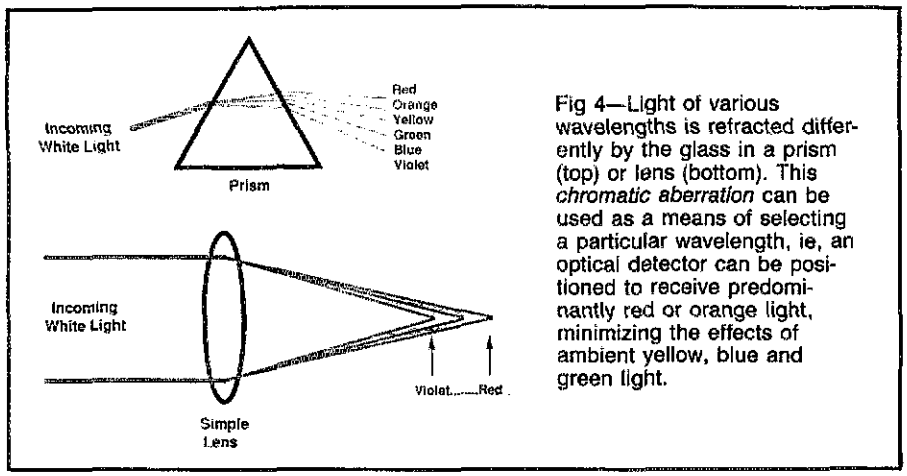


Fig 4—Light of various wavelengths is refracted differently by the glass in a prism (top) or lens (bottom). This *chromatic aberration* can be used as a means of selecting a particular wavelength, ie, an optical detector can be positioned to receive predominantly red or orange light, minimizing the effects of ambient yellow, blue and green light.

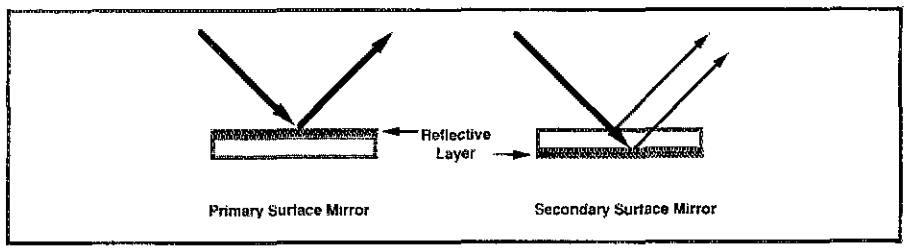


Fig 5—Primary-surface mirrors, in which the reflective coating is on top of the glass substrate (left) have less loss than common secondary-surface mirrors (right), because incident and reflected light don't have to travel through the lossy substrate.

ty, in addition to better light-gathering power.

Fresnel Lenses

Unfortunately, large-diameter glass lenses are expensive, heavy, difficult to produce, and generally difficult to work with. Luckily, lenses are available that not only provide large capture areas, but are also lightweight, easy to work with and easily affordable. *Fresnel* lenses are flat, thin pieces of plastic (commonly acetate butyrate) molded with a series of small, concentric, stepped zones, each of which acts as part of the lens. Unlike conventional lenses, Fresnel lenses are very thin—typically 1/8 to 1/4 inch thick.

Although Fresnel lenses offer advantages over conventional lenses in terms of cost, weight and size, they are somewhat less efficient than good-quality glass lenses. For example, Fresnel lenses made of acetate butyrate have a light transmissivity of about 92% in the visible spectrum, compared to about 98% for a good conventional glass lens. You can purchase a new 16-inch-diameter Fresnel lens for less than $20 (Edmund Scientific Co), but a good conventional lens of the same diameter would cost well over $1000, and would weigh tens of pounds.

Although the majority of Fresnel lenses on the market are designed for visible light, IR Fresnel lenses are also available. Composed of a whitish plastic, those of the IR variety craze rapidly when exposed to sunlight. However, they are somewhat more efficient than their visible-light counterparts, with typical light transmittances approaching 95%. Even IR Fresnel lenses are priced quite reasonably; 12- × 12-inch lenses sell for about $30 (Edmund Scientific Co).

Flat Mirrors and Prisms

Although lenses are useful for focusing light, flat mirrors and prisms are used primarily for redirecting the light beam once it has exited the laser source, or on its way to the optical detector. Mirrors can be classified as either primary- or secondary-surfaced.

Primary-surface mirrors have a reflective coating (usually aluminum) on the surface nearest the incident light, so that light is reflected without passing through any glass (see Fig 5). Reflectance figures for primary-surface mirrors approach 95% in the visible-light range. Single-lens-reflex (SLR) cameras commonly use primary-surface mirrors in their construction, and are a good source of these mirrors. Secondary-surface mirrors, typified by the common automobile rear-view mirror (which can be used for day- or night-time driving conditions by adjusting it such that the viewer encounters either the primary [night driving] or secondary [day driving] reflection), have losses associated with both light absorption from the glass and secondary reflection, with a reflectance figure approaching only 90%. Avoid lossy secondary-surface mirrors if possible.

Although aluminized primary and secondary-surface flat mirrors are effective at visible wavelengths, they tend to absorb energy in the IR spectrum. For IR laser work, you should use primary gold-surface mirrors, which are efficient at IR wavelengths. Similarly, if most of your work is centered around HeNe-laser light, you should consider a specially fabricated HeNe-laser mirror. These mirrors, with a reflectance of nearly 98% at 633 nm, can be purchased from most laser-supply houses. New 1- × 1-inch, primary-surface HeNe mirrors go for about $15 new (Edmund Scientific Co).

One type of mirror that can be useful in communications work is the so-called *cold mirror*, used in overhead projectors and projection microscopes. These mirrors reflect visible light while allowing IR light to pass, thereby minimizing heat buildup. Although expensive when purchased new ($50 for a 4- × 5-inch mirror [Edmund Scientific Co]), cold mirrors make excellent optical low-pass filters when used to protect sensitive IR detectors from daylight.

Although very dissimilar physically, prisms are functionally very similar to mirrors in that they are primarily useful for redirecting laser light. Instead of a reflective coating, prisms make use of total internal reflection to redirect the beam. Uncoated prisms, like uncoated simple glass lenses, tend to affect light of various wavelengths differently (see Fig 4), and can therefore be useful in providing some degree of optical selectivity. That is, the optical detector can be positioned such that it only receives light centered around a particular wavelength.

Inexpensive, uncoated glass prisms are available from a number of sources, including most scientific supply houses, for $3-$5, depending on the size. Avoid the plastic prisms sold in some toy stores—they are generally less efficient than glass prisms, and scratch easily. High-quality coated-glass prisms are usually easy to come by surplus (from old binoculars and—my favorite source for optics—discarded SLR cameras.)

Curved Mirrors

Like lenses, parabolic, ellipsoidal and other curved mirrors can be used to collect and focus light. Lightweight, inexpensive parabolic reflectors of highly polished aluminum can be used to focus light on an optical detector, in a manner much like a conventional microwave dish. However, they are considerably less efficient than their glass counterparts. Edmund Scientific Co markets an 18-inch reflector for about $30.

An excellent source of a highly reflective, secondary-surface parabolic or ellipsoidal glass reflector is a discarded automobile headlight (unsealed) or spotlight. Simply replace the bulb with a suitable optical detector, and aim the assembly toward the laser-light source. You will have to experiment with the exact orientation of the detector for best results. Avoid spotlights and headlights with rectangular reflectors in favor of those of the more efficient round shape.

If you can't find a source of surplus parabolic mirrors, or if you need a larger capture area than a discarded automobile headlight can provide, you can buy secondary-surface parabolic mirrors in sizes up to about 20 inches (for about $50 from Edmund Scien-

tific Co). Primary-surface mirrors of more than 2 inches in diameter are relatively rare, and are found mainly in reflecting telescopes.

Bandpass Filters

Optical bandpass filters can increase the range of both IR and visible-light lasers when used in daylight. New HeNe laser-light filters with a center wavelength of 632.8 (±2) nm, sell for about $30 (Edmund Scientific Co). Many telescope manufacturers and retail outlets (eg, Orion Telescope Center, 421 Soquel Ave, PO Box 1158, Santa Cruz, CA 95061) offer broadband light-pollution filters designed to eliminate the effects of mercury and sodium street lights on astronomical observations. These bandpass filters, usually centered on approximately 500 nm (blue-green), effectively eliminate reds and yellows, as well as violet and UV wavelengths. They are therefore useful when used in conjunction with HeCd, argon and other blue-green lasers, but not with red HeNe lasers.

Less expensive optical bandpass filters include heat-absorbing glass and colored acetate. Heat-absorbing glass, commonly used in overhead projectors and microscopes, passes visible light and absorbs IR light. Heat-absorbing glass is best used as part of a front-end system in a visible-light receiver in the presence of a high-IR-noise background. Colored acetate, although less efficient than glass bandpass filters or heat-absorbing glass, is an inexpensive and effective bandpass filter. For example, a small piece of red acetate (which passes only the red part of the visible spectrum) can be placed in front of an optical detector to minimize interference from environmental light outside the red part of the spectrum.

Optical Fiber

Optical fiber is the functional equivalent of RF waveguide, but operates with photons instead of electrical RF currents.[10] Like the prism, optical fiber relies on internal reflection for its operation. Light introduced into one end of an optical fiber propagates within the transparent, inner core to the other end of the fiber.

Like coaxial cable and waveguide, fiber-optic cable is available in a wide variety of types. In small lengths, optical fiber can be purchased new for about 50 cents per foot. Surplus-market prices are comparable to those of coaxial cable.

For runs of only a few feet, the predominant loss in fiber-optic systems occurs at the interface between the laser source and the fiber aperture. Only laser radiation within a critical acceptance angle is admitted into the fiber. Even very small alignment errors or imperfections in the fiber entrance can result in significant signal losses. If you absolutely must locate your lens system some distance from your laser transmitter or receiver, use a fiber-optic pigtail—an optical fiber that has been accurately and permanently bonded to the active area of a laser diode, LED or photodetector during the manufacturing process.[11]

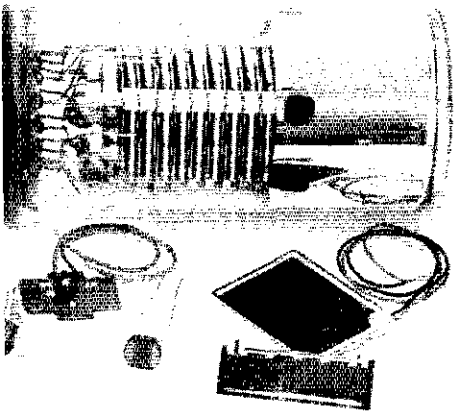


Fig 6—Examples of common visible-light and IR photodetectors. In the background is a photomultiplier tube. The photocathode is to the right, immediately adjacent to the transparent tube face, and the anode is visible near the tube base, to the left. In the foreground, from left to right, are: three common LEDs, an IR phototransistor assembly, a CdS photoresistor, and amorphous (front) and crystalline (rear, with leads) solar cells.

Optical Detectors

In order to extract audio or digital data from a modulated laser beam, a suitable optical-to-electrical transducer must be used. The detector's frequency response, bandwidth and sensitivity largely define the performance of the entire receiving system. Common optical detectors, described in more detail to follow, include solar cells, CdS photoresistors, LEDs, semiconductor and vacuum-tube photodiodes, phototransistors, and photomultiplier tubes.

Solar Cells

Solar cells (see Fig 6) are used in a variety of applications, from powering pocket calculators to charging batteries on communications satellites. As shown in Fig 1, typical silicon solar cells are sensitive to wavelengths from visible light to near IR. Silicon solar cells can generate about 0.5 V dc per cell at full illumination, and their current output is a linear function of light intensity. With a bandwidth of about 50 kHz, silicon solar cells are adequate for both voice and moderate-speed digital communications.

Cadmium-Sulfide (CdS) Photoresistors

As optical detectors go, CdS photoresistors (see Fig 6) are both inexpensive (Radio Shack sells a package of five, part no. 276-1657, for about $2) and fairly sensitive, with typical gains on the order of 10^4.[12] The resistance of these devices varies as a function of light intensity, within a range of about 100 Ω to 1 MΩ. As shown in Fig 1, CdS photoresistors respond to energy in the visible-light through near-IR range. They are, however, most sensitive to green light (approximately 520 nm). Like many photodetectors, CdS photoresistors exhibit a persistence effect—their sensitivity is reduced for 1 or 2 seconds after light is removed. Although the published bandwidth for CdS photoresistors is only about 100 Hz, I have used a CdS-photoresistor-based detector system to successfully recover 20-kHz signals from modulated HeNe-laser light.

LEDs

Primarily used to *generate* light, common LEDs also make fair optical *detectors*. Although I wouldn't recommend an LED-based detector for a long-distance communications link, LEDs make good, inexpensive detectors for close-range laser testing.

Vacuum Photodiodes

Vacuum photodiodes (see Fig 7) employ a relatively large, negatively biased photocathode and a smaller, positive anode to detect light. Current flow is directly proportional to the number of photons striking the photocathode. Although standard vacuum photodiodes have an efficiency range of only 0.5-20%, increased sensitivity (gains of five to ten) is possible when small amounts of argon gas are introduced into the partial vacuum. Vacuum-photodiode output is, like that of solar cells, a linear function of light intensity and, like CdS photoresistors,

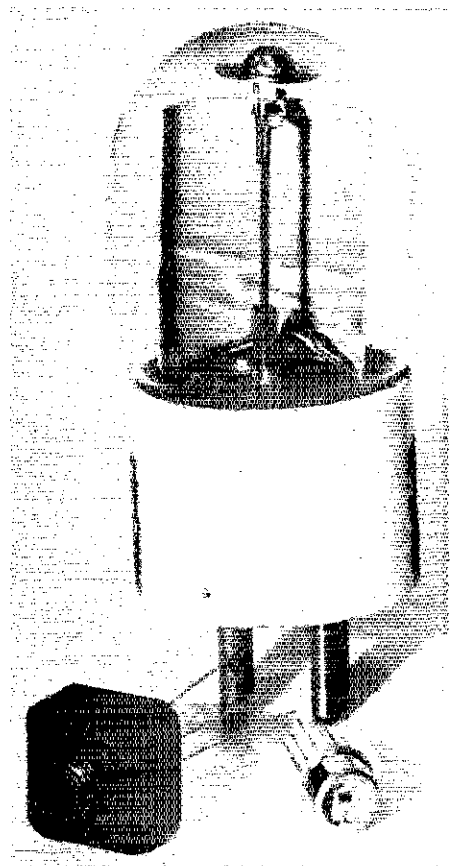


Fig 7—Photodiodes can take a variety of forms, from an early vacuum-tube design (rear), to modern silicon (front, left) and gallium-arsenide (front, right) units. The 3-pin photodiode, manufactured by EG&G for use in fiber-optic systems, is a very sensitive visible-light unit. The 10-pin photodiode from RCA, also sensitive primarily to visible light, has a built-in lens system.

vacuum photodiodes fatigue with exposure to light.

Semiconductor Photodiodes

Whereas vacuum photodiodes are practically antiques, semiconductor photodiodes are the most prevalent type of photodetector in use today (see Fig 7). Their extremely fast response times, good sensitivity and low cost make them excellent optical detectors for laser-light receiving systems. As shown in Fig 1, photo-diodes are available for visible through infrared wavelengths.[13]

The most common types of semiconductor photodiodes are the PN, PIN (P-intrinsic-N), and avalanche photodiodes. The common and inexpensive PN photodiode makes an excellent optical detector, especially at visible wavelengths, but PIN and avalanche diodes are even better.

PIN photodiodes, commonly used in fiber-optic communications systems, like vacuum photodiodes, respond linearly to incident light intensity. Normally operated with a reverse bias of 10 to 90 V, PIN photodiodes have typical bandwidths in excess of 1 GHz.

Avalanche photodiodes, designed to operate with a high reverse bias (nominally 150 V), can provide gains of 50 to 2500.[14] With a typical sensitivity of 1 μA per μW of incident light and a bandwidth in excess of 1 GHz, avalanche photodiodes make very sensitive, wide-bandwidth optical detectors. On the negative side, avalanche photodiodes are both noisier than PIN and PN diodes, and more sensitive to temperature and voltage variations.[15]

Phototransistors

Like LEDs, most transistors are sensitive to incident light. A phototransistor is essentially a normal transistor with a transparent case that allows photons to interact with the collector-base junction. Most phototransistors are NPN devices with a base region somewhat larger than that of a standard transistor. Bandwidth—approximately 1 MHz—is more than adequate for most applications, but considerably less than that of a photodiode. Typical phototransistor sensitivities, a few microamperes per microwatt of incident light, are significantly greater than those of common PN photodiodes, however. Darlington phototransistors are even more sensitive, but have correspondingly narrower bandwidths (on the order of 10 kHz).

Most phototransistors are sensitive to energy in the IR region, with a peak at approximately 850 nm. For IR laser work, phototransistors offer an inexpensive, readily available photodetector alternative. Radio Shack offers a good IR phototransistor, the TIL414 (part no. 276-145), for less than a dollar.

Photomultiplier Tubes

Despite the advances in solid-state photodetection, photomultiplier tubes (PMTs) remain the most sensitive of the generally available detectors for visible light, with gains approaching 10^8.[16] If long-distance laser communication is your goal, a PMT-based receiver is a must. For example, the current laser DX record, 95.6 miles, held by KY7B and WA7LYI, was made with 30-mW HeCd lasers (operating at 442 nm) and receivers equipped with 19- × 24-inch Fresnel lenses and PMTs.[17] Similarly, a 125-mW HeNe laser, together with a receiver constructed from a 12-inch telescope and a PMT, has been used in one-way contacts of over 110 miles.[18]

As shown in Fig 6, PMTs are considerably bulkier than their semiconductor counterparts. For example, my 19-pin EMI (Emitronics, Inc) model 9558 PMT has a 2-inch-diameter flat face. This PMT was designed for use in the visible spectrum, but PMTs are also available with peak sensitivities in the IR region. The composition of the internal emitting surfaces largely defines the spectral sensitivity of a PMT, but it is also influenced by the composition of the transparent photocathode window. Therefore, when you shop around for a surplus PMT, make certain that you get a data sheet with your tube. Although new PMTs can be expensive (in the $100 range), I have picked up working surplus units at local swapfests for under $10.

PMTs can be difficult to work with, mainly because their anode-supply requirements range from 700 V to over 3 kV. Because gain is an exponential function of the applied voltage,[19] a well-regulated HV supply is a must. In addition, PMTs demand shielding and a controlled-temperature environment, as they are sensitive to both ambient-temperature variations and magnetic fields. Even in total darkness, PMTs exhibit a small anode current that can be attributed to thermally excited electrons. This source of noise can be reduced by cooling the PMT, and by holding any material in contact with the glass envelope at cathode potential.

PMTs should never be exposed to ordinary light levels, because after even a short exposure to normal daylight, the PMT may require a day or more to return to normal dark-current levels.[20] For example, the flash I used in taking the photo of Fig 6 resulted in an abnormally high dark current in that PMT for almost 2 days.

Despite the numerous precautions that must be observed with PMTs, their superb efficiency (in excess of 25%), sensitivity (typically *1 ampere* per μW of incident light), and bandwidth in excess of 500 MHz are simply hard to beat with any other technology.

Summary

There has never been a more opportune time to enter the field of light communications. Light-communications technology has advanced to the point where the required hardware is not only readily available, but is also affordable to the average amateur. Stay tuned: In Part 2, I'll review the basics of light propagation and describe affordable laser-based communications systems that you can build.

Notes

[1]D. J. Channin, "Joining Forces," *Byte*, Oct 1989, pp 244-248.
[2]See Note 1.
[3]J. Zeman, "Visible Diode Lasers Show Performance Advantages," *Laser Focus World*, Aug 1989, pp 69-80.
[4]See Note 3.
[5]See Note 3.
[6]G. T. Forrest, "Reflected Light," *Byte*, Oct 1989, pp 249-257.
[7]See Note 3.
[8]Belove, Hopkins, Nelson, Rosenstein and Shinners, Eds., L. S. Watkins, P. Pleshko and M. Wolf, "Optical Devices and Displays," *Handbook of Modern Electronics and Electrical Engineering* (New York: John Wiley & Sons, 1986).
[9]S. J. O'Meara, "Adventures in Refractorland," *Sky & Telescope*, Apr 1989, pp 419-422.
[10]C. Greene and E. Wilson, "Fiber Optics—It's Here Now," *QST*, Sep 1987, pp 30-34.
[11]J. J. Barron, "The Nitty Gritty Optical Band," *Byte, Oct 1989, pp 239-240.*
[12]See Note 8.
[13]See Note 8.
[14]See Note 8.
[15]See Note 8.
[16]See Note 8.
[17]R. Atkins, "10-GHz DX News," The New Frontier, *QST*, Jan 1989, p 86.
[18]R. Atkins, "New World DX Record on 47 GHz," The New Frontier, *QST*, Dec 1988, p 87.
[19]P. Horowitz and W. Hill, "Measurement and Signal Processing," *The Art of Electronics* (Cambridge MA: Cambridge University Press, 1980).
[20]See Note 19.

Strays

I would like to get in touch with...

☐ anyone who has information or literature dealing with the medical condition "glass arm" of old-time telegraphers, or anyone who has personally suffered from this malady. David R. Pennes, MD, WA3LKN, 5220 Winterberry Dr, Apt C, Indianapolis, IN 46254.

☐ anyone who has a Master Crafters 24-hour clock, Model no. 1-2324. William Hanberry, K6MQT, PO Box 11, Avalon, CA 90704.

☐ anyone to regularly exchange ideas with about Amateur Radio in an elementary school. My students are eight and nine years old and we have a transceiver that covers 10 to 80 meters in our third-grade classroom. Brad Hammer, KC1RQ, John Ward School, 10 Dolphin Rd, Newton Center, MA 02159.

☐ anyone interested in participating in an architecture net to discuss the life and work of Frank Lloyd Wright. Ted Osborn, WN9PIQ, 30 Lamm St, Danville, IL 61832.

☐ anyone who worked at Wells-Gardner Radio Company when it made the military receiver BC-348 during WW II. Alan Mark, PO Box 372, Pembroke, MA 02359.

Simple Coaxial-Cable Measurements

Can that odd roll of cable do the job you need it to do? A few simple tests can tell you whether to put unknown transmission lines to work—or out to pasture.

By Chet Smith, K1CCL
2 Jonathan Ln
Bedford, MA 01730

In a typical ham shack, you'll usually find a coil or two of a coaxial cable of unknown origin, uncertain vintage and dubious quality. Because hams are pack rats at heart, we save this stuff, thinking that, some day, we'll get around to finding out what it is—and what it might be good for. A major impediment to doing so is that we don't know enough about these stray cables to make sensible applications of them. Furthermore, the subject of the speculation may be some obscure species not listed in *The ARRL Handbook* or even in *Reference Data for Radio Engineers*. Fortunately, some simple tests can be made—with equipment usually found around the average ham shack—to sort it all out.

What You Need to Know About that Cable

Four separate transmission-line characteristics need to be determined in a proper evaluation: velocity factor (VF); characteristic impedance (Z_0); length; and loss per unit length (usually in decibels per 100 feet). Determining these parameters is what I'll discuss in this article. All you really need to make the necessary tests are a dip meter, a reflectometer (an SWR bridge—preferably with linear and logarithmic scales), a good receiver and an RF power source, such as an HF transmitter. A frequency counter is also handy, but not required.

Test No. 1: Characteristic Impedance

Before putting a cable to use, its characteristic impedance (Z_0) must be found. If there is printed nomenclature on the cable in question, the characteristic impedance can probably be found in one of a number of publications (including the two mentioned earlier). The cable may be some obscure type, but nevertheless perfectly good. Foam-filled cables are something of a problem because of batch-to-batch variations in characteristic impedance (and, especially, in velocity factor [discussed later]). For instance, designing a phasing harness with unknown cable is nothing more than a guessing game. Usually, cables from the same production run vary only slightly in Z_0 and VF.

Characteristic impedance is easily measured using the simple setup shown in Fig 1A. This test is based on the transmission-line principle that the SWR on a transmission line is unity (1:1) *when the line is terminated in its characteristic impedance.* There will be a standing wave on a cable if its termination is something other than Z_0. You may not need to use the buffer attenuator (Fig 1B, and described in the Appendix) if your transmitter has stable output in the face of SWRs in excess of 3:1 (mine isn't that good!).

Common coaxial-cable impedances are 37.5, 50-53, 62, 72-75, 93 and 125 Ω. If you equip yourself with resistors with values of 25, 50, 75 and 125 Ω, terminate the unknown line with each in turn and apply enough power to measure the SWR, a curve resembling one of those in Fig 2 should develop. The SWR comes closest to 1:1 at the termination nearest the cable's Z_0. Be careful not to burn up the terminating resistors—make sure they can handle the applied power, and keep the power on just long enough to get a reading. The values of the terminating resistors do not have to be known to the ohm, but they do have to be known within reason. I'm not proposing a method to sort out cables with 50.1- versus 49.9-Ω impedances, but rather to find ballpark impedances (within a few ohms).

Characteristic impedances of twin-lead and open-wire lines can be measured the same way, but their Z_0 range is much higher (250 to 600 Ω or more). Because these lines are not shielded, they can be affected by nearby objects. You won't achieve accurate test results when these lines are coiled or near metal objects or wiring.

Test No. 2: Velocity Factor

Velocity factor (VF) is the ratio of the speed at which a radio signal travels in a cable to the speed it would travel in a vacuum, and is expressed as a percentage of the speed of light. In coaxial cables, VF is determined by the properties of the dielectric material between the cable's inner and outer conductors. Polyethylene, a common dielectric material that's solid white or brownish in color, has a VF of about 66.5% and is used in RG-8, RG-9, RG-213 and RG-214.

The Styrofoam-like white or greenish dielectric found in foam-dielectric cables such as RG-8X is polyethylene that has been expanded—foamed—by air or another gas. Foam-dielectric cables have VFs closer to 80%. You may also come across a cable with Teflon® dielectric. Solid-Teflon-dielectric cable has a velocity factor of 69%, but some Teflon-dielectric cables use wrapped-Teflon-tape dielectrics with different velocity factors. Cables that use Teflon tape or ceramic-bead spacers, and some kinds of hard-jacketed coaxial cables, do not fit neatly into any of these categories. If you intend to make use of one of these oddball cables in any sort of precision application (such as a phasing line), you'll have to measure its velocity factor.

A little over ten years ago, the late George Downs, W1CT, published an article in *QST*[1] showing not only how to measure velocity factor, but also how to compensate for certain measurement errors. I recommend that you read (or reread) that article.

Test No. 3: Cable Length

Sometimes a cable is inaccessible—in a conduit, buried, or otherwise awkward to measure for length. Even when cable can be

[1]Notes appear on p 27.

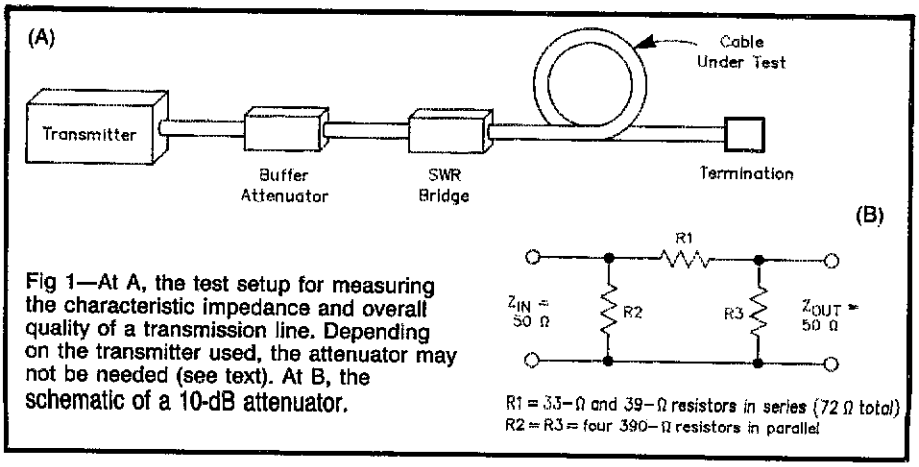


Fig 1—At A, the test setup for measuring the characteristic impedance and overall quality of a transmission line. Depending on the transmitter used, the attenuator may not be needed (see text). At B, the schematic of a 10-dB attenuator.

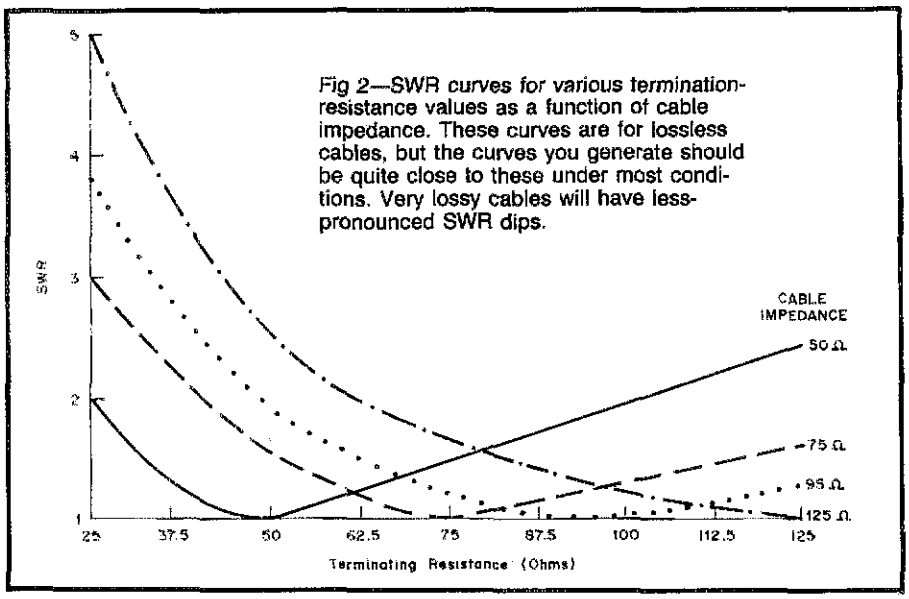


Fig 2—SWR curves for various termination-resistance values as a function of cable impedance. These curves are for lossless cables, but the curves you generate should be quite close to these under most conditions. Very lossy cables will have less-pronounced SWR dips.

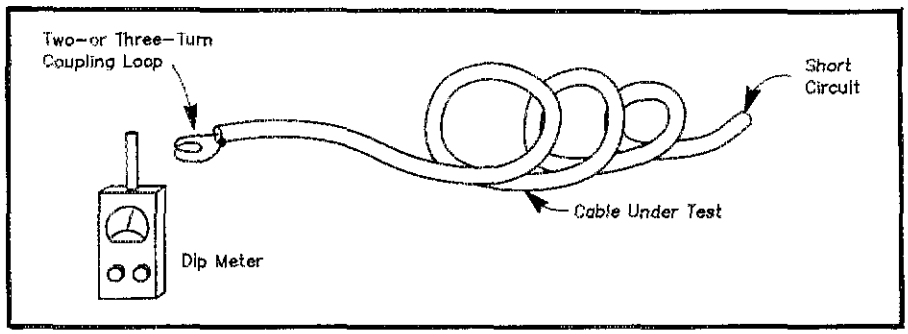


Fig 3—Test setup for measuring the length of an unknown coaxial cable.

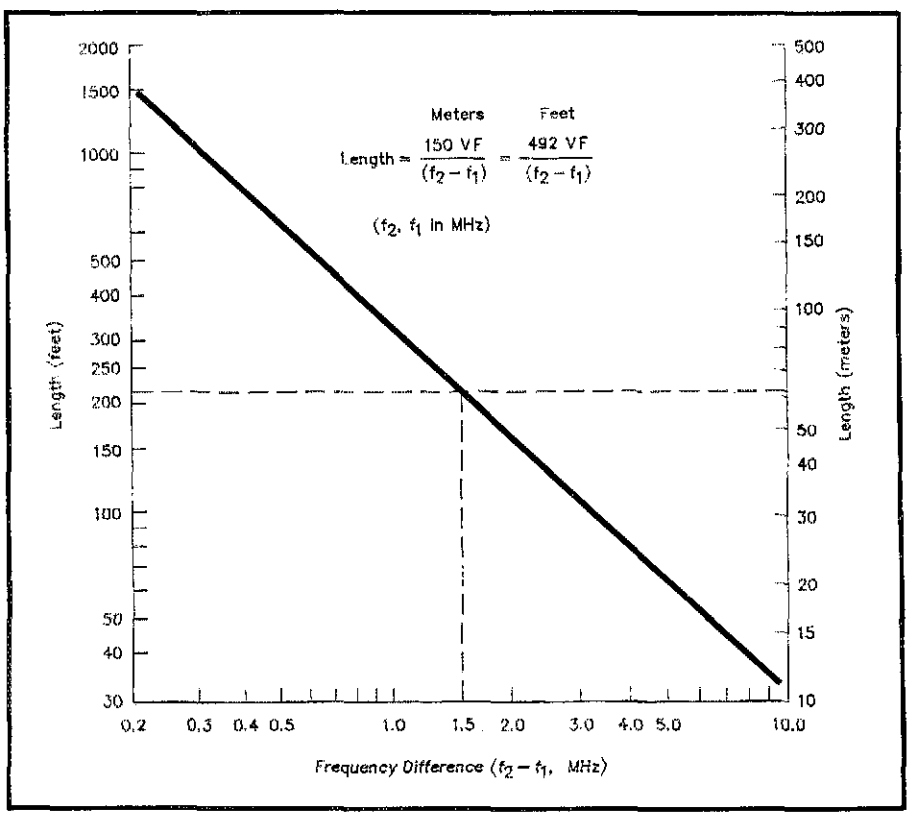


Fig 4—Nomograph for determining the length of a polyethylene-dielectric coaxial cable based on the difference between two successive resonances. For foam-dielectric cables, multiply lengths by 1.174; for Teflon-dielectric cables, multiply lengths by 1.038.

easily unrolled, trying to run a measuring tape along it inchworm fashion is fraught with errors resulting from the slippery nature of coax. The length test I'll describe is based on the relationship between two successive resonances on a transmission line.

The measurement setup is shown conceptually in Fig 3. First, short the far end of the cable. (This turns the coax into a resonant cavity). Install a small two- or three-turn wire loop on the near end. Then, bring the dip meter near the pickup loop and, starting low, gradually raise the frequency until a resonance, indicated by a sharp dip, is located. Measure the dip-meter frequency with a good receiver or, if you have access to one, a frequency counter. Make a note of the first resonance and raise the dip-meter frequency until the next higher resonance is located. (You'll find additional resonances if you keep going higher in frequency, but we're interested in just two, for now.) Subtract the first frequency from the second and read the cable length from Fig 4. For example, let's say the frequency difference between two resonances in a cable is 1.5 MHz. For a solid-polyethylene-dielectric cable, the length (from Fig 4) is 66.5 meters, or 218 feet. If the dielectric is not polyethylene, the line length must be adjusted according to the ratio of the VF of the dielectric material to that of polyethylene. For instance, a foam-dielectric cable with resonances 1.5 MHz apart would be 17.4% longer than the figure shows, because the VF of foamed-polyethylene dielectric is 17.4% higher than that of solid polyethylene. If a closer length estimate is needed, I suggest taking a series of resonance-difference measurements over a wide frequency span and averaging the results.

A few years ago, Joe Santangelo, N1JS, and I measured some RG-213 cables in a conduit. The results for one of the good cables are shown in Table 1. As you can see, successive resonance-difference measurements agree closely in good-quality cables.

Test No. 4: Overall Cable Quality

The most important issue in analyzing an unknown cable is overall quality. The test setup for this evaluation is the same as that for characteristic impedance (Fig 1A), except that the cable must be shorted at the far end instead of resistively terminated. For this test, you'll need enough power to get a usable indication on the SWR meter. Unless your rig is stable at high load SWRs, a buffer attenuator will also be needed (see Fig 1B and the Appendix).

The SWR scale on a typical SWR meter[2] is not linear, but there is often a linear scale printed just below it. This scale shows *R*, the magnitude of the reflection coefficient,

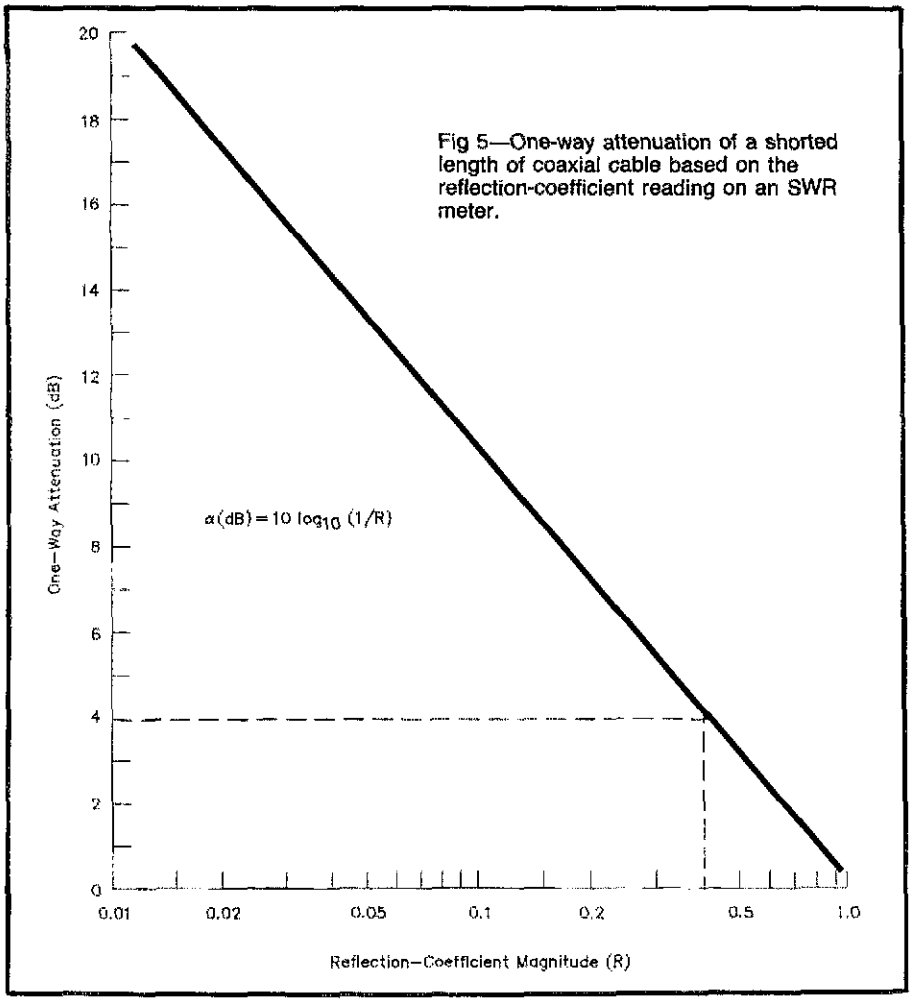


Fig 5—One-way attenuation of a shorted length of coaxial cable based on the reflection-coefficient reading on an SWR meter.

Table 1

Resonance-Based Length Measurements of a Test Cable

f (MHz)	*Difference (MHz)*	*Length (feet)*†
9.159		
10.725	1.566	227.9
12.279	1.554	227.1
13.824	1.545	226.7
15.360	1.536	226.5
16.902	1.542	226.5
		Avg: 227.0

†From Fig 4.

which is used to calculate SWR and loss. Apply some RF to the cable under test, say, in the 14-MHz band. Read the reflection coefficient from the bridge's linear SWR scale (you can approximate the reading from the relative meter position if your meter doesn't have a linear scale). Use your reading to determine loss from Fig 5, which shows one-way cable attenuation in decibels as a function of reflection coefficient. If the cable was ideal (lossless), the SWR would be infinite (R would be 1, or full scale), but in real cables it is less. The better the cable, the higher the SWR. For example, if R is 0.4, the round-trip signal loss is 4 dB (from Fig 5). If the cable is 225 feet long, its loss per hundred feet is 4 dB × (100 feet ÷ 225 feet) ÷ 2 = 0.89 dB. When you've determined the test cable's loss per 100 feet, compare it to a published table or graph, such as the one in *The 1990 ARRL Handbook* (p 16-13), to determine the cable's overall quality.

Usually, the indication of the dip meter in the cable-length test I described is quite sharp. A shallow or ill-defined null is a pretty good indication that the cable is bad. Three of the four cables used at a club I belong to (MITRE Bedford ARC) had attenuations between 0.4 and 0.6 dB per 100 feet. One, however, came out to *5.4 dB* per 100 feet. When we pulled it out of the conduit, we found that it had been spliced at some point, and water had penetrated the cable about 6 feet on each side of the splice, causing extensive corrosion. Needless to say, we junked that cable!

Summary

The quality and characteristics of a length of unknown transmission line—or known line suspected of being beyond its service life—needn't remain a mystery. The four tests I've described can help you determine the difference between good coax and bad coax—and between good coax that's right for a job and good coax that isn't.

Notes

[1]G. Downs, "Measuring Transmission-Line Velocity Factor," *QST*, Jun 1979, pp 27-28. Photocopies of this article are available to ARRL members for $1 (to cover copying costs) and a business-size SASE. Send your inquiry to the attention of the ARRL Technical Department Secretary.

[2]SWR, sometimes expressed VSWR or ISWR, is simply the ratio of the maximum voltage (or current) to the minimum voltage (or current) along a transmission line. On a line with an SWR of 1:1, there are no standing waves—the voltage and current are uniform along the line. Because the impedances of all commonly used transmission lines don't vary significantly along their lengths, these numerical ratios are the same for a given line with a given amount of power applied to it (ignoring losses). So, we simply use the term *SWR* to represent VSWR and ISWR. The only place where these terms need to be differentiated is in the laboratory, where documentation of test methods is important. You can learn more about SWR and how it's measured in K. Kleinschmidt, Ed., *The 1990 ARRL Handbook* (Newington: ARRL, 1989), pp 16-2 and 25-10, and G. L. Hall, Ed., *The ARRL Antenna Book* (Newington: ARRL, 1988), Chapters 24 and 27.—*Rus Healy, NJ2L, Assistant Technical Editor*

Appendix

The purpose of the buffer attenuator used in Tests 1 and 4 is to provide the transmitter with a stable load, and the reflectometer with a stable source impedance. Although the average MF/HF Amateur Radio transmitter is capable of putting out a robust signal, it may detune in the face of a high SWR and, if it's not properly internally protected, the transmitter may be damaged. Most solid-state transmitters include a circuit that reduces output—or may shut the transmitter down completely—under high-SWR conditions.

A buffer attenuator holds the SWR to some predetermined maximum value at the transmitter, no matter what is on the output side of the attenuator. For example, a 5-dB buffer will hold the transmitter SWR to no more than 1.94:1 if the output side is shorted or open. A 10-dB pad will do even better: a maximum SWR of 1.24:1 is all that would show up on the transmitter side, even if the opposite end of the attenuator is open or shorted.

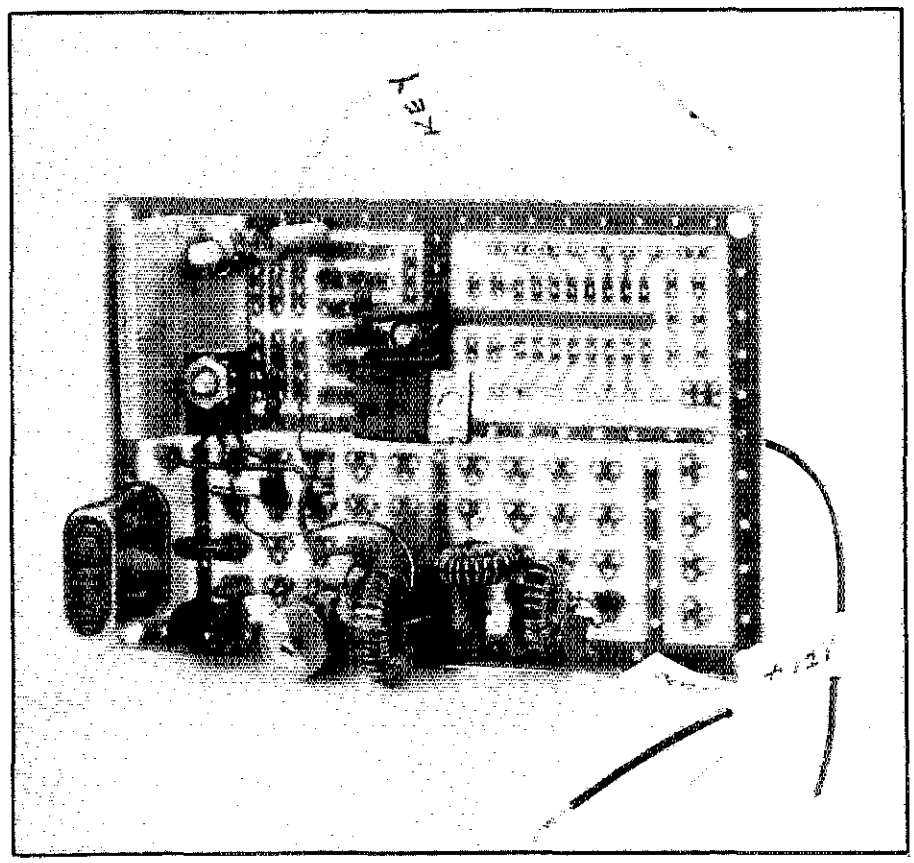
Fig 1B shows a 10-dB π attenuator. If this attenuator is built to handle 100 W, at full power the pad burns up 90 W under matched conditions, and between 90 and 100 W with a mismatch. If 2-W resistors are used throughout, this attenuator can safely handle input powers (at J1) up to about 15 W. The physical arrangement is not too critical below 28 MHz, but for best results it should be installed in a ventilated metal cylinder. Caution: An attenuator like this one will get hot if used at 15 W input. Keep it away from anything that might catch fire or be damaged by heat, and minimize the length of your test transmissions.

Chet Smith, KICCL, first became interested in Amateur Radio in Escondido, California, through the Palomar Radio Club, in the years just prior to WW II. The war, seminary, and college kept him from taking a license exam until 1957. He is a graduate of California Baptist Seminary (ThB) and the University of Utah (BSEE). Chet also has MS degrees in mathematics and physics from Northeastern University, Boston, and a PhD in electrical engineering from Clayton University. He is currently on the Technical Staff of the MITRE Corporation, of Bedford, Massachusetts. He is a Life Senior Member of IEEE and is active on several IEEE Boards and Committees, as well as being a member of the American National Standards Institute's (ANSI) C63 Electromagnetic Compatibility Committee.

Cubic Incher Mods + 30 Meters

Good things do, indeed, come in small packages. The Cubic Incher QRP transmitter from July 1982 *QST* is a fine example. Some modifications will make it even finer.

By Doug DeMaw, W1FB
ARRL Contributing Editor
PO Box 250
Luther, MI 49656



Dennis Monticelli, AE6C, squeezed a lot of circuitry into a cubic inch of space when he built his popular 40-meter QRP transmitter.[1] Later, Greg Bonaguide, WA1VUG, then of the ARRL staff, repackaged the transmitter for presentation in Chapter 30 of *The ARRL Handbook*. Greg developed circuit constants that permit operation on 80 meters. I needed a small transmitter for 30-meter use, which led to the changes described here. I did not attempt to put the Cubic Incher on 17 or 20 meters, but I think it can be done without difficulty. My version of the circuit corrects some minor annoyances I experienced with the original circuit.

Circuit Alterations

Fig 1 shows the circuit I am using for 30-meter operation. The added components will enhance performance on 40 to 80 meters as well (see Table 1).

The value of C2 should be chosen to minimize chirp when the transmitter is keyed. Too much feedback not only encourages a chirpy CW note, but contributes to unwanted crud on the output waveform. This was observed while monitoring the waveform with a 50-MHz scope. Experiment with the C2 value, irrespective of the band of operation. Use only enough capacitance to ensure reliable oscillator starting, consistent with maximum output power. Too much current through Y1 can destroy the crystal. Maintaining a low value of capacitance at C2 helps to protect the crystal.

The inclusion of C4 reduces unwanted VHF currents in the collector circuit. C4 may be added for each band of operation; its reactance (X_C) is 478 ohms. The proper C4 value for other frequencies may be derived from

$$C = \frac{1}{2\pi f X_C}$$

where
C is in μF
F is in MHz

[1]Notes appear on page 35.

The transmitter output power increased approximately 0.1 W when I added C4. I observed an improvement in the output waveform quality after reducing the VHF currents (my scope is responsive to 200 MHz, although the read-out accuracy is unreliable above 50 MHz).

I was concerned about the purity of the transmitter output waveform. The original Cubic Incher circuit in *QST* had no harmonic filtering. *The ARRL Handbook* version includes a single pi-section low-pass output filter, which enables the transmitter to comply with FCC regulations for spectral purity. The second harmonic was 32 dB below the carrier power, which is acceptable at this power level. I prefer to have the spurious energy 40 dB or greater below carrier power, however, so I used a *half-wave low-pass filter for the 30-meter* version. The added cost is small for the peace of mind it affords.

My final modification involves Q2, an inexpensive PNP switching transistor. I experienced difficulty while trying to obtain a clickless CW note. The addition of a keying transistor (dc switch Q2) enabled me to shape the output keyed waveform by selecting the necessary values for C8, C9, R1 and R2. C10 also affects the shaping of the waveform. With the values shown in Fig 1, I am able to obtain acceptable rise and fall times for the keyed waveform. The shaping is affected also by the adjustment of C3. Fortunately, the best waveform shaping coincides with maximum power output for my 30-meter circuit. This may not always be the situation, so tune C3 for a click-free note while monitoring the signal with a receiver that has the AGC disabled and the RF gain turned down to simulate a weak signal.

The final change I made was to add one *turn to L3 of T1. I started by following* AE6C's suggested turns ratio for the tuned transformer. This calls for L1 and L3 having the same number of turns. I gained ¼ watt of output when I changed L3 from

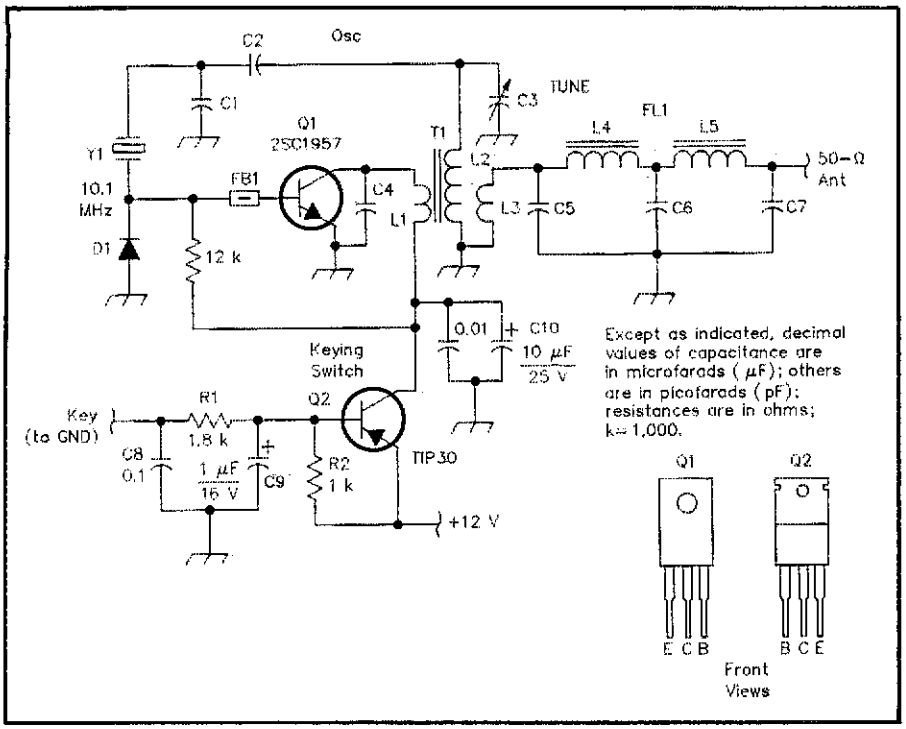


Fig 1—Schematic diagram of the remodified Cubic Incher for 80, 40 or 30 meters. See Table 1 for component values not listed here. Fixed-value capacitors are silver mica or disc ceramic. Resistors are ¼-W carbon composition.

C3—80-600-pF mica compression trimmer for 80 meters. 10-100 pF trimmer for 30 and 40 meters.
D1—1N914 switching diode or equiv.
FB1—Miniature 850 μ_i ferrite bead (Amidon Assoc).
Q1—NPN RF power transistor, NEC 2SC1957. See text.
Q2—PNP switching transistor, TIP30 or -30C. See text.
T1—Tuned RF transformer. See Table 1.
Y1—Fundamental crystal in HC-6/U holder, 30-pF load capacitance.

Table 1

Component Values and Coil Winding Information for 80, 40 and 30 Meter Operation

Band (meters)	*C1 (pF)*	*C2 (pF)*	*C4 (pF)*	*C5, C7 (pF)*	*C6 (pF)*	*L1*	*L2*	*L3*	*L4, L5*
80	1000	100	100	820	1600	4 turns no. 26 over L2	38 turns no. 26 on a T-50-2 toroid (7 μH)	4 turns no. 26 over L2	24 turns no. 26 on T-37-2 toroid (2.3 μH)
40	470	56	47	470	1000	Same as above	Same as above	Same as above	17 turns no. 26 on T-37-2 toroid (1.1 μH)
30	300	18	33	220	470	3 turns no. 26 over L2	27 turns no. 26 on T-50-6 toroid (3 μH)	4 turns no. 26 over L2	18 turns no. 26 on T-37-6 toroid (0.97 μH)

Note: The toroid cores listed in this table are likely to be available from Amidon Assoc, Inc, 12033 Otsego St, N Hollywood, CA 91607; Palomar Engineers, Box 455, Escondido, CA 92025, and RADIOKIT, PO Box 973, Pelham, NH 03076.

3 turns to 4 turns. This may be worth investigating on 40 and 80 meters as well.

The original Cubic Incher uses a Motorola MRF472 CB-band transistor for Q1. I did not have one of those devices on hand. I used an NEC 2SC1957 for my 30-meter transmitter. It works fine, although greater output power can be obtained from an MRF472 or similar transistor. You may use any RF power transistor that has a f_T of 100 MHz or greater. It should have a power rating that is equivalent to or greater than that of an MRF472. Any PNP switching transistor that can accommodate the current of Q1 is satisfactory for use at Q2.

Constructing the Transmitter

There is no PC-board pattern for this project. The photograph at the beginning of this article shows my unit assembled on a universal breadboard. The pattern is one I designed for my use, but the boards are available by mail.[2] Point-to-point wiring is used ("ugly" style). The universal breadboard is handy for many one-shot projects.

I used a 1-1/4 inch piece of L-shaped aluminum trim molding for the Q1 heat sink. It has a height of 3/4 inch and a thickness of 1/16 inch. Standard aluminum angle stock can be used.

I made no effort to crowd the circuit into a small area on the breadboard. A skilled "scruncher" can fit the parts into half the area I used. It is important in any event to keep the RF leads on the board as short as possible. There should be room on the breadboard for two or even three Cubic Incher circuits, should you wish to have a two- or three-band QRP rig. Alternatively, you could construct a direct-conversion receiver and a Cubic Incher on a single breadboard to provide a trans-receiver.

Fig 2 shows a full-size pattern for the breadboard, as viewed from the etched side of the board. The board is single-sided (no ground plane). This breadboard has one 16-pin DIP IC site. FAR Circuits (see note 2) has another version of this breadboard. It has two 16-pin IC sites, plus numerous drilled, isolated pads. The boards are suitable for prototyping or for permanent projects. If you desire a ground plane on your board, simply attach thin copper sheeting to the bare side of the board by means of epoxy. Hold the copper firmly in place, using a weight, until the cement hardens. Thin copper sheeting is available at most hobby stores. Remove the copper from around nonground PC-board holes by boring through the ground plane with a small drill bit.

Performance

The output power and collector current of Q1 of Fig 1 will vary with the operating voltage. I obtain 1.75 W of filtered output when using a supply voltage of 14. Power output declines to 1.25 W for a 12-V supply. These measurements were made across a 50-ohm noninductive load while using an RCA Senior Voltohmist and an RF probe. This transmitter draws 200 mA at 12 V. The circuit performs well with supply voltages as low as 8, but with reduced RF output power.

C5, C6 and C7 are not the exact computed values for the half-wave filter. Rather, they are the nearest standard values of capacitance. The filter values were

(continued on page 35)

Product Review

Conducted By James W. Healy, NJ2L
Assistant Technical Editor

Garant Enterprises GD-8 "Windom" Antenna

Reviewed by Jerry Hall, K1TD

The Garant GD-8 antenna is claimed by its manufacturer to cover all HF Amateur Radio bands with an SWR of 1.5:1 or less—*without an antenna tuner.* Garant offers several models: the GD-3, and the GD-5 through -9. The number in the model designation indicates how many bands the antenna is intended to cover. For example, the GD-9 covers the nine ham bands from 160 through 10 meters.

We purchased the GD-8 for testing. After it arrived, we learned that the GD-8 consists of the GD-6 antenna and a "GD + 2" addition. The GD-6 is intended to cover the 80, 40, 20, 17, 12 and 10-meter bands. Installing the GD + 2 section to the GD-6 adds coverage of the 30- and 15-meter bands.

The price for the GD-8 antenna was $161 in Canadian funds (approximately $136 US) when we bought it. The mailman brought the box with $17.19 postage due.

After paying the postman, we carefully opened the box to inspect this multiband antenna. The contents were not truly impressive for the $153 US (plus change) we had invested. The box contained two coils of no. 14 stranded copper wire, four plastic insulators, a balun transformer in a sealed plastic bag, the instructions in another sealed plastic bag, and some promotional literature.

Although the antenna is offered with a 10-day "no-risk" inspection, the accompanying literature clearly states, "Once you break a seal you have bought the item." In other words, you have 10 days over which to look at four insulators, two coils of wire, two sealed plastic bags and some promotional literature! Based on this inspection, you have to decide if you want to keep the antenna or return it for a refund. Of course, our plan was to keep the antenna for testing anyway.

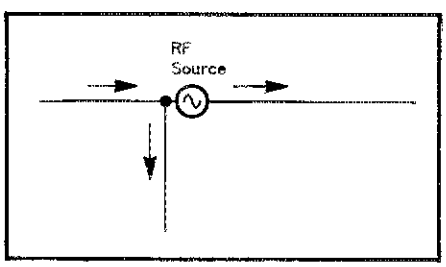


Fig 1—A coax-fed Garant Windom antenna (or even a center-fed dipole) becomes a 3-wire radiating system when current flows on the outside of the coaxial feeder. The coax shield is the third wire, represented as the vertical line in this drawing. Arrows show the direction of current flowing at a particular instant. (To avoid drawing complications, the RF source is shown directly at the antenna terminals, but the resulting antenna currents are no different from when the antenna is fed by a length of transmission line.)

Inside one of the sealed bags, the GD-8 technical data and instructions come on a single 8½ × 14-inch sheet. (If the bottom 3¾ inches of this sheet were lopped off, you'd have instructions for only the GD-6 antenna.) The GD + 2 addition to the basic GD-6 antenna consists of the second, shorter coil of wire, two plastic insulators, and the leg-length information and manufacturer's SWR curves for the additional bands.

Technical Information

The Garant Windom is not a true Windom antenna. Electrically the two antennas are quite different. An honest-to-goodness Windom is an antenna made of a horizontal top section that's half a wavelength long at its lowest frequency, and is fed against ground with a single-wire feed line, at a point 14% from one end.[1] The true Windom behaves pretty much like an inverted-L antenna (assuming the feed wire is more-or-less vertical). At its fundamental resonant frequency, the radiation pattern of a true Windom is virtually identical to that of a center-fed dipole. The Garant Windom, on the other hand, is fed with coaxial line, through a step-up balun transformer 33% from one end. Thus, the Garant Windom is in fact an off-center-fed (OCF) dipole, rather than a Windom. This antenna is horizontally polarized.

Despite the misnomer, the so-called Windom, or OCF dipole, is based on sound theory. The idea behind feeding a half-wave antenna at a point ⅓ of its length from one end is that it will operate with a relatively low feed-point impedance on low-order *even* harmonics of its fundamental frequency, whereas a center-fed half wave operates this way on *odd* harmonics. Many amateurs believe there will always be reactance at the off-center feed point, but this is not the case. As with a center-fed dipole, the reactive component of the impedance goes from capacitive through zero to inductive as the excitation frequency is raised from below to above resonance. In free space, when fed 45⅓ feet from one end, a 136-foot-long OCF dipole exhibits resonance at approximately 3.5, 7.1, 14.3 and 21.1 MHz. The radiation resistance is on the order of 100 to 150 Ω on the three lower frequencies, but is more like 3000 Ω at 21 MHz. This is because, at 21 MHz, the antenna is three wavelengths long and is fed at a voltage loop (maximum), instead of at a current loop. A reasonably good match to 50-Ω line for the lower three bands can be obtained with a step-up transformer.

Garant does not supply technical data for their balun transformer, although their ads indicate it is not a 1:4 transformer. Tests in the ARRL laboratory with a spectrum analyzer and a network analyzer were inconclusive because the balun's transformation ratio is not constant across the HF spectrum. In the 12- to 20-MHz range, the supplied transformer presents about a 1:6 transformation ratio. The transformer introduces some inductive reactance into the transformed load, but this is normal for a ferrite-core transformer.

The Garant balun transformer is a voltage balun, rather than a current balun.[2] This means that *voltages* of equal magnitude (but opposite polarity) will be applied to the two wires of the antenna from the balun's terminals. But because the RF impedance paths of the two wires at the feed point are likely unequal, the resulting antenna currents flowing in the two wires will likely be unequal. This also means that antenna current can flow on the *outside* of the coaxial feeder. How much current flows there depends on the impedance of the RF current path down the outside of the feed line. With such current flowing, the feeder radiates, and therefore becomes part of the antenna system. It's as if the antenna consists of three wires, rather than two. The resulting radiating system is shown in Fig 1.

The existence of RF current on the outside of the coax was indicated at my station by changing SWR readings as I moved my hand close to or away from my reflectometer SWR indicator (this was not the instrument used to measure the SWR values presented in the curves of Figs 2-5).

Other Garant Windom owners have reported trouble using their antennas on certain bands when they bury a portion of the coax running to the shack. This is a sure sign of antenna current flowing on the feed line. Other sure signs of this are SWR values that change as you move the feed line or as you alter the line length. (SWR readings that vary with line length can also be caused by an improperly designed or defective SWR-measuring instrument.) In the antenna of Fig 1, the antenna's feed-point impedance is unpredictable because of the unknown effects of the unwanted vertical radiator.

The presence of RF current on the outside of the GD-6 feeder was proved with a simple test. First, I took SWR readings with the balun transformer that Garant supplied. Then I placed a W2DU-type current (bead)

[1] L. G. Windom, "Notes on Ethereal Adornments," *QST*, Sep 1929, pp 19-22, 84.

[2] R. W. Lewallen, "Baluns: What They Do and How They Do It," *The ARRL Antenna Compendium, Volume 1* (Newington: ARRL, 1985), pp 157-164.

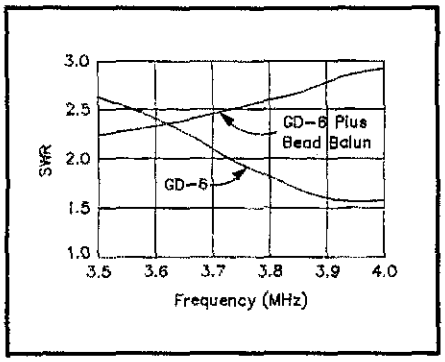


Fig 2—SWR versus frequency for the GD-6 antenna installed as an inverted V. The GD-6 curve was obtained with the Garant-supplied balun transformer only. The second curve was obtained with a bead balun directly beneath the Garant balun (see text and Note 2). These totally different curves indicate that the Garant balun allows current to flow on the outside of the coaxial feed line. The coax therefore becomes a part of the radiating system, as illustrated in Fig 1.

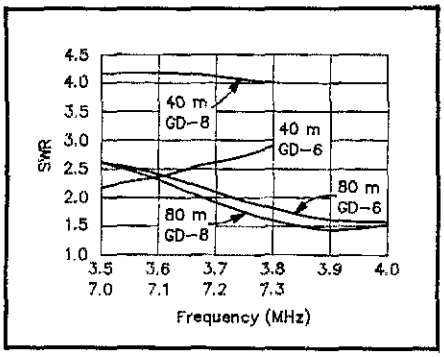


Fig 3—GD-6 and GD-8 SWR curves for the 80- and 40-meter bands with the antennas installed in inverted-V arrangements. The SWR values for Figs 2 through 5 were computed from forward and reflected power readings taken with a Bird 43 RF wattmeter at the transmitter end of a 98-foot RG-8X feed line. The plotted values are not corrected for line loss, so all SWR curves in this review show somewhat lower values than the actual feed-point SWRs.

balun[3] just below the Garant balun and repeated the SWR measurements. The bead balun forces equal currents to flow in the two antenna wires, preventing RF-source current from flowing on the outside of the coax feeder. With respect to the antenna in Fig 1, adding a current balun to the Garant antenna has the same effect as disconnecting the vertical wire at the junction point just to the left of the RF source.

On most bands, the SWR curves for the two feed arrangements differed significantly. Comparative curves for the 80-meter band are shown in Fig 2. The drastically different SWR responses across the band give indisputable evidence that the terminating load seen by the coaxial line (that is, the antenna's feed-point impedance) indeed changed considerably with the addition of the bead balun. And yet the only thing that had been done was to "disconnect the third wire" with a current balun. If no RF-source current had originally flowed on the outside of the coax with the Garant balun alone, the two SWR curves would be the same.[4]

[3]W. Maxwell, "Some Aspects of the Balun Problem," *QST*, Mar 1983, pp 38-40. The bead balun I used consists of 50 Amidon no. FB73-2401 ferrite beads slipped over a 1-foot length of RG-58 coax with PL-259 connectors at each end. The beads fit nicely over the outer jacket of the coax, and occupy 9½ inches of the coax.

Installation and Operation

The two wire coils that Garant supplied were marked as 150 feet and 50 feet, respectively. By measurement, the lengths turned out to be 144 feet 2 inches and 54 feet, respectively, so the markings appear to be only approximate indications used by Garant in making up their antenna shipments. The lengths were adequate to construct the antenna according to the dimensions on the instruction sheet, with a few feet to spare on each coil.

The Garant antenna includes no feed line; you supply your own. You also construct the antenna yourself, by measuring, cutting and soldering the wire according to dimensions given on the instruction sheet. Garant provides plastic insulators for the outside ends of the antenna wires. At the feed point, the antenna wires are attached to the plastic case of the balun transformer. Crimp-type spade lugs are provided for the electrical wire connections to the transformer, but I soldered the lugs instead of crimping them to avoid the possibility of corrosion developing at the joints.

The instruction sheet indicates the antenna can be installed as a flattop or in an inverted-V arrangement, but also states that the SWR values for the inverted-V arrangement may not be the same as those appearing on the instruction sheet. I live on a small lot, and had to use the inverted-V arrangement at K1TD. The center of the antenna was suspended at 55 feet, the end of the short leg at approximately 16 feet, and the end of the long leg at approximately 8 feet. The coax feeder hung loosely from the off-center feed point to a point on the supporting tower, 20 feet below the antenna apex. From there, the feeder went down the tower and into the shack. I first installed just the GD-6 antenna, which is approximately 136 feet long. Later I added the GD+2 portion, which is a shorter OCF dipole approximately 46 feet long, connected in parallel at the feed point with the GD-6 antenna.

The results of SWR measurements for the GD-6 and GD-8 antennas using Garant's voltage balun are plotted in Figs 3 through 5. A Bird 43 RF wattmeter was used to determine these SWR values. (This instrument did not respond to changes in hand capacitance, as did the reflectometer mentioned earlier.) The GD-6 yielded higher-than-expected SWR values on four of the six bands (based on the literature provided with the antenna), but the SWR was less than 3:1 over each band. Literature sealed with the instructions encourages the user to experiment with the wire positions to bring the SWR down, but my property limitations prevented that.

With the GD+2 addition, the SWR values increased by a fair amount on 40

[4]Note, however, that even with a current balun in use, there may *still* be radiation from the feed line. This is because the line is asymmetrically coupled to the two antenna wires; the current induced on the feeder from the short antenna leg probably will not equal the opposing current induced from the long leg. The two currents therefore will not cancel completely, and feed-line radiation—although not nearly as much as with the initial configuration—will result.

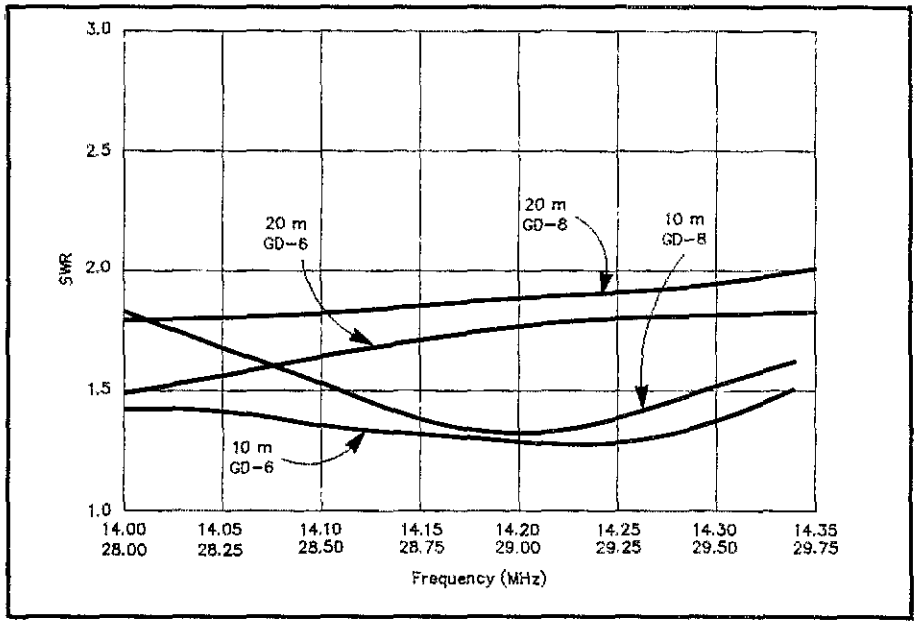


Fig 4—GD-6 and GD-8 SWR responses for the 20- and 10-meter bands with the antennas installed in inverted-V arrangements.

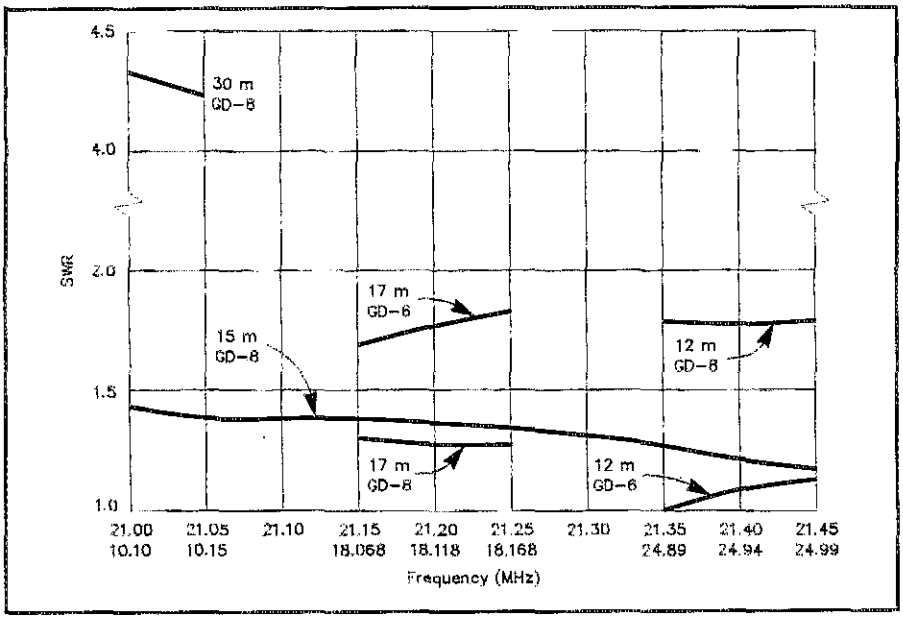


Fig 5—GD-6 and GD-8 SWR curves for the 30, 17, 15 and 12-meter bands with the antennas installed in inverted-V arrangements.

meters—to more than 4:1 across the band. SWR values across the added 30-meter band were also above 4:1. Even so, I could tune and load my tube-type transmitter (with a π-network output tank circuit) for full output power and make contacts as usual on 40 meters. (I didn't make any contacts with that rig on 30 meters, as it doesn't cover that band.) Without an antenna tuner in the line, most modern solid-state transceivers, with their SWR-protection circuits, provide little or no output power under the SWR conditions I encountered on these two bands.

In QSOs, the signal reports I received on all bands were generally consistent with those I was giving (for comparable power levels.) I was not able to crack pileups on 20 meters with 100 watts on CW—nor did I expect to.

How much does the SWR of the Garant antenna suffer with the inverted-V configuration? Not as much as it does with changes in the placement and length of the coaxial feed line. For comparison of the SWR responses between this arrangement and a flattop OCF dipole, my colleagues (and coworkers) Ed Hare, KA1CV, and Mike Gruber, WA1SVF, helped me make further tests. We installed the GD-6 and the GD-8 as a flattop at the ARRL HQ laboratory station, W1INF. The antenna was located in a clear area with each end at a height of 36 feet, and fed with about 30 feet of RG-58 coax. The installation was done "by the book," exactly as the Garant instructions recommended, with a 100° angle between the legs of the shorter GD+2 antenna section.

In the flattop configuration the SWR values were not significantly different than those I found in the inverted-V arrangement, except that those on 40 meters were generally better. However, because we found that the radio used for those tests was hot with RF (ouch!), we grounded the transceiver chassis via a short wire to a 4-foot ground rod near the radio, and installed a bead balun just below the Garant balun. Upon doing these things, the SWRs on 80 and 40 meters rose to no less than 2.6:1 on 80 meters and no less than 2.2:1 on 40 meters. The SWRs on all other bands except 15 meters were also slightly worse with the transceiver chassis grounded.

If you want to experiment with wire positions to bring the SWR down, you may also need to change the length and positioning of the feeder. An alternative is to install a current balun at the feed point in addition to the Garant-supplied balun transformer.

Technical Support

Garant Windom antennas are warranted for three years of "normal use" against defects in materials and workmanship. Basically this warranty covers the balun transformer, as wire and plastic insulators seldom go bad in normal use. Garant does *not* offer free technical support to help you solve problems with their antennas. Information accompanying the instructions indicates that you'll get no help at all by telephone. Instead, you are to submit your request for help in writing, and enclose a cashier's check, certified check or money order for $38 US (or $45 Canadian) for this service. You can send a personal check, but that will delay your reply by four weeks while Garant waits for your check to clear the bank. Fortunately, we had no need for technical support during the review period!

Garant antennas are available from Garant Enterprises, 227 County Blvd, Thunder Bay, ON P7A 7M8, tel 807-767-3888. Price class: GD-8, $161 Canadian.

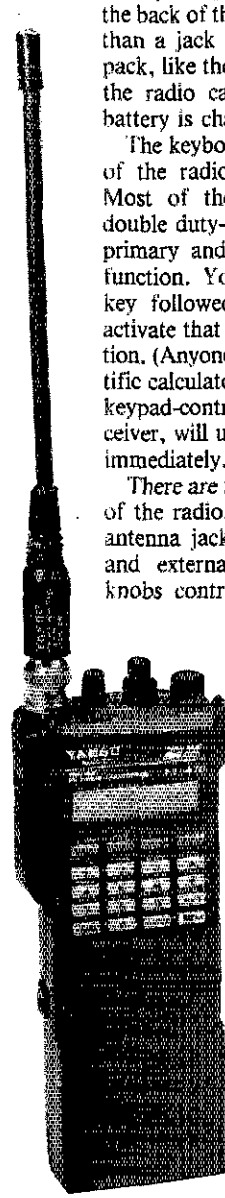
YAESU FT-470 DUAL-BAND HAND-HELD VHF/UHF TRANSCEIVER

Reviewed by Bruce S. Hale, KB1MW/7

When I agreed to review the Yaesu FT-470, I expected a complex, difficult-to-use box with too many features to learn and use. I was wrong. The FT-470 is no more complex than most single-band hand-held transceivers I've used, and it's actually *easier* to use than many of them.

First Impressions

Like other Yaesu hand-held transceivers, the FT-470 is solid. The case is metal and the radio feels comfortably heavy in your hands. The antenna jack is a BNC connector, so adding a feed line for an external antenna is easy. The battery charger connects to a jack on the back of the battery (much better than a jack on the bottom of the pack, like those on some rigs), and the radio can be used while the battery is charging.



The keyboard handles almost all of the radio's control functions. Most of the keypad keys serve double duty—each key has both a primary and a secondary control function. You must press the **FM** key followed by another key to activate that key's secondary function. (Anyone who has used a scientific calculator, or another modern keypad-controlled hand-held transceiver, will understand this feature immediately.)

There are three knobs on the top of the radio, along with the BNC antenna jack and the microphone and external-speaker jacks. The knobs control the **VOL** (AF-gain) and **SQL** (squelch) functions, and the **VOL** control also has an outer dial, **BAL**, that sets the balance (the relative levels of audio ouput on each band when the FT-470 is simultaneously receiving on 144 and 440 MHz). The third knob on top of the radio is the **DIAL** control. Depending on the radio's operating mode, this control serves either as a tuning knob or memory-channel selector.

People who like keyboard beepers will love the FT-470. With the beep enabled, each key on the keypad produces a different tone, rising in pitch as you go across the rows from left to right and from top to bottom. Two beeps

Table 1

Yaesu FT-470 Dual-Band VHF/UHF FM Hand-Held Transceiver, Serial no. 90090350

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receiver, 144-148 MHz; 430-450 MHz; transmitter, 144-148 MHz, 430-450 MHz.	Receiver, 130-180 MHz and 430-450 MHz. Transmitter, as specified.
Mode of operation: FM.	As specified.
Current requirement: Receive, 150 mA; transmit (5 W), 1.3 A (VHF), 1.6 A (UHF).	Minimum audio output, 70 mA; maximum audio output, 140 mA; transmit with 7.2-V supply, 0.83 A (VHF), 1.0 A (UHF); transmit with 12-V supply, 1.35 A (VHF), 1.39 A (UHF).
Transmitter	*Transmitter Dynamic Testing*
Power output, VHF and UHF, 2.3 W with 7.2-V battery (supplied), 5 W with 12-V battery or external 12-V supply.	High: 7.2-V supply, 2.3 W (VHF), 1.8 W (UHF); 12-V supply, 5.6 W (VHF), 5.5 W (UHF). Low: 7.2-V and 12-V supplies, 0.7 W (VHF); 0.5 W (UHF).
Spurious signal and harmonic suppression: Better than 60 dB.	As specified; see Figs 6 and 7.
Transmit-receive turnaround (PTT release to 90% of full audio output): Not specified.	Squelch on, approx 250 ms; squelch off, approx 150 ms.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity: Better than 0.158 μV for 12 dB SINAD.	146 MHz: 0.14 μV (−124 dBm) for 12 dB SINAD; 0.29 μV (−118 dBm) for 20 dB quieting. 430 MHz: 0.14 μV (−124 dBm) for 12 dB SINAD; 0.42 μV (−114.5 dBm) for 20 dB quieting.
Two-tone third-order IMD dynamic range: Better than 65 dB (offset not specified).	Offsets from 146 MHz: +15 kHz, 48 dB; −15 kHz, 48 dB; +20 kHz, 54 dB; −20 kHz, 53 dB; Offsets from 440 MHz: +15 kHz, 51 dB; −15 kHz, 61 dB; +20 kHz, 58 dB; −20 kHz, 66 dB.
Adjacent-channel selectivity: Better than 60 dB.	Offsets from 146 MHz: +15 kHz, 63 dB; −15 kHz, 53 dB; +20 kHz, 65 dB; −20 kHz, 65 dB. Offsets from 440 MHz: +15 kHz, 60 dB; −15 kHz, 56.5 dB; +20 kHz, 63 dB; −20 kHz, 62 dB.
Squelch sensitivity: Not specified.	146 MHz: Minimum, 0.04 μV; maximum, 0.20 μV. 440 MHz: Minimum, 0.03 μV; maximum, 0.19 μV.
Receiver audio output: 500 mW at 5% distortion (8-Ω load).	7.2-V supply: 195 mW at 5% total harmonic distortion (THD) with an 8-Ω load. 12-V supply: 660 mW at 5% THD with an 8-Ω load.
Other	
Size (H × W × D): 6.45 × 2.16 × 1.26 in. with FNB-10 battery pack; weight (with FNB-10), 0.93 lb. Color: Dark gray.	

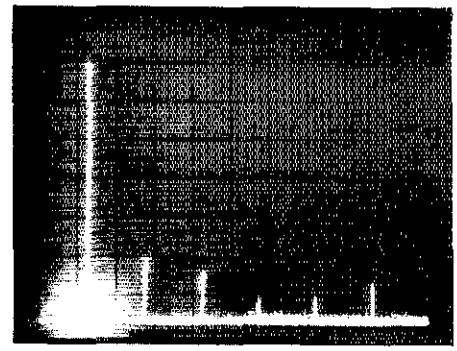


Fig 6—Worst-case spectral display of the Yaesu FT-470 operating in the 144-MHz band. Horizontal divisions are each 100 MHz; vertical divisions are each 10 dB. The reference (top horizontal line on the grid) represents −20 dBc, and the fundamental has been notched by 30 dB to prevent spectrum-analyzer overload. Output power is approximately 2.2 W at 146 MHz. All harmonics and spurious emissions are at least 80 dB below peak fundamental output. The FT-470 complies with current FCC specifications for spectral purity.

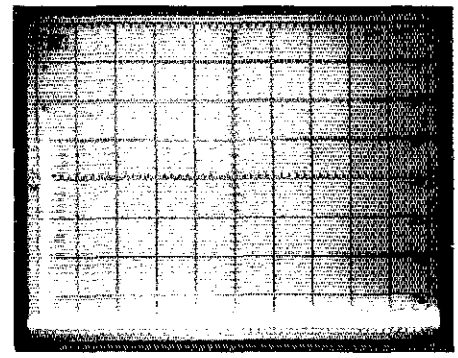


Fig 7—Worst-case spectral display of the Yaesu FT-470 operating in the 420-MHz band. Horizontal divisions are each 100 MHz; vertical divisions are each 10 dB. The fundamental has been notched by 30 dB to prevent spectrum-analyzer overload. Output power is approximately 1.8 W at 445 MHz. All harmonics and spurious emissions are at least 74 dB below peak fundamental output. The FT-470 complies with current FCC specifications for spectral purity.

sound when you start scanning; low beep-high beep when you scan up, and high beep-low beep when you scan down. The radio beeps when it stops scanning, and beeps again when the scan resumes. In fact, it beeps when just about anything happens! The beeps might be handy when you are using the transceiver in the dark, but when you are scanning they can be very annoying. Fortunately, you can easily disable the beeper with a keypad command.

The push-to-talk button is located on the left side of the radio. Just above the **PTT** switch is a smaller switch that momentarily opens the squelch. (On the European version of the '470, this switch activates a 1750-Hz tone encoder for "tone-burst" repeater access.) Above the **PTT** and squelch-release switches is a small lamp-activation button that, when pressed, causes both the keypad and display to be illuminated.

Display Functions

Yaesu fit an incredible amount of display information onto the small LCD in the '470. Some of the lettering is rather small, but it's all easily readable. Just above the LCD on the front panel is a small LED that glows green when the squelch is open, red when you are transmitting, and orange when you are transmitting on the primary band *and* the squelch is open on the secondary band.

Frequency Entry

You can enter an operating frequency directly from the keypad—the radio assumes the 100-MHz digit (a *1* on 2 meters and a *4* on 440 MHz). Once you enter the frequency, you can step up or down either with the rotary dial on top of the transceiver or with the up and down arrow keys on the keypad. Holding the up or down arrow key for a few seconds causes the radio to start scanning in the indicated direction. The step size (amount of frequency change per dial click or arrow-key press) can be set with the **STEP** control on the keypad. You can select 5, 10, 12.5, 20 or 25-kHz steps. Pressing the **FM** key followed by the up or down arrow key increases or decreases the operating frequency in 1-MHz steps.

Like most modern transceivers, the '470 uses a digitally controlled frequency synthesizer. The transceiver stores the synthesizer operating frequency in four special memory channels. Two tunable memories are available on each band—Yaesu calls these memories "VFO A" and "VFO B"—you can select between

these "VFOs" with the keypad VFO switch.

Dual-Band Operation

You can use the FT-470 as a single-band transceiver on either band, 144 or 440 MHz, with the other band disabled. In this mode, the keypad BAND switch toggles the transceiver between 144 and 440 MHz. You can also enable both bands at once. With both bands active, the display shows the primary-band information in larger digits than the secondary-band data. The keypad controls the primary band, and the BAL control determines the relative levels of received signals on the primary and secondary bands. For example, you might set the secondary band to a 2-meter repeater where you were expecting a call, set the balance control so that you could hear both bands, and then operate normally on 440.

Each band is fully independent. The keypad controls only the primary band, however. In multitasking computer terminology, the secondary band is "in the background." You can still hear signals on the "background" band if the BAL control is set appropriately, but you must switch the secondary band to the "foreground" (with the BAND switch) before you can control it with the keypad. If you start scanning the primary band and then switch bands, the scan continues on the secondary band.

Memories

The FT-470 has 21 memory channels for each band. Each memory can store separate transmit and receive frequencies (or a receive frequency and a repeater offset) and CTCSS (continuous tone-coded squelch system) data. In addition to their standard uses, three of the 21 memories have special functions. The *C* memory is used for a call feature—the frequencies stored in this memory can be instantly recalled by pressing the CALL button on the keypad. Two more memories are used for what Yaesu calls "Programmable Memory Scanning." When this feature is activated, the radio scans repeatedly between the frequency stored in the *L* (lower) memory and the frequency in the *U* (upper) memory.

Memory frequencies can be recalled by pressing the MR key followed by the memory number. Once a memory has been recalled, you can use either the DIAL knob or the up/down arrow keys to step through the memory channels. Pressing the VFO key returns the transceiver to the most-recently selected VFO memory.

Scanning

In addition to the Programmable Memory Scanning mentioned earlier, the FT-470 has two other scanning modes. I've reviewed several other VHF and UHF hand-helds, and I could never decide whether I preferred a scanning radio to stop on a channel as long as the channel was active, or resume scanning after a set amount of time even if the channel was still active. Both modes have their uses (and some people prefer one or the other, I'm sure). The FT-470 implements *both* modes. You can select either "pause" mode (where the radio does not resume scanning until the channel is clear) or "five-second duration" mode (the radio resumes scanning after five seconds, even if the channel is still active).

In both single-band and dual-band modes, the radio can scan each band individually. In dual-band mode, the secondary band can be scanned while you scan or operate on the primary band. You cannot stop scanning or operate on the secondary band without changing bands, however. The '470 also has an "alternate band" mode—in this mode, the radio first scans memory 1 on 2 meters, then memory 1 on 440 MHz, then memory 2 on 2 meters and memory 2 on 440, etc. A detailed chart in the user's manual shows how a dual-band scan proceeds if an odd number of memories are programmed.

You can lock out a memory so that it won't be scanned. You would probably do this with NOAA weather-radio frequencies or a very active repeater, for example. Locked-out memories can be recalled from the keypad or with the rotary dial, but they are skipped during scanning.

Priority Channel Monitoring

Priority monitoring allows you to check a specific memory channel every five seconds. If you are scanning through the memory channels, channel 1 is the priority channel. If you are using a VFO, you can use any memory channel as the priority channel. When activity on this frequency is detected, the radio switches to the priority channel and stays there either for five seconds (in five-second mode) or until the priority channel is clear (pause mode).

Repeater Offsets

The FT-470 has an Automatic Repeater Shift feature. When this feature is activated, the radio's programming selects the appropriate repeater offset (according to currently accepted band plans) as you tune through a band. This means that if you tune to a repeater output frequency and that repeater is using a standard offset, the FT-470 will automatically set itself to the proper input frequency when you transmit.

You can also set the repeater offset manually. The RPT key on the keypad selects plus (+), minus (–) or no offset. For nonstandard-offset repeaters, you can specify separate transmit and receive frequencies, or change the standard offset (useful if many repeaters in your area use the same nonstandard offset).

DTMF Features

The FT-470 provides a dual-tone multifrequency (DTMF) keypad that includes A, B, C, D, # and * keys. In addition, the FT-470 has 10 memories for storing DTMF information; each of these memories can store a DTMF sequence of up to 15 tones. This allows you to store frequently used phone-patch telephone numbers or repeater-control sequences for easy recall.

CTCSS

A CTCSS encoder and decoder are standard features on the FT-470. The encoder is programmed with 38 standard CTCSS tones, and each memory channel can store CTCSS information. In my area, several 440-MHz repeaters use CTCSS access, and it was easy for me to program the CTCSS information into the FT-470 as I programmed the memories.

The FT-470 can also decode CTCSS tones on receive. This allows you to use a quiet simplex channel where you will hear calls only from a transmitter that sends the proper CTCSS tones. This will usually not work on a repeater frequency—most repeaters filter out CTCSS tones.

You can also activate a "pager" feature using the CTCSS function. This sounds an alert tone and flashes a small bell icon on the LCD when the radio receives a CTCSS-encoded call. The bell continues to flash after the call, so you can tell if the radio received a call when you were not present.

Extended Receiver Coverage

As Yaesu ships the FT-470 in the US, it covers 144-148 and 430-450 MHz on both transmit and receive. It is possible to extend the VHF receive coverage to 130-180 MHz, although the user's manual does not document this feature. To implement extended receiver coverage, turn the radio off and then hold down both the up and down arrows while turning it back on. (This is a toggle function—you don't have to do it every time you turn on the radio.)

The '470 performs fairly well receiving outside the 2-meter ham band. I used the radio to scan local 150-MHz public-service frequencies and to receive 162-MHz NOAA weather transmissions.

Battery Power

The '470 comes with the FNB-10 7.2-V, 600-mAh NiCd battery pack. An overnight NiCd charger for the supplied battery pack is provided with the radio, and a quick charger is available. Refer to Table 1 for details on transmitter and receiver specifications and performance.

At Yaesu's claimed maximum-audio-output receiver current drain (150 mA), the FT-470's standard battery pack lasts for a maximum of four hours of receive-only operation. Fortunately, the '470 has two battery-saving features that extend operation time. Like most modern, full-featured hand-held transceivers, the '470 has a "sleep" mode. When this function is activated, the radio periodically checks for receiver activity. The radio listens for 30 milliseconds; if no activity is found, the radio sleeps to conserve battery power. The interval between checks can be set (from the keypad) anywhere from 30 ms to 1 second. According to Yaesu, average current consumption in sleep mode varies from 25.5 mA with 30-ms sleep periods to only about 8 mA with one-second sleep periods. Battery saving is automatically disabled when the radio is scanning, and you must also disable it during packet operation, as the radio may miss the beginnings of some packets during sleep periods.

The '470 also has an Auto Power Off

feature. This turns the radio off automatically if no keypad activity has occurred for 10 minutes, which is useful if you leave the radio unattended. This feature can also be disabled.

Accessories and Documentation

The full range of standard accessories is available for the '470. The radio comes with one NiCd battery pack, an overnight charger and a leather case. The leather case has a clear plastic window for the display and keypad (you must press the keys through the plastic, but the keypad is protected from the weather). A small hole in the back of the case allows connection of the overnight charger, so the battery can be charged with the radio in the case. The case must be removed to replace the battery pack, however.

The manual is well-written, with only a few typos, and it includes a section called "In Case of Problems" that covers common troubles and solutions. This section should be a bit more comprehensive, however (it's just one page long).

Conclusion

I enjoyed using the FT-470. It's small enough to be convenient, but not so small that it is difficult to use the keypad or read the display. The keypad functions are logically laid out, making it easy to learn how to operate the radio in a short time.

Manufacturer's suggested retail price: FT-470, $576. Manufacturer: Yaesu USA, Inc, 17210 Edwards Rd, Cerritos, CA 90701, tel 800-999-2070. QST

Strays

I would like to get in touch with...

☐ anyone with a manual, schematic, or information on a Hallicrafters S-38C receiver. Jon Book, KBØEDE, 1704 N Pine St, Davenport, IA 52804.

☐ anyone who has any information on a Pride 150 bilinear amplifier and 10-meter Squalo antennas. Keith Schneider, N9HLS, 5027 W National Ave #308, Milwaukee, WI 53214.

☐ anyone using a Johnson Thunderbolt amplifier with a modern transceiver. Bert Kuschner, W4GRP, 3340 Turtlemound Rd, Melbourne, FL 32934.

Cubic Incher Mods + 30 Meters

(continued from page 29)

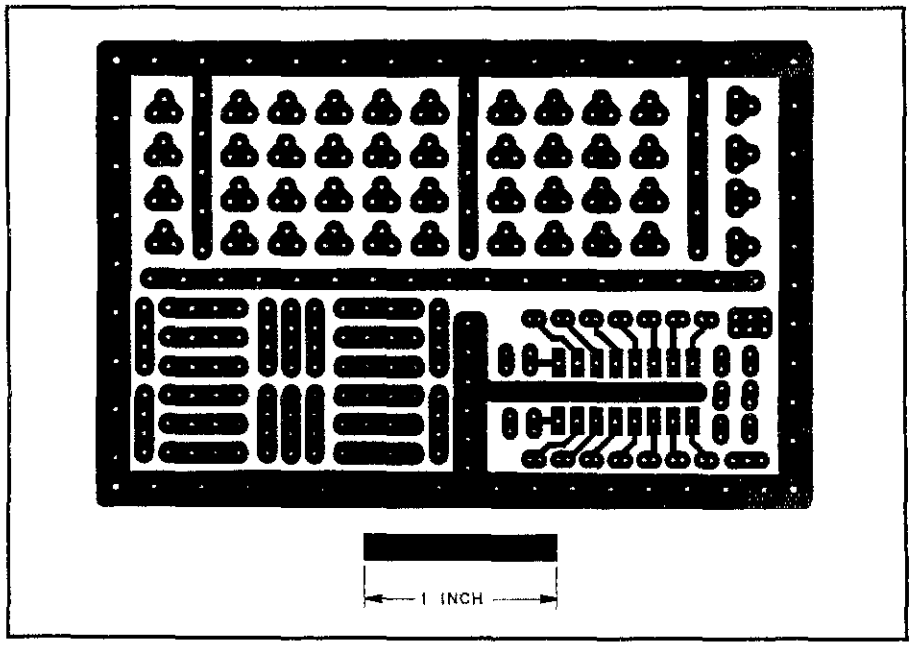


Fig 2—Scale template for the universal breadboard as viewed from the etched side (see note 2).

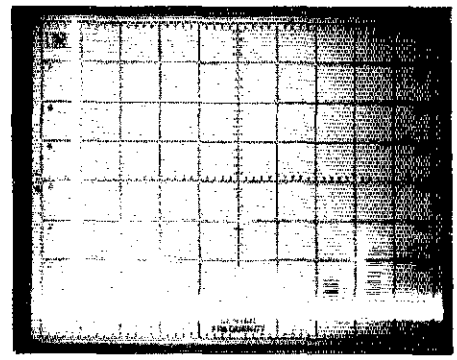


Fig 3—Spectral photograph of the 30-meter Cubic Incher. Each horizontal division represents 10 MHz. Each vertical division represents 10 dB. As tested in the ARRL Lab, the second harmonic is −51 dB below the carrier at 1.5 W output. This transmitter meets FCC spectral requirements.

derived from the normalized filter tables in *The ARRL Handbook*, 61st edition.

I was unable to damage the 2SC1957[3] while keying the transmitter into an open or shorted termination. This is because it has a high maximum V_{CE} rating of +75 V.

Changes in oscillator frequency can, and will, occur when load changes take place. This is characteristic of single-stage vacuum-tube or solid-state transmitters. This does not normally present a problem unless the antenna is blown by the wind toward and away from conductive objects.

I have worked countless stations with this little transmitter. My first QSO netted a station in the 6th call district. My report was RST 589. I was using my full-wave 160-meter loop (50 feet high at each corner) with tuned feeders.

In Summary

I wish to thank Dennis Monticelli for the privilege of riding along on his coattails during this project. His original circuit is rather elegant for so few components!

This will be a fun project for you, even more so if you've never built a QRP transmitter. The cash outlay is small, the construction time is short and you'll learn by doing.

Notes

[1]"Build a 40-M Cubic Incher," *QST*, Jul 1982, pp 34-36.

[2]FAR Circuits (N9ATW), 18N460 Field Ct, Dundee, IL 60118, tel 708-426-2431 after 6 PM Central Time.

[3]2SC1957 and other NEC RF power transistors are available from Oak Hills Research, 20879 Madison St, Big Rapids, MI 49307. Send business-size SASE for catalog of QRP kits and parts. QST

Hints and Kinks

Conducted By David Newkirk, AK7M
Assistant Technical Editor

A FAST-ATTACK AGC SYSTEM FOR QSK CW

☐ A recently constructed CW transceiver used a fast TR system, running nearly at QSK rates. An AGC system with an attack fast enough to follow the data extremes was needed. The resulting circuit is shown in Fig 1.

The signal-path IF amplifier, U1, is an MC1350P. The 910-Ω input resistor parallels the input resistance of the IC to provide a 700-Ω termination for the 3.58-MHz crystal filter used in the receiver. C1 is the crystal-filter output capacitor. Two outputs are available from U1: One, from pin 8, is transformer-coupled to the product detector. The other comes from a low-resistance load attached to pin 1. This drives U2, a second MC1350P, the output of which is applied to Q1, a PNP low-gain amplifier. Q1 sets the dc output level (E_o) to about 3 volts. (E_o can be adjusted, if required, by changing the value of R1. U2's gain can be set at pin 5 by a duplicate R3/R4 gain-control network; as shown, its gain is maximum.)

E_o establishes the dc operating conditions for U3, and, ultimately, for pin 5 of U1, the IF-amplifier AGC input. E_o is applied, after processing, to the U3's inverting and non-inverting inputs. D1 is forward biased by current flow through R2. The rectified IF sample appears at pin 3 of U3; C2 serves as a hold memory. E_o is low-pass-filtered before it reaches pin 2 of U3; although the dc component of E_o reaches the op amp, the ac components do not.

The voltage drop across D1 causes an offset that tends to bias the op-amp output (pin 6 of U3) toward ground. D2 inhibits this, however. U3 provides a dc gain of 15. Diodes D3 and D4 isolate the AGC voltage from that coming from the manual **IF GAIN** control, R3.

This AGC system is no more complicated than an audio-derived one. Its performance, however, is far superior to even the best audio-derived systems I've encountered. A fast attack, limited only by the rise time of the signals from the crystal filter, is possible. The dc biasing scheme chosen allows the loop to be easily adapted to other receivers. It is also tolerant of changing

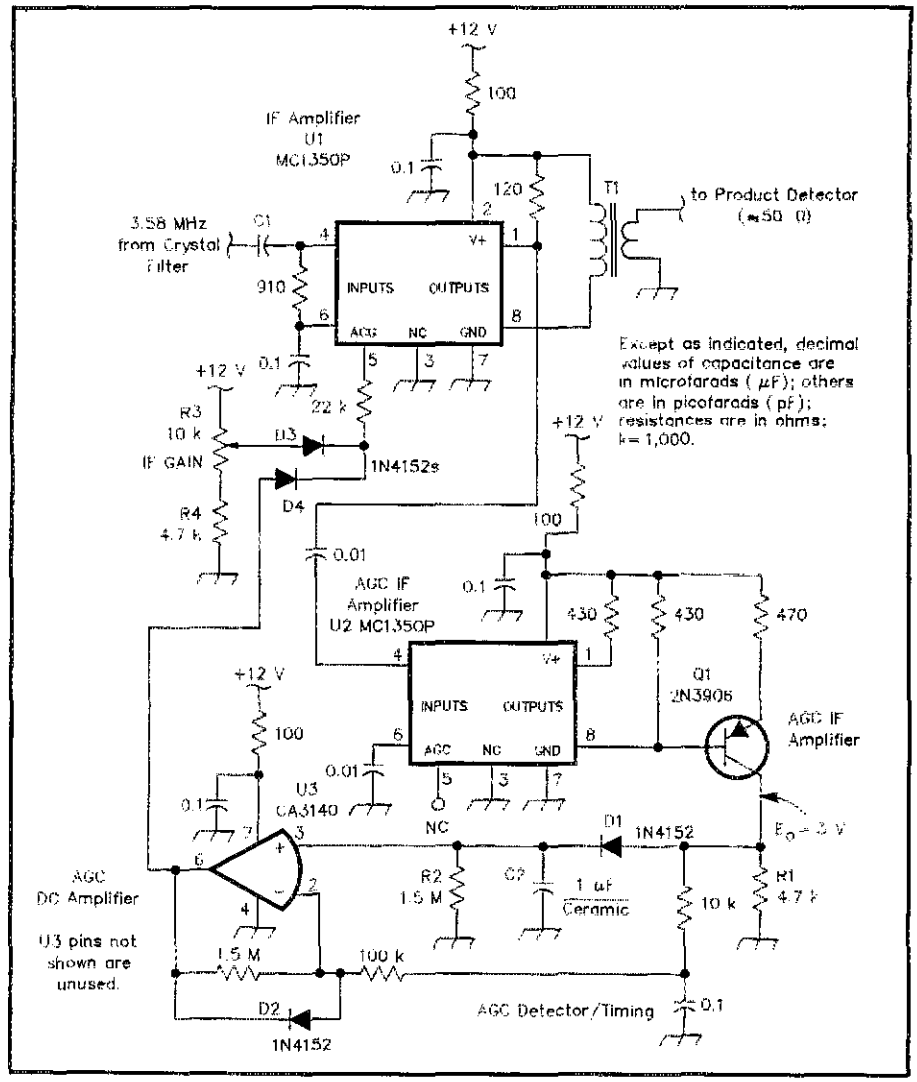


Fig 1—The decay time of this IF-derived QSK AGC system is set by R2 and C2; values as high as R2 = 6.8 MΩ and C2 = 10 μF have been used at AK7M without noticeably slowing the attack time. T1 consists of (primary) 15 turns of no. 28 enameled wire on an FT-37-43 toroidal ferrite core and (secondary) 3 turns of no. 28 enameled wire over the primary.

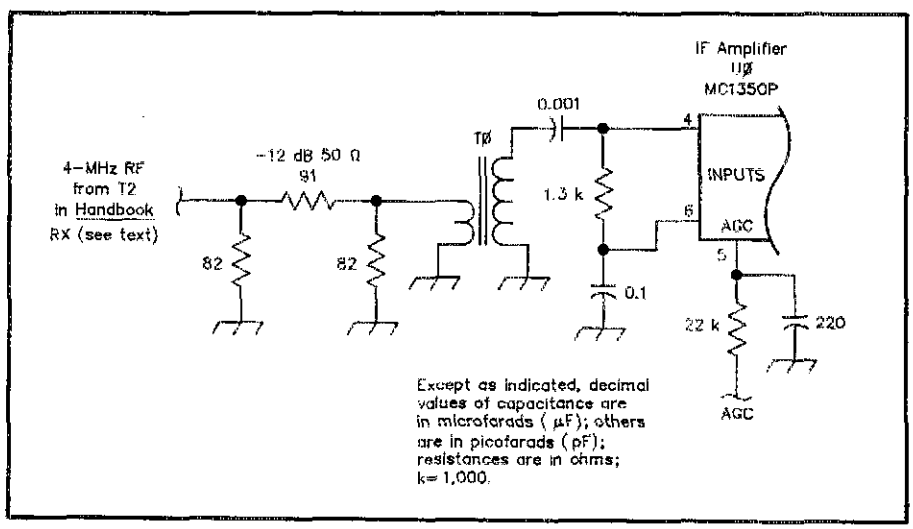


Fig 2—The AGC circuit as applied to *The 1990 ARRL Handbook* 10- and 18-MHz receiver (after adding a second MC1350P, UØ, to the receiver's IF strip). The 10/18's AGC threshold is presettable by means of a gain control at pin 5 of the AGC-amplifier MC1350P (U2 in Fig 1). TØ consists of (primary) 3 turns of no. 28 enameled wire on an FT-37-43 toroidal ferrite core over the secondary (15 turns of no. 28 enameled wire). The remainder of the 10/18's AGC circuitry is identical to that shown in Fig 1.

supply voltages—an important consideration for portable applications. For some of us, all of Amateur Radio is merely a prelude to a perpetual Field Day.—*Wes Hayward, W7ZOI, 7700 SW Danielle Ave, Beaverton, OR 97005*

AK7M: I added this AGC system to the band-imaging (10- and 18-MHz) CW receiver described on pp 30-1 to 30-7 of *The 1990 ARRL Handbook*. Because of that receiver's compact packaging and modular construction, adding AGC circuitry and a second signal-path MC1350P IF amplifier (for a wider gain-control range, not more overall IF gain) required impedance matching (Fig 2) that would have been unnecessary had I designed AGC into the "10/18" from the beginning.

As I anticipated, "kludging" another MC1350P (U∅) to the 10/18's IF strip caused instability. Modest AGC-line bypassing, and a 12-dB, 50-Ω attenuator between the 10/18's two IF-path MC1350Ps, solved this. (Too much AGC-line bypassing can audibly slow the loop's attack time; 0.001-μF bypasses at U1 and U∅, for instance, caused noticeable popping. Because of this, I replaced the 0.005-μF bypass at pin 5 of U2 in the *Handbook* receiver with a 220-pF disc.) The 12-dB pad is merely a convenience: Had I been designing from scratch, I would have RC-coupled the two IF-path MC1350Ps, doing away with the need for T2 (in the *Handbook* receiver) and T∅ (Fig 2). Such an IF strip—one using an MC1530P sibling, the MC1590G—appears on p 30-23 of *The 1990 ARRL Handbook*. Reducing the gain of an RC-coupled pair of MC1350Ps is easy: Just use a lower-value collector resistor at the output of the first IF-path MC1350P. But such stabilizing fixes should not be required in a two-MC1350P IF amplifier designed and laid out as such from scratch.

CURING ERRATIC POWER OUTPUT IN THE TS-430S TRANSCEIVER

☐ If you've experienced erratic power output from your Kenwood TS-430S transceiver in the transmit mode, here are a couple of quick things that you might want to try before packing it off to the repair center.

First, try exercising the switch on the TS-430's **X-VERTER** connector (*J3*), an eight-pin DIN socket on the transceiver's rear apron. This switch is part of the chassis-mounted connector and is actuated when a plug is inserted in the jack, removing RF drive from the TS-430S final circuits and routing it instead to the external transverter. The switch can develop poor normally closed conductivity through disuse. Use an appropriate DIN plug for this task, or actuate the switch, which is located at the keyway point on the chassis connector, several times with a small screwdriver. Be sure the TS-430S is turned off when you do this.

A second possible cause of low or variable power output in the TS-430S is poor conductivity through the single-pin, push-on connector, **DRV**, that provides +13.8 V to the driver section of the final unit. Getting to this connector requires removal of the transceiver's top and bottom covers, plus the six recessed screws around the perimeter of the rearmost chassis lip. Folding the assembly back and away from the main chassis allows limited access to the **DRV** connector, which is located almost midway across the perforated metal shield cover of the final unit. This procedure will probably allow you enough access to inspect this single-pin, push-on connector for tightness; if not, you'll need to remove the shield cover for full access. (This involves removing four more screws, cutting cable ties and temporarily redressing the TS-430's wiring harness. If you decide to do this, study the transceiver carefully before proceeding. Take plenty of time, making notes and sketches as you go to ensure correct reassembly once you've finished.) If the **DRV** connector is loose, crimp it slightly with needle-nose pliers. —*Dave Miller, NZ9E, 7462 W Lawler Ave, Niles, IL 60648*

EXTEND THE RESISTANCE-MEASUREMENT RANGE OF A DMM

☐ My digital multimeter (DMM) measures resistance up to 2 megohms, and this is adequate in most cases. When I need to measure resistances higher than 2 MΩ, I use the circuit shown in Fig 3. When two resistors are connected in parallel, the resultant resistance is always lower than the value of the lower resistor. The unknown resistance can be found from the formula:

$$R_X = \frac{R_S \times R_T}{R_S - R_T} \qquad \text{(Eq 1)}$$

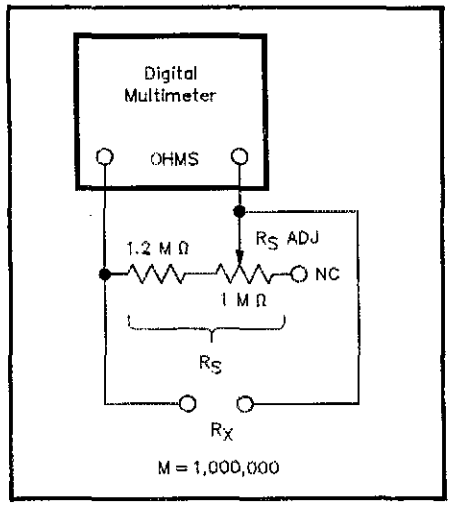


Fig 3—Cornelio Nouel measures resistances above the highest range on his DMM with the help of this circuit and Table 1.

Table 1

DMM Readings for R_X Values with R_S = 2 MΩ

Reading, MΩ	*R_X, MΩ*	*Reading, MΩ*	*R_X, MΩ*
1.111	2.5	1.636	9.0
1.200	3.0	1.666	10.0
1.273	3.5	1.765	15.0
1.333	4.0	1.818	20.0
1.428	5.0	1.875	30.0
1.500	6.0	1.905	40.0
1.555	7.0	1.923	50.0
1.600	8.0		

where R_X is the unknown resistance, R_S is the standard resistance (2 MΩ in this case) and R_T is the value indicated by the DMM.

As Fig 3 shows, my R_S consists of a 1.2-MΩ fixed resistor in series with a 1-MΩ potentiometer (wired as a rheostat); I adjust the pot so that R_S = 2 MΩ. Next, I connect R_X to the circuit and read R_T on the DMM. Then I solve for R_X with Eq 1. Table 1 shows the DMM (R_T) readings that correspond to selected values of R_X for R_S = 2 MΩ. (Any reasonable value can be used for R_S; I settled on 2 MΩ because that value fit the components I had on hand.) Using a pocket calculator, resistance values up to 50 MΩ can be determined with reasonable accuracy.—*Cornelio Nouel, KG5B, 4966 Paseo del Rey Dr, Brownsville, TX 78521*

GAUGE FINE WIRE SIMPLY

☐ As an alternative to using a micrometer or dial caliper close-wind 10 to 20 turns of the wire (how many turns doesn't matter as long as you know the number) on a pencil and measure the length of the winding. Calculate the number of turns per inch and check *The 1990 ARRL Handbook's* Copper Wire Table for the wire gauge that matches this turns-per-inch figure. —*Zack Lau, KH6CP, ARRL Laboratory Engineer*

FEEDBACK: MAKE YOUR HOUSE ANTENNA READY

☐ Charles E. Cohn's hint (July 1989 *QST*, pp 39 and 40) proposing the installation of a feed-line conduit from lower to upper levels in a residence under construction is incomplete, and potentially dangerous. Those of us in the construction trades know such an installation by another name: *chimney!*

While it is common to pre-position such conduits in many types of buildings, most fire-safety codes require that such conduits not contribute to the spread of any fires that may develop. For this reason, the *National Electrical Code® (NEC)* requires (in Article 300-12) that all raceways (including those made of nonmetals) shall be continuous between cabinets and boxes. I install junction boxes sized per *NEC* Article 370-51. What little air might flow through the few holes in a junction box won't contribute significantly to venting fire in the lower space, nor provide sufficient air to a fire in the upper space.

Additionally, since *NEC* Article 810 requires grounding conductors in various places in an amateur station, I provide a no. 10 AWG copper conductor (with green insulation) within that conduit. Most attics just don't provide a readily available grounding point for antenna systems on or near the roof. The presence of a pre-positioned grounding conductor causes the future installer of antennas to think seriously about this grounding requirement.—*Gerald E. Murphy, K8YUW, 1615 Orchard Grove Ave, Lakewood, OH 44107-3729*

Technical Correspondence

Conducted By Paul K. Pagel, N1FB
Associate Technical Editor

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

CORRECTION: MAY 1990 *QST* ANTENNA-RADIATION PATTERNS

☐ An article in May 1990 *QST*, "A Closer Look at Horizontal Loop Antennas," included a series of computer-generated antenna-radiation patterns for a 1.9-MHz horizontal loop 50 feet above ground. Those patterns were calculated by an acquaintance of that article's author, using a variant of *MININEC* (Mini Numerical Electromagnetics Code), a program written for microcomputer antenna analysis by scientists at the US Naval Ocean Systems Center (NOSC) in San Diego, California.

Because the patterns and gains in the published article weren't what I expected that antenna to produce, I used *MININEC* to analyze the loop under the conditions specified in the original article. ARRL Technical Advisor John Grebenkemper, KI6WX, kindly verified my results using *NEC 3*, the mainframe computer code from which *MININEC* was derived.

I found that the published patterns and gains were, indeed, errant. Largely, the problem seems to be traceable to errors in the modeling procedure. *MININEC* and its variants have limitations,[1] one of which is the inability to take ground characteristics (conductivity and dielectric constant) into consideration when calculating antenna impedances. This limitation causes inaccurate feed-point impedances (and thus inaccurate gains) to be calculated for certain types of antennas, such as low-impedance verticals fed against real earth, and horizontally polarized antennas over real earth at heights less than ¼ λ or so (such as the 1.9-MHz loop covered in May *QST*). Within its limitations, however, *MININEC* is an excellent tool for calculating antenna gains and radiation patterns, and its impedance results are generally adequately accurate except in the situations mentioned previously. Incidentally, *NEC 3* calculates true impedances for any antenna configuration.

The horizontally polarized square loop was modeled for the May *QST* article as shown in Fig 1. In this configuration, the antenna's axis of symmetry—the imaginary line through the antenna across which the radiation pattern is the mirror image of that on the other side—is shown by line AB. In the computer modeling done for the May article, the antenna's axis of symmetry was assumed to be a vertical line through the center of the antenna (line CD in Fig 1), 45° off the antenna's true axis of symmetry. Unless its user specifies otherwise, the *MININEC* variant used for the May *QST* analysis assumes that any antenna modeled is symmetrical, and that the axis of symmetry is oriented this way.[2] So, to save time, it calculates the azimuth-plane radiation pattern on only one side of that axis, then mirrors it across this axis for plotting purposes.

Figs 2 through 7 show John Grebenkemper's *NEC 3*-generated patterns for this antenna. They differ substantially from those shown in the May *QST* article because of this axis-of-symmetry discrepancy. John's patterns reflect the antenna's true axis of symmetry; those in May *QST* do not.

The elevation angles at which the azimuth-plane patterns in May *QST* were plotted (30° at and below 7 MHz, 15° at the higher frequencies) were probably chosen because those were the signal-arrival angles of most interest to the author. Thus, so they can be directly compared to the earlier patterns, the azimuth-plane patterns in Figs 2 through 7 are shown at the elevation angles used in May *QST*—not at the elevation-plane gain peaks.

The gains shown in Figs 2 through 7 are in decibels relative to an *isotropic* source (dBi) in free space—a source that radiates a uniformly polarized, equal-magnitude field in all directions. This is the most common reference for antenna gains. The May *QST* patterns show gains relative to a half-wave dipole in free space, which has approximately 2.14 dBi gain. Add 2.14 dB to the values shown in May *QST* before comparing gains to those

[1] R. Lewallen, "*MININEC*: The Other Edge of the Sword," in preparation for *QST*.

[2] The program used for the May *QST* analysis, version 2.0 of *MN* (which has been superseded by version 3.5), by Brian Beezley, K6STI, included documentation that cautioned users about the axis-of-symmetry assumption, and explained how to make sure that the program generated the correct azimuth-plane patterns for antennas that don't have symmetry across the CD axis shown in Fig 1.

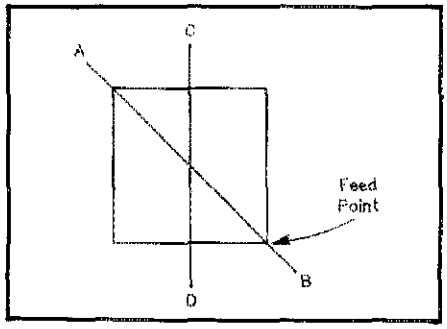


Fig 1—A top view of the horizontal 1.9-MHz full-wave loop. Line AB represents the antenna's actual axis of symmetry; CD represents the axis of symmetry assumed by the modeling program used to calculate the patterns published in May QST.

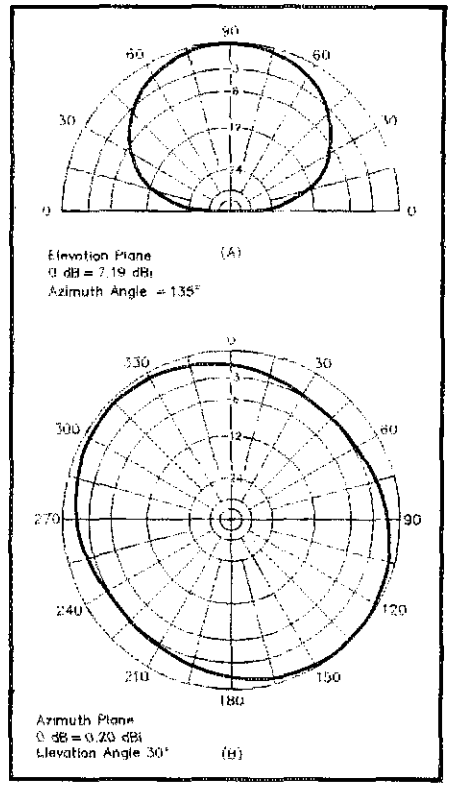


Fig 2—Elevation- and azimuth-plane patterns of the loop at 1.9 MHz.

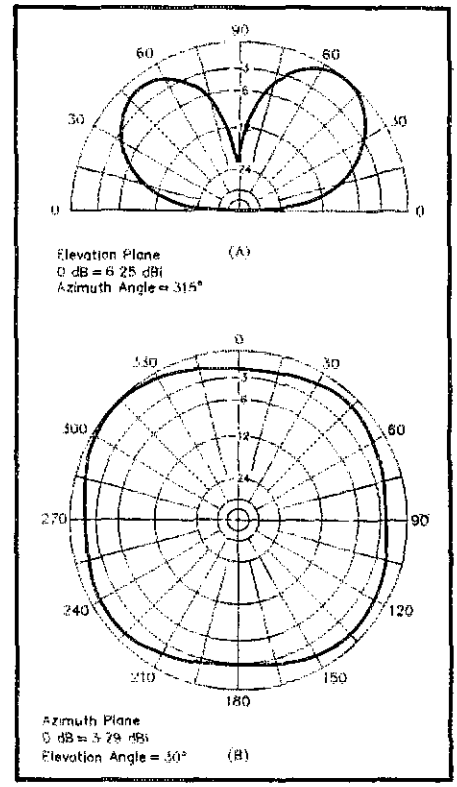


Fig 3—Elevation- and azimuth-plane patterns of the loop at 3.84 MHz.

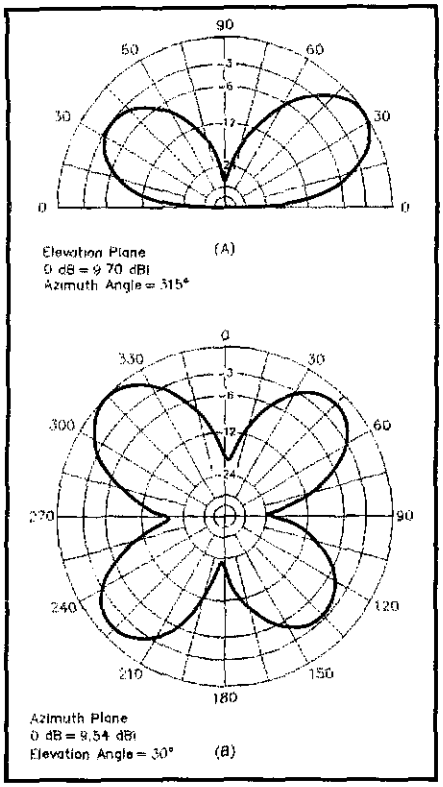


Fig 4—Elevation- and azimuth-plane patterns of the loop at 7.16 MHz.

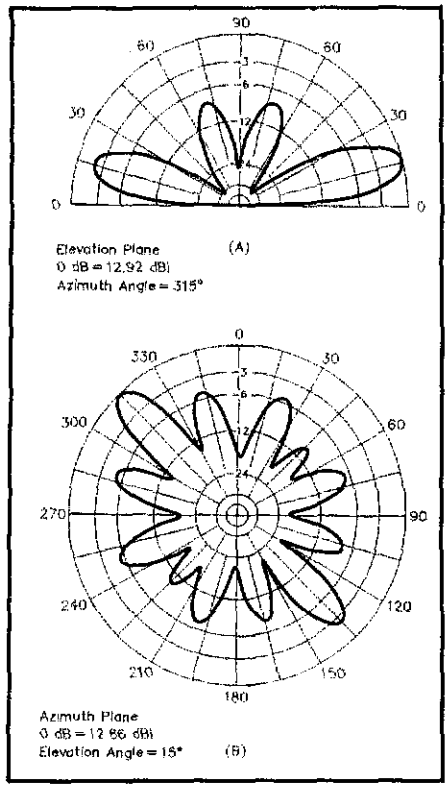


Fig 5—Elevation- and azimuth-plane patterns of the loop at 14.2 MHz.

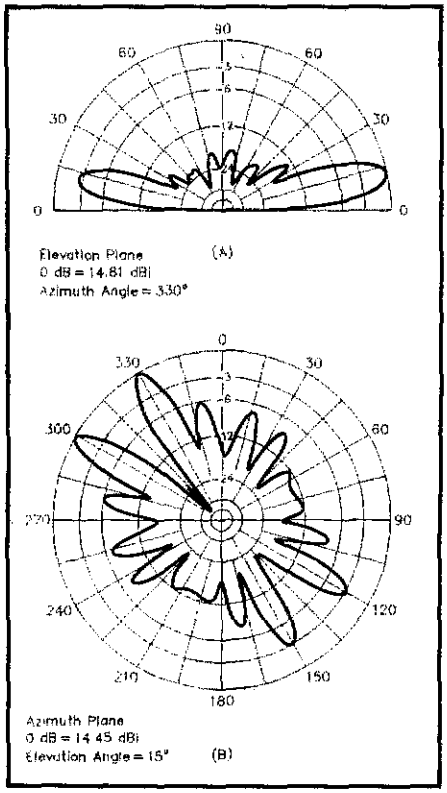


Fig 6—Elevation- and azimuth-plane patterns of the loop at 21.2 MHz.

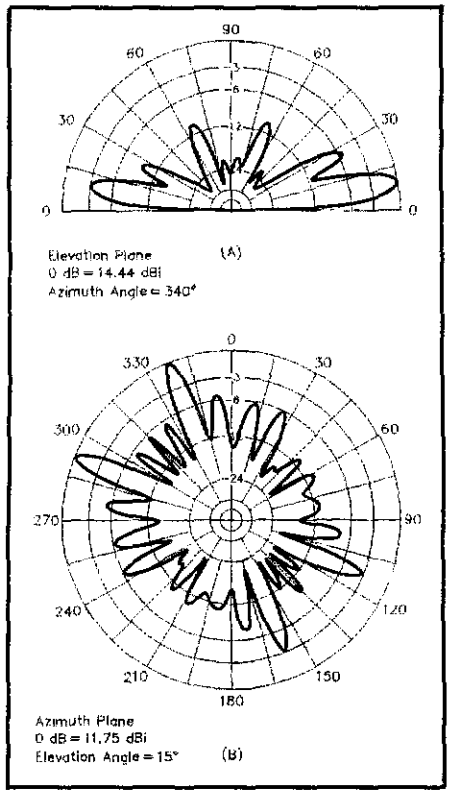


Fig 7—Elevation- and azimuth-plane patterns of the loop at 28.5 MHz.

shown in Figs 2 through 7.

Comparing antenna gains to that of a dipole in free space can be misleading. For instance, *MININEC* says that the gain of a half-wave 1.9-MHz dipole in free space is 2.14 dBi (0 dBd), but at 50 feet above average ground, *NEC 3* shows that the gain of that same dipole is 6.26 dBi (4.12 dBd). How can a dipole have 4.12 dB gain over a dipole? Easy—the reference antenna is in free space, but the dipole over ground is subject to ground reflections that increase its gain by 4.12 dB. According to *NEC 3*, That same 1.9-MHz dipole 50 feet above average ground has a whopping 10.4 dBi gain at 28 MHz. (Note that this is only 4 dB less than the 1.9 MHz loop's gain at 28 MHz [Fig 7A]). In general, it's less potentially confusing to compare antenna gains to that of an isotropic source in free space.

John Grebenkemper's *NEC 3* verification of my *MININEC* calculations brought to light some interesting differences between the programs. At 7 MHz and lower frequencies, *NEC 3*'s gain calculations were lower than *MININEC*'s by between 0.4 dB (7 MHz) and 1.9 dB (1.9 MHz). For a given antenna height, this effect becomes steadily more pronounced as frequency is decreased, as the antenna becomes closer (in wavelengths) to the ground (again, because *MININEC's* gain calculations are dependent on its impedance calculations). At and above 14 MHz, the gains calculated by the two programs agree within 0.12 dB, except above 28 MHz, where another of *MININEC*'s limitations affects the results.[3] Also, some very small lobes in the loop's patterns at 21 and 28 MHz shown in *NEC 3*'s results did not appear in *MININEC*'s output.[4] For these reasons, the patterns in Figs 2 through 7 are those generated with *NEC 3*. Overall, however, the results provided by *NEC 3* and *MININEC* were in *very* close agreement for both pattern shapes and gains.

Thanks to ARRL Technical Advisors John Grebenkemper, KI6WX, John S. Belrose, VE2CV, and Roy Lewallen, W7EL, for their assistance in preparing this item.—*James W. Healy, NJ2L, Assistant Technical Editor*

[3]Gain figures and patterns generated by *MININEC* converge toward maximally accurate values as the number of segments—the divisions into which the programs break up each wire in an antenna—is increased. Each leg of this loop antenna is 3.7 λ long at 28 MHz, and the maximum number of segments available in the version of *MININEC* I used is not high enough to provide adequately accurate gain and pattern calculations for this antenna at that frequency. In part, this is because the segment length, which is uniform throughout the antenna in the modeling configuration I used, has become too large a fraction of a wavelength for the program to yield accurate results at 28 MHz.

[4]See Note 3.

Microsats and You

Got the urge to try out our latest amateur satellites? Here's a look at what it takes to get "on the air" through the new Microsats.

By Doug Loughmiller, KO5I
President, AMSAT-NA
PO Box 27
Washington, DC 20044

Amazing, simply amazing! These were my initial thoughts as I copied signals from the Microsats for the very first time, shortly after their launch in January of this year. As the satellites filed past my Texas QTH, I admired the strong downlink signals of all of the new birds and marveled at how easy they were to copy. Being an old hand at the OSCAR game, you'd think that I would be past the stage of experiencing the thrill and excitement of tracking an OSCAR—but it wasn't so!

What's the big deal, you ask? You might point out (and rightly so) that amateurs have been tracking their own satellites for nearly three decades now, and hearing an amateur satellite signal from space is hardly an unusual event. Besides, these new birds are running a whopping 4 watts—they're supposed to be loud. Well, all of that may be true, but the source of my excitement stemmed not only from the performance of the spacecraft orbiting 800 kilometers overhead, but more from the simplistic ground station I was using to track them. My station consisted of an omnidirectional antenna on the balcony of my second-story apartment (surrounded by trees in all directions), feeding an old 70-cm (437 MHz) multimode transceiver into a PSK modem, a TNC and a computer, which was used to process the data on the downlink signal. That's hardly a textbook ground station, but it worked quite well. A diagram of my simple Microsat station appears in Fig 1.

After years of paying painstaking attention to detail while tracking OSCARs with gain arrays and low-noise, high-gain receiving setups, it was almost mesmerizing to watch the telemetry flow across the screen using this simple arrangement. Carlos Huertas, LU4ANQ, President of AMSAT Argentina, phoned me after the first few orbits to tell me that he was copying the LUSAT CW beacon on 437.125 MHz with a hand-held from his hotel room in Atlanta, where he was staying while in the US on business. And as countless radio amateurs can now attest, the strong 2-meter downlink of the DOVE spacecraft is "easy copy" with the simplest of 2-meter FM equipment.

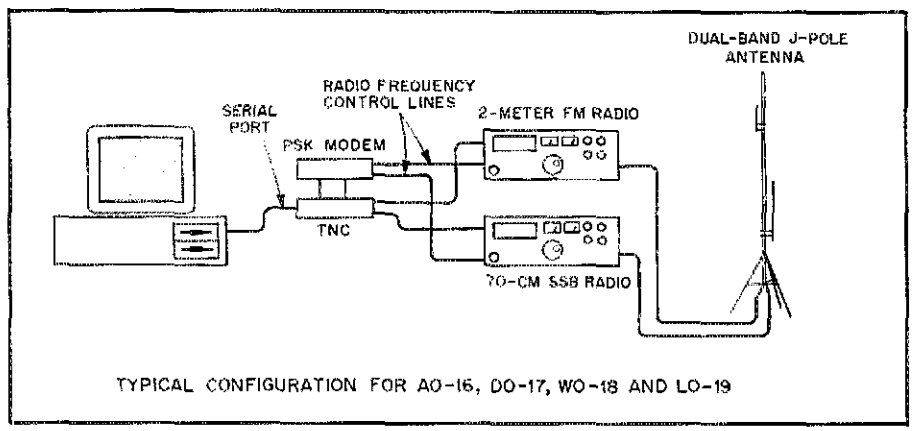


Fig 1—A typical Microsat ground station.

Even after having been active since the days of OSCAR 6 and seeing the advances made in this facet of our hobby, I never grew immune to the excitement of making amateur satellite communications easier and more enjoyable for everyone. As you are about to see, it's easy to join in the excitement! In this month's installment of our on-going series of articles about amateur radio's newest "flock of birds," we'll depart from our review of the individual Microsats[1,2,3] and turn our attention to information of use to those who want to assemble a Microsat ground station.

Background

The Microsats are the first OSCARs dedicated exclusively to digital store-and-forward communications by radio amateurs[4,5]—a relatively new concept. Although joining the packet radio revolution and OSCAR technology had been discussed since the early '80s, full-blown PACSATs took some time to reach fruition.[6,7]

The first "proof-of-concept" experiment was flown aboard UoSAT-OSCAR-11 and is known as the DCE (Digital Communication Experiment). This DCE was designed to show the feasibility of such a system while supporting only a small user base scattered around the globe. UOSAT-11 was launched in March of 1984, and since then, the DCE has supported limited operations from stations on virtually every continent and remains active. The results of this experiment have shown the effectiveness of satellite-based store-and-forward communications systems in low Earth orbit in providing global communications and has served as the basis for further experimentation.[8]

The first system intended for a broad-based user group was incorporated into the first Japanese amateur satellite known as FUJI-OSCAR-12. This satellite housed two separate systems, the first being a linear transponder similar to the those used in Phase II OSCARs. This transponder was configured for a 2-meter uplink and a 70-cm downlink (Mode J) and became known as Mode JA (analog).

The second system, known as Mode JD (digital), used four 2-meter FM uplink channels and one 70-cm SSB downlink channel. It used Manchestered FSK at 1200 bit/s on the uplink and PSK at 1200 bit/s on the downlink.[9,10,11]

Unfortunately, this satellite never

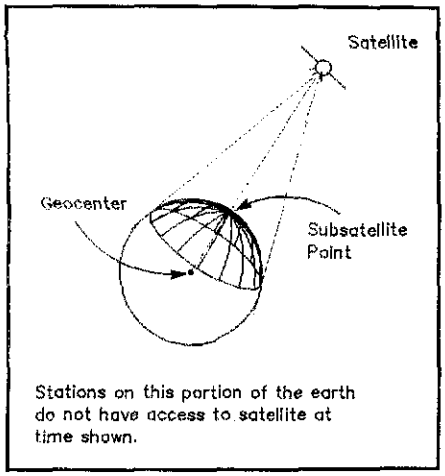


Fig 2—Stations working through conventional "transponder" satellites must be able to "see" the satellite simultaneously. The diagram shows the satellite's "footprint" or "window."

achieved its fullest potential because it suffered from a negative power budget. At best, its operations were sporadic. Its limited operation did, however, serve as a proving ground for the communications standard it employed.

The design of FO-12's digital circuitry was quite sound, so when data standards for the Microsats were being selected by the AMSAT design team, the FO-12 standard was adopted. By using the same standard, countless radio amateurs around the world would already be equipped to communicate through the new satellites.

About Digital Store and Forward

The use of a digital store-and-forward satellite is somewhat different than that of a satellite using a communications medium such as a linear transponder.

As shown in Fig 2, for two ground stations to be able to communicate with each other using a satellite that employs a linear transponder, they must both have access to the satellite at the same time (in other words, share a common window). As you might expect, the communications capability of the given satellite is limited by its footprint, which is determined by the height of the satellite above the surface of the Earth.[12]

Fig 3 shows the concept of digital store-and-forward communications. When the satellite passes within view of a particular ground station, that station can place data (a message) into the memory of the on-board computer destined for a station at any point on the globe, regardless of whether the two stations share a common window of visibility. As the satellite passes within view of the "destination" station, that station can simply connect to the satellite and retrieve the message. In this way, global communications can be supported with the use of satellites in low Earth orbit.

Putting a Station Together

Now that we've got some basic concepts out of the way, let's take a look at the specific requirements of a Microsat ground station.

In the simplest terms, as with any Amateur Radio operation, for satellite communications to take place, two processes must occur: reception and transmission. In this case, the reception and transmission will be between a ground station and a given satellite and will involve digital information.

The first issue to be dealt with is satellite tracking. Because the Microsats are in low Earth orbit (LEO), circling the globe roughly 14 times a day, we must have a means of determining when the spacecraft will be in view at our location. The simplest way to track the Microsats is with a personal computer and satellite-tracking software. AMSAT has developed a number of tracking programs for a wide variety of personal computers. For more information, write to AMSAT Headquarters and ask for the current software catalog.[13]

Once we've found a way to track the satellites, let's turn our attention to the individual components of our Microsat ground station.

As we can see in Fig 1, the basic Microsat ground station comprises six items: an omnidirectional dual-band antenna, a 2-meter FM transceiver, a 70-cm SSB receiver, a standard TNC, a PSK modem and a personal computer with the appropriate communications software. For those who already possess an OSCAR-13 satellite station, the only needed additions are the TNC, PSK modem and PC. The need

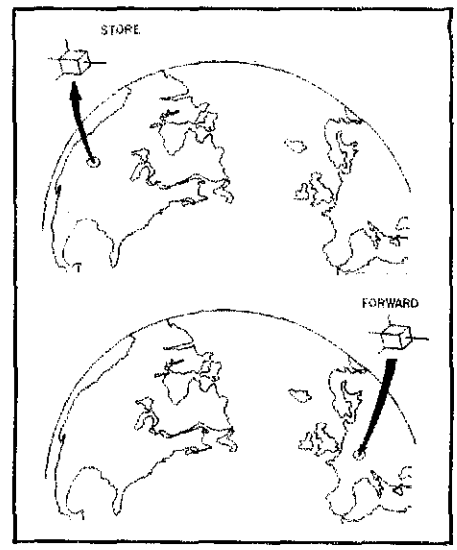


Fig 3—With store-and-forward satellites, stations do not have to have a "mutual window"—they must simply be able to see the satellite on successive orbits.

for precision tracking will be greater with this arrangement, however, as you must point your OSCAR 13 gain array at the satellite.

Each of the Microsats makes unique use of its digital store-and-forward capabilities. Because of this, the exact ground station requirements for each differ slightly. The chart in Table 1 outlines the operation of each Microsat.

Referring to Fig 1, we find that the basic Microsat ground station shown can be used for each of the individual applications involved.

For instance, in the case of DOVE, the Digital Orbiting Voice Encoder, the omnidirectional antenna, 2-meter FM receiver and TNC would be used to collect packet data from this satellite, while only the omnidirectional antenna and the 2-meter receiver would be needed when the satellite is transmitting digitized voice.

For WEBERSAT, to extract data from the on-board experiments, the ground station requires only the omnidirectional antenna, the 70-cm SSB receiver, the TNC, the PSK modem and the computer. To receive CCD images from WEBERSAT, additional software known as *Weberware* is needed.

To send messages using the store-and-forward capability of AO-16 or LO-19, the complete station—the omnidirectional dual-band antenna, 2-meter FM transmitter, 70-cm SSB receiver, the TNC, the PSK modem and the computer—is needed.

Power and Antenna Choices

An in-depth discussion of the power needed to connect to the PACSATs is intentionally avoided here. A discussion of this type is always fraught with variables that must be considered on a case-by-case basis. Rather than try to offer link calcu-

Table 1

Microsat Frequency Guide

ID	*Name*	*Primary Downlink*	*Secondary Downlinks*	*Uplinks*[A]
AO-16	PACSAT	437.025 PSK	437.050 PSK	145.900, .920, .940, .960
DO-17	DOVE	145.825 AFSK	----------	NONE
WO-18	WEBERSAT	437.075 PSK	437.100 PSK	145.900
LO-19	LUSAT	437.150 PSK	437.125 PSK	145.900, .880, .860, .840

Notes:
(A) All uplinks require 1200-Hz Manchester-encoded binary modulation of an FM transmitter. This results in a 1200 bit/s Manchester-encoded FSK signal.
(B) All downlinks except DO-17 require an SSB receiver; DO-17 requires an FM receiver.
(C) DO-17 can transmit voice or AFSK data.

Glossary of Terms

AFSK—Audio Frequency-Shift Keying.

Bit/s—Abbreviation for *bits per second*, a measure of the speed at which information is transferred. A *bit* is a binary digit.

Low Earth Orbit—A satellite's path that remains at a relatively low altitude, typically less than a couple of thousand kilometers. Abbreviated *LEO*.

Manchestered FSK—Biphase-L Frequency-Shift Keying.

PSK—Phase-shift keying.

Telemetry—Radio signals originating at a satellite that convey information on the performance or status of onboard subsystems. Also refers to the information itself. Sometimes abbreviated *TLM*.

TNC—Terminal Node Controller, a device that assembles and disassembles packets (frames).

lations and the like, I feel it's much better to point out some guidelines and offer some "food for thought."

In an ideal setting (if you were the only one trying to use the satellite), you would find that relatively low power could be used to connect with the satellite. One of the command stations has reported getting packets into the system with 25 watts of output power and a modest antenna setup. As we all know, however, you (or I) won't be the only ones trying to access the satellite at any given time, so competition with other stations will have to be considered.

Keep in mind that uplink signals are being transmitted on FM. Because of FM's capture effect, the strongest signal at the receiver will override all of the competition. Thankfully, there are four uplink channels for the traffic to spread out across.

Another hotly debated topic in the Microsat operations arena is efficient omnidirectional antennas. The debate is centered around two very basic designs: the turnstile and the J-pole.[14]

The turnstile has long been thought to be the antenna of choice for use by satellite operators who want to work through LEO satellites using simple omnidirectional antennas. Recent evaluation of the subject has, however, led many to believe that a better choice might be the J-pole antenna, because of its lobes at 30° or less—the part of the sky that a LEO bird occupies most of the time it's above the horizon.[15] Although the jury is still out, both antennas are being used successfully and I don't hesitate to encourage the use of either one.

Why PSK?

The downlink signals of all of the Microsats (with the exception of DOVE) use PSK modulation. With the countless number of AFSK TNCs, you might question the decision to use PSK, necessitating the addition of a dedicated modem in the satellite ground station. (The use of PSK signals for store-and-forward communications dates back to the design of FO-12.[16])

One of the fundamental reasons for PSK is that it offers at least a 16-dB performance increase over AFSK. The net result is that data can be successfully extracted from a PSK signal that is 16 dB further down in the noise than an AFSK signal—an attractive feature when you're experiencing fading on a downlink signal.

Another fundamental reason for using PSK is that it requires less power to generate a PSK signal than it does to generate a comparable AFSK signal aboard the spacecraft. The efficient use of power is always of paramount concern to satellite builders. Because of these reasons—and AMSAT's desire to work with an already-existing user base—the decision was made to adhere to the Japanese Mode-JD standard. FO-20, a follow up mission to FO-12, which uses an identical PSK modulation scheme, was launched in early February of this year. It rounds out the complement of digital store-and-forward packet satellites available for use today by the world's radio amateurs.

Sources for Specialized Modems

While most of the equipment needed to set up a Microsat ground station is readily available, one item that is essential but not as easily found is a PSK modem. There are three sources for this item as of this writing, with additional sources sure to follow. The first two sources provide the modems in kit or partial-kit forms. They are: TAPR, The Tucson Packet Radio Corporation[17,18] and AMSAT-UK.[19] The third source, PacComm,[20] produces a wired and tested PSK modem known as the PSK-1. This modem, while primarily designed for use with the Microsats and Fuji satellites, incorporates a 400 bit/s demodulator for decoding AO-13 telemetry as well.

The author and QST in no way warrant or endorse any of these products. This material is being offered for information only, as an aid to those who are having difficulty finding appropriate components to assemble their ground stations.

Next Time

The next article in our Microsat series takes a look at the final two "stars" of the Microsat cast, the PACSATs: AMSAT-OSCAR-16 and LUSAT-OSCAR-19.

Well, there you have it! Putting together a Microsat ground station is an easy and rewarding experience. I hope to be exchanging packet messages with you via AO-16, LO-19 or FO-20 soon. Good luck and see you on the birds!

Notes

[1]Doug Loughmiller, KO5I, "Successful OSCAR Launch Ushers in the '90s," *QST*, Apr 1990, p 52.

[2]Doug Loughmiller, KO5I, "DOVE: The Digital *Orbiting Voice Encoder*," *QST*, *May 1990*, p *40*.

[3]Doug Loughmiller, KO5I, "WEBERSAT-OSCAR-18: Amateur Radio's Newest Eye in the Sky," *QST*, Jun 1990, p 50.

[4]Doug Loughmiller, KO5I, and Bob McGwier, N4HY, "*Microsat: The Next Generation of* OSCAR Satellites—*Part 1*," *QST*, May 1989, p 37.

[5]Doug Loughmiller, KO5I, and Bob McGwier, N4HY, "Microsat: The Next Generation of OSCAR Satellites—*Part 2*," *QST*, Jun 1989, p 53.

[6]Tom Clark, W3IWI, "AMSAT's Microsat/Pacsat Program," *Proceedings of the AMSAT-NA 6th Space Symposium* and Annual Meeting, Nov 1988, p 4.

[7]Tom Clark, W3IWI, Courtney Duncan, N5BF, Bob McGwier, N4HY, Jan King, W3GEY, "The First Flock of Microsats," *AMSAT Journal*, May 1989, p 3.

[8]University of Surrey, *UOSAT Spacecraft Data Booklet*, Jun 1987.

[9]JARL, *JAS-1 Satellite Handbook*.

[10]Fujio Yamashita, JS1UKR, "A PSK Demodulator for the JAS-1 Satellite," *QEX*, Aug 1986, p 3.

[11]Tom Clark, W3IWI, "FO-12 Modems," *Proceedings of the 4th Annual AMSAT Space Symposium*, Nov 1986, p 8.

[12]Marty Davidoff, K2UBC, *Satellite Experimenters Handbook*, Chapter 9, (ARRL: Newington, 1985).

[13]AMSAT Software, PO Box 27, Washington, DC 20044

[14]Dick Jansson, WD4FAB, "Antennas for Microsat Ground Stations," *AMSAT Journal*, Mar 1990, p 11.

[15]Courtney Duncan, N5BF, "A Method of Evaluating Antennas For a Low Earth Orbit Mission," *AMSAT-NA Technical Journal*, Winter 1987-88, p 36.

[16]Courtney Duncan, N5BF, "Toward the Future in the Amateur Satellite Program," "Next Steps in the Ground" segment, *Proceedings of the AMSAT-NA 6th Space Symposium* and *Annual Meeting*, Nov 1988, p 15.

[17]Lyle Johnson, WA7GXD, "TAPR PSK Modem," *QEX*, Sep 1987, p 3.

[18]TAPR PSK Modem, TAPR, The Tucson Amateur Packet Radio Corporation, PO Box 12925, Tucson, AZ, 85732.

[19]G3RUH PSK Modems, AMSAT-UK, 94 Herongate Road, Wanstead Park, London, E12 5EQ, England.

[20]PSK-1, PacComm, 3652 West Cypress St, *Tampa, Florida 33607.*

Changing Antenna Ordinances—The Easy Way

Who says you can't "fight" City Hall? These Oregon hams found that the soft-sell approach works best.

By Jim Walsh, W7LVN
159 E 16th Ave
Eugene, OR 97401

Taking a statement from the title of a book written by an old friend, John Haerle (WB5IIR, SK), "The Easy Way" is almost always the best way to prevail in a city ordinance environment. Conversely, getting mad and going to court almost never fails to be a "no-win" situation for all concerned—and you usually don't get what you want. Some low-key publicity, combined with a little old-fashioned diplomacy, recently provided relief from restrictive antenna ordinances in Eugene, Oregon. "The Easy Way" can work for you, too.

Imagine our Surprise...

Like many hams, we in Eugene don't always closely follow everything that happens in our City government. You can imagine our surprise when, in mid-1988, one of our Valley Radio Club members, Steve Jepsen, AI7W, was refused a building permit to construct an antenna-support structure. Later, he discovered that he could appeal the initial decision, which he did. (You'll find calling your tower an "antenna-support structure" can be worth a lot. Besides being a more technically correct term, it doesn't have nearly the negative connotation to your neighbors that "tower" does.)

The City also denied Steve's appeal, suggesting that he should—because of the way the statutes were written—file for a "Conditional Use Permit." When we looked at the language of Conditional Use Permits, we found hams grouped together with an amalgam of business operations, including "...airports, carnivals, cemeteries, garbage dumps, heliports, mental hospitals, animal pounds, race tracks, and *radio towers and transmitters.*"

Even Garage Door Openers were Illegal

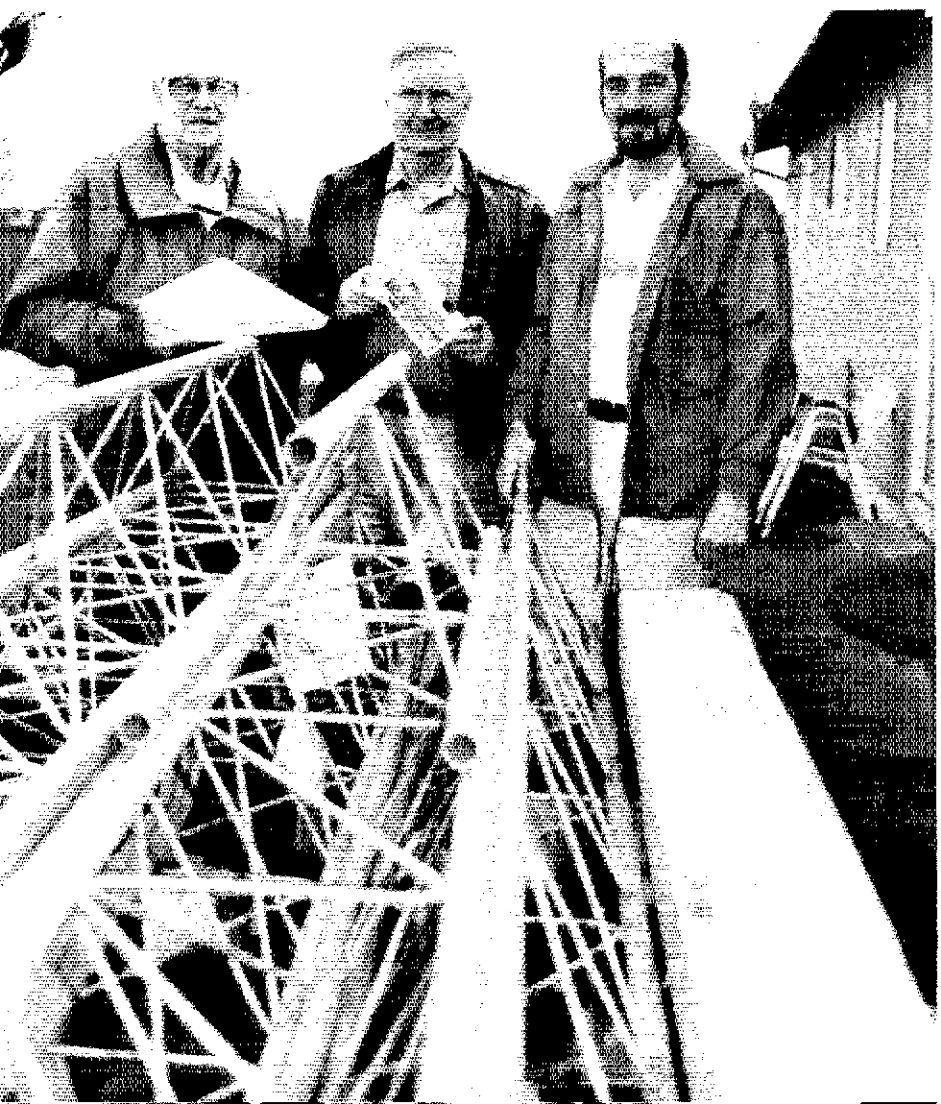
Those last four words really got our attention: In the city of Eugene, *even a radio-operated garage door opener was illegal*, unless operated under the authority of a Conditional Use Permit.

Worse yet, we read further to find that the fee for Conditional Use Permits was more than $600—and the entire amount was nonrefundable, regardless of the decision on the application. Steve was quite upset by the news. After several weeks of talking, we discarded the idea of raising funds for a sustained legal challenge to the present building codes.

Instead, we chose to approach the City "The Easy Way"— using a bit of quiet, low-key publicity and diplomacy.

We are lucky to have recently retired City Airport Manager Bob Shelby as an active ham (KA7MLJ). Bob, who is well-known and respected by the city administration, arranged a meeting with the officials who had denied AI7W's initial request.

We first pointed out that under the code,



Three happy Eugene, Oregon, hams gather on a perfect day to raise a tower. Jim Walsh, W7LVN (l), holds a stack of paperwork produced during the group's "ordinance changing" process. Bob Shelby, KA7MLJ (center), holds a copy of *The New World of Amateur Radio*, the key to educating members of the Planning Commission. Most delighted of all is Steve Jepsen, AI7W—at last he's about to see his new tri-bander flying at 60 feet above his back yard. *(photo courtesy of W7LVN)*

as then written, every person who owned a garage door opener should have paid some $600 to qualify that radio transmitter! After we all agreed that some tightening of the ordinance was in order, we were referred to a capable person in the Planning Department with instructions from the Building Department to develop a change in the code to address the situation.

Now comes the heavy public relations effort.

We furnished our new contact with copies of PRB-1, a volume of *The New World of Amateur Radio* and a video tape of an emergency operation. We also supplied copies of ordinances that had addressed this problem in different ways.

Public Service Helps

While we were working with city officials, area hams were planning communications to support the VIII World Veterans Championships. This track-and-field meet—the largest of its kind—would bring more than 10,000 competitors and spectators into our community during the summer of 1989. Such an enormously visible project demonstrated that much public good comes from Amateur Radio—and we kept our new friend in the Planning Department fully apprised of our plans. He shared this information with members of the Planning Commission, all of whom were impressed.

A seemingly endless number of meetings were held through the winter season and into the spring of 1989. Finally, in late spring, we had developed a workable addition to the Building Code. The ordinance amending certain portions of the city code was titled "An Ordinance for *Federally Licensed Amateur Radio Operators'* Antenna Support Structures." It's a lengthy title, but (much like calling a tower an "antenna-support structure") one with great benefit.

First, Amateur Radio structures are now excluded from the over-broad business spectrum as defined in the original Conditional Use Permit rules—bringing us under the authority of the Building Department with a reasonable application fee (based upon the structure's cost). Second, Amateur Radio is specifically separated from Citizens Band or any other hobby radio use, further differentiating us and establishing the importance of what we do.

Valuable Provisions

We provided that Amateur Radio antennas could be erected up to a height of 70 feet, subject to engineering in accordance with the tower manufacturer's specifications. (This allows hams to submit applications without paying for engineering studies.)

There is a setback requirement of one foot for every three feet of antenna height. Thus, to establish a 70-foot guyed tower, you need real estate which will allow for the proper placement of guy wires to fit within the lot. Because of this requirement, a self-supporting tower is sometimes the only solution for smaller lots.

We were finally advised in late summer of 1989 that we would have a work session before the Planning Commission and—approximately two months after that—the plan would, if approved, be submitted for vote by the City Council.

The Planning Commission

Using a computerized data base of all amateurs within our Eugene mailing district, we sent a letter to some 400 local hams, informing them of the situation and inviting them to attend the meeting before the Planning Commission. This initial public meeting would be devoted only to our suggested ordinance change. On the night of the meeting, the Council Chambers were packed with amateurs.

Four speakers were prepared with carefully planned and rehearsed short presentations to reinforce our proposal. Steve Jepsen, AI7W—the ham who had originally filed for a permit—led off by explaining how he first became aware of the discrepancy within the City rules and how such great effort and expense denigrated the enjoyment of a hobby that was also a vital public service.

Bob Bennett, W7BH, followed by discussing the usefulness of amateur communications during emergencies—including handling message traffic for crews fighting a fire in the mountains just east of Eugene only days before the meeting.

Scott Springate, N7DDM, is a teenage ham and former *QST* columnist. Scott discussed Amateur Radio as an educational and career tool and the necessity of getting youth involved in hamming. Then, Bob Shelby, KA7MLJ, covered the close relationship between hams and their community—including the grass-roots development of this proposed ordinance.

After those four had finished, I gave a quick summary of their remarks from my perspective as probably the oldest ham in the group. I discussed the history of antennas in the community—including their lack of structural problems—and answered questions from two Commissioners on interference and liability insurance.

The Commission then voted its unanimous approval of the requested proposal.

Our next step was to go before the City Council. As soon as the meeting with the City Council was set, we advised a few selected amateurs of the meeting time and announced it in the newsletters of two local ham clubs.

A Unanimous Vote

We prepared well for this meeting with our friends on the City Council. On the night of the meeting, October 9, 1989, the Chamber was packed as there were two major items on the docket. Inspection of the agenda showed we were seventh to be heard. Finally, after an anxious three hours, our agenda item was announced.

Council staff first summarized the proposed ordinance and Bob Bennett, W7BH, gave a brief overview of Amateur Radio activities in our area. There were only two minor questions from the Council, after which it voted: first, to approve the code amendment, and, second, to make this an emergency action. By use of the emergency motion, the amendment to the Building Code would take effect immediately. The voting by City Council members was unanimous on both motions.

Everyone Wins

Eugene, Oregon, now has a working Amateur Radio amendment to its Building Code that allows hams, with certain conditions, to erect support structures up to a height of 70 feet. Should there be a need for a taller structure, a reasonable appeal action is provided.

Our results add us to the growing list of communities that have enacted ordinances favoring Amateur Radio activity. If you need this help in your city, make sure you first try it "The Easy Way":

Make friends with workers in the Building Department or Planning Commission of your city. Show them the evidence and the video that is available and above all, don't force the issue. Be patient: explain, explain and explain. Let them know what ham radio is all about.

Yes, it took us nearly a year to develop this amendment to the City Building Code. But our only expense was the mailing and some volunteer time, plus the support of the entire amateur community. This approach can be a "win-win" solution to problems affecting communities all over the country.

PRB-1 and You

PRB-1 is a limited Federal preemption of local zoning ordinances which states that such ordinances may not be unduly restrictive so as to limit amateur communications. Local municipalities can zone for health, safety and aesthetic considerations as long as amateur communications are reasonably accommodated. A "PRB-1 Kit" is available from the ARRL HQ Regulatory Information Department; enclose a 9- × 12-inch envelope and $2.50 postage with your request. This package includes PRB-1, a number of cases, sample ordinances and other material.

Amateurs are reminded that private deed restrictions and covenants, agreements between home buyer and builder or homeowners association, are specifically excluded from PRB-1 because the buyer, in effect, agrees to be restricted by signing the agreement in the first place. See January 1988 *QST* (p 55) and April 1988 *QST* (p 80) for more information.—*KJ4KB*

Are You Ready for SET?

Simulated Emergency Test October 20, 21 is a go!

By Steven Ewald, WA4CMS
Assistant Public Service Manager

The ARRL Simulated Emergency Test is a nationwide communications exercise where the Amateur Radio Emergency Service (ARES) and the National Traffic System (NTS) get a workout under simulated disaster conditions; your ARRL Section Leadership team is planning a role for *you*.



Following the Loma Prieta Earthquake in October 1989, KB6JZM (l), and N6SPY handle disaster-related messages from East Bay Amateur Radio Club Station W6CUS at the Richmond Red Cross.

SET Objectives

This test is designed to provide a public demonstration of Amateur Radio's capability to serve many national and community agencies in times of need. The ARRL has national-level agreements with the American Red Cross, Associated Public Safety Communications Officers, Federal Emergency Management Agency, National Communications System, National Weather Service and the Salvation Army. Introducing Amateur Radio to local chapters of these organizations before a real emergency exists could make a big difference in effective communication during an actual crisis.

The SET is a productive time to gain the attention of the news media by preparing press releases and inviting media representatives to your simulated emergency drill. Planning and execution gives participants experience in communications procedures. By putting Amateur Radio public service through its paces, strengths and weaknesses in the system are revealed and a basis for improvement is established.

A Scenario for Success

ARRL Emergency Coordinators (ECs) are urged to design a scenario that involves ARES members, served agencies and traffic handlers. Here's where your imagination can pull together a wide variety of situations and reasons for trying many different communications modes (such as packet radio and AMTOR) to get the messages across. Send SET-related traffic from your location to another ARRL section or division. Remember to request a reply, too!

Results from 1989's Simulated Emergency Test appeared in July 1990 *QST*, pp 41-43. Sample scenarios are presented to give you a few ideas. Although the SET weekend is October 20-21, ARES groups are welcome to conduct their SETs anytime from September 1 through November 30 if an alternative date is preferred. Contact your local EC or Net Manager for details.

Field Organization at Your Service

If you're a newcomer to Amateur Radio public service and are interested in joining ARES or NTS, the Simulated Emergency Test is an ideal time to get acquainted. If you're an experienced operator, SET needs your guidance. If you don't know who to call to participate, contact your ARRL Section Manager (*QST* p 8) for direction. SET guidelines were published in the July issue of *Field Forum* and mailed to all Field Organization officials, station appointees and affiliated clubs. Reporting forms will be mailed separately.

Make 1990 the year *you* get involved in Amateur Radio emergency communications preparations. SET

Strays

BIRDMAN OF ESCONDIDO

☐ One day, I installed an owl decoy to prevent birds from landing on my antennas. No birds ventured near, but later in the afternoon, I noticed a commotion and watched a hawk and six ravens roar through my quad, fortunately missing all ten sets of wires. The hawk, in the lead, then viciously attacked my owl decoy, spinning it around before the formation flew off.

Soon another hawk appeared and landed on the quad. Quads are not the most robust of structures and hawks add a high wind load, so I went into the shack and rotated the antenna back and forth. The hawk seemed to enjoy the ride! Suddenly, he flew down and smacked the owl a good one. Off he went and another hawk took his place. The same thing happened again; the hawk would stare at the owl for a bit, then wham! This continued until dusk.

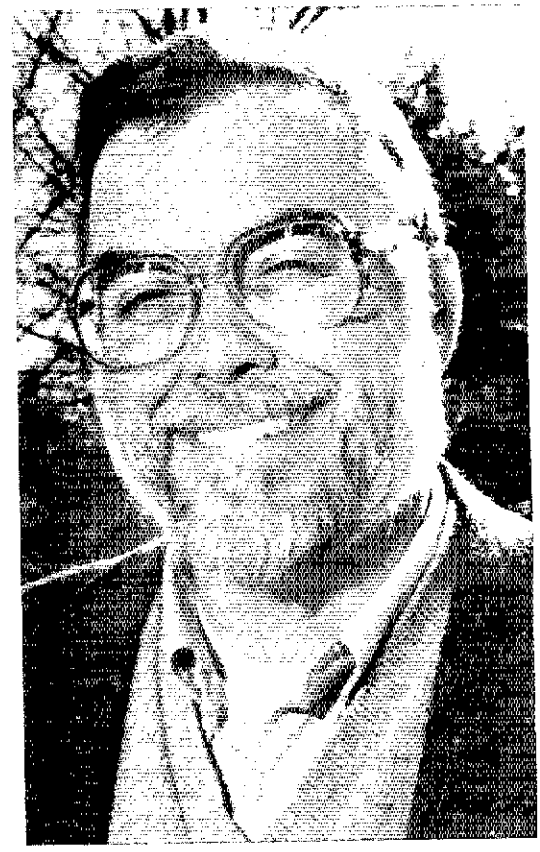
I finally lowered the antenna and removed Mr Owl. Now I put some binding cheese in the bird feeder and just grit my teeth.—*Al Doig, W6NBH*

QST Profile:

Bob Locher, W9KNI—The Key to Success

An old-time "straight key man" who's never without a paddle.

By James D. Cain, K1TN
ARRL Associate Editor



"The Complete DXer" himself, Bob Locher, W9KNI. *(NTØZ photo)*

What's a CW hound with a degree in English to do? Either teach school or make paddles, that's what. In the case of Bob Locher, W9KNI, who basks in the limelight at the top of the DXCC CW Honor Roll, the result rests on thousands of operating desks around the world—the Bencher Paddle.

Today, Bencher, Inc, of which Locher, 47, is executive vice president and co-owner, manufactures the paddles, baluns and low-pass filters with which hams are familiar, as well as hardware for the photography and video industries.

When asked how many paddles he's sold in 15 years, Locher only replies "A lot."

An auspicious record for someone who began his ham career with a straight key.

Locher discovered Amateur Radio in 1955. His early days in the hobby mirrored those of thousands of teenagers in the mid- and late-'50s, except Locher grew up in Cedar Rapids, Iowa, the home of Collins Radio and a hothouse of hamming.

"When I was about twelve years old, I became friends with Mike Collins, the son of Art Collins, WØCXX, founder and then president of Collins Radio," Locher remembers. "Art was an active ham and that's where I got my first real exposure to Amateur Radio."

Art Collins helped Mike and Bob study for Novice tickets. Mike lost interest, but Locher, at age 13, became KNØHGB.

Young Bob's first transmitter was a venerable Heathkit AT-1, a two-tube rig running 25 watts on 80, 40, 20 and 10 meters, and a BC455 war-surplus receiver that covered 6 to 9 "megacycles."

"The possibility of working DX fascinated me," says Locher, "and after a few months I had earned the money to buy a used receiver that would cover 15 meters and a kit transmitter capable of getting out on 15."

After the usual visits from Murphy, the new transmitter was built and working. KNØHGB did his CW sending with a straight key, as virtually every beginner and many old-timers did in the '50s. While electronic keyers were not unknown in 1955—the first, a multitube monstrosity, had been described in *QST* in the late 1940s—the key of choice for seasoned hams was still the "bug," a semiautomatic key that had been around almost since the days of Samuel F. B. Morse himself.

The Vibroplex Company led a number of manufacturers in the bug business. Meanwhile, adventurous individuals were building such famous early keyer designs as the "POO Key" (by K2POO) and many activated the newfangled devices by converting their bugs to electronic keyer paddles.

John Kaye, W6SRY, described the Ultimatic Keyer in early 1955; it used eight dual-triode 12AT7 tubes and was a relayless version of a similar design of two years before. The Ultimatic, using sophisticated timing circuits in a foreshadowing of "squeeze" and "iambic" keying, was mostly a constructor's project; it would take solid-state devices to bring sophisticated keyers into the average ham shack.

Veterans of those early keyer days recall horror stories of trying to find the right relay for the job. The critical relay contact spacing was impossible to obtain in sealed units. Many hams used scraps of paper to shim the contact spacing of an open-air relay. This was why CW operators found their keyer "weight" changing with the humidity.

First Long-Haul DX

KNØHGB, however, flexed his CW muscles on a straight key.

"A neighboring ham helped me get started one night. I plugged in my only 15-meter crystal (Novices were 'rockbound' in those days and most 'tripled' 40-meter crystals to 15), found the crystal frequency in the receiver and heard a station calling CQ. It was JA1ADN! He signed and I gave him a snappy three-by-eight call.

"When I opened the receiver, there he was...working a KN7. I started to move off the frequency in disgust, but my friendly neighbor told me to be patient and try another, shorter call when the JA1 signed.

"I did. My chance came and when I called again, he came back to me! Then and

there I was hooked, hooked badly on DXing.

"Every day, I kept operating, trying to work any DX station that showed up close to my crystal frequencies. I got a G fairly quickly, then a PY4. I snagged a VK one evening. Within weeks, I had five continents. At that time, no Novice had achieved a Worked All Continents award, but W9BRD's How's DX? column in *QST* speculated that it was sure to happen soon.

"I only needed Africa and searched for an African station day after day without luck."

Barely in his teens, Bob suffered the pain of being beaten to the prize; *QST* soon announced the first Novice WAC award. But KNØHGB got his African contact and one of the early Novice WACs. It would be three more years before the first Novice, KN4RID (now WØZV), achieved DXCC.

"In the meantime, I was working for my General class license," Locher remembers, "hardly able to wait for the joys of 20-meter 'phone DX. I passed the exam on the second try, got home and immediately bought a VFO from a local ham. I ordered a screen modulator kit for my rig, wired it up, attached an old crystal microphone and waited for the official license, which finally came.

"My career on 20-meter AM was a disaster, as was my career on 15- and 10-meter 'phone. The best phone QSO I ever had with that gear was on 40 meters with a station 60 miles away. On the higher bands, I went nowhere. But if I slipped down into the CW subbands, I could work the world.

"I found myself spending more and more time on CW, my skills improving with the work. Those were great days for DXing; Danny Weil, VP2VB, and Gus Browning, W4BPD, were showing up from all sorts of places. And conditions were good."

Time Out for Life

College—at Notre Dame—came along, as did a wife—Judith. Children Rob, now 22 (KA9WCO), and Elizabeth, 17, followed and W9KNI was silent for some six years. (Another son, John, is 11). But in 1971, after a brief stay in Dallas and a move to Chicago, Locher returned to the air with renewed enthusiasm and reactivated his DX hunt.

"I had a job in the photographic business with a small firm that made cameras and enlargers, but the company fell on hard times and eventually folded.

"Recognizing the likelihood of that happening, my boss and I had planned a new venture—Bencher, Inc. The day after the old firm was gone, we started up Bencher in the same place with several of the same employees. Our initial product line was a series of copy stands, a common item for photographers."

After a difficult first year, the firm started to grow. George Zielinski, W9OHH (now W9OA), owned a small company making keyer paddles, but had suspended business; Locher and his partner bought the company. The basic design was retained, but Locher and his team found more cost-efficient ways to make the paddle.

Zielinski had patterned his paddle after the legendary FYO Key, designed by Dayton, Ohio, machinist Joe Hills, W8FYO, in the 1960s. Hills produced a limited number of what are now referred to as "Original FYO" paddles. Those remaining are treated as heirlooms for their splendid feel and positive action.

The Bencher plant, now home to 23 employees, is the last metal fabricating operation left in Chicago's Loop, the downtown district once known as a nest of manufacturers.

Bencher's Amateur Radio products make up about 25% of the company's business, the rest being photographic items. While Locher and his crew have from time to time dabbled in such Amateur Radio accessories as audio filters, the Bencher line today is composed of just three successful products: the paddle, baluns and a low-pass filter.

At the Top of the Heap

In 1975, the ARRL Board of Directors approved a CW DXCC award, with contacts to start January 1, 1975.

"At first I was dismayed by it," W9KNI admits. "I was afraid it would bring a lot of new competition into the CW portions of the bands, where, until then, DXing had been a rather gentlemanly pursuit. But, since I fancied myself a CW man, I decided to pursue the award as hard as I could.

"And I did. I received CW DXCC certificate no. 4, but had the most countries of all the original applicants. A year later, an Honor Roll for the award was published and I was fortunate enough to be in the top position."

The first rule of successful DXing is being at the right place at the right time. Early in 1975, W9KNI worked XV5DA and K5CO/5A, two countries that would be absent from the bands for years hence. They kept Locher at the top of the CW Honor Roll.

"Guys on the East Coast missed Vietnam and West Coasters missed Libya. The middle of the country is a lousy place for HF contesting, but pretty handy for DXCC country-chasing," says Locher.

And what does this dedicated CW hound think of the idea of a codeless entry-level license? "I am in favor of it," says the ham at the top of the CW DXCC Honor Roll, "so long as it is restricted to VHF frequencies. Knowledge of CW is required by international law [to operate] below 30 MHz, I still believe some exposure to CW acts as a filter for those allowed access to the highly populated HF bands.

"I hope no-code will produce a healthy infusion of new blood," Locher says, "much as the recruitment of CBers in the mid-1970s did."

English Major Pays Off

At about the time he entered the CW DXCC arena, Locher began writing articles about DXing for the now-defunct *Ham Radio Horizons* magazine. This was W9KNI's first professional writing experience and the articles were well received by *HRH* readers.

"I wrote them from the perspective of life in the trenches for the committed DXer. The reception the articles received encouraged me greatly and I decided to write a book."

In those days, most writers still were confined to the typewriter. Locher waded into the murky waters of word processing with a Radio Shack Model 3 cassette tape-based computer. He learned word processing while storing the files on tape.

Advance copies of the book, entitled *The Complete DX'er*, made their way into reviewers' hands and the praise was unanimous. Written in the *HRH* style that had been so popular, *The Complete DX'er* seemed to be just about everything a beginning country chaser could ask for.

Now in its second edition and third printing, *The Complete DX'er*, a specialized work for a limited audience, has sold some 12,000 copies.

Planned for the future is another Amateur Radio book, as well as something entirely new for this many-talented ham: a novel. In fact, the novel, an historical work based in Ireland, is completed and Locher is shopping for an agent.

Despite a busy life, you can bet that when each of the four DXCC countries he needs on CW becomes available, W9KNI will be there waiting to work them. That's how you get to the top of the heap.

Strays

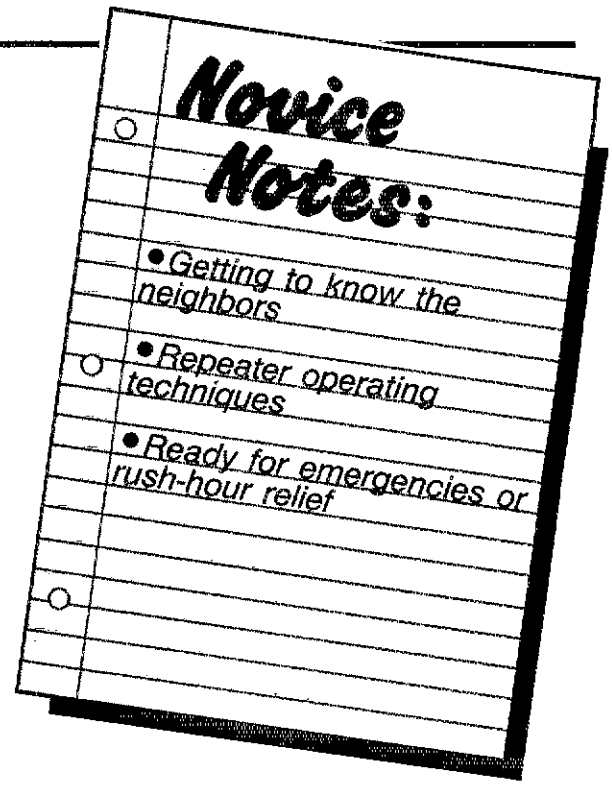
ALL IN THE FAMILY

☐ Andy Robinson, KA3WDW, passed his Novice exam just after his ninth birthday on March 1 and challenged his dad, George, WA3LVR, to upgrade to Amateur Extra Class. Andy just finished third grade at Beaver Creek Elementary School in Downington, Pennsylvania, and his goal is Extra, too. He's studying for his Technician ticket while Dad's practicing for the 20-WPM code test—when he can get near his rig!

I would like to get in touch with...

☐ anyone who would like to volunteer to help me build electronic projects, as I am blind. John C. Bailey, KC4BQI, 4201 Linden St, Fairfax, VA 22030.

VHF/UHF FM—*Part 3:* A Day in the Life of Six-Four



Our first two installments introduced VHF and UHF FM. Here's a look at the real thing.

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

Sizzle is swell, but let's taste the steak: It's time for a repeater ride.

There's the rig, that little black thing. It's a 2-meter transceiver, fairly new with plenty of memory storage, a bright display and 45 watts out. There's a 10-amp power supply underneath (in the car it runs straight from the battery). The antenna is a vertical dipole on the roof, fed with Belden 9913 coax.

It's not 9 AM yet, but the rig's been on a while. Things hop early on weekdays, with the morning rush hour and many mobile hams. In greater Boston we enjoy many repeaters, but this one's among the busiest. In fact, the rush hours have nicknames: The Morning Show and the Going Home Show. Mornings are free-form, but Kathy runs the Going Home Show; the gracious voice of KA1IYR is known far and wide. You'll meet her this afternoon.

WA1GEP/R is operated by the Waltham Amateur Radio Association. It's called "the Six-Four" because of its frequency, 146.64 MHz, or "the Waltham machine," because it's in Waltham, Massachusetts. From dawn until now, Six-Four commuters ask about traffic: "How's the Mass Pike inbound?" Nine times out of 10, somebody can tell them firsthand.

Tuning In

"Yeah, I was just through there. Everything's moving nicely. Over to you, Elliot, this is KA1OXQ."

One-second pause.

"Thanks, Kenny, this is W1MJ. I hope everyone had a good weekend. Nothing to report here, except it's nice to be rid of that humidity. I just got on the road, so I'll be here a while. Over to W1TMO. Good morning, Dave, how're things in the packet world?"

Pause.

"Good morning, Elliot. This is W1TMO and packet is doing nicely, thank you. We just mailed the latest issue of the *Packetear* and you ought to be getting it in a day or two. Other than that, everything's fine out here in Needham. I think it goes to Jim, KA1ANT."

"KC1BN."

Pause.

"Welcome aboard, Laurie. Go ahead, how's Sherman this morning?"

Pause.

"This is KC1BN. Oh, Sherman's fine. I traded a man some work on his piano for some work on Sherman. Perfect morning for a ride, I'd say. It goes to Jim, right?"

Pause.

"Right. KA1ANT here. Since Dave made an announcement about the packet newsletter, I'll get on the soapbox, too. There's a meeting Saturday morning for all of you involved in JOTA, the Boy Scouts' Jamboree-on-the-Air. Nine o'clock, at the Masonic Hall in Needham. Back to you, Kenny."

"Traffic!"

"Traffic, go."

Pause.

"This is NS1R. We have a fender-bender on Route 128 southbound near Route 20. Troopers on the scene, no injuries, but stay to the left if you can. I think it goes to Kenny, 'OXQ."

Pause.

"Thanks, Steve. Well, I'm almost at my first job, so I'll drop out here. See you guys later and don't take any wooden nickels. This is KA1OXQ."

Pause...

Squelch On

Let's discuss what we heard. You can learn a lot from that little chatter. First, I should explain Sherman. That's KC1BN's bicycle, the one he rides to work in Boston everyday; it's Sherman, as in tank!

If you were alert, you noticed some other things:

- Repeater transmissions are short, often *very* short, so more stations can be on at one time. Rush hour means most will only be on a finite period, ie, during their commute, so they'll all get several turns to speak.
- There's a loosely defined order, a circle. Each station in the loop tries to remember who follows and turns it over to that station.
- Everyone pauses for a second before transmitting, leaving room for new stations to join or sign out. Occasionally, a station will speak out of turn, but they try to maintain the loop. That prevents time-wasting *doubles*, people transmitting at the same time.
- On Six-Four, the word "traffic" gets priority. That means somebody wants to report road conditions or an accident. Different repeaters have different customs; that's Waltham's way. A couple of days on a new machine and you'll learn the local procedure.
- When KC1BN wanted to join the group, he dropped his call in during a pause—he did *not* say the word "break." Again, customs vary, but on many repeaters, "break" means an emergency. If the accident reported by NS1R was serious and apparently unreported, he

would have been justified in saying "break," but folks who say "break" just to join the loop are likely to hear about it. Local custom again, but it's so elsewhere.

About pauses: They permit comings and goings, but they also allow the repeater to *reset*, which is critical. Repeater licensees set their machines on timers to limit users from monopolizing the repeater and to keep the back-and-forth conversation flowing. (By FCC rule, repeaters must be configured to automatically shut themselves down after no more than three minutes of uncontrolled operation to avoid a malfunction that could result in continuous transmission.) The shorter the *time-out* setting, the less time a ham has to wait for a chance to join in or make a call. Most repeaters time-out sooner, in most cases much sooner, sometimes in only 30 or 45 seconds! That is, they just stop. They're usually off for a short period, then come back on with an automatic ID, either synthesized voice or CW. Some repeaters are outfitted with fancy computerized controllers and they may have distinctive digitally recorded voice messages to announce the fact that someone "timed-out." Repeaters are transmitters and must identify themselves, on voice or CW, every 10 minutes or less, just like you.

Timing-out a machine is no felony, but offenders run the risk of good-natured derision. Repeat offenders, however, can be a pain. On some repeaters, a little beep signifies the timer has reset, though Six-Four is not configured that way; it resets after only a short pause.

Squelch Off

It's late afternoon now. Let's see if Kathy's fired up the Going Home Show:

"Yeah, it was a great weekend. I'm looking forward to the next one. Back to you, Earl. This is K1PDH."

"I'm almost back at the shop, Ed, so I won't hold it. Have a good one and see you soon. N1AXG mobile."

No, I guess Kathy's late. She's usually home and she has an excellent memory for names and calls, for who is doing what. She's congenial and unflappable. The consensus long ago was to elect her as Six-Four's PM hostess. She ought to be here any minute...

"This is KA1IYR. Anyone around?"

Aha! Let's say hello: "KM1G, Kathy."

"Oh, hi, Rick. Got you down. Anybody else?"

"KA1OXQ."

"K1PDH." (some static in background).

"NS1R."

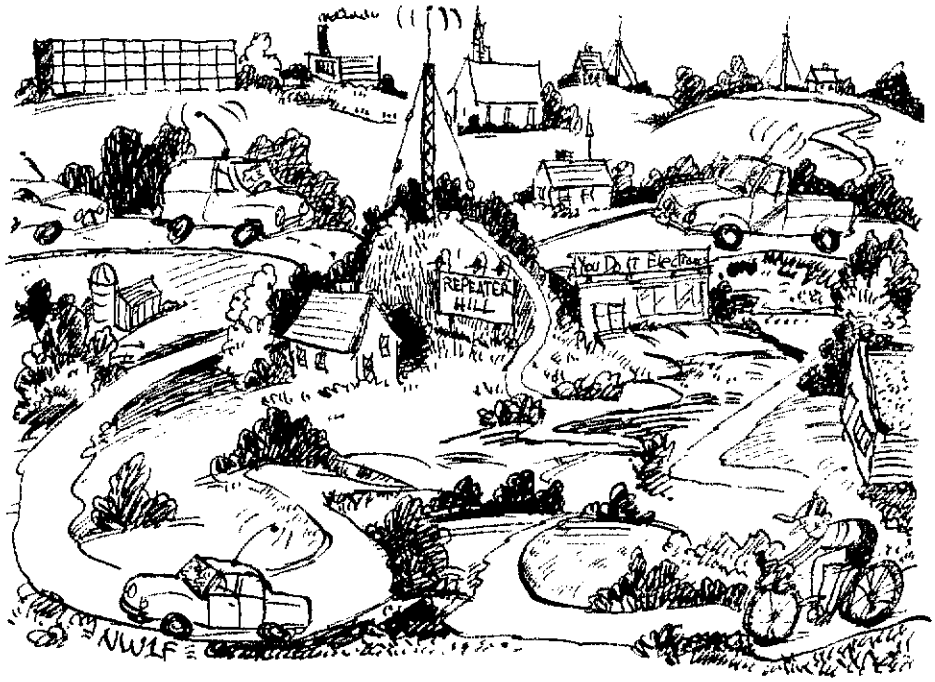
"KC1BN."

"NG1I."

"This is KA1IYR, good afternoon Ken, Eddie, Steve, Laurie and Frank. Eddie, K1PDH, you're scratchy, you must be getting out of range. Anyone else?"

"AI1D."

"There's a new call. AI1D, your name, and may we help you?"



"Yes. My name's Gene and I'm almost in town, home is Connecticut. I wondered if Customs House is walkable from Quincy Market."

"Yes, it is. Just a short walk."

"Thanks. I won't stay. 'Bye now, AI1D clear."

"Fine, Gene. Stop by anytime. Anyone else for the Going Home Show?" (long pause) "No? Okay, how are things on the roads. Anything anybody wants to report?"

Long pause.

"KM1G, Kathy."

"Go ahead, Rick."

"I've got a guest in the shack, I'll be listening. Just wanted to say hello. Got the landline here if you need it."

"Okay, thanks, Rick, and hello to your friend. Now, Kenny, how's everything..."

Well, Kathy's got the show running fine. Fixed stations, like us, usually say so, so she knows who's near a phone. That way, if somebody calls in an accident she stays on the air while another home station phones the police. Otherwise, she'd do it and leave the loop to fend for itself. The repeater has *autopatch*, a telephone link, but it ties up the machine during rush hour, so she avoids it when she can. Let's listen some more:

"This is KA1IYR. We've finished the first go-around. Anybody else?" (pause) "Okay, Jim's told about the JOTA meeting on Saturday and the *Packeteer* is in the mail. Any other announcements?"

"Traffic!"

"Traffic, go."

"An accident on Route 128 south, near the exit for Route 3. Just happened. Doesn't look like there are any injuries. Call it in?"

"Rick, can you take it?"

"Sure, Kathy. KM1G's got it. Be right back."

The index card tacked to my wall has the Massachusetts State Police telephone number listed. Excuse me while I dial... There, all done. These troopers know their stuff. I'll tell Kathy at the next pause...

"KM1G."

"Yes, Rick?"

"They're on the way, Kathy. Do you have any other home stations on to help with the next one? I'd like to see to my guest."

"Fine, Rick, I have a couple. 'Bye now and have a nice night. Now, what was today's topic? Oh, yes, the Hubble telescope. Kenny, 'OXQ, you had a comment?"

Over to You

There, we'll turn the rig down again. Kathy's a great catalyst, she gets topics going. You never know what it'll be and that's another reason people like the Going Home Show. It's stimulating, talk radio with a twist. Not all repeaters are used in such a structured manner, but each has etiquette and customs that permit users to communicate effectively. Public service plays a major role on FM repeaters. Aside from their widespread use in support of local emergencies and community events, they are a vital part of the ARRL National Traffic System. The traffic nets on FM repeaters are probably the easiest and most often-used method for newcomers to become active in formal traffic handling.

That's a taste of FM on 2-meters; you'll find 6 meters, 220, 70 cm and 23 cm essentially the same, though perhaps a little less busy in some areas. Novice Enhancement has meant a lot to 220 and dual-band rigs put more folks on 70 cm every day. FM is rising fast.

And so, I take it, is your interest. Good for you. Keep up with FM repeater operating with the FM/RPT column in *QST*, and welcome aboard.

A Father and Son DXpedition, Portable C6A

A family shares an exciting DX adventure to an island in the Bahamas originally discovered by Christopher Columbus.

By William C. Wilkinson, N2HOH
55 Littlebrook Road North
Princeton, NJ 08540

One evening last October, as I was nodding over an Agatha Christie mystery, the phone rang. It was my son, Henry, calling from Champaign, Illinois, not in itself an unusual event. However, his opening comments were, "Dad, why don't you get back into ham radio?" he asked.

If he had asked why I didn't take a trip to Mars, I might have had a good answer. As it happened, I muttered something about leaving engineering and technical matters for a life of retirement and relaxation. Little did I realize what that question augured or what memories it would bring back.

In 1946, 10 months after my wife and I had married, I was passing out cigars at the RCA Laboratories to celebrate the birth of our first son. I stopped at Clarence Tuska's office (Tuska had been one of the co-founders of the ARRL three decades earlier) and after electing a choice Havana, he kindly remarked, "Wilk, you don't know it, but your problems have just started. They won't ever end, they just change in type." Portentous words that came back to me many times, but never so prophetic as in regard to this seemingly innocent phone call.

Two days later, UPS deposited a long package on my front steps. Curiously, I carried the box to the basement and unwrapped what I thought might be some new gardening tool. What's this—a Butternut vertical antenna! A check of the dates on the UPS paperwork showed that the antenna had already been in transit at the time of my son's phone call. A conspiracy was afoot!

Rediscovering Ham Radio

That vertical brought back all kinds of memories. More than 50 years had passed since I had been issued W9TKG in Oxford, Indiana. In the interim years, I had obtained commercial licenses for phone and code, spent two years on salt water and four summers as chief radio operator on Great Lakes passenger ships, received a degree and spent 45 years in radio and communication engineering. My last contact with Morse code had been in 1944 in a Grumman TBF flying at 50 feet over Block Island Sound, working a just-surfaced (friendly) submarine, the key strapped to my leg, while testing an automatic bomb-release radar. Being a full-time, full-fledged electrical design engineer was quite enough, thank you, so I dropped out of ham radio.



The author and his son, KA9ZLS, and their A-Frame antenna mast outside the sunny DXpedition location on San Salvador Island, Bahamas.

The receipt of the Butternut, however, was not an isolated event. A Kenwood TS-440S transceiver followed, plus 100 feet of coaxial cable; connectors, recent issues of *QST* and a complete set of ARRL *License Manuals* then showed up. Some of this I *think* I purchased, other material just "appeared." Within a month, I was geared up for the Novice exam and much to my surprise (and the examiners', I suppose), I passed. I was back in ham radio!

A DXpedition Takes Shape

Gradually, I began to sense what was really going on. Henry, who had never shown an interest in anything electrical other than a wall switch, was now a plant pathologist and had decided that he needed a vacation cottage in the Bahamas to perform his research. He had selected the Bahamian island of San Salvador (accepted by some authorities as the first landing site of Christopher Columbus in the New World in 1492). The only communication with the remainder of the island from this isolated spot is via Marine Channel 16. Thus, ham radio appealed to him as a logical and useful adjunct. I was to be his support, counselor and fellow operator.

The pace started to pick up in the months immediately preceding our trip to the island. My son obtained his Novice ticket (KA9ZLS) as I worked my way up to Advanced. We set up a daily schedule on 80 meters so I could help him improve his code speed. I was delegated the responsibility for planning, designing and equipping the island installation, including taking care of the legal aspects.

Planning and Preparation

Getting licensed proved to be the simplest part of the project. By following the reciprocal operating information supplied

by the Regulatory Information Department at ARRL HQ, I had no difficulty securing the necessary authorizations from Bahamian Telecommunications and Customs. The Bahamian officials were helpful, courteous and understanding.

After consulting *The ARRL Handbook* and the *ARRL Antenna Book*, I decided the antenna system should be a simple length of horizontal wire, an inverted V or some other wire configuration. The radio would, naturally, be the TS-440S; it was compact, could run directly off a 12-volt battery, had general-coverage receive capability and could feed almost any antenna using its internal automatic tuner.

I feverishly ransacked the basement, garage and local hardware stores for supplies and tools, accumulating them in a pile on the basement floor. As departure time approached, I borrowed a fish scale and started weighing. I ended up with two piles, a large one that would not go with us and a small one that would. To stay within the weight limits for international air travel, I carried the TS-440 on board and checked a soft bag with 44 pounds of wire, bolts, insulators, coax, nylon line, pulleys and a few clothes.

Nassau—Our First Stop

Henry and I flew to Nassau, the capital of the Bahamas (our wives were to follow later) and immediately started a frantic 24 hours of "seek and purchase." Time was of the essence, because the mail boat to San Salvador was to leave in 36 hours and *all* of our cargo, much of which we had to purchase in Nassau, had to be on board well in advance.

We needed wheels to assemble what we wanted, so Henry rented a Volkswagen Beetle with the idea that it would be easy to maneuver in the narrow streets of Nassau. In the Bahamas, people still drive on the left. I decided to let him do all the driving! Bahamians in Nassau are courteous, but tend to be impatient. Luckily, our sorties down the wrong side of the streets were not many, but always exciting.

Aside from buying paint, grout, refrigerators, generator and car parts, we had a 90-ampere-hour battery built and ordered four (one spare) 20-foot pieces of board for an A-Frame antenna mast, as described in the *ARRL Antenna Book*. It was hectic, but we managed to get all of our supplies (the stuff we brought with us from stateside and the things we acquired locally in Nassau) aboard the mail boat in time. All we had left to be concerned with was transporting the human cargo, Henry and me! But that was the simple part (or so we thought). We would be catching a plane for San Salvador the following day.

The next morning, we arrived at the airport check-in counter just 30 minutes ahead of take-off time for our flight to San Salvador. Unfortunately, we were told that the plane was full, our reservations notwithstanding. There would not be another flight for several days.

Fortunately, there was another chap in the same boat, or perhaps we should say, not on the same plane! To our further good fortune, he was a police constable going to San Salvador to attend a judicial inquiry. An airline supervisor was consulted and within minutes, all three of us were on a small plane headed for our island.

Arrival in San Salvador

When our plane landed (just ahead of the regular flight we had not been permitted to board), we found what appeared to be the entire island there to greet us. Everyone on the island, it seemed, showed up for the arrival of aircraft, as they did for (we were later to find out) the mail boat.

Our first task was to get the house (unoccupied for three years) into living condition and all the utilities running. Ham radio had to wait, as we worked day and night getting the place into shape. The local jungle had moved in; a machete and some sweat allowed us to beat the growth into something of a retreat, at least temporarily. It took several days of this before I had my first glimpse of the Atlantic, only a few hundred feet distant.

On the Air

Finally, we took a few hours off from our housekeeping chores, strung a wire out to the generator house (about 65 feet long and seven feet above the sand) and fed it with coax and a long ground wire connected to a pipe in the sand. We matched the antenna using the TS-440's internal tuner, and N2HOH/C6A was on the air! We started making contacts on 80 meters; I did most of the operating, with Henry (a relatively new ham) logging, cheering me on and learning. The states began to roll in, Georgia having first honors.

Our Ship Comes In

On mail-boat day, we hurried to the dock with the rest of the islanders to monitor the unloading, a wondrous sight indeed. Contrary to the usual tales of the tropics, all our material (except the refrigerators which showed up the following week) arrived unscathed and were deposited safely on the dock, including our beautiful lumber for the A-Frame.

With arrival of the lumber, we put the mast together and erected it, all in a few hours, just as the books had assured us. We put up an inverted V and the Bahamian and US flags. We were ready to knock 'em dead.

By this time, our wives had arrived from the states. The good news was that they came loaded with food. The bad news was that now all plumbing had to be kept in complete working order! As the water-pressure sensing system was faulty, the electrical system needed to be continuously on to obtain water. Then the generator failed.

When that happened, buckets had to be bailed from the cistern for all water requirements. Eventually the island's only plumber and the island's only mechanic combined forces and solved our plumbing problems and refurbished the old diesel.

Sun and Fun

From then on, life was serene. A tropical life—swimming, snorkeling, fishing, conching and hammocking. Radio operating was mainly reserved for the evening hours. We made hundreds of contacts with the US and the rest of the world, missing only five states for WAS (Alaska, Arkansas, Idaho, Nevada and Mississippi, where were you?). We spent most of our time on 80 meters, using the random wire and the inverted V.

It was a great family reunion and a wonderful opportunity for me to rediscover Amateur Radio. To be able to share that rediscovery with my son was the icing on the cake. We all had a wonderful time and we are, of course, already planning a return trip.

And now that I'm back in ham radio, I'm back for good!

Strays

DX AID FOR SIGHTLESS HAMS

☐ Larry Cox, WA6AIL, has prepared a DX reference guide in Braille that contains The ARRL DXCC Countries List showing ITU Zones, current and previous prefixes, beam headings, distances, propagation basics, and more. To get your copy, write to the San Diego Braille Transcriber's Guild, 1807 Upas Street, San Diego, CA 92103. The guide sells for $4.15 on paper and $7.40 on thermoform.

MORE COMPUTER ENTHUSIASTS

☐ If you're a ham who was first a computer user, the ARRL would like to hear from you. Ideas are needed to help recruit computer hobbyists into ham radio. Let us know what aspects of Amateur Radio motivated you to get your license, how you heard about Amateur Radio, what you would suggest to get the attention of other computer users and any other ideas or suggestions you have. Contact Rosalie White, WA1STO, Educational Activities Manager at ARRL Headquarters.

QST congratulates...

☐ Author and Georgia Southern Professor Emeritus David Ward, WB4FTZ, has been named one of only 10 people ever to receive Auburn University's Achievement Award in the Humanities. Ward retired in 1986 after 31 years as a professor in Georgia Southern's Department of History, but continues to write books and pieces for professional journals. Three $1000 scholarships have been established in his name at his alma mater.

JOTA Needs You

Open your station to youngsters and make the annual Boy Scout Jamboree on the Air a success!

By Dan Dansby, W5URI
ARRL North Texas Section Manager
5805 Walla Ave
Fort Worth, TX 76133

One of the widest-ranging communications events in the world is coming up and you can be in on it. It's the Jamboree on the Air (JOTA), linking Scouts worldwide via the exciting medium of Amateur Radio. It began in May 1958 as a way to unite "brothers and sisters" from scores of countries. Close to a half-million participants take part in the festivities, now held the third full weekend in October. JOTA is sponsored by the World Scout Bureau of the World Organization of the Scout Movement.

In case you've heard of JOTA but never knew what it had to do with you, read on. All licensed amateurs are invited to get involved simply by opening the doors of their shacks to a Scout or Scout group. If you don't know any Scout groups in your area, most telephone books list Boy Scouts and Girl Scouts (hint: Is your ham radio club listed there?). Call them and ask if they'd like to visit your shack to get on the air.

Step Outside

If you'd rather be a little bit different, set up a Field Day-type operation at a Scout Camporee that weekend. Perhaps organizing a foxhunt would be fun—Scouts are good at tracking, map reading and orienteering. Remember that some current or former Scouts and Scouters may be shut-ins and would be thrilled to have you visit them with a portable rig.

If you're a Scouter or former Scout, jump right in. Girl Scouts, Cub Scouts, Girl Guides, Explorers, Venturers, Webelos, Campfire Girls or nonscout amateurs with a desire to do a good turn for Scouting or Amateur Radio are invited to get in on the fun. Before the event begins, make sure to notify the news media.

What Happens on the Air?

A JOTA exchange generally consists of name, QTH, Scout rank, hobbies and any other information you'd like to share. You could easily work enough stations to earn WAS or even DXCC during this single event. It begins at about 0000 local time Saturday, October 20, 1990, and ends at around 2400 Sunday, October 21, 1990. You can call or answer "CQ Jamboree." Calling frequencies are as follows:

CW—3.590, 7.030, 14.070, 21.140, 28.190

Phone—3.940, 7.290, 14.290, 21.360, 28.350

(Please move off these frequencies once a contact has been established.)

You can expect activity on CW, phone, amateur television (slow- and fast-scan), packet, RTTY, AMTOR, EME, and via amateur satellites. Special-event stations will abound, such as K2BSA/1, K2BSA/2, K2BSA/3, etc, from locations all over the US. In past JOTAs, Scouts have been heard on the air from Antarctica, Christmas Island, Seychelles, The Falklands, Ascension Island and many other remote places.

Unlicensed Scouts who participate as guests at your station must be limited to stateside contacts and DX QSOs only with stations in countries that have current third-party agreements with the US. For a list of valid countries for third-party contacts, get in touch with the Regulatory Information Department at ARRL HQ.

No Paperwork Necessary

JOTA is not a contest and there is no need to fill out special forms. If you'd like to report your station's activity, however, you're invited to submit a summary of your JOTA activity to JOTA Coordinator, International Division, BSA, PO Box 152079, 1325 Walnut Hill La, Irving, TX 75215-2079. Photos and captions are welcome, too, for possible use in the BSA report to the World Bureau.

Anyone who takes part is eligible for a free Certificate of Participation. Patches and pins are also available. There's a free brochure available that describes ideas for activities before, during and after JOTA. For information, send an SASE to the address above. The ARRL has two free brochures, *Scouts On-the-Air* and "generic" youth-oriented ones for non-Scouts that you can request from the Educational Activities Department by sending an SASE to HQ.

JOTA is your chance to help publicize Amateur Radio and Scouting, help get some youngsters interested in becoming hams and have fun by being a part of a memorable worldwide communications event.

GREATER BOSTON COUNCIL • TWO RIVERS DISTRICT
• JAMBOREE ON THE AIR •
K2BSA/1



One of many K2BSA operations. *(WB2TRN photo)*

New Products

COMPUTER CW-KEYBOARD PROGRAM AND INTERFACE KIT

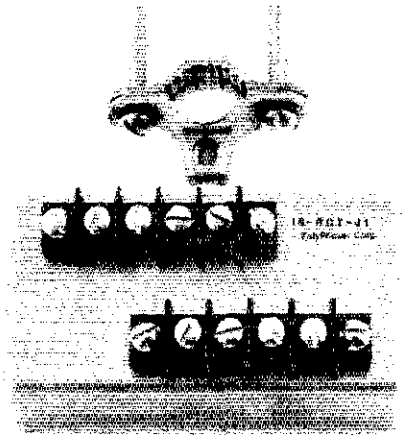
☐ Electrosoft has introduced a CW keyboard program and interface kit for IBM® PC and compatible computers. The program/interface keys your transmitter via one of the computer's serial ports. Speed is adjustable in 1-WPM steps from 5 to 100 WPM, and weighting (dot-to-dash ratio) is adjustable from 21% to 45%. Ten 200-character buffers allow storage of commonly sent text, and a repeat function allows CQs or beacon messages to be sent at an adjustable delay. An incrementing-serial-number feature is included for contesters.

The battery-operated interface circuit takes less than an hour to assemble, includes a shielded cable and all other required parts except the transmitter-keying plug, and is small enough to be mounted inside the computer or a radio. The circuit uses a reed relay and can key virtually any transmitter, regardless of polarity, open-circuit voltage or closed-circuit current.

Prices: program and interface kit, $50; program only, $25. Specify your choice of 5.25- or 3.5-inch diskette when ordering. To order, or for more information, contact Electrosoft, 3413 N Duffield Ave, Loveland, CO 80538.

ROTATOR SPIKE PROTECTOR

☐ PolyPhaser Corp of Minden, Nevada, manufactures a line of equipment for lightning and EMP protection, including the model IS-RCT rotator-control-line protector. The IS-RCT handles up to eight control lines and is mounted in a water-resistant, die-cast-aluminum enclosure. A bronze clamp allows mounting to a ½- to 2¼-inch tower leg or mast. Each control line is protected individually. Ratings: minimum clamping voltage, 35; turn-on time, 4 ns; maximum surge, 2 kA per line.



For more information about PolyPhaser products, contact them at PO Box 9000, Minden, NV 89423-9000, tel 800-325-7170 or 702-782-2511.

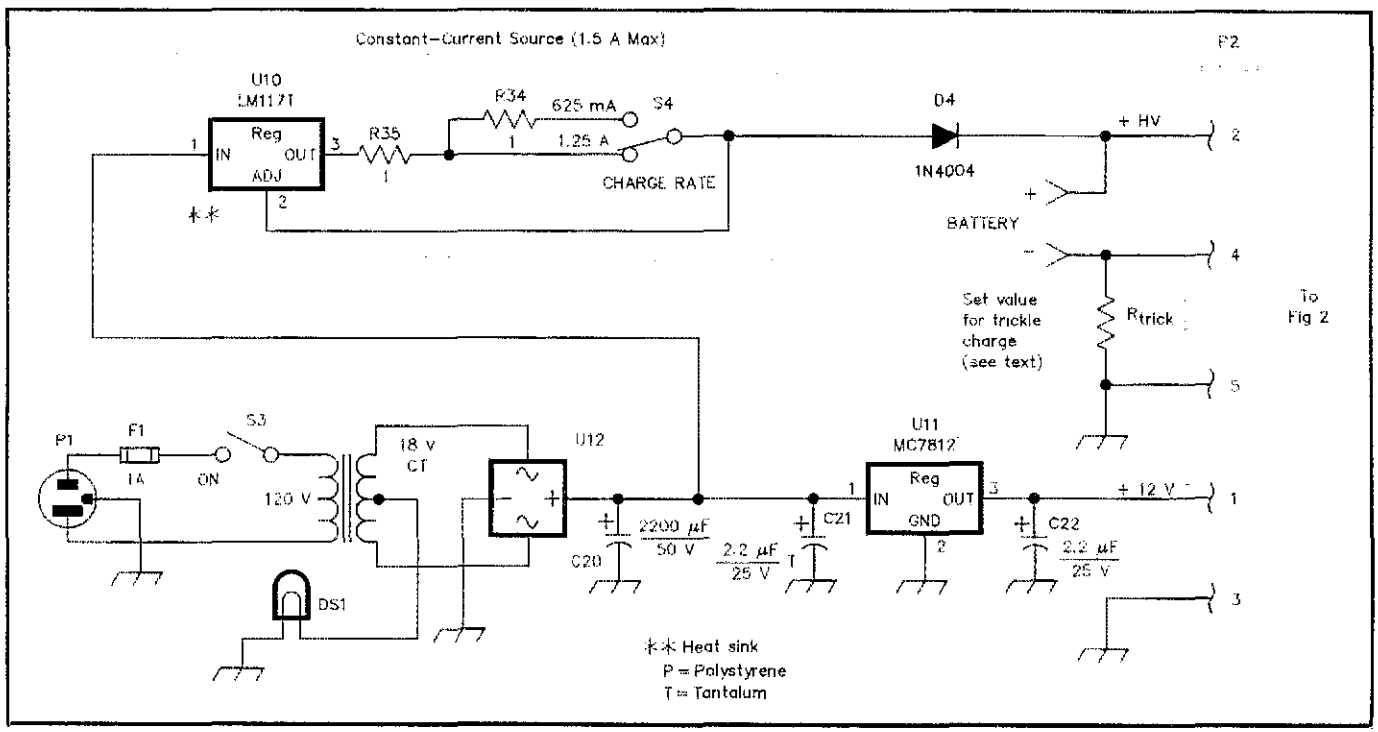
RF CONCEPTS DUAL-BAND "BRICK"

☐ RF Concepts has introduced the RFC 2-70, a dual-band amplifier intended for use with hand-helds that cover the 144- and 440-MHz bands. The amplifier takes 5 W input on both bands and provides 30 W output on 440 MHz and 25 W output on 144 MHz. Automatic band switching and GaAsFET preamplifiers for each band are also featured.

Manufacturer's suggested price: $269. For more information, contact your dealer or RF Concepts, PO Box 11039, Reno, NV 89510, tel 702-827-0133.

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

Feedback



Incorrect pin connections for P2 are shown in Fig 1 of "A Microcomputer-Controlled NiCd Battery Charger," *QST*, Aug 1990, p 17. This drawing shows the correct connections for P2.

Board Affirms Code-free License Stance

The ARRL Board of Directors meets in Hartford, July 20-21.

By Rick Palm, K1CE
Field Services Manager

The heat was on—not only outside as Hartford sizzled, but inside the Board room as well. Your elected policymakers considered a number of hot issues including the FCC's code-free license proposal and WARC-92 preparation when they gathered for their second meeting of the year, July 20-21.

League to Tell FCC: Keep Novice and Technician!

The Board of Directors stood by its assertion that a code-free license should be an *alternative* means of entry into Amateur Radio, not a substitute for the successful Novice license. The Board strongly endorsed retention of the Novice and Technician class licenses, and said the next upgrading step for both Novice and Communicator should be Technician. The Board also supported inclusion of Novice testing in the Volunteer Examiner program, with accredited General Class amateurs eligible to give Novice, Communicator and Technician exams. League comments to be filed in the FCC's code-free license proceeding will reflect the Board's position. (See Minute 22).

WARC-92 Planning: Full Speed Ahead

In reports to the Board, ARRL President Larry Price, W4RA, and Executive Vice President David Sumner, K1ZZ, highlighted preparations for WARC-92 by the ARRL and International Amateur Radio Union (IARU). Sumner addressed the possibility of expansion of the high-frequency broadcasting bands and its potential impact on the amateur bands. In particular, he described efforts to maintain a 300-kHz amateur band at 40 meters.

Sumner reported further on increased demand for UHF spectrum by new land mobile and mobile-satellite systems. He stressed the importance of continued Amateur Radio technical development in the light of future competition for spectrum.

Happy Birthday, Samuel F. B. Morse

Code aficionados will be happy to learn that the Board approved a one-time specialty certificate, The Samuel F. B. Morse Bicentennial Code Proficiency Award. The award program will commence April 27, 1991, to commemorate the bicentennial of Morse's birthday, April 27, 1791. (See Minute 16).

The Volunteer Resources Committee conveyed to the Board National Traffic System officials' recommendations for the maintenance of existing system structure, with some enhancement to accommodate the increased use of digital modes.

The Board adopted a VHF Repeater Advisory Committee proposal to provide a US map in the *Repeater Directory* depicting states using a 15-kHz separa-

Table 1
Summary of Major Board Actions

Minute	Purpose	Disposition
Regulatory		
22	Affirm Code-free stance	Adopted
Operating and Awards		
16	Samuel Morse Bicentennial Certificate	Adopted
38	MSC study VRAC-proposed 6-meter band plan	Adopted
41	PSAC study PSHR qualifying criteria	Adopted
44	N7NGT, 1989 Maxim Award winner	Adopted
45	New National Certificate of Merit	Adopted
48	KD4QA, 1989 Professional Instructor	Adopted
53	N4ICK, 1989 Technical Excellence Award	Adopted
54	MSC study assistance to Awards Manager	Adopted
58	VUAC review FCC emission standards	Adopted
61	AA6DJ, 1989 Herb S. Brier Instructor	Adopted
63	Lloyd and Iris Colvin, goodwill ambassadors	Adopted
Organizational		
20, 23-31, 46, 47	Articles, By-Laws Amendments	Adopted
49	Naoki Akiyama, NX1L, thanked for service	Adopted
52	Official QSL cards for SMs	Lost
57	Long Range Planning Committee to include Directors/Vice Directors	Adopted
60	SSCs, IARU societies to receive contest forms	Adopted
64	National Convention selection procedure	Adopted
65	VRC study club affiliation procedure	Adopted
66	Staff survey bulletin stations	Adopted
67	Guidelines for mail votes of Board	Adopted
68	VRC study putting Amateur Auxiliary provisions in Field Organization regs	Adopted
69	IARU votes to be cast	Adopted
Publications		
37	Repeater Directory 15- and 20-kHz map	Adopted
51	Staff study antenna gain figures ad policy	Adopted

Committee Reports Available

Copies of the reports of the Standing Committees of the Board, Ad Hoc Committees and Advisory Committees are available to members for the cost of reproduction and mailing. Here is a list of these reports as presented at the 1990 Second Meeting of the Board, with the number of pages and the cost. The absence of a report from this list means that no written report was submitted.

Please order by document number and include remittance with your order. Send orders to the Secretary, ARRL.

Committee	*Document No.*	*Pages*	*Cost*
Administration & Finance	12	3	$1.00
Membership Services	13	28	3.00
Publications	14	2	1.00
Volunteer Resources	15	10	2.00
Executive	16	1	1.00
Election	17	1	1.00
Bylaws	20	4	1.00
RFI Task Group	21	1	1.00
Bioeffects	22	1	1.00
Digital Communications	23	3	1.00
Legal Strategy	24	6	1.00
VHF Repeater Advisory	25	7	1.00
Contest Advisory	26	2	1.00
DX Advisory	27	50	5.00
Public Service Advisory	28	4	1.00
VHF/UHF Advisory	29	2	1.00

tion between repeaters and those using 20-kHz separation in the 2-meter band. (See Minute 37).

In light of the recent expansion of the 6-meter repeater subband, the Membership Services Committee will study a VRAC-suggested band plan for reapportionment of the band. (See Minute 38).

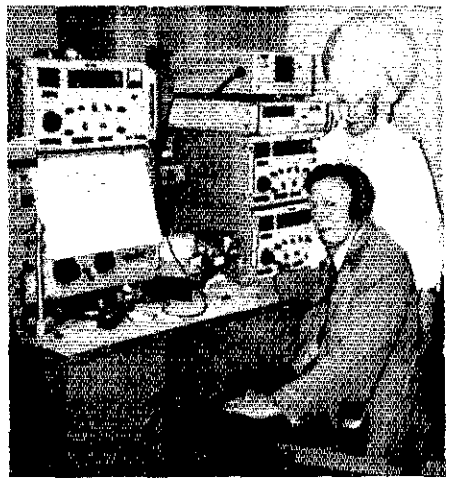
The Board asked the Public Service Advisory Committee to continue its efforts in determining a more acceptable set of qualifying rules for the popular Public Service Honor Roll. The committee will make a full report to the Board next January. (See Minute 41).

Goodwill Ambassadors Lloyd and Iris Colvin, W6QL and W6KG

For their longtime devotion to enhancing international goodwill through countless DXpeditions, the Board bestowed upon Iris and Lloyd Colvin, W6QL and W6KG, the title of Amateur Radio Ambassadors of the Decade 1980-1990. (See Minute 63).

Shauna Richards, N7NGT, was selected winner of the 1989 Hiram Percy Maxim Memorial Award for excellence in technical achievement, organizational affairs, operating, recruitment and training, and public relations by a young amateur. (See Minute 44).

Andre Kesteloot, N4ICK, got the Board's nod for the 1989 Technical Excellence Award for his May 1989 *QST* article, "A Practical Direct-Sequence Spread-Spectrum UHF Link." (See Minute 53).



The ARRL Board of Directors named Lloyd and Iris Colvin, W6KG and W6QL, Amateur Radio Ambassadors of the Decade 1980-1990. In making the award, the Board recognized their countless DXpeditions, spreading international goodwill throughout the globe on behalf of hams everywhere. See "Radio Roulette in the Soviet Union," April 1990 *QST*, for an example of their recent efforts.

Gerald Kasselmann, KD4QA, and Lyle Aufranc, AA6DJ, were selected ARRL Professional Instructor of the Year, and Herb S. Brier Instructor of the Year, respectively. (See Minutes 48 and 61).

To recognize achievements of members contributing with substantial national impact to the furtherance of the goals of Amateur Radio, the Board created the ARRL "National Certificate of Merit." The award will be bestowed by the President following approval of the Executive Committee or the full Board. (See Minute 45).

Thanks

The Board thanked departing staff member Naoki Akiyama, NX1L, for his eight years of service in the international arena to the League, the International Secretariat and IARU member-societies. (See Minute 49).

What are "The Minutes"?

The League's Board members meet twice a year to decide policy issues affecting the ARRL, Amateur Radio and you. That's their job—you elected them to lead your organization.

When they meet, Directors bring to the table opinions they have developed as a result of input received from you. And, of course, opinions can vary—a lot! Because there are fifteen directors present, all with diverse member input, they employ *Robert's Rules of Order* to provide for efficient discharge of a considerable amount of business.

Motions (proposals for official Board action) are made by one Board member, *seconded* by another to open up discussion, and are ultimately either adopted, lost, postponed, amended, referred to committee, or tabled. Motions adopted become official League policy.

The *Minutes* are the *official* record of the meeting, showing motions adopted or otherwise handled. If a question arises as to Board intent, the President has the responsibility of interpreting the will of the Board. The minutes may look like the fine print on your insurance policy, but they are important to you in that they detail the action of the Board on items that will certainly affect your Amateur Radio activities. Read them! And when a Board action comes up for discussion on your repeater roundtable, you can speak with the facts as an authority.

Moved and Seconded ...

MINUTES OF THE 1990 SECOND MEETING OF THE BOARD OF DIRECTORS THE AMERICAN RADIO RELAY LEAGUE, INC. JULY 20-21, 1990

SUMMARY AGENDA

1. Roll Call
2. Moment of Silence
3. Consideration of the Agenda for the Meeting
4. Approval of the Minutes of the 1990 Annual Meeting
5. Reports by the Officers
6. Receive Reports and Consider Recommendations of the Committees
7. Preliminary Reports of the Host Directors, 1991 and 1992 ARRL National Conventions
8. Directors' Motions

1. Pursuant to due notice, the Board of Directors of the American Radio Relay League, Inc., met in second session at the Hartford Marriott Hotel, Farmington, Connecticut, on Friday, July 20, 1990. The meeting was called to order at 9 AM EDT with President Larry E. Price, W4RA, in the Chair and the following Directors present:

Hugh A. Turnbull, W3ABC, Atlantic Division
Edmond A. Metzger, W9PRN, Central Division
Howard Mark, WØOZC, Dakota Division
Joel M. Harrison, WB5IGF, Delta Division
Allan L. Severson, AB8P, Great Lakes Division
Stephen A. Mendelsohn, WA2DHF, Hudson Division
Paul Grauer, WØFTR, Midwest Division
Tom Frenaye, K1KI, New England Division
William R. Shrader, W7QMU, Northwestern Division
Charles P. McConnell, W6DPD, Pacific Division
John C. Kanode, N4MM, Roanoke Division
Marshall Quiat, ACØX, Rocky Mountain Division
Frank M. Butler, Jr., W4RH, Southeastern Division
Fried Heyn, WA6WZO, Southwestern Division
Sam C. Sitton, KV5X, West Gulf Division

Also present as members of the Board without vote were: George S. Wilson, III, W4OYI, First Vice President; Rodney J. Stafford, KB6ZV, Vice President; Jim Haynie, WB5JBP, Vice President; Jay A. Holladay, W6EJJ, International Affairs Vice President; David Sumner, K1ZZ, Executive Vice President; and James E. McCobb, Jr., K1LLU, Treasurer.

Also in attendance at the invitation of the Board as observers were the following Vice Directors: Kay C. Craigie, KC3LM, Atlantic Division; Howard S. Huntington, K9KM, Central Division; George E. Race, WB8BGY, Great Lakes Division; Paul Vydareny, WB2VUK, Hudson Division; L.C. "Chuck" Miller, WAØKUH, Midwest Division; Joe Lambert, W8IXD, Pacific Division; James G. Walker, WD4HLZ, Roanoke Division; William M. Sheffield, KQØJ, Rocky Mountain Division; and Evelyn Gauzens, W4WYR, Southeastern Division.

There were also present: William J. Stevens, W6ZM, Past Vice President; General Counsel Christopher D. Imlay, N3AKD; Barry J. Shelley, Business Manager; Paul Rinaldo, W4RI, Publications Manager; John F. Lindholm, W1XX, Membership Communications Services Manager; Richard K. Palm, K1CE, Field Services Manager; and Perry Williams, W1UED, Washington Area Coordinator.

2. The assembly observed a moment of silence in recollection of radio amateurs who have passed away since the previous Board meeting, especially Gay Milius, W4UG; Ted Wayne, WB4CBP; Dave Talley, W2PF; Mary Dorian, KA3PJZ; and Barbara Price.

Greetings were conveyed to the Board from Honorary Vice Presidents Jean "Doc" Gmelin, W6ZRJ, Robert York Chapman, W1QV, and L. Phil Wicker, W4ACY, Past Vice President Tod Olson, KØTO, and Past Director Philip Spencer, W5LDH. The regrets of Canadian Radio Relay League President Bruce Balla, VE2QO, for his inability to be present, were also conveyed to the Board.

3. On motion of Mr. Mendelsohn, seconded by Mr. Harrison, the Agenda was ADOPTED as presented.

4. On motion of Mr. Kanode, seconded by Mr. Butler, the Minutes of the 1990 Annual Meeting were APPROVED as presented.

5. Mr. Price, as President, reported on preparation for and attendance at a special Administrative Council Meeting of the International Amateur Radio Union July 7-8 in Cambridge, Massachusetts. The meeting focused on preparations for the World Administrative Radio Conference (WARC-92) of the International Telecommunication Union. Documents establishing and providing the justifications for the IARU WARC-92 position were adopted at the Council meeting.

6. Vice President Stafford presented his report, including his duties as Chairman of the Ad Hoc By-Laws Committee. The task of that Committee was to recommend changes to the By-Laws as a result of the creation of the position of Business Manager. He also served on the Membership Services Committee, heading up the task of studying possible field checking of QSL cards in the DXCC program. The President has named Mr. Stafford Chairman of the League's Long-Range Planning Committee examining how our organization will lead Amateur Radio into the next century.

7. Mr. Haynie presented his report as a Vice President, including attendance at a binational convention in Brownsville, Texas, and HamCom in Dallas. An article by Mr. Haynie on Amateur Radio in emergency operations and public service is scheduled to appear in the September issue of *Emergency Medical Services*.

8. A mid-year report of the International Affairs Vice President was presented by Mr. Holladay. Extensive preparatory work for WARC-92 is going on in the IARU Administrative Council, the three regional organizations, and the International Secretariat at ARRL Headquarters. The report commended the efforts of IARU President Baldwin and his assistants in conducting amateur radio administration courses for telecommunications officials from many countries. Mr. Holladay was present at the CRRL Board Meeting in Rexdale, Ontario, May 12-13. Progress is reported toward a merger of CRRL and the Canadian Amateur Radio Federation. Mr. Holladay will represent ARRL at the Awards Banquet for the World RadioSport Team Championship at the Goodwill Games in Seattle.

9. Mr. Sumner, in his report as Executive Vice President, mentioned a heavy schedule of travel in the past 15 weeks, much of it related to WARC-92 preparation. Restructuring at ARRL Headquarters effective on July 23 places Mark J. Wilson, AA2Z, in the position of Publications Manager, in addition to Production/Editorial Department management. The previous Publications Manager, Paul L. Rinaldo, W4RI, becomes Manager of Technical Development, with primary responsibility for WARC-92 preparation. John Nelson, W1GNC, who has been Deputy Publications Manager, moves to the new post of Manager, Planning and Financial Analysis. Mr. Sumner also reported that a new conductor for a YL column would be recruited, and that the column would appear as frequently as *QST* space availability permits. Mr. Sumner presented an overview of technical developments in the communications and electronics fields which could have profound effects on commercial and amateur radio. Mr. Sumner's report extensively covered WARC-92 preparations, both domestic and international; Publications Group activities; achievements of the Educational Activities Department; Membership Communications Services status; and the affairs of the Field Services and Volunteer Examiner Departments. During the course of the above, the Board was in recess from 10:10 to 10:43 AM.

10. Mr. McCobb presented the report of the Treasurer. Investment of League funds was in the areas of common stocks, short to medium bonds, and bank certificates of deposits. Income from the total portfolio was better in 1989 than in 1988, and the market value of the portfolio also increased somewhat. The fund balance at the end of the year was slightly lower than the previous year, but the Board believes it has taken steps that will increase the financial strength of the League in preparation for another WARC and the coming 21st century.

11. General Counsel Imlay presented an extensive report covering spectrum allocations matters, FCC regulatory matters, other FCC affairs, and, especially, local antenna and RFI cases, including some which have reached United States Courts of Appeal. There was also an update on the ARRL's petition to the United States Court of Appeals for the DC Circuit, for review of the FCC decision in General Docket 87-14, in which the frequencies 220-222 MHz were reallocated from the Amateur Service to the Land Mobile Service by the Federal Communications Commission. During the course of the above, the Board was in recess for lunch from 12:17 to 1:20 PM, reconvening with all persons hereinbefore mentioned except Mr. Stevens.

12. Mr. Grauer, as President, presented the report of the ARRL Foundation. Its funds, which had stood at $360,000 at the end of 1989, now total $422,000, with $146,000 in unrestricted funds. The assembly was urged to keep mentioning the Foundation during the ARRL Forums at conventions and other places where amateurs gather.

13. At this point, the Board reached Item 6 on the Agenda, Receive Reports and Consider Recommendations of the Committees. In his report as Chairman of the Administration and Finance Committee, Mr. Wilson clarified a number of financial and administrative points which had arisen in the last year. His report touched on contributions, pension matters, publications inventory, the dues increase, and plans for next year's budget preparation process. Mr. Wilson called on Mr. Shelley to present his first report as Business Manager. It covered financial results for the second quarter and first six months of 1990. Both revenues and expenses were lower than budget, but the bottom line on target. Activities in the Accounting, Purchasing/Administrative Services, Computer, Circulation and Advertising Departments were also presented in the report.

14. On motion of Mr. Wilson, seconded by Mr. Harrison, it was VOTED, at 2:07 PM, that the Board sit as a Committee of the Whole to discuss personnel matters. Members of the staff departed from the meeting at this point. The Committee of the Whole rose at 3:50 PM and the staff returned. On motion of Mr. Mendelsohn, seconded by Mr. Harrison, it was VOTED that the report of the Committee of the Whole is ADOPTED.

15. Mr. Kanode, as Chairman, presented the report of the Membership Services Committee. Subjects in the report included plans to create an Amateur Radio Spectrum Consultative Committee (CCARS), field checking of initial DXCC applications, the DXCC automation process, band plans, acceptance of contest logs on disk, and equipment insurance matters.

16. On motion of Mr. Kanode, seconded by Mr. Harrison, it was VOTED that the ARRL celebrate the bicentennial anniversary of the birth of Samuel F.B. Morse by offering a special Code Proficiency Certificate as recommended by the Membership Services Committee. The anniversary period shall be April 27, 1991 through March 31, 1992. Such certificates shall be offered to members and nonmembers alike for a nominal fee.

17. Mr. Severson, as Chairman, reported briefly for the Publications Committee. Its investigation revealed that publication of call directories by ARRL would not be feasible at this time.

18. Mr. Heyn, as Chairman, presented the report of the Volunteer Resources Committee. Among topics considered by the Committee were training matters, Volunteer Examiner Coordinator affairs, a study of the National Traffic System, National Conventions, public service matters, club programs, and recommendations for awards. During the course of the above Mr. Sheffield took the seat for Mr. Quiat at 5:17 PM.

19. Mr. Price, as Chairman, presented a brief report for the Executive Committee. It had met once so far in 1990, with the Minutes of the March 10 meeting appearing on page 59 of May *QST*. Work continues on review of standing orders, with 135 completed and still others to be done. Work also continues on a study of *QST* surveys and another on the economic value to the public of the Amateur Radio Service.

20. Mr. Turnbull, as Chairman, presented the report of the Election Committee which reviews and certifies candidates for Director and Vice Director in current ARRL elections. The Committee will also serve as a Committee of Tellers, meeting at Headquarters on Tuesday, November 20, for the purpose of counting ballots. It was moved by Mr. Turnbull, seconded by Mr. Butler, that By-Law 42 be amended by adding a new section "(b) Certification of eligible candidates," with the existing sections (b) through (e) redesignated (c) through (f).

A roll call vote being required, the question was decided in the affirmative, with all Directors voting aye (Mr. Sheffield casting the vote for Mr. Quiat). So the By-Law was AMENDED.

21. Mr. Sumner reported briefly for the Shuttle Amateur Radio Experiment (SAREX) Working Group. It now appears that the STS-35, delayed by a hydrogen leak, may be launched between September 10 and 14; Amateur Radio is ready.

22. Mr. Wilson, as Chairman, presented the report of the Ad Hoc Committee on FCC PR Docket 90-55. It was moved by Mr. Wilson, seconded by Mr. Frenaye, that the following resolution be adopted:

WHEREAS, the possible creation of a class of Amateur Radio license with no requirement for knowledge of Morse code has been a topic of debate and discussion among ARRL members for more than a year, and

WHEREAS, at the direction of the Board, a petition designated RM-6995 was filed on behalf on ARRL which proposed a way in which such a class of license could be created to the benefit of Amateur radio, and

WHEREAS, partially in response to this petition, FCC has proposed in PR Docket 90-55 to create such a class of license, but with certain features that are unacceptable to the Amateur community, and

WHEREAS, in July *QST* a "straw man" ARRL position on PR Docket 90-55 was published which has elicited thoughtful comment, both pro and con, and

WHEREAS, it is essential that the Novice class license be retained as a means of entry into Amateur radio, and

WHEREAS, it is also essential that the Technician class license be retained as a distinct class of Amateur license, now

THEREFORE, The ARRL Board of Directors, in meeting assembled, after in-depth discussion to determine the best course to follow for the future of Amateur radio,

RESOLVES, to adopt the following policy to be reflected in comments filed in response to the Notice of Proposed Rulemaking in PR Docket 90-55:

1. A new class of Amateur license should be created as an alternative means of entry, to be called Communicator.

2. The next upgrading step for both Novice and Communicator is Technician.

3. Present Examination Element 3A should be expanded from 25 questions to 30 with the emphasis in the additional material to be on proper operating practices.

4. The Novice examination should consist of Elements 1A (5 words per minute Morse code) and 2.

5. The Communicator examination should consist of Elements 2 and 3A.

6. The Technician examination should consist of Elements 1A, 2 and 3A.

7. Amateur radio examination elements should only be administered through the system of three-member teams of accredited Volunteer Examiners. Accredited Volunteer Examiners holding General class licenses should be authorized to administer Elements 1A, 2 and 3A.

8. Fees to reimburse the costs of the Volunteer Examiner Program should apply equally to applicants for all classes of Amateur license.

9. Certificates of Successful Completion of Examination should be issued to candidates who are successful in passing either Element 1A or Element 2.

10. Frequency privileges for Communicator licensees should consist of all allocated Amateur frequencies above 220 MHz.

11. The maximum power output for transmitters controlled by Communicator licensees should be 200 watts.

12. Communicator licensees should be permitted to be control operators of repeaters and auxiliary stations on frequencies and at power levels authorized for operation by Communicator licensees.

13. Call signs issued to Communicator licensees should be from Group D and from the same series assigned to Novice licensees.

14. Current holders of Technician licenses who passed Element 3 before the Element was split into 3A and 3B should continue to be regarded as having credit for having passed Element 3B.

It was moved by Mr. Frenaye that paragraph 10 be amended by changing 220 MHz to read 144 MHz, but there was no second, so the motion to amend was LOST. On motion of Mr. Metzger, seconded by Mr. Kanode, it was VOTED that the Board recess for dinner at 5:40 PM. The Board reconvened at 8:37 PM with all persons hereinbefore mentioned present except Mr. McCobb and Mr. Palm. Mr. Sheffield continued in Mr. Quiat's seat. It was moved by Mr. Frenaye, seconded by Mr. Mendelsohn, that paragraph 8 be amended by adding at the end the phrase, "except that the fee may be waived for applicants aqged 18 and under." But the motion to amend was LOST, seven votes in favor to eight opposed. The question then being on Mr. Wilson's motion, the same was ADOPTED. With the adoption of this motion, the work of the Ad Hoc Committee is complete, and it was discharged by the President with the thanks of the Board. (Applause) At this point, 8:50 PM, Mr. Quiat resumed his seat.

23. Mr. Stafford, as Chairman, presented the report of the Ad Hoc Committee to Review the Articles of Association and By-Laws. It was moved by Mr. Turnbull, seconded by Mr. Mendelsohn, that Article 8 of the Articles of Association be amended to read as follows:

The officers of the corporation shall be a President, a First Vice President, an Executive Vice President, an International Affairs Vice President, not more than two additional Vice Presidents, a Secretary and a Treasurer, who shall be elected by a majority of the Directors at the Annual Meeting on even-numbered years. The Executive Vice President shall be compensated at a rate agreeable to him and the Board of Directors.

A roll call vote being required, the question was decided in the affirmative. All the Directors voted aye, so the Article was AMENDED.

24. It was moved by Mr. Turnbull, seconded by Mr. Harrison, that Article 12 of the Articles of Association be deleted, that Article 13 is renumbered Article 12, and Article 14 is renumbered Article 13.

A roll call vote being required, the question was decided in the affirmative. All the Directors voted aye, so the motion was ADOPTED.

25. It was moved by Mr. Turnbull, seconded by Mr. Shrader, that By-Law 31 be amended to read:

The President shall preside over all meetings of the Board of Directors. He shall, subject to instructions from the Board of Directors, and with the assistance of the Executive Vice President, represent the League in its relationships with the public and the various governments, governmental agencies and officials with which the League may be concerned, and shall be the official spokesman of the Board of Directors in regard to all matters of League policy. Any vacancy occurring from time to time by death, resignation or incapacity of any member of the Executive Committee may be filled by appointment made by the President, for the balance of the original term of such member. The President shall be an ex-officio member of all Committees unless otherwise designated.

A roll call vote being required, the question was decided in the affirmative. All of the Directors voted aye, so the By-Law was AMENDED.

26. It was moved by Mr. Turnbull, seconded by Mr. Harrison, that By-Law 34 be amended to read:

The Treasurer shall be the recipient of all monies of the League and shall deposit the same in the name of the League in the depository specified by the Board of Directors. He shall make a report at the Annual session of the Board of Directors and shall attend meetings of the Board. He shall furnish a bond satisfactory to the Board, the expenses of such bond to be borne by the League. He shall, on consultation with and subject to the general supervision of the Administration and Finance Committee, invest and reinvest the surplus funds of the League in any bonds or stocks or other securities as would be selected by a trustee with the care of a prudent investor.

A roll call vote being required, the question was decided in the affirmative. All the Directors voted aye, so the By-Law was AMENDED.

27. It was moved by Mr. Turnbull, seconded by Mr. Mendelsohn, that a new By-Law 36 be added after By-Law 35, and that it shall read:

The Executive Vice President shall attend all Board meetings. He shall have responsibility for and supervision over any and all matters related to publications (except advertising and circulation), membership communications services, field services and volunteer examinations. He shall conduct the general correspondence of the League and shall keep full records. He shall, under the general direction of the Board of Directors, employ such personnel as may be necessary for the effective accomplishment of the duties set forth in this By-Law. He shall sign checks drawn by the Business Manager. He shall prepare and submit at each annual meeting of the Board of Directors a comprehensive report of the progress and status of the affairs of the League. He shall perform such other duties as may be assigned to him by the Board of Directors. His entire time shall be devoted to the duties as set forth above. He shall furnish a bond satisfactory to the Board of Directors, the expense of the same to be borne by the League.

A roll call vote being required, the question was decided in the affirmative. All the Directors voted aye, so the By-Law was ADOPTED. The Board was in recess from 9:14 to 9:32 PM.

28. It was moved by Mr. Mendelsohn, seconded by Mr. Harrison, that a new By-Law 37 be added after new By-Law 36, and that it shall read:

The Board of Directors shall employ a Business Manager for a term and upon such compensation as the Board and he may agree upon. He shall attend all Board meetings. He shall have responsibility for and supervision over any and all matters related to advertising and circulation, personnel policies, comptroller functions, purchasing and administrative services and data processing. He shall, under the general direction of the Board, employ such personnel as may be necessary for the effective accomplishment of the duties set forth in this By-Law. He shall collect all monies due the League and turn them over to the Treasurer. He shall certify the accuracy of bills and vouchers on which money is to be paid and shall draw and countersign checks. He shall have charge of the books and accounts of the League and shall furnish to the Board of Directors from time to time such statements as may be required. He shall be in responsible charge, under the Board of Directors, of all the property of the

League. He shall perform such other duties as may be assigned to him by the Board of Directors. His entire time shall be devoted to the duties as set forth above. He shall furnish a bond satisfactory to the Board of Directors, the expense of the same to be borne by the League.

A roll call vote being required, the question was decided in the affirmative. All the Directors voted aye, so the By-Law was ADOPTED.

29. It was moved by Mr. Mendelsohn, seconded by Mr. Shrader, that current By-Law 37 is changed to read:

The Administration and Finance Committee:

Reviews League management performance and effectiveness, including League finances, on a continuing basis. On an annual basis, reviews the operating budget prepared by the Business Manager and the Executive Vice President for the coming year and, after approval, forwards to the Board of Directors for ratification. Reviews intermediate and long term budgetary projections as prepared by the Business Manager and makes appropriate recommendations to the Board of Directors. Makes recommendations to the Board in connection with audit and tax matters, and acts as a Board audit committee. Makes recommendations to the Board, the Executive Vice President and the Business Manager in areas of staff management, procedures, and remuneration. Acts as advisor to and supervisor of the Treasurer in regard to the investment of the League's funds. Establishes bonding guidelines for League employees.

A roll call vote being required, the question was decided in the affirmative. All of the Directors voted aye, so the By-Law was AMENDED.

30. It was moved by Mr. Mendelsohn, seconded by Mr. McConnell, that current By-Law 39 is changed to read:

The Publications Committee performs studies and makes recommendations to the Board, and acts as advisor to the Executive Vice President and the Business Manager, with regard to the League's publications programs, including *QST* and other periodicals.

A roll call vote being required, the question was decided in the affirmative. All the Directors voted aye, so the By-Law was AMENDED.

31. It was moved by Mr. Mendelsohn, seconded by Mr. Kanode, that current By-Law 41 is amended to read:

Pursuant to Article 6, the Executive Committee is assigned specific responsibility for:

Monitoring progress of Board actions and recommendations in order to see that they are expeditiously accomplished. Monitoring expenditures for legal assistance. Providing assistance to the staff and general counsel in connection with Board recommendations for petitions to the Federal Communications Commission and other governmental agencies. Evaluating for the Board proposed rules and regulatory changes. Reviewing periodically the Articles of Association and By-Laws and recommending to the Board of Directors any changes.

A roll call vote being required, the question was decided in the affirmative. All the Directors voted aye, so the By-Law was AMENDED. With the adoption of this motion, the work of the Ad Hoc Committee is complete, and it was discharged by the President with the thanks of the Board. (Applause)

32. Mr. Turnbull, as Chairman, presented the report of the RFI Task Group. The Committee continued to be represented at meetings of ANSI C63 Subcommittee 1, developing methods for measurement of radio frequency interference from appliances. There is no additional news on allegations of interference by an amateur to a medically installed pacemaker. Restrictions on the licensee's operations continue to be in effect.

33. A written report of the ARRL Bio-Effects Committee was presented on behalf of Ivan A. Shulman, MD, Surgeon, WC2S, its Chairman. Members of the Committee now include W. Ross Adey, MD, K6UI, Professor, Loma Linda University; Samuel Milham, MD, Epidemiologist, State of Washington; David Rodman, MD, KN2M, Ophthalmologist, State University of New York at Buffalo; Thomas Rozzell, DSc, WB4ZTT, National Academy of Sciences; Wayne Overbeck, JD, PhD, N6NB, Liaison, ARRL Board of Directors; and Dr. Shulman, Chairman. The Committee is conducting its business by MCI mail. Without dissent, the ARRL Board of Directors accepted the recommendation that ARRL not renew its membership in the Electromagnetic Energy Policy Alliance.

34. Mr. Rinaldo, as Chairman, presented the report of the Committee on Amateur Radio Digital Communication. The Committee reviewed the ARRL petition RM-7248, which had been withdrawn. The Committee recommends a questionnaire in *QST* concerning automatic digital operations in the HF bands. The Committee continues its work on Version 2.1 of the AX.25 Packet Radio Link Layer Protocol. It also discussed evolutionary changes in AMTOR. There was also discussion of future systems for high-speed digital microwave networks. The next meeting of the Committee will be September 23 in London, Ontario, following the 9th Computer Networking Conference held jointly by ARRL and CRRL the previous day.

35. Mr. Quiat, as Chairman, presented the report of the Legal Strategy Committee. The report covered a shift in focus for LSC seminars, so that the meetings offer advice which ordinary amateurs need before buying property or building antennas. Similarly, the Committee intends to design information packages dealing with these concerns of laymen. The Committee also recommends that a limited petition for rehearing *en banc* be filed with the Fourth Circuit US Court of Appeals in the case of Williams v. City of Columbia, SC. At this point, the Board was in recess for the night at 9:52 PM, reconvening on July 21, 1990 at 8:40 AM, with all persons hereinbefore mentioned present except Mr. McCobb.

36. Mr. Mendelsohn, as Liaison, reported briefly for the Public Relations Committee. The Committee held its first meeting in March, and expects to complete the first phase of its work in time for a report to be submitted to the Board for the 1991 Annual Meeting.

37. Mr. Shrader, as Liaison, presented the report of the VHF Repeater Advisory Committee. A primary concern has been band planning; the committee expects to have recommendations to the Membership Services Committee well in time for the 1991 Annual Meeting of the Board. On motion of Mr. Shrader, seconded by Mr. Mendelsohn, it was VOTED that the ARRL Repeater Directory provide a page upon which a map of the United States is drawn, showing which states are using a 15 kHz separation between repeaters, and which states are using a 20 kHz separation between repeaters, on the popular two-meter band.

38. On further motion of Mr. Shrader, seconded by Mr. Heyn, it was VOTED that the 6 meter band plan recommended by the VRAC be reviewed and considered by the Membership Services Committee for adoption as the ARRL band plan for the 6 meter repeater subband.

39. Mr. Kanode, as Liaison, presented the report of the Contest Advisory Committee. Issues being discussed by the CAC include adding low power categories to contests, revising Canadian Province multipliers for the DX Contest, changing the time period for the November Sweepstakes, revising the 160 meter contest rules, adding a VHF "rover" category, creating a "sprint class" within existing contests, creating incentives for contest beginners, and adding incentives for submission of logs on diskette.

40. Mr. McConnell, as Liaison, presented the report of the DX Advisory Committee. The report shows that Walvis Bay has been approved as a new country, but the Puyallup Tribe of Indians will not count as a new country. Discussions are under way concerning country status for the Penguin Islands off Namibia and Grosse-Ile in the St. Lawrence River. Items being discussed also include the basis of countries on the DXCC List, point 3 rule revision, format for new-country petitions, adding a basis and purpose section to the DXCC rules, DXpedition criteria, field checking of QSL cards for DXCC, and the start date for contacts with Banaba Island.

41. Mr. Race, as Liaison, presented the report of the Public Service Advisory Committee. Studies on printed materials to be used in describing the capabilities of Amateur Radio for prospective served agencies and a revision of the Memorandum of Understanding between American Red Cross and the ARRL are under way by the PSAC. The committee report indicates that the PSAC would appreciate assistance from the Public Relations Committee in completing the first of these projects. On motion of Mr. Severson, seconded by Mr. Butler, the following resolution was ADOPTED:

WHEREAS, there is a strong sentiment among members of the ARRL that the time has come for a review of the qualifying rules for listing in the Public Service Honor Roll to include the latest communications modes, and

WHEREAS, there are many more ARRL members who would like to express their opinions on possible rule changes, and

WHEREAS, there has not been sufficient time for the PSAC to hear from all segments of the Amateur Radio Community; now, therefore

BE IT RESOLVED, that the Board of Directors of the ARRL requests the PSAC to continue its efforts to determine a more acceptable set of qualifying rules for PSHR, and that the PSAC be asked to make a full report to the Board of Directors at its 1991 Annual Meeting.

42. Mr. Harrison, as Liaison, presented the report of the VHF/UHF Advisory Committee. Its agenda for 1990 includes examining band planning revisions for 144, 220 and 432 MHz. It awaits approval of band plans previously submitted for 900 MHz and 2.3 GHz.

43. Reaching agenda item 7, the Board heard preliminary reports from Mr. Severson, host director for the 1991 National Convention, August 23-25 in Saginaw, Michigan and from Mr. Heyn, host director to the 1992 National Convention, August 20-23 at Los Angeles, California. During the course of the above, Mr. Vydareny took the seat for Mr. Mendelsohn at 9:20 am.

44. As the first matter under agenda item 8, on motion of Mr. Quiat, seconded by Mr. Butler, it was unanimously VOTED that the ARRL Board of Directors select Shauna Richards, N7NGT, as the 1989 recipient of the Hiram Percy Maxim Award.

45. On motion of Mr. Heyn, seconded by Mr. Shrader, it was VOTED that an ARRL "National Certificate of Merit" be made available to recognize achievements of members contributing substantially to the furtherance of the goals of the Amateur Radio Service, in a manner of national significance. Such award shall be bestowed by the President following approval of the Executive Committee or the full Board. During the course of the above, Mr. Mendelsohn resumed his seat, Mr. Sheffield took the seat for Mr. Quiat, and Mr. Wilson took the Chair for President Price, at 9:36 am.

46. At 9:42, Mr. Price resumed the Chair. It was moved by Mr. Turnbull, seconded by Mr. Shrader, that the By-Law describing the duties of the Volunteer Resources Committee, (previously By-Law 40), is amended by striking the words, "The ARRL Interference Reporting System (AIRS)" and substituting therefor: "The ARRL Monitoring System (ARRL M/S)."

A roll call vote being required, the question was decided in the affirmative. All of the directors voted aye (Mr. Sheffield casting the vote for Mr. Quiat), so the By-Law was AMENDED.

47. At 9:44, Mr. Quiat again in his seat, it was moved by Mr. Harrison, seconded by Mr. Butler, that By-Law 25 be amended to read as follows: The annual meeting of the Board of Directors shall be held in the vicinity of Newington, Connecticut, beginning on the 3rd Friday of January. The second meeting of the Board of Directors shall be held in the vicinity of Newington, Connecticut, beginning on the 3rd Friday of July. The places of the meetings shall be designated by the President and notified by the Secretary. The times and places of the meetings may be changed provided that specific provision is made therefor by (1) majority vote of the directors at the next preceding annual or second

meeting, or (2) majority vote of the directors by mail *initiated by the Executive Committee or on petition* of at least five directors, such mail vote to be taken at least 60 days previous to the date proposed for the meeting.

A roll call being required, the question was decided in the affirmative, with Mr. Grauer voting no and the other directors voting aye. So the By-Law was AMENDED.

48. On motion of Mr. Severson, seconded by Mr. Wilson, it was unanimously VOTED that the ARRL Board of Directors select Gerald Kasselmann, KD4QA, as the recipient of the ARRL Professional Instructor of the Year award for 1989. The Board of Directors thanks all Professional Instructors for their service to the Amateur community throughout the year. (Applause). The Board was in recess from 10:00 to 10:25 am.

49. *On motion of Mr. Mendelsohn, seconded by* Mr. Holladay, it was unanimously VOTED that the ARRL Board of Directors, assembled in Farmington, Connecticut, this 21st day of July, 1990, thanks Naoki Akiyama, NX1L, for his eight years of *service to the League and its members in the field of* International Services and especially his sensitivity and diplomacy in dealings with other IARU member societies. (Applause).

50. On motion of Mr. Grauer, seconded by Mr. Heyn, it was VOTED that the 1991 Missouri State Convention be held in Kansas City, Missouri April 5-7, under the auspices of the PHD Amateur Radio Association.

51. On motion of Mr. Frenaye, seconded by Mr. Butler, it was VOTED that, in light of the advances made in modeling and measurement of antenna performance in recent years, the Executive Vice President prepare a report for the 1991 Annual Meeting on the issues involved and any recommendations for change in the current advertising policy related to antenna gain figures.

52. It was moved by Mr. McConnell, seconded by Mr. Heyn, that ARRL Section Managers be authorized to purchase "Official Family" QSL cards at no cost to the ARRL, but the motion was LOST.

53. On motion of Mr. Kanode, seconded by Mr. *Mendelsohn, it was unanimously VOTED that the* 1989 Technical Excellence Award be given to Mr. Andre Kesteloot, N4ICK, and that he is awarded the Pewter Cup for his article, "A Practical Direct-Sequence Spread-Spectrum UHF Link", which appeared in the May 1989 issue of *QST*. The Board of Directors thanks all Technical Advisors for their help to the Amateur community throughout the year. (Applause)

54. On motion of Mr. Butler, seconded by Mr. Mark, it was VOTED that, whereas the volume of Amateur Radio awards activity continues to increase in response to growth of the Amateur Service, the Membership Services Committee investigate methods of assisting the ARRL Awards Manager in the accomplishment of the job.

55. It was moved by Mr. Heyn, seconded by Mr. Butler, that the rules and regulations of the ARRL Field Organization be amended to include a new Section 7g to read as follows: "implements the provisions of the agreement between the Federal Communications Commission Field Operations Bureau and the ARRL by (1) overseeing the organization of a local interference committee when required; (2) appointing its chairman; and (3) executing an agreement with the appropriate FCC engineer-in-charge. On motion of Mr. Kanode, seconded by Mr. Grauer, it was VOTED that consideration of this matter be postponed until after lunch.

56. On motion of Mr. Mark, seconded by Mr. Kanode, it was unanimously VOTED that the Board accepts the report of the Membership Services Committee on spectrum management and encourages that further member input be sought with a final report and recommendation to be brought back to the Board at its 1991 Annual Meeting.

57. On motion of Mr. Mendelsohn, seconded by Mr. Frenaye, it was VOTED that the membership of the ARRL Long Range Planning Committee may include those Directors or Vice Directors who express interest in serving and who the President *may see fit to appoint.*

58. On motion of Mr. Frenaye, seconded by Mr. Butler, it was VOTED that the VHF/UHF Advisory Committee review the FCC emission standards (currently designated Section 97.307) as they affect Amateur bands above 30 MHz and recommend to the Board any changes deemed desirable.

59. The Board was in recess for lunch from 11:46 am to 12:55 pm, reconvening with all persons hereinbefore mentioned present, except Mr. McCobb.

60. On motion of Mr. Mendelsohn, seconded by Mr. Butler, it was VOTED that ARRL contest forms be made available on request to Special Service Clubs for local reproduction and that such forms be sent to IARU societies annually for local reproduction as appropriate.

61. On motion of Mr. McConnell, seconded by Mr. Heyn, it was unanimously VOTED that the ARRL Board of Directors selects Lyle Aufranc, AA6DJ, as the recipient of the Herb S. Brier Instructor of the Year award for 1989. The Board of Directors thanks all Volunteer instructors for *their service to the Amateur community throughout* the year. (Applause) At this point, 1:20 pm, Mr. Walker took the seat for Mr. Kanode.

62. On motion of Mr. Walker, seconded by Mr. Harrison, it was VOTED that the 1990 ARRL South Carolina State Convention be held in Sumter on October 27, 1990. At 1:25 pm Mr. Kanode returned to his seat.

63. On motion of Mr. Quiat, seconded by Mr. Heyn, it was unanimously VOTED that the Board of Directors confer on Iris and Lloyd Colvin, W6QL and W6KG, a special award as Amateur Radio Ambassadors of the decade 1980-1990 for their tire*less efforts to foster international goodwill by means* of Amateur Radio. (Applause)

64. It was moved by Mr. Butler, seconded by Mr. Heyn, that paragraph 5 of the Rules and Regulations concerning ARRL Conventions be amended as follows: (1) Delete the phrase "at any meeting" from the first sentence. (2) After the first sentence, add two new sentences: "The Board will consider applications at the Annual Meeting two (2) years in advance of the year of the convention, solicita*tion to be made in the prior August and October* issues of *QST*. The Board may opt to delay selection to a future meeting."

A roll call vote being required, the question was decided in the affirmative. All the Directors voted aye, so the Rules and Regulations were AMENDED.

65. On motion of Mr. Harrison, seconded by Mr. Shrader, it was VOTED that the Volunteer Resources Committee review paragraph 2 of the Rules and Regulations Concerning Affiliated Societies with regard to the approval cycle and recommend any changes to the Board at the 1991 Annual Meeting.

66. On motion of Mr. Mendelsohn, seconded by Mr. Severson, it was VOTED that the ARRL Field Services Department, in consultation with the station manager of W1AW, survey Official Bulletin Stations to determine the preferred mode of emission of bulletin delivery with emphasis on speed and accuracy of such services and that the results of this survey is announced and implemented if the survey finds that changes are requested.

67. On motion of Mr. Frenaye, seconded by Mr. Heyn, it was VOTED that the following guidelines for mail votes conducted under Article 6 of the Board be adopted:

- A *"mail vote" can include polling by electronic* mail, receipt requested;
- Directors shall endeavor to respond within 14 days, or within a time frame established by the EC. Directors who have not responded shall be contacted by the Secretary;
- The Secretary shall report the results to the Board within one business day along with the division of the vote (who voted which way);
- The minutes of the next Board or EC meeting shall include a report of the vote, including who made the motion to poll the Board, the date the vote was conducted, and a report of the division of the vote.

68. At this point the Board resumed considera*tion of the motion which had been postponed until* after lunch concerning proposed section 7g of the Rules and Regulations of the ARRL Field Organization. On motion of Mr. Wilson, seconded by Mr. Stafford, it was VOTED that the matter be recommitted to the Volunteer Resources Committee for further study. During the course of the above, the Board was in recess from 2:00 to 2:20 pm.

69. On motion of Mr. Holladay, seconded by Mr. Kanode, it was VOTED that the ARRL cast aye votes on proposals 193, 194 and 195 of the International Amateur Radio Union. Proposal 193 would make small editorial changes to Article 1 of the IARU Constitution and add, as a purpose of the Union, "encouragement of amateur radio sport activities." Proposal 194 would adopt a definition of 'Radio Amateur' in the IARU Constitution: "A per*son authorized to operate the transmitter and* receiver of an amateur station." Proposal 195 would terminate the membership of the Burma Amateur Radio Transmitting Society as a member of IARU, the grounds for this action being unquestioned *evidence that BARTS is no longer in existence.*

70. On motion of Mr. Mendelsohn, seconded by Mr. Sumner, it was unanimously VOTED that the Board assembled at Farmington this July 21, 1990 thanks Lisa Arel and her flying fingers, Perry Williams and his flying pen, John Lindholm, Rick Palm and Paul Rinaldo for their unwavering support to this Board Meeting. (Applause)

71. There followed an opportunity for all present to make final comments. There being no further business, the Board adjourned *sine die* at 3:03 pm (total time in session as a board: 10 hours 47 minutes; as a Committee of the Whole 1 hour 43 *minutes)*

Respectfully submitted,
David Sumner, K1ZZ
Secretary

Strays

APPLE® CODE PRACTICE SOFTWARE NEEDED

☐ Many schools operate Apple II computers in their Amateur Radio courses. The ARRL Educational Activities Department is looking for a Morse code practice program for the Apple II series of computers. The League recommends the following specifications for such software: It must generate Farnsworth code at specified character and word speeds, be "kid-proof" and crashproof, not written in BASIC (because of timing inaccuracies) and have a friendly user interface. Optional features include random letter and word generation, the ability to send code from text files, generate sample QSOs and teach characters as taught in *Tune in the World with Ham Radio*. It would also be helpful to verify that all characters have been used in the practice text. Please contact Rosalie White, WA1STO, ARRL Educational Activities Manager, with your information on Shareware programs or your programming abilities.

Conducted By John C. Hennessee, KJ4KB
Regulatory Information Editor

Commission Eases Code Requirements for Disabled

In response to direction by the Commissioners, changes in Morse code testing procedures for severely disabled or handicapped people are being implemented, according to John Johnston, W3BE, Chief of the FCC's Personal Radio Branch, who spoke at a meeting of Volunteer Examiner Coordinators (VECs) June 15.

"While the no-code Communicator issue is the foremost topic in Amateur Radio right now," Johnston told the coordinators, "there is another issue involving the code that has a full head of steam at the Commission. The interest on Capitol Hill for handicapped persons has reached the Commission and there is renewed concern about the degree of accommodation provided in license examinations for handicapped people."

Johnston said that the number of people requesting waivers of the code test because of disabilities has increased and that "three persons, moreover, have filed discrimination complaints under the Disability and Rehabilitation (Act)."

Johnston said volunteer examiners (VEs) themselves are another source of input on the topic. "I suppose when you only encounter the handicap examination issue from a distance," Johnston said, "it's easy to rigidly insist, as many of the commenters in the Communicator proposal are insisting, 'I passed a code test and that proves that anyone can do it.'

"Most amateurs held a similar view until the VEC systems came along," Johnston said. "Before then, you didn't have to give the heartbreaking news to persons who have a severe handicap that keeps them out of Amateur Radio. [The FCC's] examiners did that nasty little job for you. But now it's the VEs that have to do it. They are the ones on the firing line, and more and more they are becoming sensitized to the very real problems some handicapped persons have in passing the code test.

"In many cases, these persons would be an asset to your service," Johnston said. "In practically all cases, moreover, the pleasure they would receive from Amateur Radio would greatly improve the quality of their lives. As a result, the Commission found itself in the very uncomfortable bureaucratic position of having to defend the amateur community's position regarding the Morse code against concerned, caring amateur operators."

Implementing New Procedures

The FCC is asking VEs to implement two new procedures. The first would have VECs agree on special procedures for administering the code exam. Johnston said that "Such special accommodations include suitable pauses in sending the telegraphy message after each sentence, each phrase, each word or even each character to allow the examinee additional time to absorb and interpret what was sent. Where warranted, the sending test is substituted for a receiving test. Given a physician's statement attesting to the disability or handicap, examiners may be able to substitute a Morse sending test for one in receiving, to allow spoken instead of written copy and to use a Morse code recognition exam."

The second request is for VEs to implement new FCC policies, including waivers of the 13- or 20-WPM exams, if the applicant already holds at least a Novice license and if "the examinee submits a physician's certificate that, due to a severe handicap" (per the 1988 Developmental Disabilities Act), "the examinee is unable to meet the 13 or the 20 words-per-minute requirement."

VEs would receive a written request for the waiver from the applicant with the physician's certification and administer the necessary written tests. Then they would submit the package to a VEC for forwarding to the FCC licensing office in Gettysburg, Pennsylvania, where the waiver request would be acted on.

"We do not expect you or your VEs to make medical judgments," Johnston said. "You must not engage in disputing the physician's certification that due to the person's severe handicap, the person cannot meet the telegraphy speed requirement."

Johnston said "the first such waiver under the interim policy is in the process of being granted," and is being handled directly by the Private Radio Bureau. "We will be initiating a Rule Making proceeding in the near future to implement the new policy directly...so that the waiver request step will be unnecessary." (On August 1, the FCC stated that rules were being written. The FCC has also proposed to amend the rules to define "severely handicapped individual.")

"In the meantime, Section 4 of your instructions to the VEs needs revision to incorporate the new waiver policy and your expanded special accommodation procedures," Johnston told the coordinators.

The 1988 Developmental Disabilities Act lists a number of "severe disabilities," including autism and mental retardation. It also lists epilepsy, blindness and deafness, disabilities thousands of radio amateurs have overcome in passing FCC exams.

Examiners were advised to recognize the distinction between accommodation procedures and waivers. For example, a deaf person taking the code test by flashing lights is an accommodation procedure.

Reaction to the Changes

Some VECs have expressed concern about possible changes in code testing of people with certain disabilities. Among those citing the possibilities for fraud is Gordon West, WB6NOA, president of Gordon West's Radio School. "I encourage the Commission to draw a hard line as to what qualifies and (what) does not," West said, "so word does not get out that a note from the doctor will get you out of a 13 or a 20 test, because I can see them coming already."

Bruce Humphrys, KØHR, Director of Rehabilitation Technologies at the Courage Handi-Ham Center in Golden Valley, Minnesota, was asked for his views on the FCC policy change. The Courage Handi-Ham System specializes in helping people with disabilities to enter ham radio. Humphrys said his major difficulty with this decision rests in using the 1988 Developmental Disabilities Act as a definition of disabled since the Act addresses the employability of someone. None of the definitions address a functional disability. A person can be blind, but perfectly capable of copying code at 50 WPM. A (paralyzed) person can be mentally capable and still be able to copy, transcribe and use Morse code in a fully functional way...it is almost a travesty of the intent of the law to include in a blanket fashion literally everybody who has a chronic disability," Humphrys said.

Humphrys was asked about the effect of learning the code on disabled amateurs in the Courage Handi-Ham System. He replied "More than 80% of our Handi-Hams people who have gotten a license point to their having to pass the same test as you and I as being extremely important to their ego and self-esteem. In training more than 7000 people to get on the air, we have a higher percentage of our Handi-Ham disabled members holding upper-class licenses than the general amateur population."

The new FCC policy concerning testing for persons with severe disabilities is a reversal of previous FCC policy. More than a decade ago, the FCC instituted a Rule

Making proceeding (numbered 78-250) that sought to reduce or eliminate the telegraphy requirement for persons with disabilities. The proposal met with stiff opposition from the amateur community. In terminating the proceeding a few years later, the FCC noted that such a policy "...could lead to the necessity for FCC personnel to determine whether applicants were qualified for exemption, something they are not trained to do."

FCC ALLOWS CALL SIGN CHANGES

The FCC does not grant requests for specific call signs, although an amateur may swap a current call sign for another one issued in the regular sequence. According to an FCC Public Notice dated April 19, 1990, by filing a Form 610 with the FCC and requesting a change in call sign (Item 2E), the applicant will be issued a call sign appropriate for his license class from the standard rotation of new call signs.

CIVILIAN HAM GETS ARMY AWARD

An American amateur based in Germany has been honored by the US Army. On June 12, Stephen R. Hutchins, KN6G/DA2HS, president of the Wiesbaden Amateur Radio Club (an ARRL affiliated club) was presented with the Commander's Award for Public Service. Hutchins, a ham since 1977, works for the Motorola Corporation in Wiesbaden as district manager for Europe and Africa. He was recognized for his "service to military service members, civilian employees and their family members in communities throughout the Federal Republic of Germany."

In 1984, Hutchins was instrumental in forming a group of ARRL volunteer examiners (VEs) throughout Germany. This group gave the first VE-administered FCC license examinations in Europe. The Wiesbaden ARC primarily serves Americans in the military or employed by companies in Germany. Hutchins was its president in 1981 and '82, and again from 1984 to the present.

DOVE SATELLITE RESUSCITATED

DOVE-OSCAR-17 is on the air again. Shortly after its January launch, DOVE's 2-meter transmitter was turned off because of software problems that caused it to transmit continuously. Because the command uplink is also on 2 meters, command stations "lost control" of the satellite. Volunteer AMSAT engineers Bob McGwier, N4HY, and Harold Price, NK6K, updated the errant software and reloaded it into the satellite's computer on July 7. Shortly thereafter, the software crashed and the satellite reverted to its original (corrupted) software, switching off the 2-meter transmitter. But on July 22, N4HY and NK6K solved the problem, putting DOVE back on the air.

AMATEUR RADIO GOES TO THE GOODWILL GAMES

"A resounding success" was how organizers and participants in the World RadioSport Team Championship (WRTC) pronounced this unique event, held July 20 in Seattle. In conjunction with the Goodwill Games, 22 teams of Amateur Radio operators from 15 countries vied for gold, silver and bronze medals—but this was more than a radio contest.

"The only winner here was friendship," said Vasily Bondarenko, UV3BW, chief of the Krenkel Central Radio Club. "We are sincerely thankful," Bondarenko said, "for the great efforts of the organizers in making this difficult project possible." Bondarenko presented Soviet medals to the competition winners, who were also awarded medals and plaques by the organizers. All competitors received plaques for participation and other mementos of the event from ICOM, Ham Radio Outlet, MFJ and others.

The presentations were made at a banquet on July 23 on Blake Island in the Puget Sound near Seattle, where 250 people gathered. The teams finished as follows:

1) K1AR and K1DG
2) W9RE and K7JA
3) KRØY and KQ2M
4) VE7SV and VE7CC
5) DL5XX and DJ6QT
6) LZ2PO and LZ1MS
7) G3YDV and G4BUO
8) EA5BRA and EA9EO
9) UW9AR and UA9AM
10) W7EJ and AA4NC
11) UA1DZ and RB5IM
12) I2UIY and IK2DVG
13) OH1XX and OH8PF
14) OK1RI and OK2FD
15) YT3AA and YU1RL
16) HAØMM and HA6NY
17) UA9SA and UW3AA
18) UWØCN and UWØCA
19) JE1JKL and JE1CKA
20) PY5EG and PY4OD
21) FD1NYQ and F2CW
22) JM3JOW and JJ3UHS

Final scores were determined by the "ordinals" method (as used in figure skating) rather than straight-line scoring. UW9AR and UA9AM received the Murphy Award; they were plagued for four hours by a noisy power line. The award for Top CW Score went to the German team and the number-two overall team of K7JA and W9RE garnered the Top SSB award. VE7CC won Most Accurate CW Operator and I2UIY took home the Most Accurate SSB Operator plaque.

Each team operated from a local Seattle ham's home, using stations as similar as possible: (mostly) tribanders, low-band dipoles, ICOM IC-765 transceivers and IC-735 transceivers as spotting receivers. A multinational group of amateurs acted as judges, working around the clock to determine the final places.

The schedule of activities for competitors included a tour of ICOM America's corporate headquarters in Bellevue, Washington, and US license exams for visiting competitors wanting to take them. Following the WRTC, competitors traveled to the Pacific DX Convention in Portland Saturday and Sunday. Look for a story on this event in an upcoming *QST*.

FCC ENFORCEMENT ACTIONS

• The FCC has formally asked the Soviet Ministry of Posts and Telecommunications to solve an interference problem on the amateur 20- and 17-meter bands. In messages to Moscow June 21, the FCC requested assistance in "mitigating harmful interference" on 14.024 and 18.125 MHz coming from stations signing "URS" and "RKA," respectively. The requests resulted from reports filed by amateurs.

• US Marshals and engineers from the FCC's Kansas City office seized 31 pieces of illegal radio equipment from three CB operators. The three Missouri residents were "found to be operating on government frequencies, using equipment that had been illegally altered." Two of them were fined $2000, the other $1000. The equipment seized was valued at $3000. (FCC Public Notice, June 22, 1990).

FORMER HAM CONVICTED

Richard A. Burton, formerly WB6JAC, was convicted in Federal court July 20 of illegally operating a radio transmitter. Burton, arrested May 17 following an investigation by Los Angeles-area FCC engineers acting on complaints from amateurs, had been charged with three felony counts of violating Sections 301 and 501 of the US Code.

Burton's license was revoked in the early 1980s for violations of Part 97. After his appeals were turned down, he was ordered off the air, but continued to operate using his rescinded WB6JAC call sign. On January 15, 1984, US District Court Judge Manuel Real sentenced Burton on four misdemeanor counts of operating a transmitter without a license. Following appeals, Burton served seven months in jail and five years on probation. Burton now faces possible fines of up to $100,000 and/or up to two years in prison. Sentencing is scheduled for October.

ARRL COMMENTS ON PROPOSED RELOCATION OF NOVICE SUBBAND

On June 15, the ARRL filed comments on the proposal to relocate the Novice and Technician 80-meter CW subband. The proposal, numbered PR Docket 90-100, stated that the Novice/Technician 80-meter subband is subject to interference, especially from Canadian phone stations that operate on 3.725 MHz and above, making

FCC-ISSUED CALL SIGN UPDATE

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

District	*Group "A" Extra*	*Group "B" Advanced*	*Group "C" Tech/Gen*	*Group "D" Novice*
0	AAØBK	KFØLO	NØMDW	KBØHGE
1	WI1O	KC1VW	N1HUP	KA1WDM
2	WZ2R	KE2US	N2KXR	KB2KSD
3	WB3E	KD3SX	N3IHJ	KA3WQL
4	AB4WY	KN4LF	N4ZPI	KC4RUG
5	AA5SZ	KI5GY	N5QYQ	KB5NGK
6	AA6WS	KK6MJ	N6ZNT	KC6MHR
7	AA7FD	KG7GE	N7PCG	KB7LGV
8	AA8BQ	KF8HW	N8MOZ	KB8KKR
9	WT9N	KE9XQ	N9JWP	KB9FFM
Guam	KH2N	AH2CG	KH2EM	WH2AMN
Hawaii	**	AH6KN	NH6XA	WH6CII
Alaska	**	AL7MC	NL7UK	WL7BZC
Virgin Is	NP2F	KP2BU	NP2DX	WP2AHD
Puerto Rico	**	KP4QU	WP4YD	WP4JCQ

**All 2 × 1 call signs have been assigned in these districts.
Note: N-prefixed Group C (1 × 3) call signs for the fourth and sixth districts are nearly exhausted. After N4ZZZ and N6ZZZ have been assigned, the FCC will assign calls from the Group D (2 × 3) block.

telegraphy communications difficult in that narrow subband.

League comments state that the subband should be expanded to 3.675-3.750 MHz rather than shifting the band from 3.700-3.750 MHz to 3.675-3.725 MHz. The ARRL also asked the FCC to delete the 200-watt power limitations for General, Advanced and Amateur Extra Class operators to offset the reduction in operating privileges for those amateurs that would otherwise result.

FCC DENIES REQUEST FOR RECONSIDERATION IN 88-139

The FCC has denied a request for reconsideration in Docket 88-139, which revised Part 97 of the FCC rules.

The Radio-Television News Directors Association (RTNDA) had asked for a change in the rule prohibiting amateur stations from providing communications support to broadcasting operations, except when common-carrier facilities and broadcast remote pickup links have been disrupted and life or property is in immediate danger. RTNDA specifically had requested that the "immediate safety of life or property" provision be expanded to include information relating to any important news event, or as an alternative, that the immediacy factor be eliminated from the rules.

The Commission was not persuaded that it should adopt RTNDA's substitute rule or eliminate the immediacy factor from the current rule, believing that the prohibition against use of amateur stations for commercial purposes, including broadcasting, must be retained if amateur frequencies are to remain free of commercial exploitation.

LOWER PHONE RATES FOR AUTOPATCHES

Effective June 26, 1990, the Louisiana Public Service Commission has directed South Central Bell Telephone Company to file new tariffs changing its charges to Amateur Radio groups from commercial to residential rates, according to Ed Crump, KB5CX, of the Louisiana Council of Amateur Radio Clubs. This action capped two years of work by the Council.

Fred Wasielewski, WA2VJL, of the San Benito Amateur Radio Club in Texas, reports that Southwest Bell will, on a case-by-case basis, charge reduced rates for repeater autopatches.

With precedents now set in Louisiana, Texas, Connecticut and elsewhere—all by different telephone companies—this may be time for renewed efforts by autopatch repeater owners now paying commercial telephone rates to request reclassification.

ARTICLE REKINDLES EMF/CANCER DEBATE

An article in the July 9 issue of *The New Yorker* has again brought the possible dangers of electromagnetic fields to the attention of the general public. The author, Paul Brodeur, cites instances of possible "cancer clusters" near high-voltage power lines, electrical substations and power plants.

Amateur Radio operators became aware of the possible EMF-cancer connection a decade ago, following an Associated Press story on the subject carried in newspapers nationwide.

Dr Ivan Shulman, WC2S, in a *QST* article (October 1989), cited a study showing a larger-than-expected number of deaths from several types of cancer among amateurs on the west coast. Shulman pointed out, however, that for a number of reasons, no conclusions could be drawn from the study (by Samuel Milham, MD) because, among other reasons, the statistical sample was small and many of the amateurs also had been employed in potentially high-risk occupations.

Epidemiologist Dr David Savitz, speaking in West Hartford, Connecticut, on June 28, addressed a possible cancer cluster in Guilford, Connecticut. Savitz said that until definitive proof of the dangers of electromagnetic fields is available, it is prudent to avoid such fields whenever possible. This parallels Shulman's *QST* article.

Current thinking is that those most in danger are infants and pregnant women, and the most compelling cases thus far involve proximity to high-voltage lines.

HAMS RELAY MEDICAL AID FOR SOVIET AMATEUR

US amateurs from coast to coast, using HF, VHF FM and packet, have come to the aid of a critically injured Russian amateur.

On May 25, a group of Soviet hams from the UZ4FWO club station in Penza were involved in an automobile accident en route to a radiosport event. Oleg Kolosilin, RA4FB, was killed and Oleg Murugov, UA4FAY, was seriously injured. Murugov, 25, lay in a coma in a hospital near Ryazan, about 150 miles from Moscow, suffering from pneumonia and a collapsed lung. His condition had prevented doctors from moving him to better facilities.

Through the efforts of Americans, including neurosurgeon Dr Joseph Izzo of Foster City, California; Len Traubman, W6HJK; and others, US physicians advised their Soviet counterparts on treatment methods. Initial consultations took place on the 20-meter band via UZ4FWO. When Murugov's condition ceased to be life-threatening, the radio schedules became weekly progress reports.

In addition to medical advice, several hundred dollars' worth of supplies for Murugov, including powerful antibiotics and special tracheal tubing, were shipped from the US. Dr Charles L. Starke, NX2T, arranged for the tubing, which was shuttled to Kennedy airport in New York City by Allen Singer, N2KW.

Thanks to Amateur Radio, Murugov's friends received word that the shipments were en route, and they got to the Moscow airport in time to arrange expeditious treatment by customs authorities.

UA4FAY's condition has markedly improved. Two months after the accident, he was able to read, to speak with some difficulty and eat on his own.

How's DX?

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

A Timeless DX Friendship with YK1AA

By Peter Uberto, WB2WOW

One of the fascinating and rewarding attractions of Amateur Radio is establishing friendships throughout the world, an attribute which encouraged then-teen-aged WB2WOW to get licensed in the mid-1960s. Knowledge accumulated from speaking with hams all over the globe was valuable in his social, language and technical studies in high school. The friendships made endured the constraints of personal and career responsibilities and led to his DX addiction.—*W1YL/4*

One lazy weekday afternoon in June 1969, while casually tuning around a quiet 20-meter band, I was pleasantly surprised by a CQ from YK1AA, Rasheed Jamal. I quickly loaded up my HT-44 into a well-used TA-33jr, hoping my 80-watt SSB signal would be heard. Luckily, there wasn't an instant pileup, enabling me to get him on the first call. After exchanging the regular DX QSO information, we spent time rag chewing, discussing our backgrounds and other interests. As Humphrey Bogart said at the end of *Casablanca*, "this was the start of a beautiful friendship."

We began a correspondence which lasted several years. Unfortunately, going away to college limited my operating time. When I had last heard from Rasheed in 1973, he had a complete Drake line and a TA-33 on a home-made 30-foot tower, allowing him to be active on 10 and 15. His increased work schedule at the Radio Institute, however, reduced his operating time to an occasional weekend.

Rasheed studied English as a student in high school and received his degree as a radio technician at an Istanbul University in the '20s. In 1936, he became an SWL, using a home-made 20-meter receiver. Many years of raising a family and job requirements eventually led to a more relaxed pace and time was available to build a home-brew amateur station in the mid-1940s. In 1946, he came on the air with the unofficial call AR1RJ, using a crystal-controlled oscillator on 20-meter AM/CW, complemented by a wire dipole from a 1940s *QST*. In 1947, Rasheed was officially licensed as YK1AA, the call he still has today, the first radio amateur in the Arab world. At that time, he upgraded his station to 400 watts, along with a new home-brew 20-meter beam. A year later, he established and became President of Syria's Technical Institute of Radio and was responsible for Syria joining the IARU. He switched to sideband in 1965 using an HW-32 transceiver and a home-brew amplifier. That inspired his son, Hikmat, to obtain his license, YK1AM.



Veteran DXer Rasheed Jamal, YK1AA, still works the pileups with youthful enthusiasm. The 81-year-old Jamal was first officially licensed in 1947, and was the first amateur in the Arab world.

Late one night last September, after years of minimal activity, I recognized YK1AA's familiar voice saying QRZ DX on 20 meters. Two old friends became reunited over the air waves, filling years of silence. Rasheed, now retired at the sprightly age of 81, enjoys working DX more than ever. He's reconditioned his Drake line gear and is still rotating the venerable TA-33, but from a new and bigger home in Dumar, not far from his old QTH in the heart of Damascus. His son, YK1AM, is still licensed but is inactive because of work constraints. We are again corresponding via the airwaves and by mail, and hope our friendship will continue another 20 years.

Rasheed has always been a dedicated goodwill ambassador for Amateur Radio, making many a DXer happy while consistently exemplifying and promoting the fine standards of the hobby. In 1987, he was awarded a plaque from the ARRL commemorating the 40th anniversary of the Technical Institute of Syria and for his contribution to the world of radio engineering. YK1AA was gratified that his achievements outside the hobby were recognized by the Amateur Radio community. Equipment and propagation may change, but the bonds of friendship are universally appreciated and strengthened in the Amateur Radio community.

LONG-PATH ECHO?

It's about 7400 miles from San Francisco to Tel Aviv on the Great Circle and about 17,500 miles long path. Because RF travels at 186,000 miles per second, a signal will take either 40 or 94 ms to traverse the distance (depending on which way it travels). If you receive signals from both directions at once, there will be a delay of about 54 ms—producing a nice echo. Most of the stations that I heard working 4X6TT remarked on the pronounced multipath echo accompanying his signal. Amir did not respond to these comments. It did, however, seem to be an interesting physical phenomenon, no? NO! I just happened to be reading the mail earlier and overheard a New York ham reporting on and assisting with the adjustment of the degree of echo. A gadget was being used to add "distinction" to the signal. It certainly worked, but as you can see, things are not always what they appear to be.—*thanks Marty Levin, W6BDN.* [So much for the romance of L-P—*Ed*]

TRANSMITTING YOUR QTH

(*Thanks to W4KM for the following translation.*) Here are some tips from an early 1990 issue of the Russian magazine *Radio* by G. Chilyants, UY5XE, Master of Sport, L'vov, Chairman of the SWL Commission of the Federation of Radio Sport of the USSR: Give your address only when asked to do so by the other station, or after he has given you his; avoid giving your address when working DX and expeditions; it's not ethical to indicate the need for IRCs, much less the number of IRCs needed; respond via the bureau if there are no enclosures in the envelope sent to you; send your QSL by direct surface mail if one IRC is enclosed; respond by direct airmail if two IRCs are enclosed.

CIRCUIT

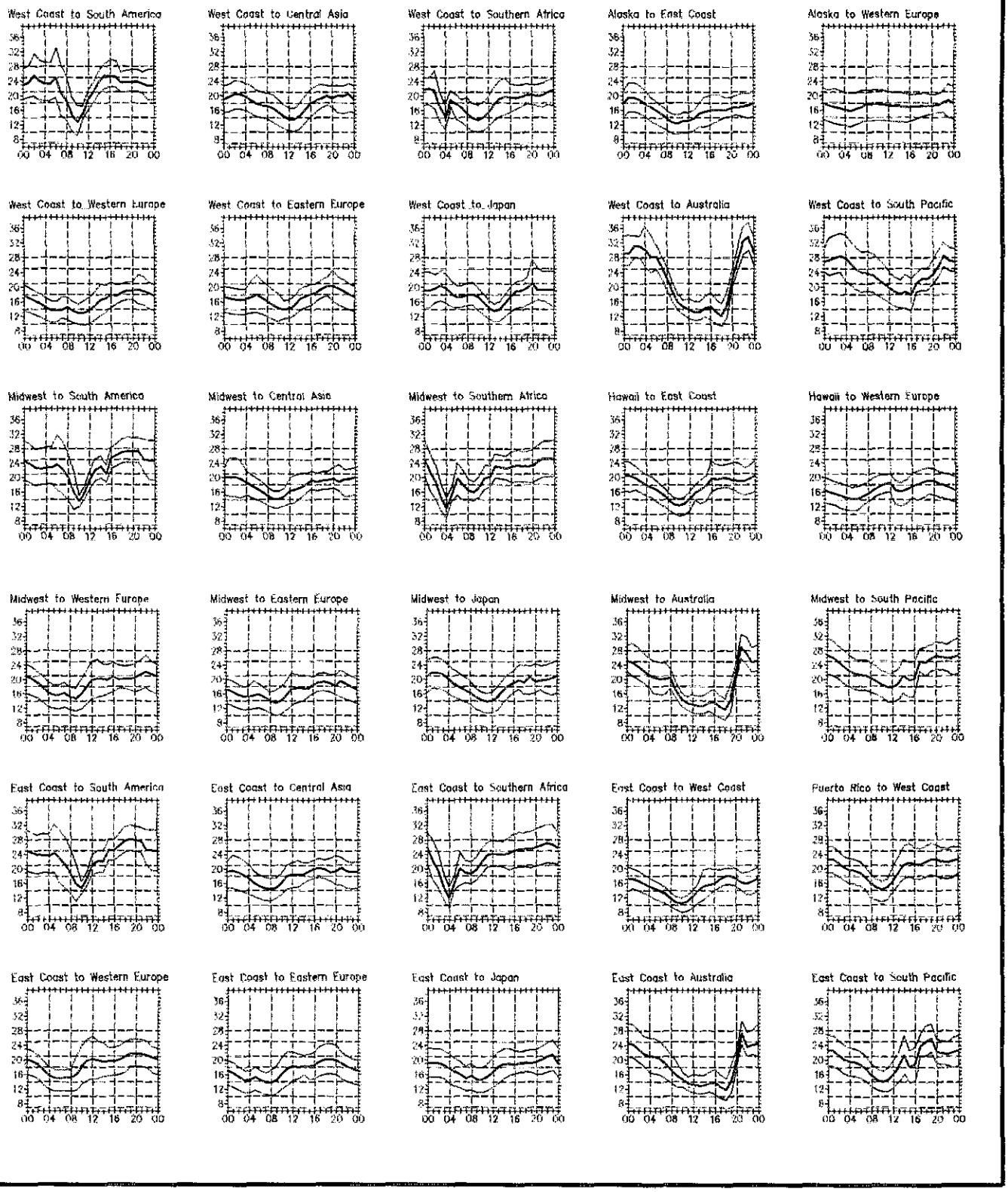
☐ **4K**: 4KØ, Polar Arctic Region; 4K1, Antarctica; 4K2, Franz Josef Land; 4K3, European Arctic; 4K4, Asian Arctic.

☐ **YASME**: W6CBN furnished a particularly interesting note *vis-a-vis* the April story on *Yasme*. It may be that Danny Weil's WWII prisoner-of-war experiences led to his confusion with the Japanese word for holiday, *yasumi*. His ship, the *Yasme*, may well be a corruption of that word. (And so language evolves!)

☐ **4S7PB**: Paddy was off the air for 12 years but is once again QRV. Many remember him from the days of the Southeast Asia Net (SEANET). (*thanks W4ZR*)

☐ **Questionables**: Dick, WB4LLV, hasn't been on HF for the last eight years. Ignore his call being used from Zaire (or anyplace else!). C31SB will not be operative until 1992, so any operation using this call sign isn't legal. N5MRX reports that the station using 8P9AF via VE3LGC is a pirate.

☐ **Routings**: QSOs July 4, 1990, and later for code man A41JV go via KJ4GK (SASE, please). EL2CX (K3RV) will be QRV for three years; cards go via N2AU, Art Hubert, 436 N Geneva St, Ithaca, NY 14850. QSLs for EOØAAK (operated May 7-10 each year by UZØAWB), go to Box 12219, Krasnoyarsk 660041, USSR. IKØNWD, IKØNWE, W9LT/1Ø, N4QIV/IKØ QSL via W9KBV. J49G, an August expedition by 20 Greek hams, was from almost-deserted Gavdos Island, the southernmost point in Europe, reports George Osipof, SV1KU, Kafksou 54, GR 113-63 Athens, Greece. WP4ATF/KP5, used on Desecheo in 1984, can now be reached through Jose Maldonado Sr, Box 1825, Carolina, Puerto Rico 00628. (*thanks K4BUF*) S79D is closed down and Dick now holds VQ9RB. Dick no longer runs the S7 QSL Bureau. Cards for either of those calls go to Richard C. Barnes, NAVSUPPFAC, Box 55, FPO San Francisco, CA 96685-2000. Cards for UAØADN go to the operator, Eugene Yakimov, Box 20618, Krasnoyarsk 660130, USSR (he also volunteers to act as a QSL manager). VP2V/NP2CG is now VP2VE, cards go via WA2NHA only. XT2BW QSLs via WB2YQH with an SASE or SAE/IRC (see below). YU1PJ (ex-YU1PJQ) now QSLs via KA7NOC. QSL route for 4S7PB: Paddy Gunasekera, 9/1 Claessen Place, Colombo 5, Sri Lanka.



When are the bands open? These charts predict this month's average propagation predictions for high-frequency circuits between the US and various overseas points. One chart showing East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or HPF). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or MUF). On 90 percent of the days of the month, it will be at least as high as the lowest curve (optimum traffic frequency, or FOT). The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. See April 1983 *QST*, pp 63-64, for a more-detailed explanation. The 3rd edition of *The ARRL Operating Manual* contains similar charts for a range of sunspot numbers and times of the year. Sunspot data is derived from *Solar Indices Bulletin*, National Geophysical Data Center (E/GC2), Boulder, Colorado. Curves are generated using IONCAP. These predictions, for September 16 to October 15, 1990, assume a smoothed sunspot number of 142, which corresponds to a smoothed 2800-MHz solar flux of 185.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmation for contacts with 100 or more countries on the official DXCC Countries List. An SASE will bring you the rules and applications forms for participation in the DXCC program. Send $1 to request *The ARRL DXCC Countries List*

DXCC Notes

1990 DXCC HONOR ROLL LISTING

Because of the unusually high volume of applications during the past few months and in the month of March, the Honor Roll month, the Honor Roll Listing will be published in the October issue of *QST*. Amateurs who submitted Honor Roll applications during the past year and during the month of March 1990 will have their updated Honor Roll totals included in the Honor Roll Listing. Your patience is appreciated.

ANNUAL LISTING REMINDER: Those who wish to update their totals for the 1990 DXCC Annual Listing must submit confirmations during the month of September. They must reach HQ on or before September 28, 1990, to be included in the listing. You must comply with DXCC Rule 5, including the once-a-year exception, to update your DXCC standings.

NEW USER FEES TO SUPPORT DXCC

The ARRL DX Century Club will institute a new fee schedule October 1. DXCC, while affecting a relatively small percentage of its members, is a substantial financial burden on the League. User fees, approved by the League's Board of Directors, will go toward better service (quicker turnaround time).

The fee structure is intended to encourage participants to send less-frequent individual submissions to DXCC. Here is the basic outline:

1) After October 1, every first-time applicant for DXCC will be charged $10, in addition to the usual charge for return postage. DXCC members as of October 1, 1990, are exempt from this registration fee.

2) ARRL and CRRL members will be allowed one submission per calendar year free of charge; this annual submission may include any number of QSLs, any number of DXCC awards and any combination of new and endorsement applications. It does not include a person's all-time first submission.

3) Non-League members outside the US and Canada will be charged $10 for their first DXCC submission of any kind each calendar year.

4) US and Canada DXCC participants who submit more than once in a calendar year will be charged $10 for each submission after the first one. Foreign nonmembers will be charged $20 for additional submissions. QST

Strays

ARRL AND RSGB COMMEMORATE TRANSATLANTIC FIRST

☐ Radio amateurs celebrated an historic event in Androssan, Scotland, on December 11, 1989, with the dedication of a plaque on a site that has great significance for Amateur Radio. In 1921, American engineer Paul Godley set up a station and first heard Amateur Radio signals from across the Atlantic Ocean. Early photographs of the camp site at Montfode Farm, now a housing development, show Abbotsford Nursing Home in the background. The plaque was unveiled at the nursing home by members of the RSGB.

The plaque reads, "Near this site in December 1921, radio signals transmitted by radio amateurs were first heard across the Atlantic. American engineer Paul F. Godley selected Androssan as a quiet spot for radio reception and spent several long winter nights in a tent with his receiving apparatus. He was rewarded with confirmed reception of more than 30 different Amateur Radio stations in Canada and the United States, thus proving that vast distances could be spanned by radio without massive commercial installations.

"Erected in December 1989 by the Radio Society of Great Britain to commemorate the 75th anniversary of the founding of the American Radio Relay League, sponsor of Godley's expedition."

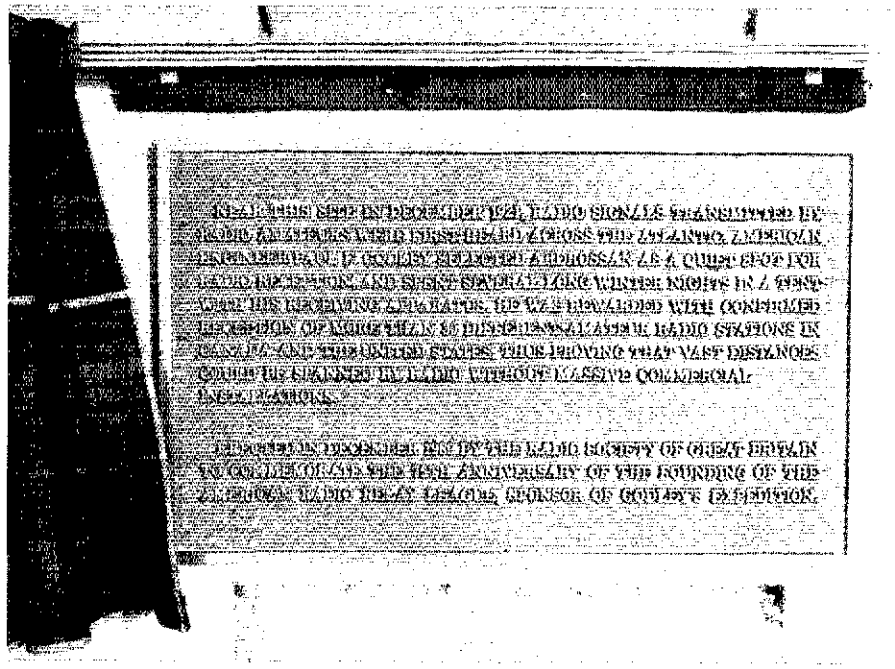
The plaque was made possible by the initiative and generosity of Ian Elliot, W7JMX, of Bozeman, Montana, who conceived the idea while visiting his ancestral home in Scotland. A replica of the plaque has been placed at RSGB HQ.

I would like to get in touch with...

☐ "motorcycle mobile" amateurs. Budd Turner, N7EOJ, 120 W River Rd, Tucson, AZ 85704.

☐ anyone who has information on a Dentron MLX-Mini 20-meter QRP rig and an Edgecom System 3000 or FMS25. I will reimburse postage and photocopies of schematics, manuals, service info or sales brochures. I'd also like to find someone who could help repair this equipment. Mike Herman, KC9NF, 1549 N Cicero Ave, Chicago, IL 60651.

☐ anyone who has operated a Theta-Tono 777 modem with a Commodore C-64 computer and a Yaesu FT-707 HF transceiver. Norman M. Campbell, VK6UV, 8 Bolt Ct, Lesmurdie 6076, Western Australia.



This plaque was unveiled by John McCreight, GM3DJS, honorary president of the Cunninghame and District ARC; RSGB President Frank Hall, GM8BZX; Ann and Neil Cowan, owners of the Abbotsford Nursing Home; and David Evans, G3OUF, secretary of the RSGB. Each year the Cunninghame club operates special-event station GB2PG to mark Godley's achievement. *(GM4SRL photo)*

Correspondence

Conducted By John Hennessee, KJ4KB
Regulatory Information Editor

All letters will be considered carefully. We reserve the right to shorten letters selected in order to have more members' views represented. The publishers of *QST* assume no responsibility for statements made herein by correspondents.

DON'T LEAVE HOME WITHOUT IT

☐ I recently had a pleasant experience that may entertain and interest hams who travel.

In April, I flew from my home in California's Mojave Desert to Purdue University in Lafayette, Indiana, to interview engineering graduates. After arriving, I found that the airline had misplaced my luggage, which contained all my interview material and my suit. A quick inventory of my carry-on bag revealed that I could survive the next day if only I could find a tie. It was Sunday night, however, and I thought few stores would be open; a quick drive around town confirmed my fears.

Also in my carry-on bag was an *ARRL Repeater Directory*, so I tuned to a local repeater and requested help in locating a store. The next thing I knew, I was sitting with Jack, K9AHX, having an eyeball QSO. Not only did he lend me his favorite tie, but he invited me to the local ham club get-together the following evening.

On my way back to the motel following the next day's interviews, I monitored a conversation about "the N6 in town whose luggage had been lost." I tail-ended the QSO and was directed to the shack of Dan, KE9OV, where I spent an hour swapping tales of 2 meters, HF and computers. That night, I was welcomed at the local gathering where I met more local hams.

Indiana is renowned for its "Hoosier hospitality" and I am certainly happy to say I discovered this phenomenon in great abundance. I'd like to express thanks to Pedro, WB9RVN; Cecil, WB9UXX; and Mike, WB9YPG, for making me feel like one of the gang. My Indiana experience points up a very comforting reality: Hams the world over are willing to help a colleague in a tight spot. It also convinced me that a hand-held transceiver and a *Repeater Directory* can be the most valuable accessories you can bring along on a trip; I know I'll never leave mine at home.—*David A. Rosenthal, N6TST, Ridgecrest, California*

HAMMING WITH YOUR SISTERS

☐ After more than 60 years of enjoying this wonderful hobby, I've found another avenue of fun. Amateur Radio and the Sister Cities movement are made for each other. Yet, my observation is that not much is being done with it by our amateur fraternity. My town, Navato, California, and Shepparton, Victoria, Australia, are Sister Cities. I maintain regular schedules with Peter O'Keefe, VK3YF. Travel plans and friendly conversation result.

If you're interested, call your city manager to find out if your town has a Sister City and let him or her know you're a ham. You could be missing out on a valuable contribution to international goodwill and friendship. Don't forget third-party traffic restrictions, though.—*Hugh Turner, W6SVC, Navato, California*

BELAY THAT CAPTION!

☐ In August's Up Front in *QST*, on p 11, the lower-left photograph, "Two Centuries of Maritime Service," shows the man in the center identified as *Commander* Paul M. Welling. The shoulder boards on this officer's shirt look more like the two stars of a Rear Admiral—not the three stripes of a Commander.

Also, the Pratt & Whitney R-2800 aircraft engine (shown on page 12 of August *QST*) should have been identified as having 18 cylinders, not 12.—*Jack Wichels, W7YF, Edmonds, Washington*

[You're absolutely right, Jack, Rear Admiral Welling is the *Commander* of the Fifth Coast Guard District, headquartered in Portsmouth, Virginia. Our apologies, Admiral—*NTØZ*]

A FRIEND REMEMBERED

☐ On June 7, 1990, the Amateur Radio community suffered the loss of one of its most devoted members with the passing of Gay E. Milius, Jr, W4UG. Gay's perpetual enthusiasm led one to think he was a much younger man. I met Gay when he was 58 and I was 27. Quite an age difference, but in Amateur Radio, it doesn't matter. Our friendship never waned even though we later lived a thousand miles apart; after all, a thousand miles was perfect for evening schedules on 160. As his illness weakened him, my 800 telephone number began to substitute for our schedules.

Gay was special; always heard in the pileups, always a leader, an elder statesman of Amateur Radio, he was a friend with a lasting influence. My hat is off to you, Gay, for a life that touched me deeply. Thanks for the memories. Old hams never die, they just QSY!—*Tim Hulick, W9QQ, Blue Bell, Pennsylvania*

MARRIED...WITH TICKETS

☐ My husband Ken, KN2U, and his dad were licensed 27 years ago. After I married Ken, my father and I decided to see what Amateur Radio was all about, so in 1979 we got our Technician tickets. I was on 2-meter FM for a decade before discovering 10 meters (maybe that was because Ken didn't want to share his Kenwood TS-440S)! Then, one day I was bored, so I sat before Ken's rig, gathered all my courage and called CQ. Someone came back to me all the way from California! Little did I know what was to follow over the next eight months.

Ken and our two boys saw me switch from following soap operas to chasing DX. They may have missed a big home-cooked meal or two, but I received my WAS and DXCC on the same weekend and I have WAC confirmed.

I was made Vice President of the Gloucester County ARC and at the banquet, Ken stood up and said, "There are three classes of people in the world: Hams, people who wish they were hams and people who are married to hams. I used to be in the first category. In the past few months, I've been doing the dishes while she works on her DXCC and takes care of the kids. If I don't hear her on 2 meters as I come home from work, I know she's hard at work in the kitchen, preparing for a contest. When I get home, I find everything on the table for me, though, with a note that says," I love you and know you worked hard all day, so look on the table for your favorite: needle-nose pliers, climbing belt, tape and meter. The SWR is a bit high and 3Y5X is coming up. When you get down, there's a pot pie, but please don't put it in the microwave because I'm on that circuit."

"It's great to be in the third category, married to a ham, but, Marla, may I use the rig for a while tomorrow?"

Well, okay...now, on to another pileup; after eight months, it's my turn to clean the house!—*Marla Bozarth, N2DWR, Wenonah, New Jersey*

FIRST WITH THE FAX

☐ I would like to note that the the fax machine that has fallen into common usage and which, in the mind of many, stemmed from the productive prowess of Japan, is in fact, an extension of early American genius.

When I was a boy, a well-known Cleveland, Ohio, amateur, Harold W. Abell, W8FHE, lived up the street. He was a willing and fascinating "Elmer." I spent hours listening to the bands and observing his activities.

Sometime around 1940, Abell installed a receiver/printer made by the Crosley Radio Company that would print a morning newspaper, complete with picture illustrations, all produced from radio transmissions. It was in a mahogany box about two feet square, with the paper on a large roll. The printing was not produced thermally, but with ink, and legibility was good.

Surprisingly, the genius of Powell Crosley did not transmute this great accomplishment into the cheaper and easier mode of using wire transmissions for sending documents, thereby turning the US Postal Service into the US Fax Service or conversely, turning the presently miniscule Western Union into a giant. Opportunities must be recognized before they are realized.—*Harlan H. Todd, N8AED, Dayton, Ohio*

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

NTS in Disaster Communications: Does it Do the Job?—*Part 2*

By Jean A. (Doc) Gmelin, W6ZRJ
Honorary ARRL Vice President

Health-and-welfare (H&W) traffic comes about because of the public's concern for the welfare of loved ones. An illustration follows:

There is a major earthquake in California. Reports on national television say that in the area involved there may be thousands of deaths and widespread destruction. Aunt Mary in St Louis is immediately concerned about her nephew Joe, who she has not seen in 22 years and has only heard from three times during that period. "Is Joe all right?" "Is he seriously injured?" "Does he need help?" Or the worst fear, "Is Joe among the fatalities?" These concerns are real. The closer the relative is to the possible victim, the greater is the concern.

Aunt Mary immediately picks up the telephone and calls. The telephone is the number one "immediate" communications device today. Of course, if the disaster is bad enough, there is no telephone communications or the lines are tied up. Aunt Mary fails to make immediate contact and this only makes her more concerned. Next, she may call the local TV station or newspaper, the police, the Red Cross, Salvation Army or some other agency. Again, she probably fails to find a way to make direct contact.

Eventually, she may be given the name and telephone number of an Amateur Radio operator. What happens next depends on the ham. Most amateur operators probably feel that they can contact the West Coast easily. After all, it's pretty easy to work W6-land via the HF bands at almost any time. If the ham is a regular traffic operator, he probably puts the message into whatever net he works on a regular or "sometimes" basis. Or, he may get on the air and make a directional CQ to the city or area of the disaster. By chance, he may make contact with an amateur in the area either by the CQ or by finding the frequency of nets taking traffic into the disaster area.

When he does make an inquiry, he may even get an answer fairly quickly. Often the traffic is not formal written traffic, but may be just a name and telephone number. If the amateur is a regular traffic operator, he will probably write the traffic in the form of an H&W message and file it on one of the nets, often via the NTS. By then, however, the system is overloaded and if there are only a few outlets in the disaster area, the traffic will pile up. Experience in the recent Loma Prieta earthquake in California shows that this was true even for packet traffic.

One reason traffic piles up is that in a disaster area, local officials and disaster/emergency organizations are—and must be—more concerned with the handling of immediate disaster problems, such as fighting fires, rescuing trapped individuals in fallen buildings and bringing needed supplies into the area. Disaster officials don't want individuals going about trying to locate possible victims to deliver H&W inquiries.

During a disaster, amateurs who have never been involved with ARES or in preparing for such situations, come on the air and offer their services. Sometimes these operators force themselves into the emergency net operations only to clutter up and disturb the normal disaster organizations. As the late Harry Engwicht, W6HC, past ARRL Director and first Chairman of the Pacific Area Staff said, "In a communications emergency, hundreds of hams 'come out of the woodwork' and do more harm than good in providing emergency communications."

It is sometimes necessary to ask "What good is the NTS if it cannot quickly handle the large bulk of H&W traffic during a communications disaster?"

It must be pointed out that the NTS is working well and handles 10,000-15,000 messages per month on a routine basis. This operation is valuable to Amateur Radio for two reasons:

1) It gives hundreds of amateurs training in handling formal, written, third-party traffic.

2) It is good public relations for Amateur Radio because it provides a service to the public, even if this service seems to handle mostly mundane messages during normal times.

NTS provides a training ground for traffic operators in the use of several modes most commonly utilized by NTS, in the use of proper message form and in net procedures. Theoretically, operators with training in handling traffic can do a better job during disasters and other times of need.

NTS is not really designed to handle the large amounts of bulk, point-to-point traffic going to a specific disaster area. Nor is the system designed to handle the short distance/short message "tactical" traffic handled in the local area of the disaster.

In practice, bulk H&W traffic is often handled on "pickup" nets and circuits set up at the time of the disaster to handle this traffic. Most recently, much of this bulk traffic has been handled on packet and AMTOR circuits. Such circuits have proven effective, although just as with the normal NTS phone and CW nets, delivery of H&W traffic coming into a disaster area is difficult because of a lack of local communications resources, especially in the early hours of a crisis.

For decades, many ARES organizations and served agencies have been putting 24- or 48-hour moratoriums on incoming H&W traffic. This makes it difficult or impossible to learn the condition of people living in the disaster area. It is better to handle H&W traffic during disasters by sending status information out of the area rather than accept incoming H&W inquiries.

Better planning and organization are the keys to better emergency operations. Also, better cooperation between NTS and ARES organizations will lead to improved coordination between the groups. But it could be that the organizational structure of the NTS, and perhaps the ARPSC itself, do not lend themselves to easy coordination. Maybe it is time to look at the organizational structure to find better ways to bring about coordination at all levels. Because we are taking a hard look at NTS structure, perhaps this is the time to attack the problem of how to best handle H&W traffic during disasters. By improving our system, we can better achieve our goals of training and service through Amateur Radio.

Field Organization Reports
June 1990

Note: An August Public Service column sidebar commented that the purpose of BPL was to recognize "NTS traffic handlers." A more accurate statement would be that BPL is for those who handle traffic in standard ARRL format, regardless of NTS affiliation. See "Brass Pounders League" for BPL qualification information.

Cycle Three

Area Net

EAN	30	149	4.91	.479	75.2	

Region Net

1RN	30	71	2.45	.255	93.1	80.0
2RN	30	91	3.03	.255	96.0	73.3
3RN						96.6
4RN						62.0
8RN						90.0
ECN						66.6

Cycle Four

Area Nets

EAN	30	742	24.73	.975		96.19
CAN	30	510	17.00	.911	100.0	
PAN	22	326	14.82	.825	97.8	

Region Nets

2RN	48	160	3.33	.382	76.7	96.6
3RN	30	104	3.46	.276	90.0	100.0
4RN	80	372	6.20	.285	94.7	100.0
5RN	60	422	7.03	.480	84.1	100.0
6RN	60	276	4.60	.540	97.5	98.3
7RN	60	186	3.10	.584	82.2	100.0
9RN	60	190	3.16	.380	94.0	100.0
TEN	60	171	2.85	.307	100.0	
TWN	62	144	2.32	.310	62.0	91.9
ARN	30	59	1.96	.052		93.3

*PAN operates Cycles One and Two.

ARRL Section Traffic Managers reporting: AL, AR, AZ, CT, DE, ENY, GA, IL, IN, KS, MDC, ME, MI, MN, NC, NFL, NH, NLI, NNJ, NTX, NV, OH, OK, OR, ORG, SB, SC, SD, SFL, SNJ, SV, TN, VA, VT, WNY, WV, WWA.

75
WA1JVV
KA4RZZ
NY8W
KA8CPS
KA7WZM
N7BGW
K8JDI
WB1BTJ

74
WA2FJJ
N2DXP/T
AA4XF
KJ9J

73
N8FPN

72
WV0L
K2PBP/T

71
KA2QOO
WA2PAC
KD0NH
N7MAL
KB7LX

70
W6RE
WA3YLO
KA0VEQ
W4TZC
K7OVK

69
KA2INE
WB5J
NW3K
NB2D

68
W4IBU
ND0N
NZ5J
AA4ZV

67
WA4RUE
KA4HHE
K0PIZ
WB5YDD
N4SSX
W1TC

66
WB0WNJ
KB4CAU
W7LNE
KA7WFW
N8FWA

65
KA4FZI
NJ3V
KA2KJF
WA8DHB
N6CRV
N2AKZ
KD8KU

64
WB2FTX
KB4CYC/T
N6FWG/T
N5ILI
NR3Q
N8INP

63
W7LBK
W2FR
N4JAQ
W9UMH
K3GHH
K1ABO
KD0YL

62
W4DWN
AB4EZ
WA4GYR
N5KEI

61
KA2ZNZ/T
WB2QIX
WB2OEV
KA2QOU
NM3K
N5OQW
KC4OJM
K2TWZ

60
KB2HYT/T
WA2UKX

WA4RNP
WA3UNX
KB4OPR
WF2M

59
KA6TND/T

54
N2EVG/T
N2KBD/T

52
N2JBA/T

51
WB2ZIE/T

49
N2JRS/T

48
KA2UIU/T

47
KA1HPO/T
N7MME/T

46
KB2CEV/T
KA2JMA/T

45
N5JUU/T
N4LST

41
KA6HJK/T

40
KA8YWV/T
KC4JGC/T

The following stations qualified for PSHR, but were not listed in the appropriate months' columns: N5LJF (April). W8AKF, N2IMP (May).

ARRL Section Emergency Coordinator Reports

There are currently 30,039 ARES members accounted for in SEC records. Twenty-eight sections reported this month: AL, EPA, GA, IN, KS, KY, ME, MI, MN, MO, NE, NFL, NLI, NM, NV, OH, ORG, RI, SD, SDG, SFL, STX, VA, WWA, WMA, WNY, WPA, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Central	85	83.50	332	332
TCC Pacific	100	83.33	366	622
Summary	185	83.41	698	954
Cycle Four				
TCC Central	63	70.00	160	342

TCC Roster

Eastern Area, Cycle 2: KW1U, Director.

Eastern Area, Cycles 3 and 4: KN1K, Director.

Central Area, Cycle 2: N0FBW, Director. KG5TL W5QFU WB5YDD N5SM K5UPN VE5KZ KE5ZV WA4JDH W5CTZ AE5I W0FE

Central TCC Area, Cycle 4: K5GM, Director. K5GM WB5J W5JDF K5MXQ N5TC K5TL W5TFB W5TNT KB5W W9CBE W9KLN WA9QCF KF0FI W0GRW AI0O NR0S N0SM NB0Z

TCC Pacific Area, Cycle 2: ND5T, Director. W5JOV ND5T WB6DOB WF6O K6UYK KF7AG W7AMM KA7YYR VE7EII W7IGC KF7R W7TGU KA7YYR WA0YNP.

TCC Pacific Area, Cycle 4: K0DJ, Director.

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep to Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	30	550	18.33	.600	90.0	
CAN	30	627	20.90	.550	100.0	
PAN*	58	428	7.37	.675	95.5	
Region Nets						
1RN	60	350	5.83	.398	92.0	100.0
2RN	59	196	3.32	.287	93.2	96.7
3RN						90.0
4RN	60	239	3.98	.350	75.0	93.3
5RN	60	563	9.38	.383	83.0	100.0
6RN	59	119	2.01	.255		98.2
7RN	52	197	3.78	.310	77.8	100.0
8RN	60	179	2.98	.275	94.4	93.3
9RN						100.0
TEN						100.0
TWN	59	181	3.07	.277	75.0	98.2
ECN						66.7

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, will be awarded a special PSHR certificate from HQ. This certificate is a one-time award, ie, it is not issued more than once.

620
W8AKF

238
WD8V

178
W2MTA

166
KF5BL

147
WA2SPL

145
WT0G

141
WB2OWO

135
N2JAW

134
N4GHI
WI2G

133
KF8AU

125
KA1EXJ

121
WB4DVZ
K0BXF

120
WA4PFK
W4ANK
W7LNE

117
K9CNP

116
KK4M
KA8ZGY
WA1TBY
KB2EPU

115
W1PEX

114
W7LRB

113
N0CYR

112
W9DM

110
KI6ZH
N1FLO
WE2G

109
K4IWW

108
KJ3E

107
WB2ZJF
WA4JDH
N3EMD
N3EGF
WB4KSG

106
N2EIA
KM4JD

105
W4QAT

104
WB8SYA

103
W7TVA
WB4MMD

102
W2QNL

101
W0OYH
W4PIM
WT8J
KD8HB
WB2VUK
N5MEA

100
KT1Q
WA4EIC
KC4GCK
W4JLS

99
N2XJ
KA0PDM
WD4LOO

98
N1CPX
WF6O
KT6A

97
WA9VND
KA0ARP
W5YQZ
WB4WII

96
WA4QXT
N4EXQ

95
KC3Y
KB1AF
KA1GEP

94
W1KK
KA1S

93
WA2ERT
AC5Z
N4JTG

92
WS7U
WB8FSV

91
N4TJT

90
WA0TFC
KB9LT
WD5GKH
WB4ZTR

89
KA2GJV
WT0E
NR9K
KA0KPY
K4MTX

88
N0FOO
KI4YV

87
W7TGU
W2RRX
N4VVX

86
KB5BNU

85
W1ALE
W2MTO
WR2E
WB4IDB
N4XFX
WD0GUF
W5CTZ

84
KD2WP
K0ERM
KJ4EK

83
W2DMM
N5LJF
N5NAV
W1KX

82
WB7WVD

81
K3RXK
KA2VZX
K2ZVI

80
K2YAI
WB8R
KC5NG
AA4AT

79
K2VX

78
N7KLO
KA0VQN
KA1IFC

77
KF7GB
N4WFU

76
KC4BHX
N3DRM
N7LVK

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	697	2984	3013	431	7089
W3CUL	715	806	1309	87	2917
N0BQP	31	946	49	662	1688
N0FBW	0	641	641	90	1372
W3VR	441	396	461	52	1350
W1PEX	0	335	703	31	1069
WB0WNJ	215	95	736	2	1048
W1FYR	31	410	415	20	876
W3IWI	1	476	478	0	955
WB7QWG	0	393	383	0	776
N2GTE	13	358	365	2	738
KA1IFC	0	290	368	14	672
WA4JDH	0	303	342	6	651
WB0TAX	25	300	300	0	625
K0HOA	2	304	306	0	612
KF5BL	65	210	287	35	597
WA2SPL	9	276	248	35	568
N4GHI	3	303	213	28	547
K4DOR	63	210	265	8	546
W7TGU	62	400	72	0	536
N4SS	1	271	243	8	523
WI2G	6	214	261	38	519

BPL for 100 or more originations plus deliveries:

WD4IIO	166
KA0ARP	147
W0FIR	120
KB6ECH	105

The following stations qualified for BPL during the month of May but were not listed in last month's BPL column: W3CUL 2983, W3VR 1210, W8AKF 7981.

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	26	247	308
Bears of Manchester	30	359	410
Central Gulf Coast Hurricane Net	30	83	2563
Clearing House Net	30	197	310
Great Lakes Emergency & Traffic Net	30	101	942
Golden Bear Amateur Radio Net	30	74	1235
IMRA	26	503	1443
Mission Trail Net	30	153	821
NYSPTEN	30	72	437
Southwest Traffic Net	30	238	1261
20-Meter ISSB Net	25	924	289
75-Meter Interstate SB Net	30	186	871
7290 Traffic Net	48	334	3083

The World Above 50 MHz

Conducted by Bill Tynan, W3XO*

1990 Central States VHF Conference—Another Success

The 24th annual VHF/UHF/microwave conference held by the Central States VHF Society took place July 26-28 in Wichita, Kansas. Jon Jones, NØØY, this year's Society President, was assisted by a fine crew. He and his wife Pat, NØHKT, who headed up the family program, put on another interesting, informative and fun-filled affair for anyone interested in the world above 50 MHz. Among the collection of technical programs assembled by Vice President John Lock, KFØM, was an presentation on lightning and its effects by NØJWY, a dissertation on power GaAsFET preamps by WA5VJB, and one man's approach to putting together a simple 2-meter moonbounce station by K5YY.

The antenna range was, as usual, a very popular spot Friday morning, with all sorts of commercial and home-brew arrays assembled for testing. Prizes were awarded for the highest gain home-brew entries for each band. Friday evening's events included the traditional VHF flea market and the always-popular noise figure measurement session. Like the antenna range, prizes were awarded for home-brew preamps with the lowest noise figures on each band. While these events were transpiring, those who preferred went to see *The Unsinkable Molly Brown* at a nearby dinner theater.

For those with sufficient stamina, there was the usual midnight meeting of SNOTTS (Silly Nitwits On Two-Twenty Sideband). The slightly wacky group meets only once per year, at midnight Friday night during the Central States Conference. Perennial SNOTTS scribe WA5VJB entertained the assemblage with accounts of previous years' lively meetings. A feature at this year's gathering was the initiation into the organization of the young sons of several members. These boys have received their amateur licenses and met the SNOTTS requirements of operating 220-MHz sideband and showing up at the meeting. After much discussion, it was decided that, since they are "harmonics" of their OMs, their membership numbers should be multiples of those held by their fathers. On that note, the SNOTTS meeting finally decayed to below a critical mass a little after 3 AM. I'm not sure what happened after that!

At the membership meeting, the Society endorsed the 13-cm band plan recommended by the VUAC and reaffirmed its earlier decision to contact other VHF groups to obtain their views on the advisability of submitting a petition to the FCC asking for protection of the weak-signal segments of the bands from increasing FM operation.

It was announced that next year's Central States Conference will be held in Cedar Rapids, Iowa, with KØDAS as President. One of the points repeatedly brought out during the affair was that one need not attend the Conference to be a member of the Society. Anyone interested in the bands above 50 MHz is urged to join and help support this worthy organization. Each member will, of course, be sent information on the coming year's Conferences, as well as other interesting material. Dues are currently just $5 per year. Send checks to Bob Taylor, WB5LBT, Treasurer, 10715 Waverland Dr, Baton Rouge, LA 70815.

ON THE BANDS

Like the old story of several blind people describing an elephant, this year's 6-meter Sporadic-E season has been varied to say the least—terrible to many and wonderful to a few. W2CAP/1, on Cape Cod, although describing the overall 1990 season as "mixed" will, nevertheless, remember it fondly. June 26 made the difference. That memorable day, Steve had, *what seemed to him at the time, his own* "private European opening." Beginning about 1200Z, he started hearing the CTØWW beacon as well as in-band video. Then, 40 minutes later, the 9H1s appeared and he worked eight of them during the next 50 minutes. During this time, he realized that he was the only US station working anything except K1IKN in Rhode Island, about 75 miles to the west, who snagged one 9H1. The band was quiet from 1330Z until 1550Z, when French stations began to be heard. Over the next hour, much of Europe was in. W2CAP/1 seemed to be at the center of things with huge pileups of Europeans calling him. Score for the day: eight 9H1s, nine French stations, six PAs, one CT1, four Italians, five *Germans, five Belgians plus OE5NEL and LX1JX.* Steve worked five new countries, which put him well over the 100 mark! K1JRW was also reported to have taken advantage of the conditions, working DK1PZ and SV1OE for new countries.

Another New England station to make hay June 26 was W3EP/1, Lebanon, Connecticut. Like W2CAP, Emil was alerted by the appearance of the CTØWW beacon, which was in at his QTH from 1400Z to 1730Z, and reached S9 plus 20 dB. 9H1BT was worked at 1455Z and F5QT, who was S9, was worked at 1523Z. Then, as Emil says, "the real fun began." Six French stations went into the log over the next half hour and, through the pileup, a new country in the form of SV1OE. The Greek station was an incredible 20 over! PAØERA was worked at 1644Z, followed by I1LUT, LX1JX and DJ6MB—all new countries. From 1658Z until 1719Z, *DL6YAM, PAØRDY, PA3BFM, DL6EBW,* DK7ZB, DJ3TF, DL4RU, DK2PR and F6BSJ were worked. W3EP adds that, on the 28th, he heard CT1QP at S-9 starting at 1147Z. CT1DTQ was also heard. Both stations seemed to be working 9s and Øs. At 1419Z, Emil worked ZB2EO for a new country. Then, beginning about 1950, he worked G3FXB, G4IGO, PE1LCH, G3IOL, G1DWQ, PAØBFM and OE1CAK for another new country.

In his rundown for June, G4UPS notes that the 26th featured a "big Sporadic-E opening" to OZ, SM, OH and LA. Some of the highlights of that day included contacts between SM6PU and Italian stations, with signals running S-9 and better, and a QSO between SM6FZD and *CU1EZ, in the Azores. For the 28th,* Ted chronicles the "first contact between San Marino and the US." This historic first took place at 2016Z between T77C and K4CKS, in Georgia. G4UPS's report for June lists some E_s or auroral activity somewhere between the UK and various parts of Europe during 27 days of the month. Compare that with our North American experience. Things seemed to pick up in this part of the world during the end of June and the first few days of July. CU1EZ was worked in much of the eastern part of the country around the 6th and 7th. A DXpedition to the Azores by G3SDL reportedly worked as far west as K5UR, in Arkansas. OX3LX has been active again, working into both North America and Europe.

One who would characterize the 1990 E_S season as "terrible" is El Paso station WA5QCP. Richard says that except for the Memorial Day weekend, when he worked stations from VE1YX to NI6E/KH6—including 33 new grids, conditions in his part of the country have been disappointing. XE1GRR was worked during Field Day, but most openings have been spotty and confined to the western states.

W5OZI reports on a June 15-17 6-meter *"gridexpedition" to the hot, normally dry, west* Texas grids of DM90, DM80, DL89, DL79 and DM70. Intended operation from DL88 had to be postponed because of bad road conditions. Although hampered by 108° temperatures and flash floods, Pat made a total of 127 QSOs. The QSO/grids rundown is: DM90, 7; DM80, 15; DL89, 73; DL79, 0; DL70, 0; and DL99, 32; E_S conditions were reported as spotty, with few sustained openings. As this is being written, WD8Z is in the midst of a "gridexpedition" to Ontario. I'll try to have a report next month.

W2RS's principal 2-meter activity has been working new grids on meteor scatter, as well as continuing to increase the list of stations worked via the moon using a single 32-19 Yagi and a *150-W solid-state amp. During the Eta Aquarids* Meteor Shower, Ray landed two new grids by working NØAKC/9 in EN44 and N4OYS in EM65. The first of these contacts was rather special in that NØAKC's XYL gave birth to a baby boy the night before their morning schedule. But, Charlie kept the sked anyway. The EME total for W2RS now stands at 16 stations in seven countries and six states, his latest addition being K2GAL during the REF EME contest in which KI3W and KB8RQ were also worked. Ray has had a total of 48 QSOs via the EME. W2RS also notes the fine record of OZ1AZZ, who has worked 49 different stations via the moon, running somewhere around 1-kW output to a single Cushcraft 4218 Yagi.

*Mail reports to Bill Tynan, W3XO, at HCR 5 Box 574-334, Tierra Linda Ranch, Kerrville, TX 78028, or phone 512-257-1296 to make a voice recording regarding late-breaking information or to send a fax.

70-cm Standings

For WAS holders, listings are WAS number, call sign, state, call areas worked and grids worked. For others, call sign, state, US states worked, call areas worked and grids worked. Call areas are the 10 US call areas plus KH6 and KL7 plus each VE and XE call area plus DXCC countries not located within the continental limits of the US, Canada or Mexico. (The UN does not count as a call area.) Grids are those Maidenhead designators worked since the VUCC award was instituted January 1, 1983. To make the standings a true reflection of current 70-cm activity, those not reporting within the past two years have been dropped. They will be reinstated upon presentation, in writing, of a statement indicating continued activity. It is not necessary to show additional states, call areas or grids worked to be relisted. Compiled July 8, 1990. See page 77 of March 1990 *QST* for publication schedules and submission dates for this and other boxes.

1	W0YZS*‡	MO	—	—
2	K2UYH*†	NJ	71	—
3	K5JL*†	OK	48	—
4	WB5LUA*	TX	41	—
5	W5FF*†	NM	28	—
6	W1JR*†	MA	54	178
7	W0RAP*†	IA	44	206
8	WB0TEM*	IA	—	—
9	KA0Y*	IA	—	—
10	WA4MVI*†	SC	26	—
11	K5FF*†	NM	29	—
12	DL9KR*†		55	202
13	K4QIF*	VA	36	—
14	K1FO*	CT	44	286
15	KL7WE*	AK	—	—
16	N4GJV*	NC	—	—
17	NC1I*†	MA	—	—
18	VE4MA*†	MB	50	—
K1LPS*		VT	22	12 32
WA1HYN		RI	17	9 53
W1RIL		MA	15	9 36
N1AIS		MA	11	5 —
W1FAJ		CT	10	3 12
K2LME/1		CT	6	— 8

* = EME used for some contacts.
† = WAC

W2VC	NJ	27	11	78
WC2K	MJ	25	12	96
K2GK	NY	24	10	77
W2PGC	NY	24	10	45
W2CNS	NY	23	10	—
N2WK	NY	19	9	58
WA2FUZ	NY	18	9	20
N2BJ	NY	16	9	50
K2OVS	NY	16	6	24
WB2YZV	NY	13	5	26
KU2A	NY	11	6	26
KA2RDO	NY	11	6	26
W2ONP	NY	6	4	12
KB3PD*	DE	45	13	98
W3RUE	PA	31	11	74
W3IP	MD	28	10	57
NW3C	PA	25	10	44
WB3LJK	MD	24	10	65
W3ZZ	MD	24	9	76
KB3QM	DE	23	—	54
KZ3X	PA	14	7	34
W3OTC	MD	8	6	14
KC4EG*	KY	30	9	67
K4QF	AL	25	9	—
WS4F	GA	24	9	68
K4CKS	GA	24	8	102

N4MW	TN	24	8	59
WB4SLM	GA	21	8	70
KX4R	GA	21	7	100
N4VC	TN	21	6	54
KI4CI	FL	18	6	72
N4MM	VA	18	6	44
WD4AFY	GA	14	5	47
WA4MJD	TN	13	5	27
KK4NO	SC	12	6	35
WD4FAB	FL	10	4	52
WD4AHZ	FL	9	2	60
NA4I	GA	7	2	21
K1FJM/4	FL	4	2	24
W5RCI*	MS	45	32	181
K5UR	AR	29	10	156
K5SW	OK	29	9	120
W5HN	TX	28	8	62
W5DFU	OK	22	8	84
WA5VJB	TX	22	7	—
WA5TKU*	TX	22	6	68
W5UGO	OK	22	5	109
WA5HNK*	TX	20	6	50
N5BBO	TX	12	3	64
AA5M	TX	9	3	50

W6ABN*†	CA	43	34	—
N6AMG*	CA	9	16	—
K6QXY	CA	4	3	—
W6RXQ	CA	3	2	16
N7ART*	WA	49	42	130
W7FN*	WA	47	46	122
W7HAH*	MT	42	25	87
W7JF*†	MT	40	25	—
W4WD/7*	UT	38	33	—
K7ICW	NV	15	15	53
W7RV	AZ	7	5	47
NW7O	NV	3	2	18
W8IDU*	MI	49	12	107
W8YIO*	MI	40	31	105
WB8BKC	MI	33	9	133
N8OJB	OH	27	9	112
K8AXU	OH	20	9	36
WB8TGY	MI	18	8	51
WB9OJR	IL	27	8	74
K9SM	IL	19	7	70
K9VGE	WI	17	9	70
W9UC/9	WI	15	5	69
W9YCV	WI	13	6	35
KA9MGR	IL	13	5	40
K0TLM*†	MO	47	24	101
K0ALL*	ND	41	21	—

W0KJY*	CO	33	33	101
K0DAS	IA	27	7	49
K0IFL	MO	22	6	54
WB0DRL	KS	21	6	74
W0JRP	MO	20	6	79
K0US	NE	20	7	51
N0LL	KS	18	7	85
WQ0P	KS	16	5	61
KB0HH*	KS	15	6	53
K0RZ*	CO	11	7	51
KX0O	CO	6	—	17
KH6HME	HI	2	2	6
VE3LNX	ON	23	9	69
VE5LY	SA	2	4	6
VE6AFO	AB	3	4	11
SM0PYP*		32	—	—
G3SEK*		29	46	190

FM/RPT

Conducted By Brian Battles, WA1YUA
QST Copy Editor

Fight RptFI (Repeater-Frequency Interference)—*Part 1*

Last night I heard, "That repeater in Allentown is sure wiping us out, I'll have to increase my power." Soon after, those using the W3OI machine in Allentown, Pennsylvania, shut down. I heard a "3" call and several "2" calls and wasn't sure which repeater I was listening to, so I inquired. It turned out the repeater was in Liberty, New York. The ops expressed surprise that I was dead full-quieting (DFQ) into their machine using only five watts. There was a band opening, so this was no great feat. I was also receiving another machine between transmissions, location unknown, but DFQ nonetheless.

While working a machine 50 miles away, I often interfere with a repeater about 110 miles distant, even on low power (five watts). The Eagleville, Pennsylvania, machine (146.835) has CTCSS[1] capability, but usually disables it because of the patch into the Emergency Operations Center (EOC)—just dial 9-1-1 on the DTMF pad. This causes interference with Manahawken, New Jersey, which also has CTCSS capability that is usually not activated. The redeeming feature is that the Eagleville machine transmits a subaudible tone. A receiver equipped with a decoder blocks unwanted signals.

A problem exists with the term "PL." Many amateurs think this means the repeater is "private." This could not be further from the truth. Maybe a change in the terminology would help. Education through the *Repeater Directory* seems appropriate. If a repeater is "private," print it in italics or otherwise note it in the directory. List the required tone frequency on the same line as the repeater, rather than in the front of the directory. This would save time for mobile operators seeking emergency help. Repeater voice or CW IDs could include the CTCSS tone information.

There are enough tones for all repeaters sharing a frequency within 400 miles of each other to use different ones. This would take care of most band openings, relieve frustration and make the 2-meter band plan workable once again.—*David L. Williams, N3FNW, Glenside, Pennsylvania*

Some repeaters using CTCSS are identified in the *ARRL Repeater Directory* with something like, "CTCSS 131.8." Unfortunately, amateurs whose 2-meter rigs do not support subaudible tones would have to modify their rigs, buy new radios or be "locked out" of certain repeaters. In emergencies, it might be difficult to quickly determine the correct tone, program it into a transceiver and bring up the machine. This is especially true for hams who travel—and who are likely to come upon road emergencies.

There is no official doctrine on standard incorporation of CTCSS access tones for 2-meter FM. (In July 1980, the ARRL Board of Directors adopted a uniform voluntary plan for tones to be used on 10-meter repeaters.) Before we debate whether there should be such a policy on other bands, why not write in with your comments about the pluses and minuses of this idea (aside from those mentioned above)? When you write, however, don't just point out a problem; propose a solution.—*Ed.*

[1]Subaudible access tone systems are known generically as Continuous Tone-Coded Squelch System (CTCSS). This is widely used in commercial two-way radio communications technology. "PL" is a term trademarked by Motorola that stands for Private Line. A receiver using CTCSS responds only to carriers transmitting a particular tone "under" the user's voice. Some receivers use CTCSS to keep their audio squelched until a particular station transmits. The subaudible tone is generated by the transmitting station when the mike is keyed. Nobody hears the tones because their frequencies are below the receiver's audible passband.

Repeaters equipped with CTCSS are not readily activated by distant transmitters. This reduces unwanted "DX" from interfering with local communications—and it is sometimes deliberately used to restrict use of a "private" repeater to those who know the access tones. The system isn't foolproof, however; a repeater being accessed by a tone-equipped station responds to other signals received at the same time. Interference can occur.

CTCSS uses a series of tones between 67.0 and 254.1 Hz adopted by the Electronic Industries Association (EIA), designated by Motorola's alphanumeric PL codes, eg, YZ = 82.5 Hz, 9Z = 229.1 Hz, etc.

Amateur Satellite Communications

Conducted By
Douglas A. Loughmiller, KO5I
PO Box 27, Brookston, TX 75421

Introduction—*Part 2*

As my colleague Jeff Ward, GØ/K8KA, reported in June, we will be sharing the byline on the Amateur Satellite Communications column. Jeff and I will be working together to provide you with a wide variety of information about the different aspects of amateur satellite operations.

Jeff and I have been involved in the amateur satellite program in various roles for some time now. Our backgrounds and interests complement each other in a unique way, so we jumped at the chance to work together on the column. The excitement of today's amateur satellite program has been well depicted in Jeff's first three installments. I will strive to follow suit.

We're interested in your suggestions on how we can make the column useful and informative. So please let us know the topics you'd like to see covered. We can be reached at the addresses listed at the top of our respective columns. We look forward to hearing from you!

1990—The Year of the Amateur Satellite Program

As we entered 1990, the prospects for an expanded amateur satellite program were great. A number of significant and independent projects were about to reach fruition. In recognition of the expected advances, the ARRL Board of Directors issued a proclamation in early January declaring 1990 "The Year of the Amateur Satellite Program." Events since then have fulfilled our every expectation. Seven OSCARs have been placed into orbit since the first of the year. Each of the new birds offers unique resources that enhance amateur satellite communications on a global basis.

1990 continues to be a productive year. More satellite launches are anticipated, as is the return of manned Amateur Radio operations aboard the space shuttles. So stay tuned as the space-based excitement of Amateur Radio continues!

RS-14

Probably the most noteworthy satellite expected to reach orbit in the near future is RS-14. By the time you read this column, the new Soviet satellite should be circling the Earth. RS-14, a joint project of AMSAT-U-ORBITA in Molodechno, White Russia, the Adventure Club in Moscow and the AMSAT-DL/RUDAK group in Marburg, Munich and Hannover (Germany), will bring to eight the number of amateur satellites launched during 1990.

Table 1
RS-14 Transponder Data

Transponder 1

Uplink: 435.102-435.022 MHz
Downlink: 145.852-145.932 MHz
Output power: 10 watts (max)
Beacon frequency: 145.822 MHz, 0.2 watts
Telemetry formats: 8 parameters of CW telemetry, 30 parameters of PSK digital telemetry, 1100 bit/s

Transponder 2

Uplink: 435.123-435.043 MHz
Downlink: 145.866-145.946 MHz
Output power: 10 watts (max)
Beacon frequency: 145.948 MHz, 0.2 watts
Telemetry formats: 8 parameters of CW telemetry, 30 parameters of PSK digital telemetry, 1100 bit/s

RS-14 is a versatile amateur spacecraft incorporating linear transponders and digital store-and-forward capabilities. There's something for everyone aboard this new bird!

Orbital Parameters

RS-14 will be placed into a sun-synchronous circular orbit at an altitude of 1000 km, with an inclination of 98° to the equator. Its orbital period will be about 105 minutes. Users of OSCAR-8, which was active in the late '70s and early '80s, will recognize the similar track.

Communications Capabilities

RS-14 contains two separate Mode-B linear transponders (70-cm uplinks, 2-meter downlinks). These are inverting transponders with 80-kHz pass bands. Table 1 outlines the specific details of both transponders.

The digital store-and-forward capabilities of this satellite are both unique and versatile. In our next installment, we will take an in-depth look at this aspect of RS-14.

Approaching LOS

As this column is prepared for press, the amateur community has learned of the launch of a satellite aboard a Chinese *March* launch vehicle on July 16. The new bird reportedly has downlinks in the 2-meter band. Although details are sketchy, indications are that this satellite, known as BADR-1, was built in Pakistan with the participation of the Pakistan Amateur Radio Society. The satellite uses a UoSAT-OSCAR-11 type DCE (digital communications experiment) with a downlink on 145.825 MHz. We will provide additional details as they become available. BADR-1 is reportedly in a very low orbit with a perigee of 200 km and an apogee of 984 km. Its orbital inclination is 28.49°, with an orbital period of 96.5 minutes. For computer-tracking purposes, an initial set of orbital data is offered in Table 2.

Table 2
BADR-1 Orbital Data

Satellite Name: BADR-1
Epoch: 90198.08455059
Inclination: 28.493100
RAAN: 297.7287
Eccentricity: 0.0562305
Arg of Perigee: 138.089000
Mean Anomaly: 226.384400
Mean Motion: 14.90429605
Decay Rate: 0.001972920
Beacon frequency: 145.825

LOS

In closing, please remember that the achievements of the amateur satellite program are made possible only through the financial support of the entire amateur community. AMSAT—The Radio Amateur Satellite Corporation—makes the OSCAR program possible. Your support will ensure the further advancement of this special aspect of Amateur Radio. For more information about the amateur satellite program, write to AMSAT, PO Box 27, Washington, DC 20044.

Until next time, 73 and happy tracking!

Strays

I would like to get in touch with...

☐ anyone who has a Ten-Tec Century 21 Model 570 CW transceiver. Weldon Cromwell, VE3ILN, 15 Orton Pk Rd #1501, Scarboro, ON, M1G 3G3, Canada.

☐ anyone who has a schematic and manual for an Edo-Aire RT551A transceiver. Allan Leto, KA1LXT, 12 Eden St, Ludlow, MA 01056.

Packet Perspective

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716-2702
CompuServe ID no. 70645,247

HF Packet SRO Redux

The June column wrestled with the problems of HF packet radio. Data throughput is poor because HF packet is popular. Its popularity has resulted in overcrowding and to make matters worse, the HF packet crowd is largely undisciplined, with some ops using USB, others using LSB and everyone using different tone pairs and frequency shifts. With such a cacophony of standards, it's a wonder that any HF packet communication occurs at all!

Since June, I've received many suggestions on how to improve our HF lot. Two writers summed it up best and I have excerpted their responses to give you the gist of their ideas. There was also an article in the July issue of *QEX* about a new HF data communications mode called "cloverleaf," which could offer a solution. With that, I turn the column over to Dave Casler, KEØOG, of Louisville, Colorado, and Mike Moore, N7RY, of Estacada, Oregon.

New Protocol for HF Packet

Thinking about AMTOR got me thinking about HF packet radio. AMTOR is a natural for the HF environment. Send a little, see if it's okay, then send a little more. Packet functions well in a more benign environment, like VHF and UHF. When I monitor HF packet radio, I see endless retries by PBBSs sending files to one another. AMTOR is more efficient, although two stations in AMTOR communications tie up a channel full-time.

Clearly, we have to change HF packet protocols to match the medium. A combination of error detection (ACK/NACK) and forward error correction (FEC) would provide a great improvement in throughput. This combination increases overhead, perhaps as much as 100%, but we could invest that 100% increase in a *good* FEC code. Error-correcting codes have error-detection properties also; for example, an error-correcting code that corrects 10 errors in 100 bits can detect up to 20 errors.

There are two kinds of error-correcting codes: block codes and convolutional codes. The most common convolutional code (rate ½, constraint length 7, JPL polynomial) has 100% overhead and does not resynchronize well after a burst error. Also, the most common convolutional decoding method, Viterbi, is complex and difficult to implement in amateur-affordable hardware.

Block codes have fixed block lengths, but offer excellent error correction and would be more suitable for amateur applications. Once we select a block-code length, this will force all packets to be a multiple of that block length. I suggest a code with a length of approximately 63 bits (the total of message bits and parity bits) with an overhead goal of about 40%. Packet lengths would be multiples of 63 bits and each 63-bit block would be encoded and decoded separately. Then if the checksum fails, the packet would be retransmitted. This results in effective FEC. While there is some overhead, it is not very different from AMTOR overhead and it preserves the advantage of ALOHA-type channel access.

Many error-detecting codes are intended for randomly occurring errors rather than burst errors. HF errors tend to be bursts (a lightning static burst can wipe out several bits in a row). One way around this is to interleave bits; that is, deliberately mix up the bits to spread out burst errors more evenly after returning the bits to their proper order.

Error-correction coding, bit interleaving and requests for retransmission of non-reconstructable packets should provide a significant increase in HF packet throughput. Some experimentation is in order to find the best combination of codes, code lengths, interleaving schemes, packet size and so on, but within a reasonable period of time, we can optimize AX.25 for HF.—*Dave Casler, KEØOG*

Conserving the Radio Spectrum

For many years, hams have gotten by with 45-baud, 5-level RTTY because that's about as fast as many people can type. HF packets are sent at 300 bauds because that was a commercial standard for telephone modems when packet was born.

A problem with 300 bauds is its 3-ms data bits—they are too short for most HF conditions. Lengthening the pulses by 6 to 10 ms would make a big difference. If we abandoned the telephone-modem 300-baud standard and slowed down to perhaps 200 or 150 bauds, the pulses would be longer and more data would get through on HF.

What shift should we use to conserve bandwidth? Some TNCs provide 600-Hz shifts for 300-baud operation. Let's analyze this "standard" with a rule of thumb for estimating bandwidth. If the modulation rate in bauds is somewhat less than the shift in Hertz, add the shift plus twice the modulation rate to obtain the bandwidth. A 600 Hz-shifted 300-baud signal has an approximate bandwidth of 1200 Hz [600 Hz + (2 × 300 bauds)]. Compare this to 170 Hz-shifted 100-baud RTTY or AMTOR with an approximate bandwidth of 370 Hz, or old 170 Hz-shifted 45-baud RTTY with an approximate bandwidth of 260 Hz. This illustrates that we are missing the boat if we shift at 600 Hz. By doing so, we lose two or three adjacent channels that would be available if there were narrower shifts.

How about 200-Hz shift? The modulation rate in bauds is more than the shift, so a different rule of thumb applies. Most of the intelligence is sent at approximately the shift plus the modulation rate in bauds (200 Hz + 300 bauds = 500 Hz). Although rigorous analysis shows more bandwidth is being filled with energy at the transmitter, most of the intelligence is in a 500-Hz spectrum and you can copy packets through a standard 500-Hz filter, allowing HF packet channels to be spaced more closely.

Minimum bandwidth occurs when the shift equals the transmission rate in bauds. Then, the energy appears as a Gaussian bell-shaped curve instead of the double humps that typify standard RTTY. When the shift is less than the transmission rate, as it is now on HF packet, the curve flattens out and no longer has the minimum bandwidth we desire. If hams could live with 150- or 200-bauds and a 200-Hz shift, we could keep almost all the spectral energy in a 500-Hz slot and pack signals in like RTTY. If we stick with 300 bauds, we should use a 300-Hz shift to minimize bandwidth and conserve radio spectrum.

USB or LSB?

I have read that it "makes no difference whether you use LSB or USB on packet." That's partially true, but to avoid clobbering each other, we have to select a standard. For years, we've used LSB for AFSK RTTY, so that would be my recommendation. If we agree on standard tone pairs, telling the other person your carrier frequency would be enough to locate you.

Of course, someone will come along with true FSK and ask, "But where are you?" If they don't know what the standard tones are, they can try MARS' method of using the center frequency between the final output spectral peaks.—*Mike Moore, N7RY*

Strays

I would like to get in touch with...

☐ any amateurs who conduct a net for farmers or cattlemen. Rich Porter, WYØK, Rt 1 Box 64, Reading, KS 66868.

☐ anyone operating 2-meter packet using a Texas Instruments TI/99-4A computer with a Kantronics KPC-2 TNC. Bill Soble, W3QXT, 9357 Hoff St, Philadelphia, PA 19115.

At the Foundation

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

Back to School with a Double-Header

Our season's beginning and again we're "up to bat" for education. If you're putting a son or daughter through school or if you're a student yourself, here are two more reasons to "think Foundation" when you want to support or apply for a scholarship.

It's M-I-S-S-I-S-S-I-P-P-I, Friend!

Jackson-area hams have founded the Mississippi Scholarship Fund to be administered by the ARRL Foundation. The scholarship will be for Mississippi student-hams with an interest in engineering, computer technology or other scientific disciplines. Clyde Hurlbert, W5CH, former ARRL Vice President and Delta Division Director, and other Charter-Founders (see the names denoted with an asterisk in Contributor's Corner, this page), hope to raise the funds to grant a scholarship in 1991. If you or your club want to help, send your tax-deductible donation to: The Mississippi Scholarship Fund, ARRL Foundation, 225 Main St, Newington, CT 06111.

For Those Who've Already Graduated...

Study as hard as you might and you still won't get a PhD in Amateur Radio. That can only be had by making a $25 (or more) contribution to the PhD Scholarship Fund, founded by the PhD Amateur Radio Association, Inc, of Liberty, Missouri. The attractive certificates were a hit at the 1990 ARRL National Convention in Kansas City and there's still time for you to get your "degree" until November 1, 1990. All proceeds are to fund the planned 1992 ARRL Foundation-administered scholarship to be open to US student-hams with an interest in journalism, electronics or computer science. Send your contribution, payable to the ARRL Foundation, to: PhD ARA, PO Box 11, Liberty, MO 64068.

Contributor's Corner

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As received and acknowledged during the months of **May** and **June**.

Club Spectrum

Conducted By Rick Palm, K1CE
Field Services Manager, ARRL



Reminder: September 15 is **Amateur Radio Public Awareness Day!** To make the public aware of the existence, purposes and benefits of Amateur Radio, get your club members together to put on a display at a local school, library, town hall, park or mall.

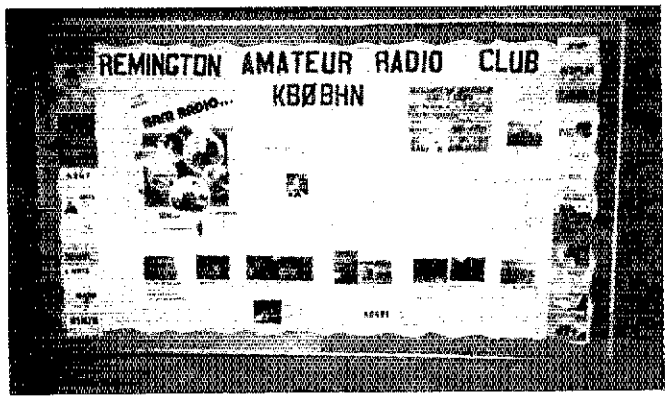
Members of the Central Arkansas Radio Emergency Net (CAREN) Mary Allsopp, WB5DVA, and her husband Bill, W5TJI, of Little Rock, Arkansas, operate a station at the Arkansas State Fair. *(WD5AHP photo)*

The ARRL can provide you with exhibit materials. Let's make sure everyone knows about ham radio! Contact HQ for assistance.

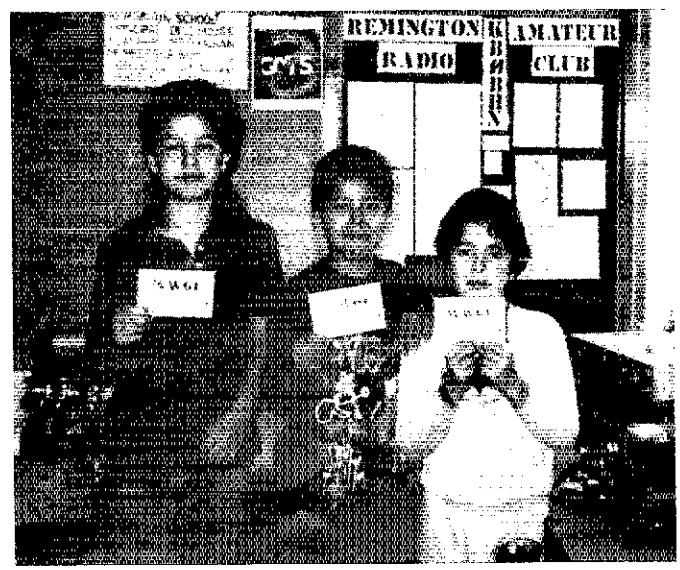


Rebuilding antennas are students at Remington Elementary School in Denver, Colorado. Thanks to grants from AT&T and the Victor C. Clark Youth Incentive Program, Remington Amateur Radio Club members are renovating the local elementary school's club station. *(KBØBHN story and photos)*

[For more info on the ARRL Victor C. Clark Youth Incentive Program, contact the ARRL Foundation, 225 Main St, Newington, CT 06111.]



A Remington Elementary School bulletin board publicizes Amateur Radio and draws students into the club. Glenn Durant, KBØBHN, of Firestone, Colorado, a member of the Longmont ARC, uses aspects of Amateur Radio in his fifth-grade class to help teach a variety of subjects.



Remington ARC members (l-r) Rudy Varela, Rudy Martinez and Carlos Salas, show off their first QSL cards. The club has about 25 members and is open to all students in the school.

Coming Conventions

ILLINOIS STATE CONVENTION

September 15-16, 1990, Peoria

The Illinois State Convention is sponsored by the Peoria ARC and will be held at the Exposition Gardens on Northmoor Rd. Open 6 AM-4 PM. Features include refreshments, forums, VE exams, flea market. Admission is $4 in advance, $5 at the door. Talk-in on 146.16/76. For info, contact Superfest '90, PO Box 3461, Peoria, IL 61614 or call 309-674-5656.

ROANOKE DIVISION CONVENTION

September 15-16, 1990, Virginia Beach, Virginia

The Roanoke Division Convention is sponsored by the Tidewater Radio Conventions, Inc and will be held at the Virginia Beach Pavilion. Open Saturday 9 AM-5 PM, Sunday 9 AM-4 PM. Features include ARRL and DX forums, major commercial exhibitors for Amateur Radio and computers, VE exams Sunday and an outdoor flea market. Admission is $5 in advance, $6 at the door (good for both days). Talk-in on 146.37/97. For info, contact Manny Steiner, K4DOR, 3512 Olympia La, Virginia Beach, VA 23452, 804-340-6105.

MICHIGAN STATE CONVENTION

September 21-23, 1990, Gaylord

The Michigan State Convention is sponsored by the Chain of Clubs and will be held at the Fairgrounds; take I-75 to M-32 E to North Center, then N to the Fairgrounds. Features include VE exams, forums, exhibits, net meetings, Wouff Hong, banquet, campsites available. Admission is $3 in advance, $5 at the door. Talk-in on 147.72/12. For info, contact Jim Toler, WM8T, 3070 Van Tyle, Gaylord, MI 49735, 517-732-7748.

KANSAS STATE CONVENTION

September 22-23, 1990, Wichita

The Kansas State Convention is sponsored by the Wichita ARC and will be held at 53rd St North and I-135. Open 9 AM Saturday through noon on Sunday. Features include Saturday evening banquet, ARRL and technical forums. Admission is $5 in advance, $6 at the door. Talk-in on 146.34/94. For info, contact Vern Heinsohn, WAØZWW, 950 Back Bay Blvd, Wichita, KS 67203, 316-264-2796 (reservations for lodging—Red Coach Inn, 1-800-362-0095 in Kansas or 1-800-528-1234 for the rest of the US. A block of rooms is reserved; just mention the Kansas ARRL Convention).

1990

October 12-14
Pacific Division, San Jose, CA

October 13-14
New England Division, Boxborough, MA

October 27-28
Tennessee State, Chattanooga

ARRL NATIONAL CONVENTIONS

August 23-25, 1991—Saginaw, Michigan

August 20-23, 1992—Los Angeles

DAKOTA DIVISION CONVENTION

September 28-30, 1990, Fargo, North Dakota

The Dakota Division Convention is sponsored by the Red River Radio Amateurs and will be held at the Holiday Inn, West Acres. Open Friday night, Saturday all day and Sunday morning. Features include ARRL forum, DX speaker, QCWA, 10-10 Net forum. Admission is $5 in advance, $6 at the door. Talk-in on 146.16/76. Contact K. W. Covey. Reservation info: Holiday Inn, 3803 13th Ave S, Fargo, ND 58109, 218-233-4691.

KENTUCKY STATE CONVENTION

September 29-30, 1990, Louisville

The Kentucky State Convention is sponsored by the Greater Louisville Hamfest Association and will be held at the Commonwealth Convention Center, downtown. Features include flea market. Admission is $5 in advance with SASE, $7 at the door. Mail request for tickets or more info to Greater Louisville Hamfest Assn, PO Box 34444, Louisville, KY 40232, 502-964-1132.

Attention Hamfest and Convention Sponsors

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You are encouraged to register your event with HQ as far in advance as your planning permits. Note that the hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register: Registering dates with ARRL HQ does not constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your Division Director. For conventions, approval must be made by your Director and by the Executive Committee. Application forms can be obtained by writing to or calling the ARRL Convention Program Manager, telephone 203-666-1541, ext 283.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance.

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 (Mobile)—September 22-23,** Sat 9 AM-5 PM, Sun 9 AM-4 PM. *Spr:* Mobile ARC. ABBA Temple Fairgrounds, 7700 Hitt Rd, (off Schillinger Rd, S of Airport Blvd). Refreshments, forums, ATV, packet, MARS, VE exams (Sat 10 AM), self-contained RVs welcome. *TI:* 146.34/94, 146.22/82. Adm: adv $3, door $4, children free. *Tables*: $8 for 1 day, $10 both days. Jess, N4HPL, 205-957-6674 or Ed, KC4BRI, 205-649-4597.

†**Alaska (Anchorage)—September 22-23**; Sat 10 AM-6 PM, Sun noon-6 PM. *Spr:* Anchorage ARC. *TI:* 146.34/94. Adm: $1. Cathy Moody, KL7NR, 907-694-4077.

Calgary (Alberta)—September 15; 9 AM-1 PM. *Spr:* Novatel ARC. Parkhill Community Ctr, 4013 Stanley Rd SW. Ham radio, computer & test equipment, refreshments. *TI:* 146.16/76, 146.52. Adm: $2. *Tables*: $2 (to reserve a table, send your name, call sign & $2 to Novatel ARC, 1020 64th Ave, NE, Calgary, Alberta T2E 7V8).

California (Perris)—October 5-14. *Spr:* Lee De Forest ARC. 18700 Lake Perris Dr. Demonstrations. *TI:* 145.240. Adm: $5, 12 & under free. Ruth Ann Rich, N6HIW, 41020 Benton Rd, Hemet, CA 92343, 714-767-7603, PBBS address N6HIW @ KA6JOB; Donna Lindsey, N6OKS, 714-926-4106, or Jim Cameron, KB6YBP, 714-927-4555.

†**California (Sebastopol)—September 15**; set up 7 AM, public 8 AM-2 PM. *Spr:* Sonoma Co Radio Amateurs. Holy Ghost Hall, 7960 Mill Station Rd, just off Hwy 116. Refreshments, VE exams, free parking, radio clinic, auction (11:30 AM). *TI:* 146.13/73. Adm: free. *Tables*: adv $10, door $12. SCRA, Box 116, Santa Rosa, CA 95402, 707-523-1001 days, 707-526-2198 (eves).

†**Connecticut (Danbury)—September 23**, 8 AM-3 PM. *Spr:* Candlewood ARA. Take I-84 to exit 5, Danbury, turn right onto Rt 53 S ½ mi, across RR tracks to Elks Hall on right. Refreshments, tailgating $6 (incl 1 adm). *TI:* 147.72/12. Adm: $4. *Tables*: $8 (incl 1 adm). Bob Elton, NI2B, 60 Padanaram Rd, No. 18, Danbury, CT 06811, 203-790-7987.

†**Georgia (Augusta)—October 13-14**; Sat 9:30 AM-5 PM, Sun 9:30 AM-3 PM. *Spr:* ARC of Augusta. Civic Ctr in downtown Augusta. Forums, auction (2 PM Sun), VE exams (both days). *TI:* 144.89/145.49, 223.34/224.94, 444.95/449.95. Adm: adv $4, door $5. Jim Abercrombie, PO Box 5943, Augusta, GA 30906, 404-790-7802.

†**Georgia (Gainesville)—September 23**, 9 AM-4 PM. *Spr:* Lanierland ARC. Downtown Gainesville, 50 mi NE of Atlanta off I-85 & I-985. Refreshments, VE exams (9:30 AM). *TI:* 146.07/67, 442.625/447.625. Adm: $5. Lanierland ARC, PO Box 2182, Gainesville, GA 30501, 404-532-1479.

†**Illinois (Godfrey)—September 8**, 8 AM. *Spr:* Lewis & Clark RC. Hwy 67 to Lewis & Clark Community College Campus. Refreshments, *TI:* 144.63/145.23. Adm: no adv, door $2. Lewis & Clark RC, PO Box 553, Godfrey, IL 62035, 618-466-3547 eves.

Illinois (Grayslake)—September 22. *Spr:* Chicago FM Club. Lake County Illinois Fairgrounds near Rts 45 & 120, Manufacturers & distributors, VE exams, flea mkt, camping, parking, overnite security provided. *TI:* 146.16/76. Adm: adv $4, door $5. Mike Brost, WA9FTS, PO Box 1532, Evanston, IL 60204.

Illinois (Springfield)—September 30, 8 AM-1 PM. *Spr:* Sangamon Valley RC. Sangamon Co Fairgrounds, New Berlin, IL, US Rt 36, exit 82. Overnight parking (no hookups) refreshments, VE exams. *TI:* 146.205/805, 223.08/224.68. Adm: $3, under 12 free. *Tables*: $5. Don Pitchford, PO Box 8252, Springfield, IL 62791, 217-789-4519.

†**Indiana (Huntington)—October 7**, 8 AM-3 PM. *Spr:* Huntington Co ARS. Police Athletic League Club, 2099 Riverside Dr. Free parking, flea mkt, refreshments, handicapped access. *TI: 146.085/685, 146.52, 443.975/448.975.* Adm: adv $3.50, door $4. *Tables:* reserved 8-ft tables $5 each in adv.

†ARRL Hamfest

Jim Covey, KC9GX, 1752 Kocher, Huntington, IN 46750, 219-356-3269 eves.

†**Indiana (Indianapolis)—September 2,** 8 AM-4 PM. *Spr:* IVY Tech ARC. State Fairgrounds, E Pavilion Bldg. Refreshments, free parking. Adm: adv $3, door $4. Central Indiana Hamfest/Computerswap, PO Box 20158, Indianapolis, IN 46220-0158, 317-251-9833.

Massachusetts (Cambridge)—September 15, set up 7 AM, public 9 AM-2 PM. *Spr:* MIT Electronics Research Society & MIT RS. Albany & Main St. Free off-street parking, tailgate area (sellers $8/space at the gate, $5 in adv; incl 1 adm), flea mkt. *TI:* 146.52, 444.725/449.725 (PL 2A) W1XM/R. Adm: $1.50. Mail adv reservations *before Sept 5 to Steve Finberg, W1GSL, PO Box* 82 MIT BR, Cambridge, MA 02139, 617-253-3776.

Michigan (Lansing)—October 7, 8 AM-1 PM. *Spr:* Central MI ARC & Lansing CD Rptr Assn. Nat'l Guard Armory, Marshall St. VE exams (prereg), vendors, refreshments, flea mkt, free parking. *TI:* 146.34/94. Adm: $3. *Tables:* $8 (reservations and adm to be paid in adv). Rowena Elrod, KA8OBS, 111 Lancelot Pl, Lansing, MI 48906, 517-482-9650.

†**Michigan (Mt Clemens)—September 16;** set up 6 AM, public 8 AM-2 PM. *Spr:* L'Anse Creuse ARC. L'Anse Creuse HS on Reimold St, NE of the I-94 & Metro Pkwy int. Refreshments, dealers, trunk sales ($4 per space), parking. *TI:* 147.68/08, 146.52. Adm: adv $2, door $3. *Tables:* $10. Ralph Wilcox, KA8YOJ, 39610 Chart, Mt Clemens, MI 48045-2154, 313-469-3308.

†**Missouri (St Peters)—September 30,** 7 AM-1 PM. *Spr:* St Peters ARC. O'Fallon Civic Ctr. Flea mkt ($1 per space), refreshments. *TI:* 144.81/145.41. Adm: $1. Walt Franzer, WX0C, 4 Eagle View Ct, St Peters, MO 63376, 314-278-1993.

New Hampshire (Contoocook)—September 16, 8 AM. *Spr:* Contoocook Valley RC. 14 mi from Concord; ½-mile off I-89. Flea mkt, refreshments, parking. Adm: $5, buyers $1. Dave, K1OPQ at WA1WOK-2/BBSWOK, or 603-746-5090.

†**New Jersey (Pennsauken)—September 16,** 8 AM-3 PM. *Spr:* S Jersey RA. Pennsauken HS, Rt 130 S. Swap shop, refreshments, eyeball QSOs, free parking, tailgating ($5 per space, tailgaters must purchase an adm ticket), VE exams (reg at 9:30 AM). *TI:* 144.69/145.29. Adm: adv $3.50, door $4. Jim McGrath, KB2IYS, 2 Dickens Lane, Mt Laurel, NJ 08054, 609-866-0890.

New Mexico (Alamogordo)—Correction: Admission for the **September 1-2** hamfest is free. It was incorrectly listed in last month's column as $5.

†**New York (Ballston Spa)—September 15,** 9 AM-5 PM. *Spr:* Saratoga Co RACES Assn. Saratoga Co Fairgrounds, take I-87 Northway to exit 12, follow red & white hamfest signs. Refreshments, forums, ARRL Hudson Div Dir Steve Mendelsohn, WA2DHF, Vice Dir Paul Vydareny, WB2VUK. *TI:* 147.60/00, 147.84/24. Adm: $4 ea, incl an outside selling space or $5 per 8-ft table provided. N2FEP @ WA2UMX PBBS or at 67 Margaret Dr, Ballston Spa, NY 12020.

New York (Buffalo)—September 22; set up 6 AM, public 9 AM-4 PM. *Spr:* Rochester ARA. Erie Co Fairgrounds, Rte 62, S Park Ave, Hamburg, NY. Flea mkt $5 per 10 × 20-ft space, parking $1 per vehicle collected by the Fairgrounds Mgmt. Adm: no adv, door $5, under 12 free. Harold Smith, K2HC, 300 White Spruce Blvd, Rochester, NY 14623, 716-424-7184 during business hrs.

New York (Horseheads)—September 29, 6 AM-5 PM. *Spr:* Elmira ARA. Chemung Co Fairgrounds. Flea mkt, dealer displays, refreshments, VE exams, free parking, QSL contest, programs, camping ($8 for hook-up). *TI:* 147.96/36, 444.20/449.20. Adm: adv $3, door $4, 10 & under free. For VE exams Bill, 607-962-1134; dealer inquiries Jay, 607-733-0761; ticket inquiries 607-589-4067.

†**New York (Old Westbury)—September 16,** 9 AM-4 PM. *Spr:* Long Island Mobile ARC. NY Inst of Technology, Rte 25A. Refreshments, VHF tune-up clinic. *TI:* 146.25/85. Adm: no adv, door $5, exhibitors $8. Neil Hartman, WE2V, 516-462-5549 or Mark Nadel, NK2T, 516-796-2366.

†**New York (Queens)—September 23;** set up 7:30 AM, public 9 AM. *Spr:* Hall of Science ARC. NY Hall of Science Museum parking lot, Flushing Meadow Park 47-01-111 St. Amateur Radio exhibit station WB2JSM, VE exams (10:30 AM & 12:30 PM), films, ARRL info, tune-up clinic, free parking refreshments. *TI:* 144.300 simplex link, 223.600, 445.225. Adm: buyers $3, sellers $5 per space. Steve Greenbaum, WB2KDG, 718-898-5599 eves only or Phil Kubert, N2HYE, 212-777-8648.

New York (Yonkers)—October 7; set up 8 AM, public 9 AM-3 PM. *Spr:* Yonkers ARC. Yonkers Municipal Parking Garage, corner Nepperhan & Main. New & used equipment, refreshments. *TI:* 146.265/865, 440.15, 146.52. Adm: $5, under 12 free. *Tables:* $10 per space (own table). YARC, PO Box 378, Centuck Station, Yonkers, NY 10710, 914-963-1021.

†**North Carolina (Benson)—September 30,** 8 AM-4 PM. *Spr:* Johnston ARS. American Legion Complex, Hwy 301 N 4 blocks off Hwy 50. Refreshments. *TI:* 147.87/27. Adm: adv $4, door $5. Jim Creswell, KJ4SW, Rt 1, Box "JARS," Benson, NC 27504, 919-894-5479 (7-9 PM).

†**Ohio (Canfield)—September 16;** set up 6:30 AM, public 9 AM-4 PM. *Spr:* 20/9 ARC. Mahoning Co Joint Vocational School, 7300 N Palmyra Rd, off Rt 224. VE exams (1 PM), flea mkt, dealers ($1 per space), handicap parking. *TI:* 147.915/315, 144.67/145.27. Adm: $2. *Tables:* $6. Paul Resch, 216-793-8352 or David Spencer, 216-544-3723.

†**Ohio (Cincinnati-Ross)—September 16,** 7 AM-6 PM. *Spr:* Greater Cincinnati ARA. Rt 128 to Stricker's Grove. Free parking, vendors, flea mkt (space $10), forums, refreshments, VE exams. *TI:* 146.07/67. Adm: adv $6, door $7 under 12 free. Exam info K14QJ, 606-341-3952, other info John Haungs, WA8STX, 10615 Thornview Dr, Cincinnati, OH 45241, 513-563-7373.

†**Ohio (Cleveland)—September 23,** 8 AM-4 PM. *Spr:* Cleveland Hamfest Assn. 1 mi W of I-71 & Bagley Rd Interchange, ½-mi S on Eastland Rd. Technical forums, VE exams (all classes walk-in), refreshments. *TI:* 146.52 (6 AM-12 PM). Adm: adv $3.50, door $4. Marion Hill, WA8GZC, 8384 Barton Dr, Strongsville, OH 44136, 216-238-1152.

†**Ohio (Springfield)—October 7,** 8 AM-4 PM. *Spr:* Springfield Independent RA. Clark Co Fairgrounds, W of I-70 on SR 41. Flea mkt, vendors, refreshments. *TI:* 144.85/145.45, 222.66/224.26. Adm: adv $4, door $5. *Tables:* adv $6, door $7 w/power. Charlie, WA8P, 513-324-2896 or SIRA, PO Box 523, Springfield, OH 45501.

Oklahoma (Ponca City)—October 6. *Spr:* Kay Co ARC, OIDAR & Cowley Co ARC. Ponca City Airport. VE exams (9:30 AM, bring orig license & orig CSCEs & photocopies of those documents for your 610 form), commercial vendors, swapmeet (1 PM). *TI:* 146.37/97. Mark Byard, N5OGP, 504 Foster, Ponca City, OK 74601, 405-762-1966.

†**Oregon (Milton-Freewater)—September 21-23;** Fri 7:30 AM, Sat 8:30 AM, Sun 8:30 AM. *Spr:* Walla Walla Valley ARC. Refreshments. *TI:* 147.88/28. Adm: free. W7DP PO Box 321, Walla Walla, WA 99362, Packet: WA5ZAY N7HHU, 509-525-7003.

†**Pennsylvania (Butler)—September 9,** 9 AM-4 PM. *Spr:* Butler Co ARA. Butler Farm Show Grounds, *Rt 68W. Refreshments, flea mkt, vendors. TI:* 147.96/36. Adm: $1. Gerald Wetzel, W3DMB, PO Box 1787, Butler, PA 16003-1787.

Pennsylvania (Franklin)—September 22, set up 8 AM, public 9 AM. *Spr:* Fort Venango Mike and Key Club. Main auditorium of the 4-H Club, Rte 62. Auction (10 AM), ham gear, computer goods. *TI:* 144.63/145.23, 144.59/145.19, 147.72/12. Jim, N3BAT, 814-437-1871, or Bruno, K3MHB, 814-677-8694 eves, or write Fort Venango Mike and Key Club, PO Box 591, RD1, Cranberry, PA 16319.

Pennsylvania (Palmdale-Hershey)—October 7, 7 AM-3:30 PM. *Spr:* Central PA 99/4A Users Group. Nat'l Guard Armory. Adm: prereg accepted through August 3. Central PA 99/4A Users Group, PO Box 14126, Harrisburg, PA 17104-0126 or: Dave Ratcliffe, 717-238-5414, Barry Long, 717-564-2975, Tony DeDonatis, Sr, 717-534-2056, Terry Longenecker, 717-838-7843, The Data Factory BBS, 717-657-4992 or 4997 24hrs 8-N-1 300/1200/2400.

Pennsylvania (Uniontown)—September 8. *Spr:* Uniontown ARC. Club grounds on Old Pittsburgh Rd, off Rte 51 & 119 by-pass approx 40 mi S of Pittsburgh. *TI:* 147.045/645, 147.855/255, 144.57/17, 443.750/448.750. John Cermak, WB3DOD, PO Box 433, Republic, PA 15475, 412-246-2870.

Pennsylvania (Warrington)—October 6-7; Sat 9 AM-5PM, Sun 6 AM-4 PM. *Spr:* Mt Airy VHF RC. Warrington Motor Lodge, from PA Tpke exit 27 take 611 N 4½ mi to 1 block N of Rte 132 (Sat) Bucks Co Drive-In Theater, Rte 611, 4 mi N of PA Tpke exit 27. (Sun tailgating $8.) *TI:* 146.52. Adm: adv reg for the conf is only $8, door $10 incl flea mkt, admission to just the flea mkt is $5 per person, $8 per carload. HAMARAMA, PO Box 311, Southampton, PA 18966.

Pennsylvania (York)—September 22-23; Sat 8 AM-4 PM, Sun 8 AM-2 PM. Sprs: York ARC, Keystone VHF Club & Hilltop Transmitting Society. Tailgating, overnight camping. *TI:* 146.37/97. Adm: no adv, door $4. York Hamfest, PO Box W, Dover, PA 17315.

†**Texas (Wichita Falls)—September 15,** 8 AM-5 PM. *Spr:* Wichita ARS. 144/287 to 10th St, & turn E on 10th to Indiana, turn S on Indiana; the Activity Ctr is on the left. Refreshments, ARRL forum, AMSAT, MARS, QCWA, workshops. *TI:* 147.14/74. Adm: adv $6, door $7, $2 for nonhams. Valerie Thomerson, KB5HWY, 817-767-6504.

Vermont (Berlin)—September 22, 9 AM-3 PM. *Spr:* Central VT ARC. Nat'l Guard Armory, exit 7 I-89, turn left at 3rd set of lights. Rivendel & other dealer displays, VE exams (1 PM), refreshments, tailgating $4, handicapped accessible. *TI:* 146.025/625. Adm: $2. *Tables:* adv $6, door $8. Todd Bigelow, PO Box 524, Williamstown, VT 05679, 802-433-5587.

Strays

NOT WASTING ANY TIME

☐ About three years ago, I went on a Field Day trip with my dad, K7WK; Grandpa, W7IVB; Uncle Dave, KC7X; and my dad's employer, Dennis. We had a good time.

I didn't get to go to the next Field Day. When I asked to go to the Fort Tuthill Hamfest, my grandpa told me that if I learned Morse code, I could go to the next hamfest. It took about a month to learn all the letters, so I got to go to the Tucson swap meet.

After that, we went to a Scottsdale club meeting and that's where we heard about the Novice classes. My dad signed me up.

For the next six weeks, Chris, NU7V, and Brian, NT7R, worked hard to teach me Morse code and theory. We also worked on it at home. A couple of weeks before the class was finished, I passed the theory. On the last day of class I finally passed the code and went home with a big smile on my face.

It seemed like years until I got my license in the mail. Then, I came home Friday, December 22, and found it in the mailbox.

When we sat down at the radio that night, we heard HL1ACP calling CQ, so I worked him and picked up a new country! I had four other QSOs that night, one of which was my grandpa and another was our friend, Reinhard, W7/DL1UF.

Since then, my father has been teaching me how to find and work DX. One advantage is that I sound like a YL on the air! Another advantage is that we have a good radio and antenna.

I've been able to work 82 countries including GD, 3Y, CN, 3W, 9H, CY0, SØI, V8, TL, YO, 9J, CU, 5H and CP. I got a chance to operate in the ARRL DX contest and made 121 QSOs and talked to 52 countries, for a total of 18,876 points. That was the most points I ever got in a contest, but I could have scored higher if I could've gotten the radio away from Dad!

I plan to get DXCC and WAZ; maybe later I'll go after WAS. I'm also looking forward to working Field Day contacts. Maybe I'll see you there.—*Robert Sheldon, KB7JEC, age 10.*

Silent Keys

Administered by Nancy A. Slipski

It is with deep regret we report the passing of these radio amateurs:

K1BI, Herbert H. Gathercole, Mt Dora, FL
KA1CSB, James Dillon, Burlington, VT
W1DFK, Frank P. Wilkins, Lexington, MA
WB1GJM, Marion L. Carr, New Bedford, MA
W1HLI, Richard M. Packard, Bridgewater, MA
W1HUT, Deane R. Quinton, Auburn, ME
K1SJ, Stanley W. Jasut, East Hartford, CT
W1UPF, Bernard F. Goyer, Hampden, MA
WJ2A, Gunther J. Berju, Vineland, NJ
W2BXP, William Delvin, Schenectady, NY
KA2HRU, Richard J. Guirey, Horseheads, NY
W2IDU, George E. Horner, Irvington, NJ
K2LET, Robert L. Levy, Loudonville, NY
W2LKS, Ernest O. Creque, Mount Vernon, NY
W2OWS, Robert Paskouskas, New Providence, NJ
WA2RGR, Ralph A. Endres, Clarence, NY
W3BOU, Frank G. Mullins, Fort Pierce, FL
KB3DE, Adm Lawson P. Ramage, Bethesda, MD
N3FHQ, William J. Parker, Linthicum, MD
K3GAS, Isadore Cutler, Elkins Park, PA
K3JG, James M. Gibson, Altamonte Spring, FL
KA3LGM, R. D. Herman, Harrisburg, PA
*W3QD, Robert E. True, Adelphi, MD
K3TOQ, James M. Inverarity, Pittsburgh, PA
K4BLM, Stanley Offenhutter, Miami, FL
K4CDY, S. A. Matthews, Crestwood, KY
KC4GKE, Gerrard Burt, Bradenton, FL
KE4HR, Ralph E. Waldron, St Augustine, FL
N4HUB, Ralf F. Munster, Decatur, GA
K4JEU, Edward J. Cook, Brooksville, FL
K4JNW, Joseph E. Beauregard, Largo, FL
W4KUE, Herbert G. Powell, Cary, NC
W4NSP, Donald S. Parris, Arlington, VA
W4PLW, Jacob Mandel, St Petersburg, FL
W4QE, William L. Martin, Richmond, VA
K4SBX, Jack Hamilton, Sylvester, GA
K4TZN, Frederick E. Warth, Savannah, GA
W4TZP, Clifford A. Fling, Leesburg, VA
W4WVU, John N. Johnston, Bowling Green, KY
K4YBN, Lowry Gaddy, Waynesville, NC
WA4ZSB, William J. Hauser, Titusville, FL
W5CNH, Oscar W. Redwine, Groves, TX
W5EBH, Karl T. Blakeley, Houston, TX
KA5HNV, Jack L. Burns, Enterprise, AL
*W5IK, Melville M. Zemek, Little Elm, TX
W5KMO, Richard L. Wood, Corpus Christi, TX
N5LGZ, Hermann F. Forstmann, Corsicana, TX
W5MKX, Robert C. Stephens, Beaumont, TX
K5MMV, Joseph G. Fleniken, Baton Rouge, LA
W5QYE, Robert L. McKinley, San Antonio, TX
KB6AMO, Elmer Payne, Lucerne, CA
W6BFU, Jesse O. Hill, Oakland, CA
W6BPV, Wesley C. Thompson, Santa Cruz, CA
WD6DPH, Wilmer H. Siegfried, Santa Cruz, CA
W6EQG, Conrad J. Breen, Oakland, CA
W6FWK, Frank G. Nash, San Jose, CA
W6GTM, Charles H. Zierman, San Diego, CA
†W6HEG, Harriet E. Gilbert, Redding, CA
AA6IK, Alfred R. Deyell, Los Angeles, CA
W6IU, Roderick J. McLeod, Marysville, CA
KC6JBL, Richard L. Chatham, Spring Valley, CA
KA6MBB, Robert L. Engdahl, San Luis Obispo, CA
W6QQM, Wasson W. Nestler, San Marino, CA
WB6QYP, James W. Williams, Mountain View, CA
*W6RNL, Brock W. Roblin, Eureka, CA
KE6SS, William H. Coleman, Kernville, CA
W6TL, Clarence F. Heister, Escondido, CA
W6UT, Philip S. Snyder, Oakland, CA
W6VIV, William J. Abbott, Yucca Valley, CA
W7ADY, Everett Lasher, Medford, OR
*KA7CED, Rozella L. Clulow, Portland, OR
KB7DSZ, Phil M. Holleman, Seattle, WA
N7EG, Alton L. Alderman, Athens, OR
AL7GB, Jim McCurdy, Eagle River, AK
W7GSZ, John M. Scovill, Seattle, WA
KB7HSS, Roger J. Quillen, Colville, WA
W7ODQ, Walter A. Milewski, Kirkland, WA
WB7PKD, Jack L. Huber, Fernley, NV
KD7SN, John P. Winn, Beaverton, OR
W7TP, Douglas H. Reid, Seattle, WA
W7ZMG, Donald R. Snyder, Sumner, WA
WB8CHO, John D. Jonkman, Kentwood, MI
KA8CYC, Edgar L. Lees, Cleveland, OH
W8HJE, Loy N. Brautigam, Troy, OH
W8KDL, John Rinderknecht, Southern Pines, NC
K8LXT, William R. Robinson, Troy, OH
W8OYT, Charles Lomnicky, Cleveland, OH
N8RE, Allen L. Baker, Newport, MI
WB8ZKY, R. Johnston, Washington Court, OH
K9AAR, George W. Oprisko, Hammond, IN
W9GFA, Bart J. Besinger, Indianapolis, IN
WB9GQZ, Philip W. Dewey, Des Plaines, IL
KA9ICC, Marvin W. Luecke, Menomonee Falls, WI
W9KPZ, Donald R. Poling, Decatur, IN
W9NGB, John J. Spudic, Hammond, IN
W9RQC, Earl E. Kesselhuth, West Chicago, IL
WØBVL, James S. Malsbary, Glendale, MO
WØCCH, Willis M. Bisenius, Bellflower, CA
WAØDUB, Fred A. Behn, Preston, IA
WDØGQC, Paul E. Anderson, Aberdeen, SD
KØGVK, John T. Cantrell, Des Moines, IA
WØHNM, Francis G. Neff, Brookfield, MO
NØLKW, David H. Souers, Estes Park, CO
WØIPY, Delbert E. Nelson, Renton, WA
KØJDD, Harold R. Fick, Great Bend, KS
NØJDJ, Robert E. Seals, Jr, Versailles, MO
WØKJ, W. A. Hanks, St Louis, MO
WØMOA, J. R. Crouch, Ogden, IA
WBØTHE, Richard N. Corpstein, Dubuque, IA
KAØTID, John L. McGowan, St Louis, MO
KØZZG, Erwin A. Arnoldy, La Crescent, MN
ZL2BT, Alfred R. Tanner, Longburn, New Zealand
NH6V, Garry S. Chambers, Tokyo, Japan

†Edward Gilbert, W6GAT, was incorrectly listed in June *QST*.

*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

September 1940

☐ "It Seems to Us—", after musing on the apparent amateur indifference to f.m. experimentation, shifts gears to the hotter topic of the government's need for qualified radio personnel: "There is going to be a job in radio for everybody who can handle a soldering iron or copy code."

☐ If it's radio, R.C.A. is probably doing it, and Hq. staffers Goodman, Grammer and Rodimon take eight-plus pages to relive the oohs and ahhs of a day spent touring R.C.A.'s legendary Long Island receiving and transmitting stations in "*QST* Visits Riverhead and Rocky Point."

☐ Raymond W. (W1EAO) Woodward's low-frequency converter allows any communications receiver tuning 1600 kc. to provide a window on doings in the 90- to 600-kc. region.

☐ G. H. Browning reports the results of experiments intended to determine optimum weak-signal operating conditions for f.m. limiters.

☐ In describing the T match—a means of feeding a half-wave antenna via a balanced, untuned line—John D. Kraus, W8JK, and Stocker S. Sturgeon, W8MPH, suggest that it can be regarded as an intermediate step toward the two-wire half-wave antenna, one version of which many hams now know as the folded dipole.

☐ What price 11 frequency memories? Automatic tuning for amateur rigs has long been a tough nut to crack, but W. M. "Bill" Atkins, W9TJ, and C. T. Read, W9AA, have developed an affordable motorless, relayless system that can be applied "to almost any type of transmitter." (Maybe this gadget explains '9TJ's eighth-in-the-top-ten DXCC standing, reported in this issue's "How's DX?" as 142 countries confirmed!—*Jeeves*)

☐ "On the Ultra Highs" reports two new two-way DX records: At 112 Mc., Albert C. Nuno, W6KIN/6, worked Gilbert de la Laing, W6BJI/6, on July 4 at a distance of 255 miles; on July 13, Arthur E. Bent, W1COO/1, worked Henry S. Shaw, W1JK, over a 90-mile path at 224 Mc.

☐ With 256 operators reporting, activity in last February's Second A.R.R.L. 1.75-Mc. Worked All States Party was up 57% over that in the 1939 running.

25 Years Ago

September 1965

☐ *QST* congratulates the International Telecommunication Union on its 100th birthday and records portions of ITU Secretary-General Gerald C. (W3GG/HB9IA) Gross's address to the 1965 ARRL National Convention.

☐ Testing an s.s.b. exciter or linear amplifier ought to be a lot easier for readers who digest this issue's single-sideband trio, "Testing a Sideband Transmitter," "A Pulsed Two-Tone Test Oscillator," and "Pulsed Signals Through S.S.B. Transmitters," by A.R.R.L. Hq. staffers Douglas A. Blakeslee, W1KLK, Walter F. Lange, W1YDS, and Byron Goodman, W1DX, respectively.

☐ If his photograph of a cubical quad hanging tough despite *a half-inch coating of ice* is any indication, Harold W. (KØJTP) Morgan's "Quadwrangle" has something useful to say about putting up a quad for keeps!

☐ Using the 1000-foot-diameter, ground-mounted parabolic reflector at Cornell University's Arecibo (Puerto Rico) Ionospheric Observatory and a kilowatt of input power, the six-ham crew at KP4BPZ contacted 28 stations on c.w. *and s.s.b.* via 432-Mc. moonbounce on July 3. Hq. Staffer Doug DeMaw, W1CER, describes the action in "The Story of El Radar."

☐ Kenneth N. Sapp, W4AWY, reviews the operation and application of a popular military-surplus frequency meter in "Frequency Measurements with the LM/BC-221."

☐ "Happenings of the Month" carries the full text of the League's comments on FCC's Notice of Proposed Rulemaking in Docket 15928 (incentive licensing).

☐ "Crisis in the Caribbean—I" by Fred Laun, W9SZR/HI8XAL, and "Crisis in the Caribbean—II," by Jose E. Saldaña, KP4JM, describe Amateur Radio's role in providing emergency communication during early April's revolution in the Dominican Republic.—*AK7M*

Rules, ARRL International EME Competition

1) **Object:** Two-way communications via the Earth-Moon-Earth path on any authorized amateur frequency above 50 MHz.

2) **Contest Period:** Two full weekends, October 13-14 and November 3-4; full 48-hour period UTC each weekend.

3) **Categories**

A) **Single operator:** One person performs all operating and logging functions, equipment adjustment and antenna alignment.

(1) **Multiband.**

(2) **Single-band:** Single-band entries on 50, 144, 220, 432, 902 and 1296-and-up categories will be recognized in awards offered. Contacts may be made on any and all bands without jeopardizing single-band entry status. Such additional contacts are encouraged and should be reported. See also Rule 8, Awards.

B) **Multioperator:** Two or more persons participate; includes neighboring amateurs within one call area, but with EME facilities for different bands on different team members' premises, as long as no two are more than 50 km (30 miles) apart. Multioperator neighborhood groups cannot use the same call signs at each location; all calls will be listed in the results.

C) **Commercial equipment:** Stations using equipment that is not amateur (such as a dish antenna for lab equipment owned by an institution or government agency) will have their scores listed separately.

4) **Exchange:** For a valid contact to occur, each station must send and receive both call signs and a signal report in any mutually understood format and a complete acknowledgment of the calls and report. Partial or incomplete QSOs should be indicated in your log, but not counted for contest credit. Stations may be worked once per band for credit.

5) **Scoring**

A) **QSO Points:** Count 100 points for each complete EME contact.

B) **Multiplier:** Each US and Canadian call area and each DXCC country (not US/Canada) worked via EME on each band.

C) **Final Score:** Multiply QSO points by the sum of multipliers worked on each band for your final score.

6) **Miscellaneous**

A) Fixed or portable operation is permitted. Stations operating outside traditional call areas must indicate so, identifying the call area of the operating site.

B) Contacts may be on CW or SSB. Only one signal per band is permitted.

C) A transmitter, receiver or antenna used to contact one or more stations under one call sign may not be used subsequently under any other call sign during the contest, except for family stations where more than one call has been issued, and then only if the second call sign is used by a different operator.

D) There is no specified minimum terrestrial distance for contacts, but all communications must be copied over the moonbounce path, regardless of how strong (or weak) a nearby station's terrestrial signal may be.

7) **Reporting:** Entries must be postmarked no later than 30 days after the contest and must include complete log data. Your summary sheet should show a band-by-band breakdown of QSOs and multipliers and include details of your station setup and a photo.

8) **Awards:** Certificates will be issued to the top five stations worldwide in each of the entry categories: single operator, multiband; single operator, single band (separate awards for each band); and multioperator. Additional awards will be issued where significant achievement or competition is evident. Each station that successfully completes at least one EME contact during the contest period will receive a certificate commemorating that achievement.

9) **Disqualifications:** See January 1990 *QST*, p 80. QST

Rules, 1990 CRRL Fall VHF/UHF Sprints

The CRRL Fall VHF/UHF Sprints are sponsored by the Canadian Radio Relay League, Inc.

1) **Contest Periods:** 902-3456 MHz, 2300Z September 27-0300Z September 28; 432 MHz, 2300Z October 4-0300Z October 5; 220 MHz, 2300Z October 9-0300Z October 10; 144 MHz, 2300Z October 15-0300Z October 16; 50 MHz, 1000Z October 27-0300Z October 28. Each band operated should be scored as a *separate* sprint contest. The September 27 date allows operation on four bands, but score each band individually.

2) **Exchange:** Exchange grid square locations (see January 1983 *QST*, p 49).

3) **Scoring**

(A) *QSO points:* Count 1 point per valid QSO.

(B) *Multipliers:* Multipliers are the number of different grid squares worked per band. Multipliers must be clearly marked in the log.

(C) **Final Score:** Multiply total QSO points by total multipliers for the final score.

4) **Reporting:** Submit a separate log for each band. Send results (cover sheets and logs) by November 30, 1990, to CRRL Fall VHF/UHF Sprints, c/o Dana Shtun, VE3DSS, 500 Willard Ave, Toronto, ON M6S 3R6, Canada. The results will appear in *QST Canada* and the *National Contest Journal*.

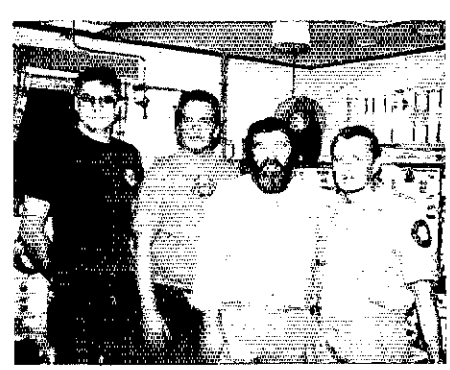
5) **Awards:** Certificates will be issued for the highest score in each CRRL and ARRL section. QST

Strays



←The Greiner family of Iowa boasts three generations of amateurs: (l-r) Keith, 41, AKØQ, and Aaron, 16, KBØBDY, of Des Moines; and Loren, 81, WØGTW, of Emmetsburg.

Radio operators aboard the oil drilling platform *SSV Britannia* enjoy a visit from John Ellis, W5PDW (far right), of Magnolia, Texas. John is a videographer for oil well firefighters and blow-out specialists Boots & Coots Inc of Houston. John was welcomed by (l-r) Anders, SM5BMK, Lars, SMQ6BV, and Les, GM1MUY. *(photo courtesy of W5PDW)* →



Results, 1990 School Club Roundup

The future of Amateur Radio is in good hands.—*Bob Mullen, KC7UH*

By Lew Malchick, N2RQ
Brooklyn Technical High School
Dekalb Ave and S Elliott Place
Brooklyn, NY 11217

The following is a summary of the entries for the 1990 School Club Roundup.

School	Call Used	Total Score	QSO Pts	States	DX	Clubs	School Hrs	Ops
Cubs ARC of Sedro Woolley HS	WY7Q	223,491	943	41	8	9	34	24	6
JHS 22 RC	WB2JKJ	124,460	980	47	25	5	9	24	—
Rockaway Beach Jr HS	KE2N	13,838	187	31	13	0	6	9	12
Brooklyn Tech HS ARC & Society	W2CXN	5,247	99	19	5	2	5	8	6
Marlborough Elem	KBØCUS	3,680	92	14	11	0	3	11	—
Memorial Park Middle Sch ARC	WD9ITM	3,105	69	29	6	0	2	10	6
Rye Neck Middle Sch	KC2LM	2,205	45	4	23	1	4	10	4
Coleman Elem Sch	WB1P	1,269	47	15	12	0	0	8	2
Manchester Gate Elem Sch	AA6QA	1,054	17	12	0	0	10	—	—

The fourth annual School Club Roundup was the most successful to date. Entries increased 50% over 1989. Total QSOs increased by 10 times. Schools contacted increased by four times. Last year's winning score of 16,640 by Alfred Hovey, WA9BZW, and his youngsters in Wisconsin would have been a distant third to Jeff Wigal, WY7Q, and his partners at Sedro Woolley High School in Sedro Wooley, Washington, at 223,491.

Marty Smith, KA2NRR; Hip Koutsoupakis, N2FDJ; and Ron Lulov, KD2LA, originally conceived the School Club Roundup. They're charter members of the Council for the Advancement of Amateur Radio in the New York City Schools (CAAR/NYCS). The purpose of this contest, from its beginning, was to provide a vehicle for interaction among school Amateur Radio programs.

The CAAR/NYCS was well-represented by Joe Fairclough, WB2JKJ, at Junior High School 22 in Manhattan; Gerald Skloot, KE2N, at JHS 180 in Queens and W2CXN at Brooklyn Technical High School. They took second, third and fourth places, respectively. WB2JKJ set record highs for QSOs and states, but fell short of WY7Q in the most important School Club 5× multiplier category.

Jeff, WY7Q, and classmates Aaron Young, KB7GGY; Mark Koopsen, WI7V; Todd Tittle, KF7LX; Bob Solgat, KB7ICG; and Kevin Allen, KF7MF, from the Cubs ARS of Sedro Woolley, made a record 34 contacts with other schools. WY7Q was also the only entry with no adult operator. Their advisor, Bob Mullen, KC7UH, who supervised but did not operate, proclaims, "Fun, fun and more fun...a most accurate description of the 1990 School Club Roundup! Members of the Cubs ARS of SWHS will never forget the four-day snowstorm, two school closures and faulty coaxial cable the week of February 12. Nor will we forget the camaraderie that surfaced while talking with other students throughout the US.

"Hams in general were terrific, offering encouragement and support almost continuously. Pileups were common! The bulletin board in our shack is filled with QSL cards received since the contest, and working DX stations from the Bahamas, Spain, Mexico, England, South Africa, the Barbados and Japan only added to the excitement. Most impressive of all was the quality of station operation and courtesy displayed by student operators throughout the country... the future of Amateur Radio is in good hands. Excellent job, kids!

"The School Club Roundup is an exciting innovation for encouraging the involvement of young people in Amateur Radio. Kids talking with kids...and some friendly competition thrown in for added incentive...providing a positive impact on the future of Amateur Radio. A sincere thanks to Lew Malchick, N2RQ, and his group for a job well done."

Bob Jones, WB1P, principal of Coleman Elementary School in Woonsocket, Rhode Island, set up a station in the school library. All week, classes came into the library to hear DX QSOs. When Bob had to attend to his work, he enlisted the aid of his friend, Jim White, W1PHW, to keep the station going. Notes Bob, "...it was a great experience for the youngsters and me. We had no luck contacting other schools, but did work quite a bit of DX and had interesting ragchews... thank you for organizing the School Club Roundup. It's a great idea and I look forward to participating next year."



Some members of the Brooklyn Tech ARC (l-r), Garrett O'Brien; Vinu Jacob; club president Joseph Ku, N2KGF; Faini and advisor Lew Malchick, N2RQ. *(photo courtesy of N2RQ)*

Bob Jost, AA6QA, at Manchester Gate Elementary School in Fresno, CA, set up a station in his classroom. "This was great—my class had fun talking to other class groups; several QSOs lasted 20-30 minutes. Why not make this a monthly or quarterly event? Thanks!" Bob had only 17 QSOs, but 10 were with other schools. This was the highest rate of school contacts and truly in the spirit of the SCR.

"I'm a fifth-grade math and science teacher in the Rye Neck Middle School, Mamaroneck, New York...I can't tell you the excitement this contest generated and the joy it brought to my students. This is a new station and we weren't very experienced, but the 5th graders operating the rig had the time of their lives."—*Ed Poccia, KC2LM*

Charles Murray, WD9ITM, and the Memorial Park Middle School ARC showed they're learning how to use computers in Amateur Radio by computer-logging their operations.

"We made almost all of our contacts before and after school because it's difficult for the kids to get out of their classes to use the radio. About 25% of our contacts were on 2 meters. A friend of the club got on the repeater and asked the morning commuters to call us direct for the contest. This gave our school a lot of publicity with the local hams...a real plus. Thanks for organizing the contest."—*Chuck Bryan, KBØCUS, Marlborough Elementary School, Kansas City, Missouri*

Although there are three entry classes, we have not had any entries in the Individual or Other Club categories. The Council thanks all who have worked to make this a successful and enjoyable experience.

The 1991 School Club Roundup will be the week of February 11-15. Help get a school on the air next year!

Contest Corral

Conducted By Warren C. Stankiewicz, NF1J
Assistant Contest Manager

SEPTEMBER

2

LZ-DX Contest, see August *QST*, p 83.

5

West Coast Qualifying Run, 10-35 WPM, September 6 0400Z (9 PM PDT September 5). 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.

8-9

European DX Contest, phone, see July *QST*, p 81.

8-10

ARRL September VHF QSO Party, see August *QST*, p 82.

9

North American Sprint, CW, sponsored by the *National Contest Journal*, from 0000Z to 0400Z September 9 (Phone Sprint September 16). Single operator only. No helpers or spotting nets. No crossmode. Suggested frequencies: CW— 3.540 7.040 14.040; phone: 3.900 7.225 14.280. Work same station once per band. For exchange, send other stations call/your call/your serial number/name/location (state/ province/country). Only valid two-way contacts count and logging must begin with serial number one (001). Scoring: Multiply total valid contacts by the sum of the states/provinces/NA countries to get final score (do not count USA or VE as countries. KH6 is neither state nor country. The eight VE multipliers are Maritime, (VE1, VO1 and VO2), VE2-7, and Yukon-NWT (VY1 and VE8). Non-North American countries do not count. Send CW logs to Trey Garlough, WN4KKN, Rt 1, Box 99, Thrall, TX 76578. Send phone logs to Rick Niswander, K7GM, Box 2857, College Station, TX 77840. Send summary, logs, dupe sheets no later than 30 days after Sprint.

13

W1AW Qualifying Run, 10-35 WPM, September 14 0200Z (10 PM EDT September 13). Transmitted simultaneously on 1.818 3.5815 7.0475 14.0475 18.0975 21.0775 28.0775 50.08 147.555 MHz. See September 5 listing for more details.

15-16

ARRL 10-GHz Cumulative Contest, see June *QST*, p 82.

Scandinavian Activity Contest, CW, sponsored by the Norwegian Radio Amateur League, 1500Z September 15 to 1800Z September 16. (Phone contest 1500Z September 22 to 1800Z September 23.) Work LA-LB-LG-LJ, JW, JX, OE-OG-OH-OI, OHØ-OJ, OHØM, OX, OY, OZ, SJ-SK-SL-SM and TF stations on 3.5, 7, 14, 21, and 28 MHz only. Work stations once per band; no crossmode QSOs. Categories: single op, one transmitter; single op, one transmitter, QRP (max input 10 watts); Multi-op single transmitter; and SWL. Multi-single stations may have only one transmitted signal at any given time and must remain on a band at least 10 minutes after a band change. Exchange signal report and serial number starting with 001. European stations count one point per Scandinavian QSO on any band. Non-European stations count one point per Scandinavian QSO on 14, 21, and 28 MHz and 3 points on 3.5 and 7 MHz. Multiply total QSO points by the number of different Scandinavian call areas worked per band (LA1 = LB1 = LJ1 and NF1J/OZ = OZØ, etc) for final score. Avoid contest traffic in these subbands: 3.560-3.600, 3.650-3.700, 14.060-14.125 and 14.300-14.350, except when this conflicts with national regulations; in that case, split operation must be used. Mail entries for both modes with complete summary sheet by October 31 to Heinrich Thomsen, OZ7HT, Kirkevej 10, DK-5083, Haarby, Denmark.

16

North American Sprint, phone, see September 9 listing.

22-23

Scandinavian Activity Contest, phone, see September 15-16 listing.

26

W1AW Qualifying Run, 10-35 WPM, September 26 1300Z (9 AM EDT September 26). See September 13 listing for more details.

27-28

CRRL Fall VHF/UHF Sprint, 902-3456 MHz, see this isssue, p 78.

29-30

***CQ* World-Wide RTTY DX Contest,** see August *QST*, p 83.

30-Oct 1

Fall Classic and Home-brew Radio Exchange, sponsored by the *Classic Radio Newsletter*, 2000Z September 30 to 0400Z October 1. Object is to restore, operate and enjoy equipment at least 10 years old and home-brew equipment, but is not required for entry. Exchange name, RS(T), QTH, receiver and transmitter type (home-brew send final amp tube or transistor). The same station may be worked with different equipment combinations on each band/mode. Suggested frequencies: phone—3.880 7.290 14.280 21.380 28.320; CW—60 kHz up from lower band edges; Novice—3.720 7.120 21.120 28.120 28.320. Add the number of all the different transmitters and receivers worked plus the different states/provinces/countries worked per band. Multiply that number by total number of QSOs. Multiply that total by total years-old of all your transmitters and receivers used (minimum three QSOs per unit). For transceivers, multiply years-old by two. For home-brew, count as 25 years old unless older. Awards. Mail logs (include SASE for results) to Jim Hanlon, W8KGI, PO Box 581, Sandia Park, NM 87047.

OCTOBER

2

West Coast Qualifying Run, 10-40 WPM, October 3 0400Z (9 PM PDT October 2). See September 5 listing for more details.

4-5

CRRL Fall VHF/UHF Sprint, 432 MHz, see this issue, p 78.

6-7

California QSO Party, sponsored by the Northern California Contest Club (NCCC), 1600Z October 6 to 2200Z October 7. Single ops limited to 24 hours, time-off periods at least 15 minutes and noted in log. Work stations once per band and mode. Only one transmitter signal allowed. California stations may be worked again if they change counties. CW QSOs must be in CW subbands, except for 160 meters. No repeater or MCW QSOs. Suggested frequencies: CW—1805 and 40 kHz up from low end; phone—3.850 7.230 14.250 21.300 28.450; Novice—10 kHz up from band edges. Try CW on the half hour; 147.540 at 2000Z, 0000Z, 0400Z; 160 at 0500Z; 80 at 0300Z and 0700Z. Exchange QSO number, state (county in CA)/province/country. Scoring: phone—two points per QSO, CW—three points per QSO. Multiply QSO points times number of CA counties (max 58). California stations multiply by number of states and provinces. Awards. Entries with more than 200 QSOs must submit dupe sheet. Submit entries by November 15 to NCCC, c/o Jim Duffy, WA6AUE, PO Box 8820, Truckee, CA 95737.

Columbus Contest, sponsored by the Columbus ARA, 0000Z October 6 to 2400Z October 7. Phone only. Suggested frequencies: 7.240 14.340 21.375 28.500. Exchange name, QTH, and signal report. Count one point per contact. Certificates to stations with at least 10 points (working club station W8TO counts as six contacts). Plaques. Submit an SASE (four units of first-class postage) for QSL and certificate, 9- × 12-in SASE for unfolded certificate. Otherwise, use no. 10 envelope to Roger Dzwonczyk, WB2EIG, 283 E Longview Ave, Columbus, OH 43202.

VK/ZL/Oceania DX Contest, phone, sponsored by the Wireless Institute of Australia (WIA), 1000Z October 6 to 1000Z October 7 (CW contest, 1000Z October 13 to 1000Z October 14). Single op and SWL classes. Operate only 12 hours in even one-hour blocks (1000Z-1100Z, 1200Z-1300Z, etc; not 1035Z-1135Z, etc). Work stations once per band. No crossband QSOs. Exchange signal report and serial number starting with 001. Count two points per VK/ZL/O QSO. Multiply by total VK/ZL/O prefixes worked on all bands. Use separate log for each band and mode. Mail entries to be received by February 15 to WIA VK/ZL/Oceania Contest Manager, ZL1AAS, 146 Sandspit Rd, Howick, New Zealand.

7

OMARC Midnight Special

9-10

CRRL Fall VHF/UHF Sprint, 220 MHz, see this issue, p 78.

12

W1AW Qualifying Run, 10-40 WPM, October 13 0200Z (10 PM EDT October 12). See September 13 listing for more details.

13-14

ARRL International EME Competition, this issue, p. 78.

Pennsylvania QSO Party, Sponsored by the Nittany ARC, 1600Z October 13 to 0500Z October 14 and 1300Z-2200Z October 14. Classes of entry: Single-op; mobile (multi-op is okay); multioperator, single transmitter; multioperator, multi-transmitter; QRP (max 5 W output), Novice (identify with /N or /T and must operate in Novice frequencies). Phone and CW. CW contacts in CW subbands only. Work stations once per band and mode. No repeater QSOs. Work mobiles again as they change counties. Exchange serial number and QTH (county for Pennsylvania stations, ARRL Section for others). Suggested frequencies: CW—40 kHz up from low end and 1.810 MHz, SSB—1.850 3.980 7.280 14.280 21.380 28.580; Novice—10 kHz up from low end; mobile window—5 kHz below listed frequencies. Try 160 around 0300Z October 15. Count one point per phone QSO, 1.5 points per CW QSO and two points per 160/80-meter CW QSO. Pennsylvania stations multiply by total ARRL sections plus Pennsylvania counties, plus max one DX country. Others multiply by total Pennsylvania counties (max 67). Stations on county lines count for one QSO credit, but multiple county multipliers. Multiply total QSO points by total multipliers for final score. Mobiles add 500 bonus points for each county from which 10 or more QSOs are made. QRP entries multiply final score by two. Novice/Tech entries multiply final score by three. Entries with more than 100 QSOs must include dupe sheet. Official summary sheet is available. Awards. Mail entry by November 15 to Pennsylvania QSO Party, Nittany ARC, PO Box 614, State College, PA 16804.

VK/ZL/Oceania DX Contest, CW, see October 6-7 listing.

14

RSGB 21/28 MHz SSB Contest, sponsored by the Radio Society of Great Britain, 0700Z-1900Z October 14. 21 MHz and 28 MHz phone only. Single operator and multioperator. Exchange signal report and serial number starting with 001. Suggested

frequencies: 21.150-21.350 28.450 29.000. Non-European stations count 3 points per QSO with G, GD, GI, GJ, GM, GU, GW stations (not GB). Multiply by number of call areas worked per each G prefix. Awards. Log must be received before December 5. Mail entries to RSGB Contests Committee, PO Box 73, Lichfield, Staffs WS13 6UJ, England.

14-15

Illinois QSO Party, sponsored by the Radio Amateur Megacycle Society, 1800Z October 14 to 0200Z October 15. Phone and CW. No repeater QSOs. Suggested frequencies: CW—3.550 7.050 14.050; phone—3.890 7.290 14.290; Novice—30 kHz up from bottom for CW, 28.390 for phone. Other bands may also be used (except 30, 17 and 12 meters). Illinois stations exchange RS(T) and county; others exchange RS(T) and state/province/country. Count one point per phone QSO, two points per CW QSO. Work stations once per band and mode, and once per band/mode/county for Illinois mobile stations. Illinois stations multiply QSO total by sum of states plus VE provinces plus a maximum of five DX countries. Count additional DX for points, but not multipliers. Illinois portables and mobiles may add 200 to final score for each county from which 10 or more contacts were made. All others multiply QSO points by the number of Illinois counties worked. All stations may take one bonus multiplier for each eight QSOs with the same Illinois county. Awards. Stations with over 100 QSOs must submit a dupe sheet. Send logs by November 6 to RAMS, c/o Joe LeKostaj, WB9GOJ, 9134 Ewing Ave, Evanston, IL 60203.

15-16

CRRL Fall VHF/UHF Sprint, 144 MHz, see this issue, p 78.

21

RSGB 21 MHz CW Contest, sponsored by the Radio Society of Great Britain, from 0700Z-1900Z October 21. CW only. Single operator and QRP single operator (less than 10-W input). Exchange signal report and serial number starting with 001. 21 MHz only. Avoid 21.075-21.125. Non-European stations count 3 points per QSO with G, GD, GI, GJ, GM, GU, GW stations (not GB). Multiply by number of call areas per G prefixes worked. Log must be received before December 31. Mail entries to RSGB Contests Committee, PO Box 73, Lichfield, Staffs WS13 6UJ, England.

20-21

Jamboree on the Air (JOTA), see "JOTA Needs You" on p 52 of this issue.

Simulated Emergency Test (SET), see this issue, p 45.

27-28

***CQ* World-Wide DX Contest,** phone, sponsored by *CQ* magazine, 0000Z October 27 to 2400Z October 28 (CW contest 0000Z November 24 to 2400Z November 25). 1.8 through 28 MHz. Entry classes: single op, all bands; single op, single band; single op, QRP, single op, unlimited; multiop, single transmitter; multiop, multi transmitter. QRP is defined as 5-W output or less. Multi-single: Only one transmitter and one band permitted during a 10-minute period. Exception: one—and only one—other band may be used during the same 10 minute period if—and only if—the station worked is a new multiplier. Stations found in violation of the 10-minute rule will be reclassified multi-multi. Multi-multi stations are allowed one signal per band maximum. All transmitters must be located within a 500-meter-diameter circle or within the limits of the licensee's address property, whichever is greater. All antennas must be physically connected to the transmitters by wires. Exchange signal report and *CQ* zone number. A station in a different zone or country than indicated by its call sign must sign portable. QSOs between stations on different continents count three points. QSOs between stations on the same continent but in different countries count one point. Exception: QSOs between North America stations in different countries count two points. QSOs with your own country count for multiplier credit, but not for QSO points. Multipliers: Count one multiplier for each different *CQ* zone worked per band (max 40 per band). Count one multiplier for each different country worked per band (DXCC and WAE lists). Multiply QSO points from all bands operated by multipliers (zones plus countries) from all bands operated for final score. Single-band logs eligible for single-band awards only. Single ops must operate at least 12 hours (multiops, 24 hours) to be eligible for awards. Dupe sheets required for any band with more than 200 QSOs. Entry forms are available from the sponsor for an SASE and all entrants are encouraged to send for a set. Each dupe removed by the *CQ* Contest Committee also carries a three-QSO penalty. Phone logs must be postmarked by December 1, 1990, and CW logs must be postmarked by January 15, 1991. Mail logs to *CQ* Magazine, 76 N Broadway, Hicksville, NY 11801.

CRRL Fall VHF/UHF Sprint, 50 MHz, see this issue, p 78.

28

W1AW Qualifying Run, 10-35 WPM, October 28 2400Z (7 PM EDT October 28). See September 13 listing for more details.

Contest Announcements: Items for this column can be sent on a 5¼- or 3½-inch MS-DOS floppy diskette in ASCII format to ARRL HQ, via modem (ARRL HQ BBS, 203-665-0090, 2400-8-N-1), or in written form. The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **October 1** to make the **December** issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111. QST

Strays

PITCAIRN BICENTENNIAL

This year, Pitcairn Island (VR6) celebrates its 200th anniversary. On January 15, 1790, nine mutineers led by Fletcher Christian landed the *HMAS Bounty* at Bounty Bay, to found what is now the British crown colony of the Pitcairn Islands.

The population consists of 48 *Bounty* descendants, about 10 resident non-*Bounty* people and whatever visitors might be present. For Bounty Day, January 23, 1990, that number was augmented by 86 visitors as four ships attended bicentennial celebrations.

There are a half-dozen active hams on the island, including Meralda Warren, VR6MW; Kari Young, VR6KY; Irma Christian, VR6ID; Keith Brown, VR6KB; and long-term visitor Jim Russell, VR6JR/G3OKQ. Special-event station VR2ØØPI is being operated this year to celebrate the bicentennial (see Up Front in *QST*, July 1990).

Pitcairn Island has a unique history of Amateur Radio operations in its daily routine. There are only four government offices, Magistrate, Engineer, Police Chief and Radio Officer, the last commanding the highest salary. Morse code is used to indicate who telephone calls are for. —*Sanford K. Smith*



Irma Christian, VR6ID



Jim Russell, VR6JR



Keith Brown, VR6KB



Kari Young, VR6KY

Special Events

Conducted By Warren C. Stankiewicz, NF1J
Assistant Contest Manager

Central City, Kentucky: The Muhlenburg ARC will operate *1800Z-2400Z* **September 1** to commemorate the Everly Brothers Homecoming. For certificate, send SASE to Buell L. Sallee, PO Box 663, Central City, KY 42330.

Sierra Vista, Arizona: The Cochise ARA will operate WA7KYT **September 1-3** from the Ghost Town of Paradise, Arizona. CW—7.040; phone—3.885 *7.285 14.288 18.150 21.288 28.385 and 6 meters.* For certificate, send a 9- × 12-in SASE to Cochise ARA, PO Box 1855, Sierra Vista, Arizona 85636.

Waterford, Connecticut: The Tri-City ARC will operate KA1BB 1700Z **September** 1-2300Z **September 3** in conjunction with the seventh annual Stay-Awake Coffee Stop offered by BSA Troop 24. Operation is in the middle of the General segments of 80, 40, 20 and 15 meters and 146.52. For QSL, send SASE to Tri-City ARC, PO Box 686, Groton, CT 06340.

Rolling Meadows, Illinois, and Henin-Beaumont, France: Operators from the *Rolling Meadows ARC* and its sister city, Henin-Beaumont, will operate **September 1-9** to celebrate the 35th anniversary of the founding of Rolling Meadows. CW—45 kHz from the bottom of the band, phone—15 kHz up from the bottom of the General bands. QSL with SASE to Bob Lynn, W9PYA, 3802 Jay Lane, Rolling Meadows, IL 60008.

Schaumburg, Illinois: The Schaumburg ARC will operate WB9TXO 1500Z-2100Z **September 2** at Schaumburg's annual Septemberfest. 7.290 14.290 21.290 28.390. For certificate, send QSL to SARC, PO Box 68251, Schaumburg, IL 60168-0251.

Atlantic City, New Jersey: The Southern Counties ARA *will operate* K2BR ***September 3-8*** *from the* Miss America Pageant. CW—65 kHz up from the bottom of the General bands, phone—25 kHz up from the bottom of the General bands; Novice—28.100-28.500. For QSL, send SASE to SCARA, PO Box 121, Linwood, NJ 08221.

Boone, Iowa: *The Boone Mike and Key ARC will* operate KØCY 1500Z-2200Z **September 8** during the Boone Pufferbilly Days. Operation is in the General phone segments of 40, 20 and 15 and Novice 10 meters. For certificate, send QSL and SASE to Mike and Key Club, c/o Calvin Rossman, 1717 Boone St, Boone, IA 50036.

Corona, California: *The Corona Norco ARC will* operate W6TKV 1700Z **September 8**-0500Z **September 9** to commemorate the 77th anniversary of the Grand Boulevard road race of 1913. *3.875 7.250 14.250 18.130 21.375 24.940 28.450 146.535.* For QSL, send QSL with SASE or IRC to CNARC, PO Box 1783, Corona, CA 91718.

Belgium: *The Verviers Radio Amateurs Group will* activate ON4USA/P 0800Z **September 8**-1600Z **September 9** to celebrate the 46th anniversary of the liberation of the eastern part of Belgium by US 1st Army troops. CW—3.540 7.040 14.040 21.040 28.040, phone—14.190 21.250 28.490. QSL via the bureau or send SAE to PO Box 11, B 4800 Verviers 1, Belgium.

Lubbock, Texas: KG5BL will operate 1300Z **September 8**-1300Z **September 9** at the second annual Buddy Holly special event. CW—7.125 14.040 21.120 28.140, phone—7.250 14.270 21.370 28.454. For QSL, send SASE to KG5BL, Moody Forgey, 7603 Wayne Ave, Lubbock, TX 79424.

Bethlehem, Connecticut: The HH Gang will operate W1FHP **September 9** from the 66th annual Bethlehem Fair. Operation is on 40, 20, 15 and 10 meters. For QSL, send SASE to W1FHP, Hard Hill Rd N, Bethlehem, CT 06751.

Peoria, Illinois: The Peoria Area ARC will operate *W9UVI 1400Z-2000Z* ***September 15*** *in conjunction* with Superfest '90. Operation is in the lower 25 kHz of the General portions of 40, 20 and 15 meters and the Novice portion of 10 meters. For certificate, send QSL to WB9CIS, John Harper, PO Box 5374, Morton, IL 61550.

Audubon, Iowa: The Audubon County Storm Spotters *will operate* KAØLZU 1300Z-2100Z **September 15** in conjunction with T-Bone Days. Operation is in the General 40-10 meter bands. For QSL, send SASE to KAØLZU, Lester Larson, 606 S Division, Audubon, IA 50025.

Fort Meigs, Ohio: The Lucas County-Northwest Ohio ARES will operate K8JA **September 15-16** to commemorate the 178th anniversary of the War of 1812. CW—10 kHz up from the bottom of the General bands, phone—3.963 7.263 14.265 21.365 28.365, 2 meters and 70 cm. For certificate, send a 9- × 12-in SASE to K8JA, 3215 Warsaw St, *Toledo, OH 43608.*

Clyde, Ohio: The Clyde ARS will operate NF8E 1600Z-2400Z **September 15** and 1600Z-2200Z **September 16** from the Winesburg Fall Fair. CW—7.125 21.150, phone—7.250 21.375 144.750. For certificate, send SASE to NF8E, 302 Hammer St, Clyde, OH 43410-1212.

Fort Lauderdale, Florida: South Florida amateurs will operate ND4G each weekend **September 15-March 15** from the Discovery Center science museum. Operation is on the General portion of 20, 15 and 10 and the Novice portion of 10 meters. For QSL, send SASE to *David Oppenheimer, KB4NRC, 2608* NE 37th Dr, Fort Lauderdale, FL 33308.

Gilford, New Hampshire: The Central New Hampshire ARC will operate N1LT 1600Z-2300Z **September 16** in conjunction with the 150th anniversary of Belknap County. 14.235 21.310 and Novice 10 meters. For certificate, send QSL and 9- × 12-in SASE *to Dick Christopher, 38 Kensington Dr,* Gilford, NH 03246.

Muskegon, Michigan: The Muskegon Area ARC will operate W8ZHO 1300Z **September 15**-1700Z **September 16** from the submarine *USS Silversides.* 3.855 7.255 14.255 21.320 28.460 146.34/94. For certificate, send QSL and 9- × 12-in SASE to *William Bowman, KB8ARY, 1870 Francis,* Muskegon, MI 49442.

Davenport, Iowa: The Palmer College of Chiropractic ARC, in cooperation with the Davenport RAC, will operate 1300Z **September 16**-0100Z **September 17** to commemorate Chiropractic *Founder's Day. Operation is ten kHz up from the* bottom of the General bands. For certificate, send QSL and SASE to Dr Wayne Henry Zemelka, KBØCIO, 1000 Brady St, Davenport, IA 52803.

Gaithersburg, Maryland: The Montgomery ARC will operate WA3EWJ 1200Z-1700Z **September 16** to commemorate the City of Gaithersburg's Olde *Towne Day. Phone operation is in the General por*tions of 40, 20 and 15 and the Novice portion of 10 meters. For QSL, send SASE to Bob Keller, KY3R, 5806 Namakagan Rd, Bethesda, MD 20816.

Mt Kaputar, Australia: VK2CMK will operate **September 20-23** as part of the New South Wales Astronomical Society's expedition to Mt Kaputar. *For more information, contact Chris Mylarnik,* 7 Doncaster Ave, West Pymble, New South Wales, 2073, Australia.

Troy, New York: The North East Sector Aviation Society will operate KA2TFM 1300Z-2200Z **September 20-23** to commemorate the 20th anniversary of the Freedom Network. 7.250 14.250 21.350 28.450 146.94. For certificate, send QSL and SASE to Arnie Fowler, 237 Belleview Rd, Troy, NY 12180.

Alpine County, California: The Calveras ARS will operate WA6YGA 1700Z **September 22**-0100Z **September 23** to activate that county. 14.300 21.300 28.350. For QSL, send QSL and SASE to CARS, *PO Box 122, San Andreas, CA 95249.*

Chattanooga, Tennessee: The Chattanooga Choo-Choo chapter of 10-10 International will operate 0000Z **September 21**-2400Z **September 30** in conjunction with Chattanooga annual Choo-Choo Festival. For certificate, send QSL and SASE to Alice Jenkins, NR4R, 1 Mitchell La, Rossville, GA *30741.*

Butler, Pennsylvania: The Butler Co ARA will operate W3UDX 1300Z **September 22**-0400Z **September 23** and 1800Z-2400Z **September 23** to commemorate the 50th anniversary of the Jeep. Operation is in the lower portions of the General phone segments of 80, 40, 20 and 15, Novice 10-meter phone and CW. *147.96/36 and 146.52. For certificate, send* QSL and 9- × 12-in SASE to Butler ARA, Box 1787, Butler, PA 16003.

Pea Patch Island, Delaware: The Tristate ARC will operate from Fort Delaware **September 28-30**. *Operation is in the General portions of 40, 20 and* 10, Novice 10 meters, and 6 and 2 meters. QSL with SASE direct to the operator worked.

Kingwood, West Virginia: Preston Co hams will operate WM8E 1400Z **September 28**-0200Z **September 30** in celebration of the 49th annual Preston County Buckwheat Festival. Operation is *25 kHz up from the bottom of the General phone* bands and the Novice CW bands. For certificate, send QSL and SASE to John Wills, KE8NO, 104 Swartz Rd, Kingwood, WV 26537.

Owensboro, Kentucky: The Owensboro ARC will operate K4HY 1900Z **September 28**-2200Z **September 30** in association with the International Bluegrass Music Festival. Operation is on the lower portion of the General phone bands and the Novice portion of 10 meters. For certificate, send QSL and 9- × 12-in SASE to Bob Hardin, N4PNG, 57 Colonial Ct, Owensboro, KY 42301.

Madisonville, Kentucky: *The Hopkins Co ARA will* operate 1400Z-2400Z **September 29** to celebrate Madisonville's 4th annual James Madison Days. Operation is on 40, 20, 15 and 10 meters. For certificate, send SASE to KM4FO, Dwight Orten, 4285 Nebo Rd, Madisonville, KY 42431.

Kingman, Arizona: The Hualapai ARC will operate *WA7LAZ 1500Z-2400Z* ***September 29-30*** *to* celebrate Andy Devine Days. 7.250 14.325 21.325 28.325. For QSL, send QSL and SASE to Hualapai ARC, PO Box 4364, Kingman, AZ 86402.

Branchville, South Carolina: The Edisto ARC will operate AD4U 1400Z **September 29**-0400Z **September 30** and 1700Z-2200Z **September 30** to *celebrate the Raylrode Daze Festival. 14.285 21.375* 28.400. For certificate, send QSL and 9- × 12-in SASE to AD4U, PO Box 117, Branchville, SC 29432-0117.

Special Event Announcements: Items for this column can be sent in ASCII format to ARRL HQ *on an MS-DOS floppy disk, via modem (ARRL HQ* BBS, 203-665-0090, 2400-8-N-1), or in letter form. The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **September 1** to make the **December** issue. Please include the name of the sponsoring organization, the call sign of the special-event station, the city location, dates and times (Z), suggested frequencies and QSL information. Requests for donations will not be pub*lished.*

QSLing Special-Event Stations: To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-*addressed, stamped envelope. If sending for a* certificate, use a 9- × 12-in envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail 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 often print their cards and/or certificates after the operation is over so they will know how many to order. QST

Strays

DO YOU NEED A MAN?

A group from the Ellesmere Port and District ARS will be operating in the RSGB 21/28 MHz contest Oct 7 from the Isle of Man as GD3CSA/P (see Contest Corral, p 80). QSL via the bureau or to Brian Saggerson, G4WSE, 18 Ploughmans Way, Great Sutton, South Wirral, L66 2YJ, UK.

Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

ATLANTIC DIVISION

EASTERN PENNSYLVANIA: SM, Robert M. Stanhope, KB3YS—ASM: N3ECL, WA3PZO. ACC: KC3QB. BM: KB3UD. OOC: W3IS. PIC: W3ZXV. SGL: WA3IAO. SEC: WB3FPL. STM: KD3AO. TC: W3FAF. Carter, KB3AO, & I discovered a "path" problem between PBBS @ WB3JOE & @ WB3AFL. The tfc report last month never arrived! Only with the help of the wife, KC3LM, N3FVO & a fax machine did I even have a chance to get it in before my 12th-of-the- month deadline. Thanks, ladies, for the extra effort! I also want to send a special thanks to the SysOps @ WB3JOE who took the time & effort to solve the path problem. At that, some of the report didn't get in, so it will be listed 1st, as a lot of hard work of the tfc handlers shouldn't be forgotten. May tfc: EPA Net QNI 490, QTC 132, in 62 sess, NM AA3B, total tfc for month 38. As we speak of NM Bud Trench. AA3B, who has served EPA for 10 yrs, he is leaving. We are always sorry to lose such dedicated people. Replacing Bud is Dick Jaeger, W3DP, of Camp Hill. He has been a net member since 1976 & wants to offer the CW tfc-handling training course—good luck. Want to check in? EPA 3510 at 7 & 10 PM, PTTN at 6:30 & EPAEPTN 3917 at 6 PM. All nets meet daily. Congratulations to the Tamaqua ARC. Dave Christ, NI3H, president, for being recognized by the mayor in his Proclamation for 25 yrs of community service! To all who use the League letterhead stationary, please only use it when writing strictly within your volunteer job status & duty. If it's misused, it can send an incorrect message to an independent amateur group or agency. Any questions, please call. Field Day is now history until next yr—I hope your group's efforts proved to be successful. I visited with Penn-Mar ARC, Columbia ARC, & York ARC Field Day sites. I just loved the ARRL flag cake made by the Penn-Mar wives. I also received 16 tfc msgs of well wishes & returned same on that wknd. Ray, KD3RN, reports they had 8 upgrades & 1 new Novice at the Winfield Hamfest exams. For amateur exam info, please check your local PBBS for times & dates. I send an updated list on a regular basis, as well as from other sources. Take a chance, upgrade. Hamfests include C-Cars in Carlisle Oct 14, PA Wireless Assn Oct 21 at Bensalem & finishing out the yr, the RF Hills ARC at Sellersville. Thanks to ASM N3ECL for attending. Thanks to ASM N3ECL for attending the Fire Cracker Hamfest in Harrisburg. I want to congratulate my fellow SMs who recently took the hot seat. In Delaware, KC3TI & N3EFN in WPA. Everyone talks about working with the local school system to teach Amateur Radio electronics & start a communications club, but you have done it! Many clubs have had great success in this area. It takes 1 major ingredient—your time. Don't put it off any longer. 73 de Bob, KB3YS, SM/EPA. Nets: D6ARES 88/8, PFN 291/254, SEPATN 66/11, PTTN 155 155/45. D8ARES 89/1. EPAEPTN 372/143. EPA 457/203. MARCTN 148/20. MARCNET 51/0. Tfc: N3DRM 254, W3IVS 204, N3CD 178, W3JKX 109, KD3AO 101, AA3B 78, W3KAG 65, N3EFW 61, WA3EHD 60, W3IPX 50, N3FLE 45, W3DP 39, NZ3G 29, W3NNL 27, KU3R 26, KA2MVM 25, KA3VTC 24, W3KOD 23, WA3CKA 22, W3FAF 15, N3CSE 11, NY3J 7. K3ARR W3BNR 6, N3AT WA3JKB 4, KC2EG 3, W3ADE 2. PSHR: N3DRM 76, NM3K 61. @BBS WA3TSW 232, K3RLI 209, WB3JOE 60, WB3AFL 34, N3ET 7.

MARYLAND-DC: SM, Ken Cohen, NI3F (@ WA3NZW)—ASM/Pkt: KJ3E. ASM/ACC: WA3YLO. OOC: NB3P. SEC: WA1QAA. TC: W3VNN. STM: N3EGF. SGL: KW3X. PIO/BM: WA3SCW. Thanks to Holly, N3BMB, for her part in having Amateur Radio Week declared in June by the Governor's office. Did your operate on FD? Thanks for the wonderful FD msgs! Your Atlantic Dir & I spoke to the BRATS this month. Nice to meet you all. MPTN continues to wow all the tfc folks. This "wonderking" passed 738 messages during its 2nd full month of existence. WA3VAT is still "state-of-the-art" handling tfc on his 1929 vintage CW rig! MMARC members demonstrated ham radio to the Boy Scouts at Severna Park & cosponsored a foxhunt with CARA & BRATS. Hey, that reminds me—too many hams are couch potatoes! Why not have your club attempt a Japanese or Soviet style "Radiosport"competition? Without cars! It can be done on foot out in the wild—or perhaps on bikes! A real test of athletic & DF'ing skills. Who will be the 1st club to sponsor an FFF (Find the Fox on Foot) Contest? We are looking forward to the MD QSO Party. Any club wanna sponsor a Worked All MD Award (WAM)? Let me know! 73 es 88.

Nets: NM/QND/QTC/QNI:
MSN/KC3Y 29/33/251
PON/WB3BFK 27/21/270
MDD/K3GHH 60/185/343
(Top Brass, K3GHH/198, W3QQ/124, KC3Y/114)
MEPN/K3RXK 31/97/633
HOCARES/WA1QAA 2/8/25
MPTN/KJ3E 30/738/594
Net schedules:

MEPN	Dy 2300Z	3920 kHz
MDD	Dy 0000Z	3643 kHz
MDD	Dy 0300Z	3643 kHz
MSN	Dy 0030Z	3717 kHz
MPTN	Dy 24 hrs	N2GTE-6 via nodes

Tfc: W3IWI 955 (BPL), N2GTE 738 (BPL), KJ3E 339, N3EGF 274, K3GHH 238, N3GPR 212, KC3Y 191, NR3Q 114, WA3YLO 113, K3RXK 111, K1LNJ 82, KD@M 67, KK3F 45, WB3BFK 38, W3FZV 36, N3GIY 26, W3YVQ 22, W3DQI 21, KA3DXX 7, K3EF 4, WA3GYW 4, WD8LAQ 4, WA1QAA 2, W3ZNW 1. PSHR: KJ3E 108. N3EGF 107, KC3Y 95, K3RXK 81, WA3YLO 70, NR3Q 64, K3GHH 63.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—SEC: W2HOB. STM: WB2UVB. ACC: N2IXE. TC: N2BQT. OOC: WA2HEB. ATCs K2JF, KA2RJA & WB2MNF. PIO, SGL, BM: vacant. Our SEC, W2HOB, sent me a number of public service activity reports recently. Although they are a little dated, I'd like to report them to you because public service is important to the preservation of our hobby. On April 22, 14 members of the Gloucester Co ARES handled comms for the Jaycees of Gloucester Co "Bike Hike." On April 27, the Gloucester Co ARES was involved in a drill where a toxic chemical leak occurred. Four amateurs, working with the Gloucester Co OEM, handled 6 messages & various other comms. During this drill, the 147.18 & 224.660 MHz rptrs were used, along with 147.54 simplex. Twenty-one members of the Burlington Co ARES helped with comms during the March of Dimes WalkAmerica April 29. Also working this same event was the Gloucester Co ARES. Six amateurs handled comms & 56 messages. Until next month, 73. Tfc: WB2ZJF 60, KC2PB 9 (May): WB2UVB 150, NG2R 46, W2HOB 27, N2JXG 19, W2FFE 18, K4FFM 14, KB2CDB 12, WA4JRP 12, N2EPH 6, K2UL 6, WA3EMY 2, K2OG 2, N2IVN 1.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—ASMs: W2BCH, W2GJ, W2GLH, WB2YQH. ACC: N2EH. BM: K2KWK. OOC: W2MTA (A). PIC: WA2PUU. SEC: NN2H. STM: N2EIA. SGL: WB3CUF. TC: K2QR. No BPL June. PSHR: N2EIA N2EVG WA2FJJ W2FR KA2GJV NN2H KC2HJ KB2HYT N2JAW N2JRS W2MTA WB2OEV WB2OWO WB2QIX KA2QOO WA2UKX NJ3V KD2WP K2YAI KA2ZNZ. Rome Ham-of-the-Year WA2GBE at 38th Annual Rome Hamfest. Congrats to GRAM, made the big time on p 12 of July *QST*! Club officers: GRAM WA2JRR KA2OQZ WA2AIV KB2IDH; Auburn W2NVQ KC2VB N2JPX WA2ITV per newsletter. From WA2LVW (Thanks, Warren); WNYDXA KD2YP WA2DSC WB2YQH. W District Net enters its 15th yr of operation; thanks to founder WA2AIV & WDN's other mgrs N2APB KC2QQ WB2OWO & N2EVG & the many active members. Greater Adirondack Rptr Assn continues progress with relocation of 93/33 with thanks to NS2Y NR2V KE2Q & N2IIK—WB2BHS. Blue Line operations continue. Field Day msgs received: NR2B KD2A NT2F W2FMM K2IQ AF2K WK2K WA2L W2LZ WF2L W2MTA WY2N W2OFO K2SA W2SB NQ2W. (At least 3 others were active in FD).

Nets:	QNI	QSP	QND
NYSEMO SSB	082-008-04		
NYSR CW	011-003-04		
NYS/M* CW	266-181-30		
NYS/E* CW	318-181-29		
WDN/M* FM	266-082-30		
Q Net/220 FM	note		
NY Fone*SSB	113-086-30		
BSN FM	note		
NYPON* SSB	358-180-30		
LCARES FM	note		
ESS CW	340-115-30		
Q NET/146 FM	note		
NYSPT&EN SSB	437-072-30		
JCRACN FM	note		
OCTEN/E* FM	834-134-30		
OCTEN/L* FM	300-102-30		
STAR* FM	319-038-30		
CNYTN* FM	232-084-30		
WDN/E* FM	374-129-30		
WDN/L* FM	307-135-30		
ORTN 28 SSB	047-000-04		
TIGARDS FM	019-005-03		
OARCN FM	065-003-04		
BRVSN FM	note		
VHF THIN FM	019-000-04		
EBN FM	197-000-21		
NYS/L* CW	312-202-30		

*NTS Net. Note: Net reports not received by the 7th will be included in next month's column. Here's a quote: "CW is a bit art, a bit magic, a bit skill . . . There is a real feeling of accomplishment when you have finished a CW QSO . . . It's not from the speed at which you send or even the QRM you have overcome . . . it's more the accomplishment of communicating in a language unknown to most other humans. That & a feeling of being touched by the magic. I learned the language a long time ago . . . young hams had no alternative but to use CW. There was magic in listening to the airwaves. I spent months listening to my brother's receiver before I got my ticket. CW wasn't a burden then. In fact, I never gave it a thought. It was part of the requirement for entrance into this mystical brotherhood."—WA2ISC. That reminds me of the story of Tony Wheeler, ex-8BCZ/W2ITA, the kid from the 20s who made it in big-time radio in the 30s & 40s. Ah, the nostalgia of it all! Mr DeSoto, tell us more about the values of past Amateur Radio! I wonder who will write the history of Amateur Radio beyond 1936? Maybe even until 1980? or 1990? Tfc (June): W2MTA 324, N2JAW, WB2OWO 252, K2YAI 205, WA2FJJ 201, N2EIA 166, NJ3V 160, N2EVG 144, KC2HJ 139, KA2ZNZ 129, KD2WP 99, N2JRS 91, WB2QIX 91, NN2H 90, WA2UKX 90, AF2K 84, KA2GJV 79, KG2D 75, KB2EOO 72, KA2OOO 69, WB2OEV 55, W2PPS 40, N2DLN 23, KB2HYT 24, KA2DBD 20, WB3CUF 7, KA2TWY 7, KA2SJG 2. Are you ready for the Simulated Emergency Test? Really? Have a great fall!

WESTERN PENNSYLVANIA: SM, B. E. Fuller, N3EFN @ K3ASI— ASM: KA3OEM @ NM3G. SEC: WA3UFN @ WA7SSO. STM: WA2QXA. BM: KC3ET @ KA3NVP. OOC: KX3V. ACC: AK3J. I consider myself fortunate to have been selected to fill the remaining months of the current term of John Fleming, NO3M, as SM of WPA. As I knew I would, I am already finding John's shoes hard to fill; I only hope I can perform half as well. As time passes, I will be calling on many of the hams in WPA for help in continuing the quest for excellence. Right now, we are in need of energetic, devoted amateurs to fill the section staff positions of TC, PIO & SGL. This month has been a hectic one for the Emergency Communications Teams throughout the western part of the section. SKYWARN activity has been common. I would like to especially commend the ECs & SKYWARN teams of Allegheny, Crawford, Erie & Washington Cos for the outstanding job keeping the Nat'l WX Service informed of on-the-ground activity during periods of severe WX. It is interesting to note that pkt radio is playing a significant role in the SKYWARN ops in Crawford & Erie Cos. Field Day ops throughout the section showed efficiency & professionalism in spite of the rather terrible propagation conditions. While I was not able to visit every club, my travels around the section proved educational.

Net	QNI	QTC	Sess	kHzT/D	NM
WPACW	180	100	30	35857 P/Dy	WA3UNX
WPAPTN	279	104	30	39836 P/Dy	WA3HLN
KFN	***Suspended for summer***				N3EMD
PFN	291	254	30	39585 P/Dy	WA3THT
WPA2MTN	337	65	30	146888 P/Dy	KA3BGC
NWPA2MTN	546	34	24	145139 P/Dy	WA3ZSC

June tfc: W3EGK 363, N3EMD 322, N3FM 264, N3AES 122, W3OKN 92, WA2QXA 78, WA3UNX 73, NO3M 57, W3NGO 47, W3RUL 30, KA3EGE 13, WA3QNT 25, KC3YE 13, WA3DBW 12, K3LTV 10, N3COR 2.

CENTRAL DIVISION

ILLINOIS: SM, Dave Carlson, AA9D—SEC: W9QBH. BM: K9EUI. ACC: WB9SFT. STM: K9CNP. SGL: K9IDQ. TC: N9RF. OOC: W9TT. PIC: N9EWA. DEC: WD9EBQ. The annual Mid-America Canoe Race was held June 3 with over 1000 canoes participating. The course is 23 mi long on the Fox R between S Elgin & Aurora. FRRL members providing comms for this event were KE9GC, N9FWM, WD9GIG, KD9RU, N9GWU, KØTZI, W9LRG, KD9RD, W9XA, KD9IG, KA9OJT, WA9AUW, K9LUW, WA9TRG, KB9BKN, KB9BVQ, KB9BVS, W9ETU, WB9MRL, N9FXQ, N9FWW, N9FSU, KB9CIN, WS9F, N9JLO, N9JZB & N9IVG. The 1990 IL QSO Party will be held 1800Z Oct 14 to 0200Z Oct 15. See *QST* or contact WB9GOJ for details. Ray Waldman, Meteorologist-In-Charge of the WX Service Forecast in Chicago retired at the end of June after 47 yrs of federal service. Ray has been helpful in getting Amateur Radio involved in the severe-WX spotting networks in IL. Metro Amateur Radio Club (MAC) communicators at the Evanston Kiwanis/St Francis Hospital Road Race were WD9ARS KD9DQU W9FO N9FQJ N9GLL W9IWI K9JRY W9LYA KA9NFN KA9OBZ & WB9ZIN. Field Day weather was nice, in N IL, at least. I received about a dozen FD msgs, of which 7 had the correct format & content. It's up to HQ to sort out the bonus points, but if it was up to me . . . This is my last column as IL SM. My term expired on July 1 & I did not run for reelection. My thanks to all IL hams for their cooperation & patience over the past 2 yrs. Special thanks to the Section Cabinet (Section Level Appointees) who work so hard & get so little recognition. 73 & see you on microwaves.

Net	Freq	Time
ISN	3905	1800 Dy
ILN	3690	1830,2200 Dy
ITN	3705	1900 Dy
CTN	147.69/09	2100 Dy
ILARES	3905	1630 1st, 3rd Sun
IEN	3940	0900 Sun
ILPN	3855	1645M-F;0830Sun
NCPN	3915	0700 M-Sat
NCPN	7270	1215 M-Sat

Tfc: NS9F 136, W9HOT 112, W9HLX 92, K9CNP 76, WD9HQW 61, W9LWH 44, KA9JNE 37, WD9CIR 15, W9LNQ 8, W9VEY/M 8.

INDIANA: SM, Peggy Coulter, W9JUJ—SEC: WB9ZQE. STM: KJ9J. OOC: N9INN. SGL: WA9VQO. BM: W9OCL. PIC: N9IPA . There are no changes in the ORS, OBS & OO appointments. I deeply regret to report Silent Keys: Francis J. Bock, W9AMI, of S Bend; Edward T. Conner, W9IRT, of Jeffersonville; William J. Quick, W9OMD, of Muncie; & Robert E. Witte, W9PMT, of Ft Wayne, who will be greatly missed. Bob was VHF NM for many yrs & active on the phone net. June was hard hit by tornadoes & heavy rains. ARES & RACES had a workout, but true to form, they provided a remarkable public service working together. More than 40 of Indiana's 92 cos conducted SKYWARN nets, passing damage reports to the Nat'l WX Service & State Emergency Mgmt Agency. Congratulations to newly Certified & appointed District 2 DEC James S. Sellers, K9ZBM, & EC George VanDeWater, WA9RXP. The Indianapolis Hamfest Assn & the IN Section ARRL presented 1990 Young Amateur of the Year Award to Andrew Crum, KB9CUS, of Kokomo & the Worker of the Year Award to Richard Heck, WB9WTX, of Indianapolis. We hope this will be an annual award. The deadline for nominations for 1991 awards is May 31, 1991. Send them to Indianapolis Hamfest Assn, PO Box 11776, Indianapolis, 46201. Thanks to Bruce, W9UMH, for making the transition to the new administration easier. With a new administration comes a few new appointments to the Section Cabinet. Please note beginning of article. Have enjoyed receiving the club bulletins & newsletters. Please keep them coming. Congratulations to John Wallace, WA9OHX, who has been appointed interim mgr for D9RN Cycle 1 & 2, pending a permanent mgr. Newly affiliated clubs are Elkhart Co Radio Assn, Inc in Elkhart & Memorial Park Middle School ARC in Ft Wayne. Reports received from EC K9LMJ DEC N9DTG, ATC WA6OIZ, OBS W9OCL, WA9UXP, N9BC, N9BAC. NM: ITN, W9UMH. QIN, KJ9J. ICN, NR9K. IWN, WA9OHX. June net reports:

Net	Freq	Time/Dy/UTC	QNI	QTC	QTRSess	
ITN	3910	1330/2130/2300	2621	328	1884	89
QIN	3656	1430/0000/0300	315	185	790	58
ICN	3705	2315	87	97	618	24
IWN	3910	1310	2123		312	31
IWN	VHF	Bloomington	668		450	31
IWN	VHF	Kokomo	822		162	31
IWN	VHF	Ligonier	538		600	31

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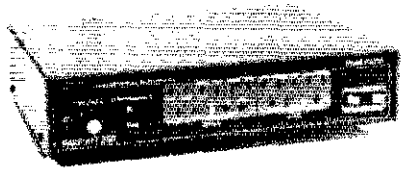

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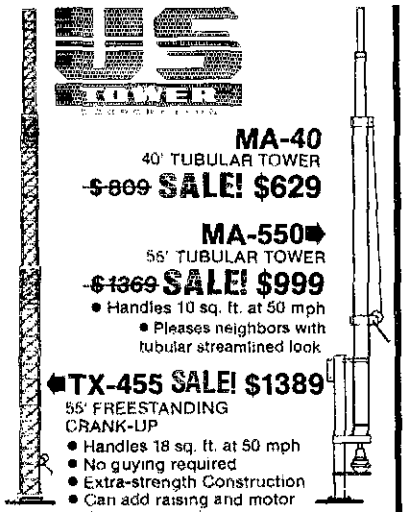

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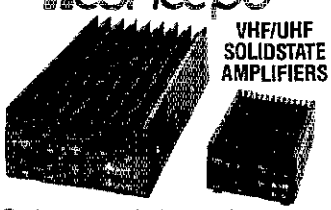

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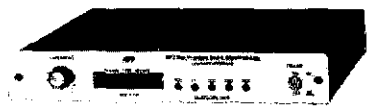

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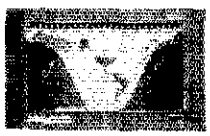

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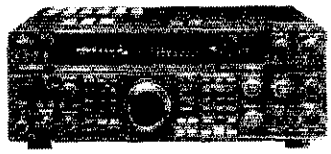

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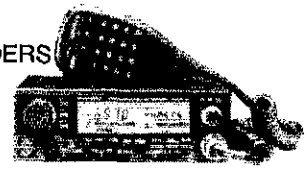

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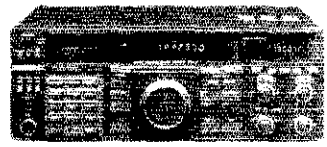

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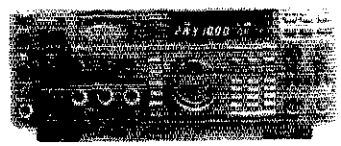

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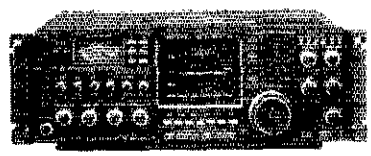

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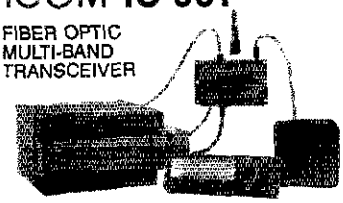

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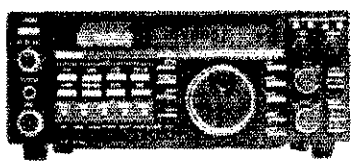

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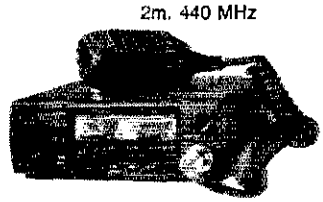

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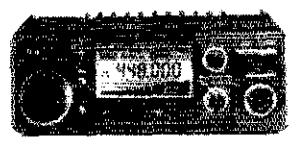

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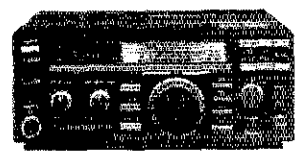

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2 MTR/440 MHz 50W/40W

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YAESU FT-1000 NEW

200 WATTS RF power output
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COMPACT DUAL BAND
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Built-in 10 memory
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VHF/UHF All Mode Transceiver

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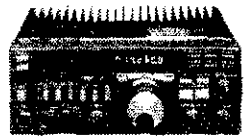

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YAESU FT-411 HANDHELD

Standard 2.5W
49 Memories
2m/140 to 174 MHz
EXTENDED RECEIVE



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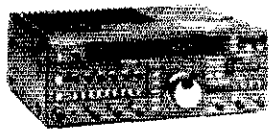
FT-811

440 MHz VERSION
REG. $410.00 **SALE $359.95**
SALE PRICE

FT-767GX

HF/VHF/UHF



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Optional Modules 50/144/430-440 MHz

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100 WATTS, DUAL VFO'S
Receives 100KHz to 30 MHz
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- Optimized for reduced Phase Noise
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TITAN 425

- Pair 3CX800A7 • External Power Supply
- Performance at legal limit
- 3 MS QSK, 1.6 to 22 MHz • Assures "Loaf Along"
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IN STOCK NOW! FREE SHIPMENT!

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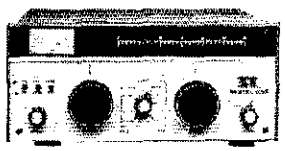

MODEL 238

2kW Antenna Tuner
with SWR bridge

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Mast not included

A3S

DX THAT STANDS OUT FROM THE CROWD

10, 15, 20 Meters

NEW WITH STAINLESS STEEL HARDWARE

cushcraft

Whether busting pileups, rag chewing or hunting rare DX, the A3 stands out from the crowd with the perfect combination of easy assembly, the right size, rugged durability and great performance.

- Boom Length 14 ft., Weight 27 lbs.
- Wind Surface Area 4.36 ft.

REG. 425.00
SALE 299.95

SALE



AR-270

NEW DUAL BAND RINGO

cushcraft

The AR-270 has Ringo Ranger technology in a durable all aluminum antenna with stainless steel hardware. Instant assembly and 3 short radials make it easy to install anywhere. AR-270 features sealed phasing coil and base matching network with single 50 Ohm cable connection.

- 2 Meters (144-148 MHz)
  70 CM (435-450 MHz)
- Height: 3.75 feet

REG. 80.00
SALE 69.95



R5

14, 18, 21, 24, 28 MHz
Half Wave Vertical

cushcraft

The new R5 has a broadband solid state impedance matching network for full coverage of all 5 bands. Frequency selection is completely automatic. There are no moving parts or remote tuner. The only connection required to the antenna is your 50 Ohm coax.

- The unique counterpoise has four 48" long .100" diameter stainless steel rods for excellent ground isolation
- No radials required

REG. 340.00
SALE 249.95



A3WS

NEW 12 & 17 METERS

DUO-BANDER

cushcraft

Enjoy the 12 and 17 meter bands with a full performance beam. Easy to use kit will add 30 meters. Mount it on a lightweight tower and rotator or with your existing tribander. A3WS features all aluminum construction with stainless hardware.

*Optional A103 30 Meter Add-on

Reg. 135.00
Sale 109.95

- Boom Length: 14 feet
- Weight: 22 lbs.
- Turning Radius: 14.4 ft.
- Wind Area: 4.1 ft²

REG. 350.00
SALE 269.95



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Twin Band

Detachable/Remote Control

- 2M/70CM FM Transceiver
- 45 watts 2 meters
- 35 watts on 70 centimeters
- High Power/User Friendly

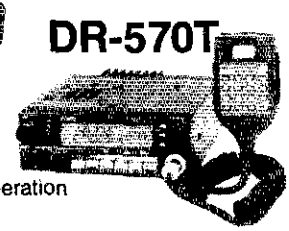


Call in September for low price

ALINCO DR-570T

The Twin Band

2m/70cm FM Transceiver
40W 2m
35W 70cm
Full Duplex Cross Band Operation
Twin Band Receiver



REG. ~~749.00~~
SALE ~~549.95~~

Call in September for low price

September ALINCO Month New Managers Sale

Woodbridge, VA	Curtis Brown WB4KZL
Salem, NH	Paul Randazzo NW1U

ALINCO and H.R.O. are jointly honoring the new managers in Woodbridge, VA and Salem, NH, by offering the lowest prices ever. For the entire month of September our nationwide team at all locations and 800 numbers will have this special pricing. Call or stop by—you won't believe it!

In addition, on September 29th, the Woodbridge, VA and Salem, NH stores will have ALINCO personnel on location, as well as free refreshments and a free prize drawing for those present.

ALINCO DJ-120T

2 Meter H.T.

LCD Display

- 2.5 watts (Standard Battery)
- 6.5 watts (Optional Battery)
- Easy to use



REG. ~~245.00~~
SALE ~~209.95~~

September for low price

ALINCO DJ-500T SUPER SALE



2m/70cm
FM Transceiver
Dual Bander H.T.
2.5W 2M/2W 70cm ~~339.95~~ ~~379.95~~
CAP + MARS MODIFIABLE
Promotional Item, Limited Invt.

SPECIAL ***Call in September for low price***

30 Day Warranty Std.
Alinco 2 Year Warranty Available.

ALINCO DJ-160T

2 Meter H.T.

Most Features Built In

- *2 Watts* (Standard Battery)
- *5 Watts* (Optional Battery)



Ask for Photos

REG. ~~369.00~~
SALE ~~259.95~~

ALINCO DR-110T

2m Mobile

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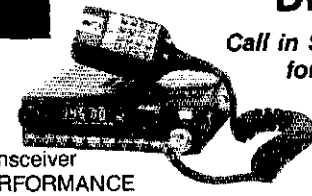

Great For Packet

2m FM Transceiver
GREAT PERFORMANCE
45 Watts
CAP + MARS MODIFIABLE

REG. ~~519.00~~
SALE ~~299.95~~



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1220 MARCIN ST.
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FASTEST SHIPMENT IN THE INDUSTRY.

MA SERIES CRANK-UP TUBULAR TOWERS
Will handle 10 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
MA-40	40'	21'6"	2	242	3" sq.	4½"	$ 809.00
MA-550	55'	22'1"	3	435	3" sq.	6"	$1369.00
MA-550MDP*	55'	22'1"	3	620	3" sq.	6"	$2909.00
MA-770	71'	22'10"	4	645	3" sq.	8"	$2509.00
MA-770MDP*	71'	22'10"	4	830	3" sq.	8"	$3969.00
MA-850MDP*	85'	23'6"	5	1128	3" sq.	10"	$5349.00

*MDP models complete with heavy-duty motor drive with positive pull down.

Shown w/optional MARB550 rotorbase and rotator.

FREE STANDING CRANK-UP TOWERS
Will handle 18 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
TX-438	38'	21'6"	2	365	12½"	15"	$1019.00
TX-455	55'	22'	3	670	12½"	18"	$1539.00
TX-472	72'	22'8"	4	1040	12½"	21⅝"	$2529.00
TX-472MDP**	72'	22'8"	4	1210	12½"	21⅝"	$4069.00
TX-489	89'	23'4"	5	1590	12½"	25⅝"	$4399.00
TX-489MDPL*	89'	23'4"	5	1800	12½"	25⅝"	$6599.00

*TX-472MDP includes heavy-duty motor drive with positive pull down. TX-489MDPL comes with heavy-duty motor drive with dual level wind and positive pull down. (Both motor drive models include limit switch brackets)

FREE STANDING HEAVY-DUTY CRANK-UP TOWERS.
Will handle 30 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
HDX-538	38'	21'6"	2	600	15"	18"	$1319.00
HDX-555	55'	22'	3	870	15"	21⅝"	$2309.00
HDX-572	72'	22'8"	4	1420	15"	25⅝"	$3959.00
HDX-572MDPL*	72'	22'8"	4	1600	15"	25⅝"	$6049.00
HDX-589MDPL*	89'	23'8"	5	2440	15"	30¾"	$7919.00

*Includes heavy-duty motor drives with dual level wind and positive pull down. HDX-572MDPL includes limit switch brackets only. HDX-589MDPL includes limit switches and limit switch brackets.

FREE STANDING "LOW PROFILE" COMPACT CRANK-UP TOWERS.
Will handle 18 sq. ft. antennas at 50 MPH winds. (TMM-433HD handles 24 sq. ft.)

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
TMM-433SS*	33'	11'4"	4	315	10"	18"	$1089.00
TMM-433HD*	33'	11'4"	4	400	12½"	20⅛"	$1319.00
TMM-541SS*	41'	12'	5	430	10"	20⅛"	$1429.00

*Hy-Gain and some Alliance rotors when installed inside tower will restrict retracted height by approx. 24". Most Kenpro models allow full retraction

Tower ratings to EIA specifications

CALL FOR FREE CATALOG

Standard bases included with all towers (except MA-770, 770-MDP and 850-MDP).

Full line of Accessories including:
• Tower motor drives • 5' to 24' antenna masts • Coax arms
• Thrust bearings • Mast raising fixtures • Rotating bases
• Limit Switch Packages

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Pkt BBS reports received: KD9WH 3484, N5AAA 1704, WA9UXP 1677, WA9IVB, N9BAC 1330. KK9G 1162. Tfc: WB7QWG 775, NR9K 290, KD9WH 268, N5AAA 242, KJ9J 204, WA9OHX 195, W9ZGC 142, W9JUJ 119, W9UMH 115, WA9QCF 80, W9UEM 56, N9BS 40, K9ZLS 38, WA9IVB 35, W9PPO 35, N9BAC 34, K9GBR 27, WA9UXP 24, K9SBW 22, KK9G 21, K9OUP 20, K9DIY 13, N9DTG 11, WD9DWD 10, WB9IHR 8, AB9A 8, WD9CIV 8, K9EDF 7, W9EHY 6, W9XD 5, NZ9S 2, W9KMY 1.

WISCONSIN: SM, Richard R. Regent, K9GDF—Everyone is welcome to the WI Nets Assn Picnic & Fall Mtg, Sept 8 at Hartman Creek State Park, Hwy 54 W, Waupaca; K9FHI of prize committee will have surprises to give away. Send monthly net reports & individual tfc counts to KC9CJ, STM; Dick could also use more NCSs. W9KLN is 9RN Mgr & needs liaisons to Central Area Net. Free severe WX procedures & msg formats are avail from W9ZAG, SEC. WI's Badger State Smoke Signals received a "superior" in the Amateur Radio News Service publications contest; get BSSS subscription info from K9ZZ. N9AW has semiautomatic key collection & is looking for more keys. New officers of Sheboygan Co ARC: pres KB9AFT, vp N9IXX, secy WE9R & treas WA9SNU. Green Bay Mike & Key Club provides comms for Bellevue-East Optimist Club Run Aug 28. Milwaukee Radio Amateur's Club has Amateur Radio classes starting Sept 5 for 9 wks, Wed 7:30 PM at Wauwatosa EHS, contact WB9BWP for info. MRAC exams Sept 5. Eau Claire ARC exams Sept 13, Facilities Mgmt Bldg, Univ of WI-Eau Claire. Badger Examiners exams Sept 15, St Nicholas Church, Milwaukee, WI9M. Sorry to report Silent Key, W9WQ, a hard- working volunteer of Amateur Radio. N9FZL has recipe for delicious strawberry pizza.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, KCØT—This happens to be my birthday & I am celebrating by writing this monthly report. Here we are in the busy-ness of summer & lots of things happening. We are having the wettest drought in history—the Olympic Festival opens today & our Chief Loon, NØFOO, reports that the annual Loon Festival is about to begin at Brainerd. Aside from that, band conditions notwithstanding, we managed a tfc total of 2,776 with 23 reporting stations—not bad for a hot, stormy summer—and Judy, WBØWNJ, continues her scorching pace with 1048 points! Congratulations to Ray, KAØARP & Judy, WBØWNJ, for June BPL—keep up the good work, gang, your efforts are appreciated. The help & support is great! Until next time, 73 es GL—Jim Swisher, KFØFI, STM MN.

Net	Freq	Time	QNI/QTC/Sess	NM
MSN/1	3685	6:30P	213/60/30	KDØNH
MSN/2	3685	10 P	186/56/30	KBØBE
MSSN	3710	6 P	354/28/30	KAØSBY
MSPN/N	3860	12 P	332/131/29	WAØTFC
MSPN/E	3860	5:30P	534/184/30	KCØT
PAW	3929	9A	2206/245/110	WDØBAC

Tfc: WBØWNJ 1048, KAØARP 415, KFØFI 310, WAØTFC 292, NØFOO 95, KAØPDM 94, WØGRW 90, KDØNH 73, KØPIZ 58, KCØT 46, KØOBE 44, W9DM 38, WDØGUF 31, KAØSBY 25, KØWPK 23, NØFKU 19, NIØA 15, NØKOM 14, KN9U 12, NØJP 12, KAØVQN 10, WØKYG 7, KØOGI 5. Total Tfc: 2776.

NORTH DAKOTA: SM, Bill Kurtti, WCØM—ARRL Dakota Div Conv Sept 28-29 in Fargo, ND, VE testing, seminars, foxhunts, CW contest & more fun activities for the hams. I am sorry to report the sudden passing of WØOEL. Congratulations to KBØGLM, KBØGLL & WBØGKS for upgrading to Tech; KBØGKS & KBØGKV to Gen; KBØGKT to Adv; WBØCUV & KEØVF to Extra. A group of Fargo hams, KAØWTZ, KEØDJ, KDØYX & W9NT, had an interesting time as they sailed the sailboat *Wildflower* to Thompson I in L Superior & put VE3/W9NT on the air for a day June 27-30. Bismarck area hams provided comms for the Big-Man Reel & Rec Walleye Derby on the 9th & Take a Kid Fishing Day on the 19th. Field Day was an active time again for ND hams, with about 6 club groups & several informal groups taking part. We used the WR9R logging program & I can say it's the slickest thing I have seen since girls. If you want a copy, let me know.

Net	Freq	Time	Sess/QNI/QTC	NM
Goose River	1995 kHz	9 AM Sun	4/43/0	NTØV
DATA	3937 kHz	6:30 Dy	28/480/25	NØIJR
WX Nets	3937 kHz	9 AM 12:30PNov-Mar		WØGFE
NORTH 40	146.64	8P MST Sun		NØELA
Superlink	repeaters	7 PM SunAll Superlink 5/127/3		NØKMG

SOUTH DAKOTA: SM, R. L. Cory, WØYMB—ASM: NØABE, WAØFPR. SEC: KAØKPY. STM: KDØYL. Stations that sent me Field Day messages & earned 100 pts for doing so include Aberdeen ARC, WDØHWL, with 12 ops; KØHP from Devils Tower with 4 ops; LARK at Watertown, NØDL, with 8 ops; PDARC at Yankton, WØOJY, with 8 ops; Mobridge ARC, KØERM, with 7 ops; Black Hills ARC, Rapid City, WØBLK, with 10 ops; Hot Springs ARC, KAØFUI, with 12 ops & WØGSY at Ridgeview with 1 op. Sioux Falls club reported to our SEC with 23 ops & 99 people present & NFØN from Volga with 4 ops. Details are being worked out by Aberdeen ARC & will be announced on the evening net on 3870 for a VE testing sess & flea mkt Oct 6; watch for this announcement & plan to attend. Brookings club & Lark of Watertown are working on plans to furnish comms for a bike-a-thon that will travel from Sioux Falls to Big Stone. Tfc for June was 405.

DELTA DIVISION

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—ASM: KB5CX, ACC: K4KR. SGL: KD5SL. TC: W5RWF. OOC: WB4ICV. Packet: WB5ASD. STM: WB4FDT. SEC: KG5PV. Recently elected officers of the False River Rptr Assn are pres Gene, N5PIZ; secy Mary, KB5HGE; treas Jay, N5NXI. Finally, good news on telephone rates for autopatch rptrs; the following is quoted from Ed Crump, KB5CX, "The LA Council of ARCs is happy to announce that the LA Public Service Commission has directed S Central Bell to file new tariffs changing their charges to Amateur Radio groups from commercial to residential. Although they have been working on the project for more than 2 yrs, it took the effort of John Hitt, N5JH, of Shreveport, to convince the Commission to take this action." The new Tariff Order was effective June 25, 1990. Additional 1990 Affiliated Club updates are: Ozone ARC, Slidell; Central LA ARC, Alexandria; Delta DX Assn, New Orleans; United ARC, Mansfield; Jefferson ARC, Metairie; & the Rosedale Rptr Assn. 1990 Field Day msg reports to the SM were received from: Jefferson ARC, Metairie; Ascension Parish ARC; Spring-

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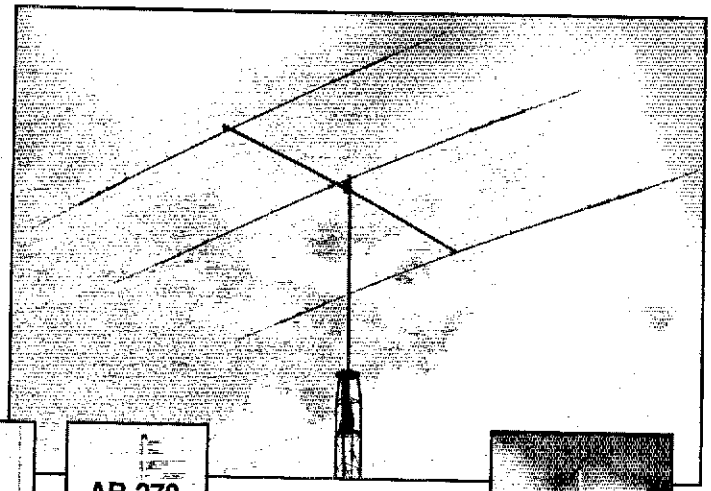

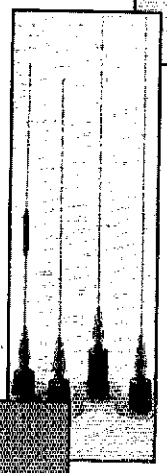

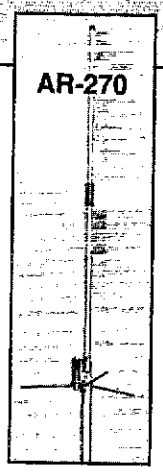



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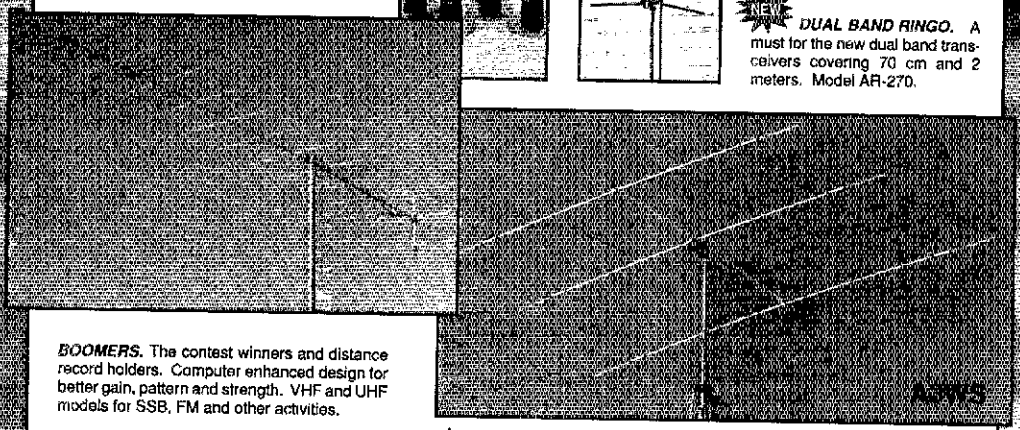



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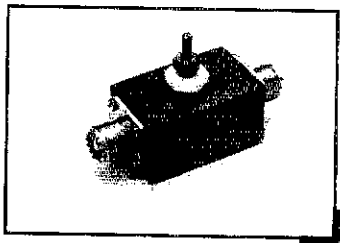

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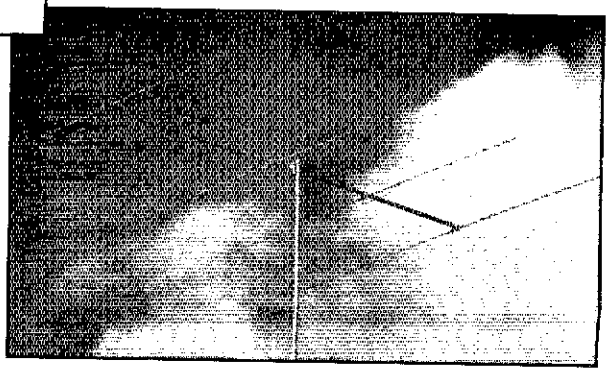

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hill ARC, Baton Rouge ARC; Ozone ARC, Slidell and the Acadiana ARC, Lafayette. 73 & GL de "Wondy," K5KR.

MISSISSIPPI: SM, Butch Magee, *KF5DE—ASM: WD5GHW.* SEC: N5DVR. TC: W5VZF. STM: KB5W. BM: W5EPW. SGL: KA5WRX. OOC: WA5TMC. Field Day here in the MS section may not have all the participants we would have liked, what with lousy band conditions & all, but it didn't stop the clubs in this state from operating & having a good time. Old-timers know that when the band drops out, you just put on some burgers, drink something cold & wait...or take a nap; it'll open back up later. Several club stations earned extra points by originating & delivering msgs to the SM & SEC. *The Biloxi* Hamfest & State Convention is just around the corner, so make your plans to attend now. All appointees should make an extra effort to be there—we have a lot to talk about & plan for.

Net	NM	SessQNI	QTC	Emer
MS Section Phone	W5HTV	30 1711	23	0
Magnolia Sect	KF5DE/ Acting	30 721	7	0

Stns heard: KB5W*, NS5M*, W5DEJ*, W5JDF*, KT5Z*, *N5KKI, W5YRX, KF5I,* WB4LAL, W4MRD, *KA4RZZ*
(* designated as NCS)

CAND (MS 100% by NS5M)	K5UPN	60	621
DRN5	WB5YDD	60	563

(MS 100% by W5HKW, N5KKI, W5DEJ, KB5W, NS5M, KT5Z, KF5I, N5HBB, KF5DE, W5YRX, WB4LRL)

MS Slow Net	W5YR	23	97	4

(Need more participation by MS hams.)

TENNESSEE: SM, Harry Simpson, W4MI— Eastern ASM/PIC: W4TYU. Western ASM/ACC: K4CXY. STM: WB4LAL. SEC: K4UVH. OOC: *K4LSP.* TC: *W4HHK. The TN Phone Net* is on 3980 kHz with early sess at 6:40 AM Eastern, Regular sess at 7:45 AM Eastern M- F, at 10 AM Eastern Sat, Sun & hol. Eve sess M-Sat at 6:30 PM Central. CW Net Sess are on 3635 kHz at 7 PM Central, M- F. Congratulations to STM WB4LAL on sending me reports from 9 TN Nets! This is a new record. DRN5 Manager WA5YDD reports TN was represented on 87% of their sess by K4WWQ & KN4HL; I'll bet old Harmon appreciated the help from Charles! Note to NMs: You have *been doing such a great job, I sort of hate to mention it, but* all nets must be registered every 2 yrs. If you have not done so during the last yr, the deadline for your inclusion in the *1991 ARRL Net Directory* is Sept 7, 1990. I will be glad to send you a card if you need it. I regret to report the passing of Clayton Elam, K4FZJ, of Memphis. Clayton was active in almost every phase of Amateur Radio for over 35 yrs. Most of you knew him from his appearance in flea mkts at hamfests all over the country. He was "head flea" at the Memphis Hamfest for *many yrs & will be sorely missed by his host of associates.* On a lighter note, I hope you are all resting up for the flurry of hamfests next month! It starts on the MS Gulf Coast at Biloxi on 6-7, then Memfest '90 on 13-14, Tri-Cities at Gray on 20 & ends with the super show in Chattanooga on 27-28! Tfc: WA4FMR 135, K4WWQ 82, W4DDK 69, WB4LAL 61, K4WOP 36, W4MRD 33, W4MI 27, KA5KDB 25, WA4HKU 20, W4TYU 14, W4TYV 10, WA4GZZ 10, K4UMW 8, W4PSN 6.

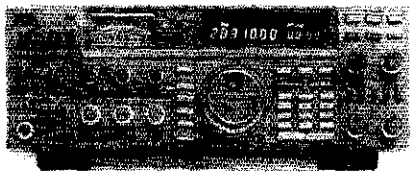
GREAT LAKES DIVISION

KENTUCKY: SM, John Thernes, WM4T—ASM: KC4WN. SEC: WB4NHO. STM: KA4MTX. (June) Mammoth Cave ARC participated in the comms aspect of the Scottish Goodwill Games. BARS reports 25 hams provided comms for the children's classic golf tourney. Numerous amateurs provided emergency comms during the recent storms and tornados. Because emergencies do not stop at state lines, hams from *Owesboro sent a "jump team" into IN & hams from the N KY* area did the same. My thanks to the BARS club of Lexington for their hospitality during my visit. Also, your SM & ASM met with state officials at the Frankfort EOC & discussed the KY emergency plan & how NTS works. Olen did a fine job in selling DES on our abilities. Special thanks to members of the Capitol ARC in Frankfort for their efforts during CIVEX-90; because of their efforts, the Boone EOC station is back on the air & a major upgrade is in the works. Field Day msgs were *received from* KN4DM, KI4B, W4NJA, WA4UXJ, KD4SS, KM4FO, WF4N & W4CN. Thanks & 73...WM4T, KY SM.

MICHIGAN: SM, George E. Race, WB8BGY (@ WA8URE)— STM: WB8R (@ NT8R). SEC: K8CQF (@ N8JAT). SGL: N8CNY. TC: W8YZ. OOC: WA2AJQ. BM: N8IWS (@ WA8OOH). PIC: WR8R. (@ KC8TU). ACC: W8POX. Our SEC, K8CQF, has appointed Larry, WA8QCW, as EC for Montcalm Co. Jim, N8KNM, has been named the VHF NM for Branch Co. Congratulations to Inez Pearson, KY8V, recipient of the *CMARC Ziegenbein award. U. P. Ham of the month for June* was Nelson, W8UFS. Upcoming swaps: Aug 26 Five-County Swap, Saginaw; Sept 16, L'anse Creuse Swap; Sept 23, Adrian Hamfest. From the 46 Field Day msgs I received, it seems that Field Day was a success in MI, in spite of the rainy weather. Kalamazoo amateurs provided comms for the Air Show July 7-8, they also operated special-event station W8VY. Dale, N8IIC, has released a VHS video tape featuring interviews with MI State Police EMD officials, discussing the benefits of Amateur Radio comms in emergencies. The tape is designed to be shown to served agencies & would make a great presentation to your local Emergency Mgmt Officials; contact Dale for info on obtaining a copy. Joe, K8CQF, our SEC, has announced the 1990 SET planning mtgs. 1st mtg is in Gaylord Aug 18; 2nd will be at the ARC in Lansing Sept 15. My congratulations to all members of the MI NTS & ARES who put together a 1st-rate effort for the 3rd yr in a row. The yearly SET has become the leading training sess for MI amateurs & the results sure do show. Let's get even more counties involved in this yr's sess. In closing, I would like to thank Dale, WA8EFK, for all the yrs of service to the MI ARRL as SEC & then EC for Monroe Co; Dale continues to serve the organization as an Asst Dir to the Great Lakes Div. 73...Please support the following MI-area nets:

Net	Freq	Time/Day	QNI	QSP	Sess	NM
MITN	3953	7 PM Dy	558	139	30	WD8EIB
*QMN**	*3663*	*6 PM Dy*	*456*	*94*	*60*	*WB8SYA*
SEMTN	145.33	10:15 PM Dy	290	59	30	N8HSC
MNN*	3722	5:30 PM Dy	73	31	30	KF8AU
MACS*	3953	11 AM M-Sat	382	47	30	K8OCP
GLETN	3932	9 PM Dy	942	101	30	NW8M
UPN*	3921	5 PM Dy	930	62	34	WA8DHB
NMTN	147.12	7:30 PM Dy	323	47	30	N8JCL
WSSBN	3935	7 PM Dy	No report			GOU
VHF Net Activity			781	5	50	N8CRV

*QMN Early-6:30 PM Dy; QMN Late-10 PM Dy; MNN Late-



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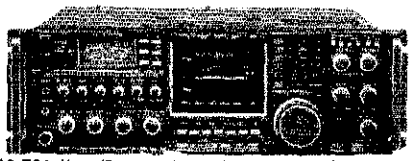
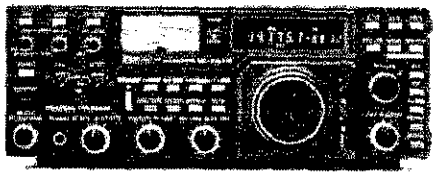


IC-781 Xcvr/Rcvr/ps/tuner/scope	6149	5199



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RC-10 External frequency controller	49.00	



IC-735 HF xcvr/SW rcvr/mic.....	1149.00	989.95
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AT-150 Automatic antenna tuner	445.00	389.95
FL-32A 500 Hz CW filter.....	69.00	
EX-243 Electronic keyer unit.....	64.50	
UT-30 Tone encoder	18.50	
IC-725 HF xcvr/SW rcvr..... (Special)	949.00	799.95
AH-3 Automatic ant tuner .. (Special)	489.00	379.95
IC-726 10-band xcvr/6m/.5-30MHz rx	1299.00	1129

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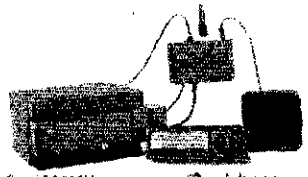

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IC-3SAT 220 HT/TTP	449.00	369.95
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A-2 5W PEP synth. aircraft HT.....	525.00	479.95
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FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-44A SSB filter (2nd IF).....	178.00	159.95
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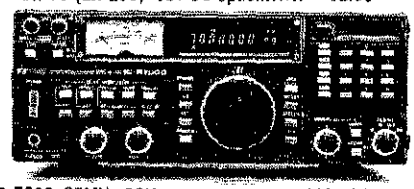
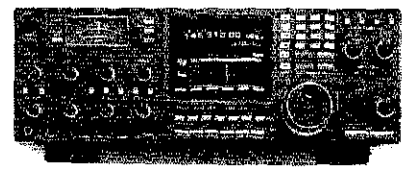
SP-3 External speaker.....	65.00	
CK-70 (EX-299) 12V DC option.....	12.99	



R-7000 25MHz-2GHz receiver.....	1199.00	1029
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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magnet stepper motor.
7.5 degrees per step.
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Two hole mounting flange, 2.625"centers. 6 wire leads.
CAT# SMT-6 $6.00 each • 10 for $50.00

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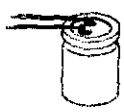

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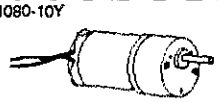

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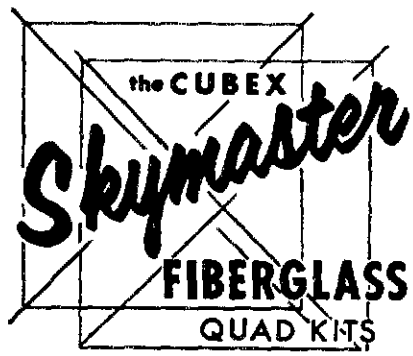

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Tfc for June: KF8AU-510, KA8CPS-202, WB8VYN-191, WB8I/PBBS- 158, N8JAT/PBBS-134, WB8R-93, K8GXV-90, WB8SYA-74, WB8BGY- 68, WD8MJB-58, NW8M-58, WA8DHB-51, WB8YDZ-49, K8HAP-42, N8FPN-38, N6CRV-36, W8EOI-30, W7LVB-30, K8UPE-28, K8ZJU-28, W8YIQ-27, K8OCP-27, K3UWO-27, NY8W-25, KB8DZX-25, WT8J-22, W8IHX-20, KA8BYK-19, N8CNY-14, KD8LZ-11, WD8EIB-10, W8CSO-7, W8RNQ-6, WB8WJV-6, N8EXS-4, W8URM-3, KN8JDN-3, N8CFF-1.

OHIO: SM, John Haungs, WA8STX, tel 513-563-7373—ASM: David Kersten, N8AUH, tel 216-221-6740. SEC: WD8MPV. STM: KF8J. ACC: KJ3O. BM: W8PH. TC: KB8MU. OOC: WB8ZCE. SGL: N8CVK. PIC: K8CQE. This report is being written in Lakespur, CA, while on vacation & listening to the report on the flood disaster in Shadyside, OH. Supposedly, there were ARES members helping the disaster team search for missing persons. You can never tell where the next diaster will strike, so it always pays to be prepared. No earthquake tremors were experienced while across the bay from San Francisco. There still are problems traveling through the city because of many roads being repaired. Rte 1 from San Francisco S is closed & will be under repair for 3 yrs after they start the repair. The environmental problem is where to put 50,000 cu yds of dirt & stone. By the time you read this, the new OH SM will have been elected. We all wish the person elected the best of luck. I will be glad to help in any way I can to make a smooth transition. Don't forget the Section Conf in Columbus, Sun, Oct 14—this will be an opportunity to meet your new SM & offer your help or volunteer for an assignment. When I return home, the recorder tapes were full of tfc; thanks to daughter Barbara, N8IRF, I was able to have all the June tfc saved for quick transcribing for the reports—it's always nice to have another ham in the family. Thanks to Vancouver, BC, amateur VE7HUT, who took my tfc for Cincinnati & delivered it to WA8SSI via the NTS. And thanks again to Tony, WA6DSV & Day for their hospitality in Shingletown, CA, where he has his TH6DXX at 4050 ft & you can see the snow on top of Mt Lassen. Tony, the new lighter plug put my dual-bander back on the air. It's fun to have a little ham radio while on vacation.

Net	QNI	QTC	Sess	Time (Local)	Freq	NM
BN(E)	163	79	30	1845 Dy	3.577	WD8C
BN(L)	247	120	30	2200 Dy	3.577	KD8HB
BNR	203	61	30	1800 Dy	3.605	W8EK
OSSBN	1450	606	99	1030,1615,18453	3.9725	N8IBS
OSSN	208	66	30	0645 M-F	3.577	WB8FSV
OSSN	---	---	080			
			0	S-Su	3.577	WB8FSV
OSN	176	47	29	1810 Dy	3.708	WD8KRW
OH Section ARES Net				1700 Sun	3.875	WD8MPV

Tfc: KD8KU 225, W8BQ 216, K8TVG, KD8HB 172, W8JLW 164, WA8STX 158, K8JDI 151, KC8TW/PBBS 137, KF8J 124, W8SKP 115, N8IIP 114, WD8KFN 113, WB8DPZ 110, N8FWA 109, W8EK 92, WA8HED 92, WA8SSI 91, K8ALV 82, W8LDU 80, KA1S 74, WB8FSV 69, W8RG 61, W8QZK 52, W8VND 50, WD8IKC 50, W8BDC 48, KB1OW 42, K8DHD 41, WD8KBW 32, W8VVL 30, NS8C 28, N8INP 28, N8HJB 26, K8ES 26, W8GBM 26, N2NS 25, KB8ESU 24, W8PBX 23, K8BNQ 23, WD8RIB 23, NY8V 22, NF8B 22, N8CXI 22, WB8HHZ 21, N8JOC 20, K8JA 19, KA8YIT 18, N8EFB 17, N8JRV 16, K8EF 16, N8XX 15, W8LDQ 14, WD8JYE 14, N8AJU 12, KC8JV 11, KA8OQF 10, N8CEI 10, KE8WA 8, N8FPH 8, WK8H 8, K8WZX 8, W9SWM 7, N8JYV 7, N8JHP 7, W8FPA 6, K8CKY 6, KF8FU 5, KD8VYT 5, N8CW 4, W8XT 3, KD8IC 3, KB8GUM 2, KA8CGF 2, WB8NHV 1. (May) WD8C 53, KC8JV 13.

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EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—STM/ASM: K2ZM. SEC: WA2ZYM. ACC: KV2A. SGL: KB2HQ. BM: WB2IXR. OOC: N2DVQ. PIO: KB2TM. ATC: WA2VGM. ASM/Pkt: N2FTR ASM/Newsletter: WB2NHC. Special thanks to the clubs & groups who took the time to originate Field Day msgs—received quite a few. Club news: Albany ARA provided comms for the "Bagel Run" June 10. Those participating were WB2BEJ, KA2WEI, WB2LXC, N2JBI, KA2MCU. Info provided by WA2YBM. WA2FUZ talked about pkt at the July mtg of the Catskill Mtn ARA. Mt Beacon held elections: pres N2GWC, vp K2DPL, rcrd secy KD2TZ, crspdg secy N2JBK, treas K2LYE, dir/eng N2FZC & dirs N2FTR & N2SZP. Overlook Mtn ARC hopes to hear from WA2DHF/WB2VUK one of these days. The last trip in their direction ended up with the car being towed to the nearest dealer in Newburgh. They held a pizza party in July. Saratoga RACES is feverishly preparing for the hamfest Sept 15. Most clubs are taking a summer hiatus. The Hudson Div Convention July 8 was successful, with a number of interesting & well-attended forums. W2MTA, NN2H & I attended the VOAD mtg in Albany the end of June—very educational conf; had a chance to learn how other volunteer organizations assist in disasters. VOAD provides a valuable forum for exchange of info between groups. If anyone is interested in the Tech Coord position, please contact me ASAP. Net reports for June (Check-ins/tfc passed): CDN 549/63 ESS 340/115 NYP 113/86 NYPON 350/180 NYS/E 328/187 NYS/L 312/202 NYS/M 266/181 SDN 439/96. June PSHR: KB2EPU WE2G WB2VUK N5MEA K2ZVI WB1BTJ WF2M N2JBA. June Tfc: N5MEA 202, WB2IIV 173, WB2VUK 91, KB2EPU 75, K2ZVI 71, WB1BTJ 63, WF2M 62, WE2G 61, WA2JBO 60, K2LYE 37, N2FTR 36, WA2GYY 18, K2HNW 17, N2JBA 7, WB2NVR 2.

NEW YORK CITY-LONG ISLAND: SM, Walter M. Wenzel, KA2RGI— ASM: WB2IBO. ASM: N2GQR. ASM/ACC: KA2LCC. SEC: W2HPM. STM: K2MT. OOC: NB2T. PIC: KA2JMA. TC: W2QUV. BM: W2JUP. Upcoming events: Sept 16 LIMARC Hamfest @ Greenvale Sept 23 HOSARC Hamfest @ Flushing Oct 13/14 NDMS Exercise. Nov 4 NYC Marathon. With the return to school & the cooler WX, we should all be reminded that the hurricane season is still upon us & the need for trained & experienced communicators is an all-yr need, so please contact your local EC or the SEC, Joe, W2HPM, or me for more info on how you can assist. Speaking of assisting, if anyone can tell me which clubs in the section Steve, WA2DHF, our Div Dir has not been to lately or has not been scheduled to visit, please let me know, it seems that even Paul, WB2VUK, is having a problem as to remembering where they have been lately because of the scheduling. If you have not scheduled Steve or me at 1 of your mtgs & would like to, please let me know. We are still looking for persons interested in assisting in the Oct drill with NDMS & other programs, such as SKYWARN & The Emergency

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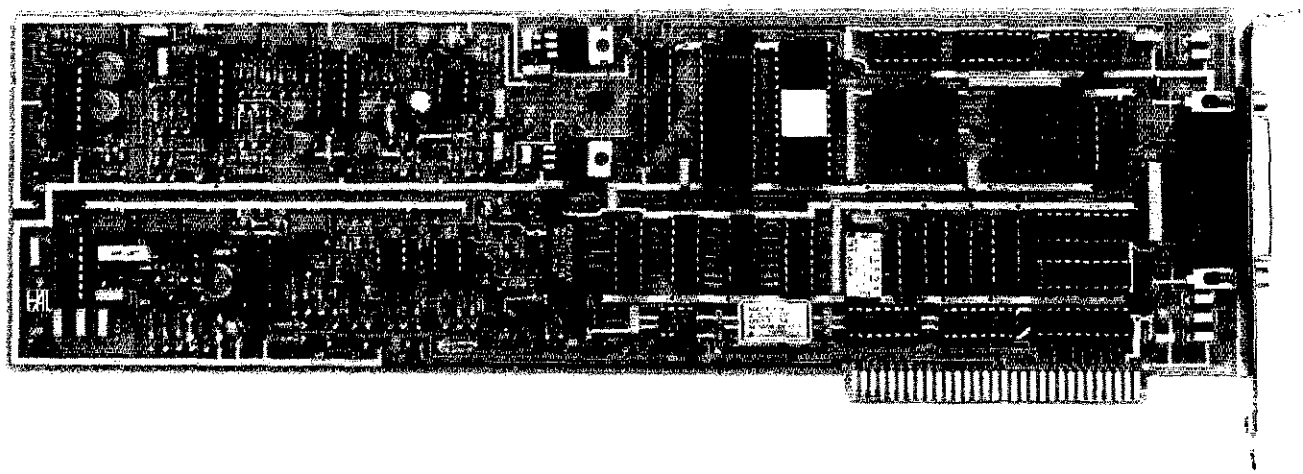

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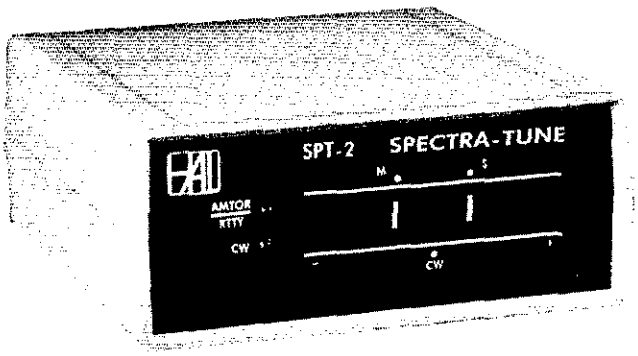

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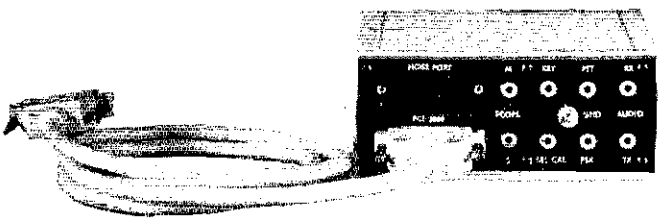

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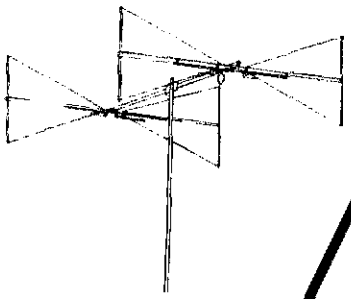

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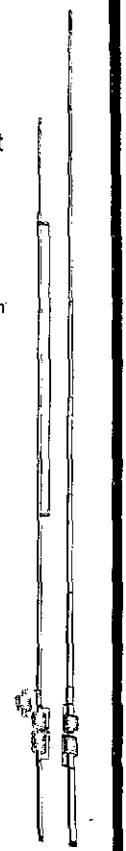

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Net	Freq	Time	Day	NM
BAVHF	146.850/R	2000	Dy	K2TWZ
NCVHF	146.745/R	1930	M-F	N2IMP
NCVHF	146.805/R	1930	Sat-Sun	N2IMP
SCVHF	145.370/R	2000	Sun-F	KA2JMA
NYP	3.925 MHz	1300	Dy	W2MTA
NYPON	3.913 MHz	1700	Dy	KA2UBD
NYS/M	3.677 MHz	1000	Dy	N2EIA
NYS/E	3.677 MHz	1900	Dy	N5MEA
NYS/L	3.677 MHz	2200	Dy	W2YGW
NLT	28.450 MHz	2100	Wed	N2IMP
ESS*	3.590 MHz	1800	Dy	W2WSS

*Independent net, recognized by NTS; local times.

Pkt Node Stations

AI2Q -4 Freeport	145.010 Nassau, W Suffolk
W2HPM -4 Farmingville	144.970 Cent Suffolk
NR2L -4 Water Mill	145.090 E Suffolk
WB2IBO-4 Massapequa	145.030 Backup for AI2Q-4

Tfc: WI2G 519, N2AKZ 253, KA2VZX 96, W2GKZ 51, K2TWZ 51, N2IMP 37, WB2ZIE 29, NB2D 28, K2MT 28, KA2JMA 26, KA2UIU 16. (May) N2IMP 58.

NORTHERN NEW JERSEY: SM, Richard S. Moseson, NW2L (@ KD6THI)—ASMs: Recruitment/KA2F, Youth/(Vacant), Vol Counsel/N2IGO, SE/KY2S, SW/KC2ZA NW/NW2S; ACC: WA2QYX. BM: K2ULR. CO/AAC: KA2BZS. PIC: WE2R. SEC: WB2HBZ. STM: WB2FTX. TC: WG2W. Ham Radio Info Line 201-680-1585. Tnx to all who made the trek to LI to support the ARRL Hudson Div Conv in July—especially to ASM N2IGO, SGL W2KB, W2HBX, former STM K2VX, N2XJ, NO2T, N2DSY & WU2Z for helping out with forums (Hope I didn't miss anyone). Other NNJ leadership officials present included ACC WA2QYX (at the BEMARC ATV demo), PIC WE2R, Passaic Co DEC KA2ZVZ, NJPN NM W2CC & TC WG2W—and, of course, ARRL Hudson Div Dir Steve Mendelsohn, WA2DHF, who was Gen'l Chmn. Tnx also to BEMARC & RATS for running demo stations all day. Special tnx (in my hat as Conv Chmn) to LIMARC for hosting the event, to FCC Amateur & Personal Radio Chief John Johnston, W3BE & ARRL Field Services Mgr Rick Palm, K1CE, for attending & participating; to N2GQR & KB7UV for making it all work; & especially to my wife, Susan, for not divorcing me before or during the convention. Back to NNJ: Welcome new Tech Coord Chris Peckham, WG2W. Chris is actively recruiting Asst TCs (ATCs) in various specialties. If you're an expert at anything (or everything) & are willing to share your expertise, contact Chris or me. Congrats to new officers at Cherryville RA: pres, KE2HG; vp, KD2RC, secy, KB2DDM; treas, NS2K & dirs WB2LVC, WB2NQV, WB2EPW, W2GD & WA2RMZ. Following clubs reported FD activity: New Providence ARC, Englewood ARA, Metuchen RC, Piscataway ARC, Garden State ARA, Old Bridge ARA, Fair Lawn ARC, Bergen ARA, Maj. Armstrong Mem. ARC & Cherryville RA. Ballots will soon be in the mail for ARRL Hudson Div Dir & V Dir; I urge you to vote for the candidates you feel will be best able to represent your views & provide national leadership at the same time. Vote as if your hobby depended on it...it does. June Net Stats (QTC = messages handled/QN) = checkins):

Net	NM	Freq	Time	Sess	QTC	QN
NJM	WB2ZJF	3695	1000	30	104	295
NJN/E	KA2INE	3695	1900	30	64	207
NJN/L	WA2OPY	3695	2200	30	30	105
NJPN	W2CC	3950	1800	34	71	331
NJSN	WR2E	3735	1830	29	20	135
OBTTN	WR2E	147.12	2000	30	95	180
NJTTN	N2DXP	223.88	2100	30	21	162
NJVN/E	WB2FTX	146.895	1930	30	87	487
NJVN/L	KA2KJF	146.49	2230	30	57	244

June Tfc (Call/Total msgs/PSHR): N2DXP(T)/263/74, W2ONL/223/102, N2XJ/183/99, W2MTO/ 161/85, W2RRX/113/87, K2VX/103/79, KA2KJF/98/65, K2PBP(T)/95/72, WB2FTX/70/64, WA2PAC/58/71, KA2INE/57/69, WA2CLP/42/-, W2DMM/37/83, KB4CYC(T)/31/64, KA2OOU/21/61, W2CC/21/- N2KBD(T)/20/54, W2XD/14/-, NW2L/14/-, WA2DHF/2/-. WB2GJE/1/-. 73 de NW2L.

MIDWEST DIVISION

IOWA: SM, Wade Walstrom, WØEJ—ASM, KØCNM. SEC: KDØBG. ACC: NUØP. OOC: WAØQMU. BM: KØIIR. TC: KØDAS. SGL: WRØG. PIC: WEØM. Field Day msgs were received from the following clubs: Coon Valley ARC, Ft Madison ARC, Mt Pleasant ARC & Jones Co ARC. The Cyclone ARC is holding a VE sess Sept 8. Contact KCØRX at 515-292-4504 for details. The SW IA ARA will sponsor VE sess the 3rd Fri of Oct & Dec; contact WAØO or NØBKB. DMRAA will sponsor a VE sess Nov 18. WØPEX of the Lee DeForest QCWA Chapter was presented with the Continuous Support Award by the Dakota QCWA Chapter at the IA State Convention in Sioux City. The Mt Pleasant ARC demonstrated ham radio at the Old Threshers Heritage Boy Scout Camporee. The Cyclone club is participating with the IA State University solar-car entry in the Solar Rayce from Orlando, FL, to Detroit, MI. Regretfully, KØYHO & WØRKT became Silent Keys. New calls heard: NØLYP & NØLYQ. KEØUC upgraded to Extra. At long last, WBØZKG has upgraded to General—congratulations, Chuck! N9HVT & N9HVU have a new tower up. Club newsletters: IA-IL ARC, SW IA ARA, Mt Pleasant ARC, Central IA RAS, WIGWAG, Davenport RAC, Ottumwa ARC, Cedar Valley ARC & Ft Madison ARC. Tfc: KØPT 134, WØSS 129, KAØADF 68, KØCNM 48, KØGP 18, WBØMCX 14, N9HVT 11, KAØVBA 12.

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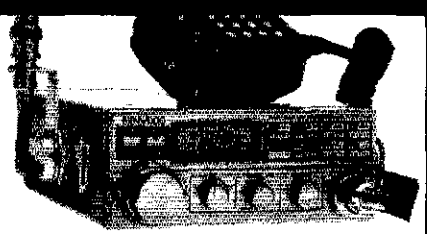

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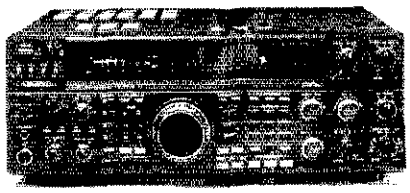

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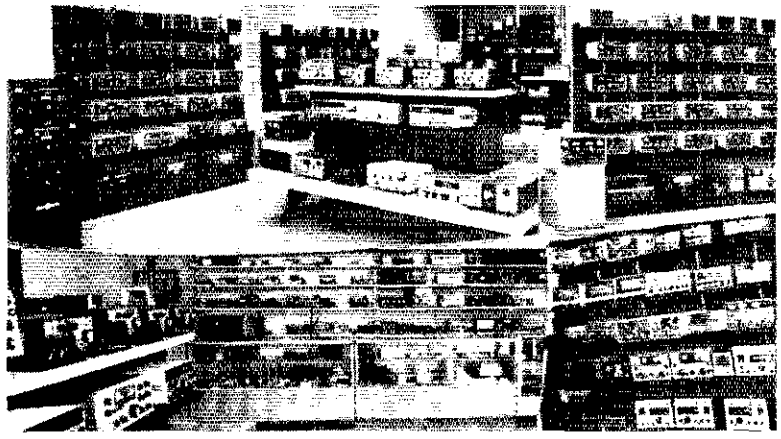

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KANSAS: SM, Robert M. Summers, KØBXF—SEC: KØBIX. STM: WØOYH. ACC/OOC: KØBXF. TC: KAØHEP. BM: open. PIO: WBØWSG. SGL: NØIZE. Earl, WBØSEE, of Wichita, was admitted to the hospital June 18 for heart surgery; hopefully, by the time you read this he will be out & back at his NCS spots. WØPB is looking into what it takes to get on pkt; you'll enjoy it, Harry. NZØM reported the USCenter ARC hamburger feed was attended by 76 people this yr & is getting larger each yr. Just might have to kill a *whole* cow next year if we all try to attend. Looks like many enjoyed Field Day 1990—thanks to the clubs that sent me msgs of your activity. June was an active month weather-wise in Kansas. ARES nets in the central part of the state were activated for many storm watches that included several tornados. Reports from each of these disasters have not yet reached my desk, but as soon as they do, we will acknowledge those who took active parts. Have you checked in with your EC? Net activity for May '90: KSBN QNI 1340 QTC 108. KPN 426/19. KMWN 794/701. KWN 1009/759. CSTN 1918/53. QKS 260.64. QKS-SS 36/16. Tfc: KØBXF 300, WØFIR 250, NZØM 236, WØFRC 221, WØOYH 81, NØKOJ 80, WDØY 70, WAØYXK 48, NBØZ 41, WTØE 23, WØMYM 21, WØPB 19, WVØL 19, WOØE 18, WØNYG 10, KXØI 9, WZØB 6, WØSC 6.

MISSOURI: Bill McGrannahan, KØORB—June was an exciting month for ham radio in MO. The ARRL National Convention in KC was a great success! Congratulations to the PhD club members for their many hours of support & to Chuck Miller, WAØKUH, the convention chairman. We enjoyed visiting with K1CE, WA4CMS & WA1STO of the Newington staff & with Harry Dannals, W2HD, QCWA Pres. One of the highlights of the convention was the speech delivered by 12-yr-old Mary Alestra, KB2IGG, the recipient of the "Ham of the Year Award." On the opposite side of the state, Charles Boyd, KEØAH, won the 1st-place medal for all North America in the Worldradio DXathon! The McDonnell-Douglas Corp has asked their ARC for help in disaster-response planning. The Kimberling ARC is helping their public library with several tasks, one of which is painting the facility! STC Mac McKenzie, *K4CHS, at a recent meeting of the MO Rptr Council, reported* that almost all the 220 & 440 rptr pairs in KC & STL have been assigned. The Suburban ARC responded to a call for help from the St Charles EOC during a dangerous flash flood. For this public service, the following will be awarded Emergency Communications Commendations from the ARRL: NØJNC, WBØAZH, NØKBS, NØKPC, KBØFYI, NØLX, NØJFZ, NØLCB & KEØBNZ. Despite flooding of their usual stn site, the St Charles ARC manned the Lewis & Clark Special Event Stn; 94 contacts were made in 4 hours by NFØQ, WAØCKO & NØFQE. Attention ECs & SECs: the SET will be Oct 20 -21; please get your ARES members involved in this exercise. You will be hearing from SEC Jim Schroeder, KFØBM. There was much Field Day activity all over the state. I received 32 activity reports! 73, Bill, KØORB. Two-month totals for net activities will be seen here every other month (saves space!) Tfc: NØFBW 1372, WAØYJX 150, NDØN 116, WRØR 100, KØROB 66, WØOTF 45, WØBMA 36, WBØWLU 34, KFØBM 11 & KØPCK 6.

NEBRASKA: SM, Vern Wirka, WBØGQM—The Lincoln ARC announces their transmitter hunts have resumed & will be conducted each Sun, following a club mtg at 1300 local time; the starting point will be the Red Cross parking lot at 1701 "E" in Lincoln. For more info, contact Scot Davis, WBØWSL. I have received several telephone calls and letters recently regarding the use of obscene, profane & indecent language on our amateur bands. Many of the comments have come from newcomers to our hobby. One example was from an amateur that was demonstrating his new hobby to family relatives and was embarassed by the language used. The FCC rules state (97.113) "*no station shall transmit...obscene, indecent or profane words, language or meaning...*" but it is difficult to legally define what words can and cannot be used. Our OO/Amateur Auxiliary volunteers stand ready to help, but it is a difficult problem, especially on HF, where the offending party can be hundreds of miles away. I have advised fellow hams to set a good example in operation practice. The ARRL *FCC Rule Book* puts it in common sense terms on pp 7-5, "instead of nit-picking Commission-imposed standards, it is hoped every amateur will answer to a higher and simpler standard, one best expressed in the Amateur's Code: the Radio Amateur is considerate...never knowingly operating in such a way as to lessen the pleasure of others." It is with a great deal of sadness I report that Reid "Jake" Jacobsen, WØTYG, of Blair, became a Silent Key June 17, 1990, at the age of 80. Jake, as most of his amateur friends called him, was active in ham radio since the 1920s & was employed in the radio and television broadcast industry for yrs. Jake was involved with putting the 1st FM broadcast station on the air in Omaha and he was there when television first came to Omaha. After his retirement, Jake remained active in Amateur Radio on many modes including ATV, packet, UHF, VHF & HF SSB.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Caesar Rondina, N1DCS—ASM: KB1H. STM: K1EIC. SEC: N4GAA. ASEC: N1FIQ. OOC: KY1F. ACC: NK1J. BM: N1API. PIC: WA1CMF. TC: W1HAD. SGL: K1AH. I am pleased to announce that I will be serving as your SM for another 2-yr term; I am also pleased with the progress our section has made & I'm sure we'll continue to reach our goals. I thank the individuals above who have given so much of their time & efforts in making our section one to be proud of. I will also be looking forward to working with them & all amateurs during the next 2 yrs. Some of our goals are to further establish & strengthen our ties at the local & state levels for emergency comms readiness. We also wish to maintain leadership visibility in our section. As we have in the past, we will soon be holding our next Section Cabinet mtg. You're welcome to send comments & suggestions to me at my address on p 8 of this issue of QST. It's important that you communicate with your leadership officials; through this, we can properly represent you & help you when needed. Because fall will be here soon, we must think of securing ourselves for typical disasters that may strike at this time of year. Are you ready? Is your station ready? CT had 100% rep in 1RN Cycle 3 & 96.7% rep in 1RN cycle 4. Thanks to all who participated in the nuclear power plant drill. These drills are important, because we hams have proven time & time again that our skill as communicators is invaluable in a time of emergency. In addition, congrats go to all who participated in the June 9 ARC disaster drill. I received a synopsis from Dan, KY1F, our OOC & NM for CPN—a great study guide as to how it should be

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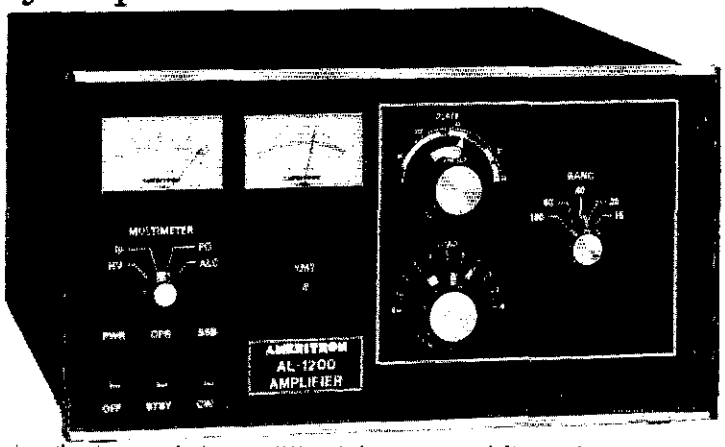

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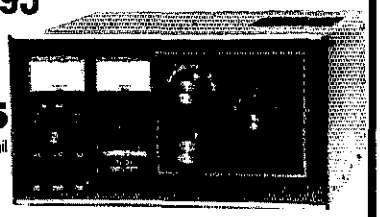

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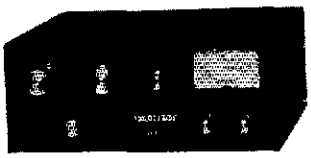

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Heavy duty silver plated bandswitch virtually eliminates switch failure. High power transmitting capacitors. 1.8-30 MHz. Peak reading SWR/wattmeter. 6 position antenna switch. Selectable 1:1 or 4:1 balun. 5¼ x 13¼ x 13½ inches. Meter lamps uses 12 VDC.

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AL-1500
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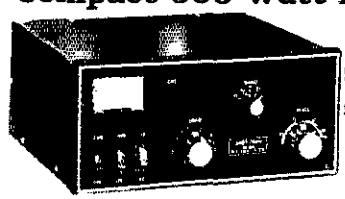
Suggested Retail



Ameritron super power amplifier uses the herculean 8877 ceramic tube.

It's so powerful that a mere 65 watts drive gives you full legal output — 1500 watts — and it's just loafing because the power supply is capable of 2500 watts PEP.

Compact 600 Watt Linear



AL-84
$549
Suggested Retail

600 watts for only $549! 5x10x11 inch powerhouse gives 600 watts PEP, 400 watts CW output. Four 6MJ6/6LQ6 tubes. Low SWR input for solid state exciters.

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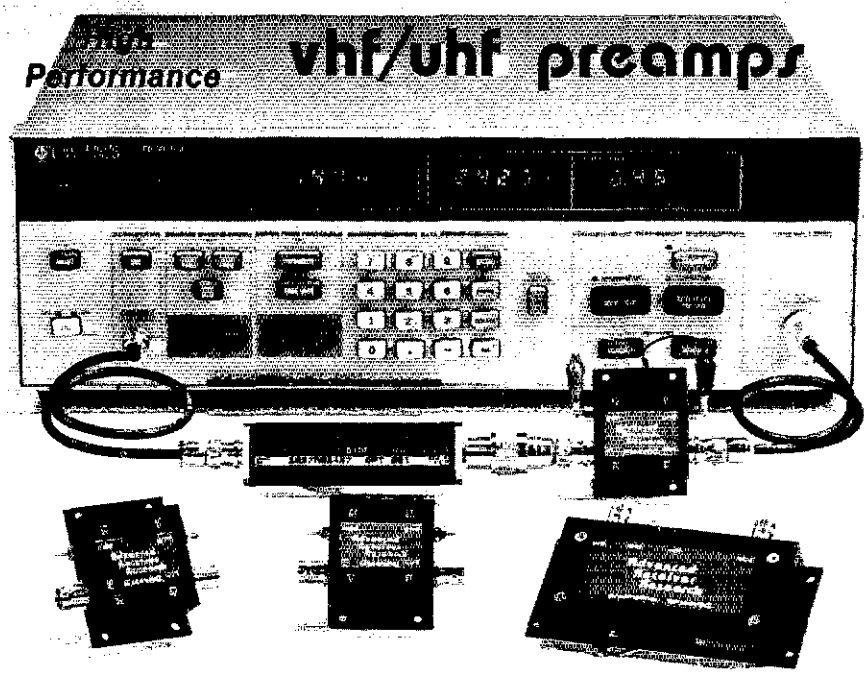
High Performance **vhf/uhf preamps**



Receive Only	Freq. Range (MHz)	N.F. (dB)	Gain (dB)	1 dB Comp. (dBm)	Device Type	Price
P28VD	28-30	<1.1	15	0	DGFET	$29.95
P50VD	50-54	<1.3	15	0	DGFET	$29.95
P50VDG	50-54	<0.5	24	+12	GaAsFET	$79.95
P144VD	144-148	<1.5	15	0	DGFET	$29.95
P144VDA	144-148	<1.0	15	0	DGFET	$37.95
P144VDG	144-148	<0.5	24	+12	GaAsFET	$79.95
P220VD	220-225	<1.8	15	0	DGFET	$29.95
P220VDA	220-225	<1.2	15	0	DGFET	$37.95
P220VDG	220-225	<0.5	20	+12	GaAsFET	$79.95
P432VD	420-450	<1.8	15	−20	Bipolar	$32.95
P432VDA	420-450	<1.1	17	−20	Bipolar	$49.95
P432VDG	420-450	<0.5	16	+12	GaAsFET	$79.95
Inline (rf switched)						
SP28VD	28-30	<1.2	15	0	DGFET	$59.95
SP50VD	50-54	<1.4	15	0	DGFET	$59.95
SP50VDG	50-54	<0.55	24	+12	GaAsFET	$109.95
SP144VD	144-148	<1.6	15	0	DGFET	$59.95
SP144VDA	144-148	<1.1	15	0	DGFET	$67.95
SP144VDG	144-148	<0.55	24	+12	GaAsFET	$109.95
SP220VD	220-225	<1.9	15	0	DGFET	$59.95
SP220VDA	220-225	<1.3	15	0	DGFET	$67.95
SP220VDG	220-225	<0.55	20	+12	GaAsFET	$109.95
SP432VD	420-450	<1.9	15	−20	Bipolar	$62.95
SP432VDA	420-450	<1.2	17	−20	Bipolar	$79.95
SP432VDG	420-450	<0.55	16	+12	GaAsFET	$109.95

Every preamplifier is precision aligned on ARR's Hewlett Packard HP8970A/HP346A state-of-the-art noise figure meter. RX only preamplifiers are for receive applications only. Inline preamplifiers are rf switched (for use with transceivers) and handle 25 watts transmitter power. Mount inline preamplifiers between transceiver and power amplifier for high power applications. Other amateur, commercial and special preamplifiers available in the 1-1000 MHz range. Please include $2 shipping in U.S. and Canada. Connecticut residents add 7-½% sales tax. C.O.D. orders add $2. Air mail to foreign countries add 10%. Order your ARR Rx only or inline preamplifier today and start hearing like never before!

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done; thanks, Dan. BM Al, N1API, operates N1API-4 PBBS on 145.05 & lists all the ARRL bulletins; the N1DCS-4 PBBS on 145.05 & 145.07 maintains the educational files for tfc training & more—check in to both & keep informed. Candlewood ARA flea mkt Sept 23 in Danbury; Natchaug ARC flea mkt Sept 16 in Vernon. 73.

Net	*Sess*	*Stations*	*Tfc*	*NM*	*Liaison*
CPN	30	317	94	KY1F	1RN
CN	58	316	153	W1WCG	1RN
NVTN	30	328	121	K1HEJ	CPN
RTN	30	289	70	WA1FCA	CN
WESCONN	30	380	118	KA1GWE	CPN
CSTN	365	297	662		

N1DCS- 4

Tfc: K1EIC 540, NM1K 481, KA1VED 400, KA1JAN 268, W1WCG 173, W1EFW 143, KA1GWE 130, KA1VEC 85, KY1F 76, K1HEJ 70, W1NJM 47, KA1TBM 39, WA1K 36, N1API 32, W1YOL 31, KA1SHO 31, W1WP 28, N1GUU 17, NX1Q 17, W1KYD 14, W1GPS 13, KF1B 10, W1CUH 8, K1CE 8.

EASTERN MASSACHUSETTS: SM/SEC, Barry Porter, KB1PA—STM: WA1TBY, ACC: N1GTB. BM: KA1NOI. SGL: K3HI. TC: KA1IU. PIC: K1HLZ. OO/AA: KA1FNA. EMass Hotline: 617-437-0111. I hope everybody has made plans to attend the NE Div Conv this yr & I look forward to seeing you there. I put a PBBS up on 145.01, so if you want to contact me, please send a msg to KB1PA @ KB1PA; coverage is good in Norfolk, Suffolk, Northern Bristol & Northern Plymouth cos. The Amateur Radio Special Interest Group (SIG) of the Boston Computer Soc (BCS) has interesting plans for the fall, including forming subgroups for Beginners, Pkt, Satellites, RTTY, SWL & TCP/IP, to name a few. Their Aug mtg focused on ISDN & the challenges & implications this new technology has for ham radio. There are over 300 BCS members who receive the group's newsletter. If any club is looking for an activity for the annual fall SET, please give me a call (see p 8). On July 4, the members of the Wellesley club ran W1TKZ from the *USS Constitution* Park & handled numerous NTS msgs for those in attendance. Attention clubs: As part of the observance of the 500th anniversary of the discovery of North America, the Tall Ships will be coming to Boston in 1992; we will need a coordinated multiclub effort to provide the various agencies with comms during this period. If your club is interested in participating, please contact me, ACC N1GTB, or WA1IDA—we need to start planning now. The section staff is avail to come to your club & speak on numerous topics, so if you're interested, please contact us! I know I enjoy traveling & visiting the different clubs in this area. I will travel anywhere & talk to any group to promote Amateur Radio, so if you know of any group (ham or nonham) looking for a speaker, have them contact me. If you know of anyone having problems with their local government regarding antenna ordinances & looking for help or advice, please let me know; there seems to be a sudden increase in this activity in our section & I want to stay on top of it. In E MA, there are many hams working hard at improving the image of ham radio—if you're one of them, thanks! If not, why not start? We need to do our utmost to ensure that the nonhams in our communities become aware of the opportunities ham radio provides. Are you doing your part?

Net	*NM*	*Freq*	*Time(EDT)*	*Day*	*Sess*	*QTC*	*QNI*
EMRI	KA1GEP	3658	1900/2200	Dy	55	198	295
EMRIPN	W1TC	3915	1730	Dy	30	81	141
EMRISS	N1CVE	3715	2100	Dy	18	8	31
EM2MN	N1DUB	63/23	2000	Dy	27	196	421
HHTN	N1FLO	04/64	2230	Dy	30	123	390
CITN	KB1AF	745/045	1930	Dy	29	89	439
NEEPN	WA1FNM	3945	0830	Sun	4	12	34

Tfc totals for June: KA1AMR 17, N1HTR 28, K1YHM 3, NK1Q 6, KA1PEP 14, K1GGS 108, KA1EDY 36, WA5NVI 24, N1AJJ 24, K1ABO 77, KB1EB 24, NZ1D 20, KA1CEY 56, K1UXB 31, KA1GEP 120, W1TC 125, WA1TBY 311, KA1RSY 30, K1BZD 23, KC1TI 29, N1FLO 112, N1EGN 18, WA1FNM 91, KA1KCU 3, N1FWV 108, K1SEC 24, W1CE 86, N1CVE 79, NS1N 52.

MAINE: SM, Jeff Weinstein, K1JW—By the time you read this column, a number of changes will have been introduced to various ARRL Section Activities, new leadership & station appointments will have been made & new programs begun to enhance Amateur Radio in ME. All radio amateurs will be kept informed about evolving section developments in 3 key ways: this *QST* column, regularly broadcast ME Section Bulletins & the *Maine Section Quarterly Newsletter*. The *Newsletter's* 1st edition will appear in late Oct & will be mailed to all ARRL members in ME. The *Newsletter's* chief purpose & major advantage will be a significant expansion of editorial space over that avail in *QST*, allowing fuller discussions of issues & ideas & more complete section news reports. The ME Amateur Radio Club Council (MARCC) has been formed & the 1st mtg has been restructured into 4 districts, each operating under the direction of a DEC, with quick-response Area Teams in each district headed by ECs. The SM's telephone at 846- 0700 is avail 24 hrs a day for your comments & inquiries, or you can leave a pkt msg anytime at K1JW-1 on 145.03. Section tfc reports will be compiled & reported in the *Quarterly Newsletter*, with outstanding tfc activity also mentioned in this column beginning in Oct. A list of ARRL Leadership & Station Appointments will appear here next month. I look forward to meeting you at the various ARRL Affiliated Club mtgs this fall!

RHODE ISLAND: SM, William M. Foss, KA1JXH—NRIRC is sponsoring a Work All City/Town Award for RI 1200-2400 Sat-Sun, Sept 15-16. W1JFF is the new NM for the RIEM2MTN, E Bay & NRIRC sponsored comms for the RI Lung Assn 100-mi bike race Aug 24-25, from Barrington, RI, to Plymouth, MA, & back. OSARC provided comms with 22 ops for the Gaspeeday Parade. The N1DKF/KA1RCI PBBS is working well. W1EOF's tfc total for Apr-Jun is 815.

VERMONT: SM, Mitch Stern, WB2JSJ (@ N1GMU)—Greetings to all fellow hams in VT. As SM, I'll do my best to make this column accurately reflect ham radio happenings in VT. A hearty Thank You goes to Bob DeForge, K1HKI, who did an excellent job as our interim SM. It's hamfest time again! Central VT ARC will be holding their Fall Foliage Hamfest Sat, Sept 22 at the Nat'l Guard Armory in Berlin; exams at 1 PM—hope to see you there. Field Day was June 23-24 & here is what VT hams were up to: Green Mtn Wireless Soc (N1VT-2A, Rutland) set up wire beams on 80/40 mtrs & had plenty of good food avail! Amateur Radio Assn (K1LOO-2A, Montpelier) ran their 1st FD ever from Hubbard Park. Central VT ARC (W1BD-2A, Barre) imported ops from the Lyndon State College

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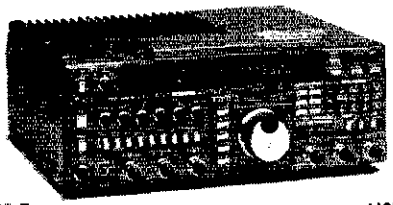
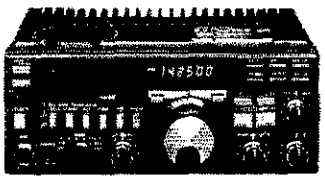
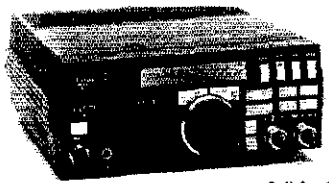


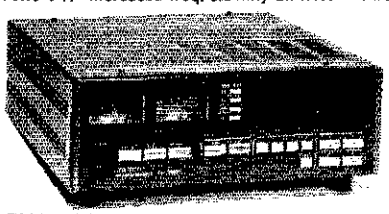
HF Transceivers	LIST
FT-767GX 160-10m xcvr	Call for Special
2M/767 2m module	239.00
6M/767 6m module	196.00
430/767 430-440 module	296.00
440/767 440-450 module	296.00
SP-767 Speaker w/audio filters	99.00
SP-767P Speaker/phone patch	136.00
FAS-1-4R Remote antenna selector	120.00
FIF-232C Interface	95.00
FTS-8 Encoder/decoder	55.00



FT-757GX MkII 9-band xcvr w/mic	Call for Special
FP-757HD Heavy duty supply with fan	309.00
FP-700 Power supply	244.00
FC-757AT Automatic ant. tuner w/memory	429.00
FAS-1-4R Remote antenna selector	120.00
SP-767 Speaker w/audio filters	99.00
SP-767P Speaker/patch	136.00
FRB-757 External relay box	14.00
MMB-20 Mobile mount	26.00

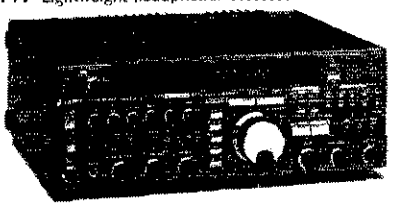


FT-747GX HF transceiver	Call for Special
FP-757HD Heavy duty supply with fan	309.00
FP-700 Power supply	244.00
SP-767 Speaker w/audio filters	99.00
MD-1B8 Desk microphone	115.00
MH-1B8 Hand microphone	29.00
FM-747 FM unit	47.00
MMB-38 Mobile bracket	14.00
TCXO-747 Increased freq. stability unit	42.00



FL-7000 Solid-state 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 wattmeter	Call for Special
YS-500 140-520 MHz 200w wattmeter	99.00
YH-55 Lo-Z headphones	28.00
YH-77 Lightweight headphones	26.00



VHF/UHF Base	LIST
FT-736R 25W 2m/430	Call for Special
FEX-736-50 6-meter module	294.00
FEX-736-220 220MHz module	322.00
FEX-736-1.2 1.2GHz module	589.00
TV-736 1.2GHz ATV converter	163.00
Keyer-B Electronic keyer unit	19.00
FTS-8 Encoder/decoder	55.00
FVS-1 Voice systhesizer	37.00

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FT-712RHT/D8 35w 440 FM w/autodial mic	536.00
FT-290R MKII 25w 2m FM/SSB xcvr	610.00
FT-690R MKII 10w 6m FM/SSB xcvr	752.00
FT-790R MKII 25w 430-450 FM/SSB xcvr	681.00
FBA-8 Holder for C-cell Nicads	32.00
NC-26B Wall Charger for FBA-8	10.00
CSC-19 Soft case	16.00
MH-10F8 Speaker/Microphone	30.00
MH-10E8 Hand Microphone	24.00
FTS-7 Encoder/decoder	40.00
FT-4700RHT/C8 50/40W 2m/440 FM/TTP	799.00
AD-2 50w 2m/440 duplexer	48.00

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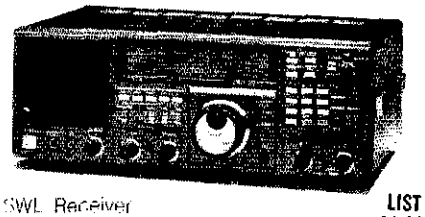
FT-470 2m/440 FM HT	Call for Special
FT-23R 2m HT	306.00
FT-33R 5w 220MHz HT	Call for Special
FT-73R 2w 440MHz HT	Call for Special
FT-73R/TTP 2w 440MHz HT w/TTP	Call for Special



SWL Receiver	LIST
FRG-8800 150 KHz-29.999 MHz Shortwave	$ 784.00
FRA-7700 Indoor active receive antenna	58.00
FRT-7700 Antenna tuner	77.00
FRV-8800 118-174 MHz VHF converter	107.00
FIF-232C Interface	95.00
DC-8800 DC kit	4.00
FM-W/8800 FM-wide kit	21.00

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G-5400B Az/El rotor combo	Call for Special

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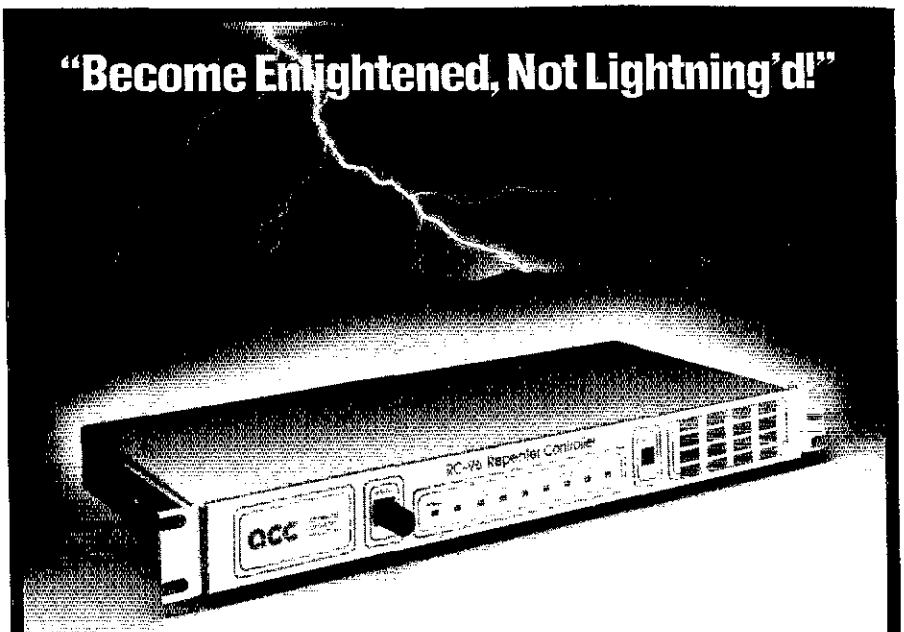

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You'll hear thunderous applause when you install a '96 controller on your repeater. Remote programming will let you easily make changes to your repeater from anywhere without a trip to the hill. Change codes, autodial numbers, ID and tail messages and more, with reliable storage in E²PROM memory.

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Alumni ARC & ran most of their operation on solar power. Silicon Junction RC (K1VT-2A, Williston) continued in their high-scoring ways & used computers to log their 3000 QSOs (the computer used to compose this report was used on the CW log). A group of hams from the Middlebury area (N1FS-3A, Rochester) got together in W1KRV's back lot & put together a fine FD effort. The Twin State ARC (W1FN-2A, Norwich) moved their FD site from NH to the Montshire Museum in VT & collected a nice score. The Pallotta family (KC1TE-1A, Eden) made FD a true family affair! Although not technically in VT, our neighbors right across the lake, Champlain Valley ARC (K2TTI-2A Plattsburgh, NY) also put on a fine effort & were heard on several bands. Seven FD groups in VT—must be a new record! Hope you all had fun! Don't forget, Sept 13-14 is the VHF QSO party. Make an effort to get on some of the less-popular VHF/UHF bands/modes. Tfc: WA2SPL-566, KT1Q-364, WA1JVV-235, N1GMU-112, KC1KI-108, NB1A-108.

WESTERN MASSACHUSETTS: SM, Jean Hurtle, KA1IFC—STM: KA1EXJ. OOC/TC: KA1SNA. PIC/ACC: K1BE. SEC/SGL: WB1HIH. Dick, WB1HIH, after 8-1/2 yrs, stepped down as SEC/SGL on May 31. He gave many hrs to the section & we wish him the best in all future endeavors. He will continue his commitment with ARES & RACES. June 17 there was a msg fair at the Masonic Home's Country Fair in Charlton. This was a 1st-time venture there & was initiated by WA1OUZ who was assisted by WMA tfc handlers; it was an enjoyable day for all. It also introduced Amateur Radio & our msg service to many. HCARA had a banquet mtg in May, enjoyed by those in attendance & Joy, KA1EXJ/STM, gave a talk on nets, tfc handling, training, etc. Our OO appointments are growing & the program showing new activity, as some of you know! Should you receive a card from an OO, don't take it as a personal vendetta by someone, but as a reminder toward better on-the-air practices—which is just what it is. NX1K, NM of the CM2NM (local NTS net) had a series of training sess that proved beneficial to several & will provide the area with new tfc handlers. Send msgs via the NTS & give these folks the experience they trained for. I hope everyone is having a safe & enjoyable summer. Tfc: KA1IFC 782, W1UD 597, KA1EXJ 176, KA1QFV 95, W1KK 61, NM1U 55, WB1HIH 49, W1SJV 39, NX1K 30, KA1TDL 24, KA1OFC KI2L 17, WA1OUZ 11, W1ZPB 1. PSHR: KA1EXJ, WB1HIH, KA1IFC, KA1QFV/T.

NORTHWESTERN DIVISION

ALASKA: SM, Harley Steward, KL7IZZ—ASM: KL7HO. OOC: KL7IKX & AL7ABB. STM: AL7IX. TC: KL7CE. Help your new SM by sending him info on local club activities—please! Moosehorn ARC had a successful Field Day at Kalifonsky with 11 ops. Anchorage ARC FD set-up was back of Providence Hosp. QSOs: 20-mtr CW, 164; 20-mtr SSB, 469; 40-mtr SSB, 68; 80-mtr SSB, 17; 17-mtr SSB, 20; Pkt, 7. Over 148 bodies attended Motley Group picnic at Byers Lake with special 2-mtr link (KL7HD, NL7HQ) plus own FM station (KL7GG).

IDAHO: SM, Don Clower, KA7T—ASM: K7REX. STM: W7GHT. SEC: N7MAL. OOC: WB7CYO. PIO: WG7E. June 16-18, a group of hams led by KE7RL, set up a ham station at the ID Centennial Scout Jubilee; this event was attended by more than 7200 scouts. The ham station was used for demos & a couple of emergency msgs were passed—thanks to all who helped. Several ID groups were out during Field Day; send me your scores by Sept 1 to be eligible for the plaque given to the group with the highest score. Thanks to WS7U for filling in for W7GHT, who's still under the weather.

Net	*Sess*	*QNI*	*QTC*	*NM*
FARM	30	1693	38	K7CDA
NWTN	30	838	7	N7AH
ID CD	21	648	21	K7UBC
IMN	30	213	50	WS7U

Tfc: KA7WZM 155, WS7U 65, N7MAL 52, W7GHT 11.

MONTANA: SM, Pete Peters, KF7R—Extra: KG7BW. Techs. Charles Rafferty, Anthony Rio; Nov: Eric Sedgwick, Erleen Laduke. Congratulations to the Yellowstone RC, SEMARC, Hellgate Amateur RC and Flathead Valley ARC for their ARRL affiliated club renewals. Helena has a new 10-mtr net 2nd & 4th Sun at 7:30 on 28.360 MHz. AA7ES, Robbin Brooks, is EC for Rosebud Co, replacing Otto, WA7KMP; thanks, Otto, for the many yrs as EC for Rosebud Co. Blanchard Mtn 146.80 & Big Fork 146.62 rptrs are now linked.

Net	*QNI*	*QTC*	*Sess*	*NM*
MSN	72	0	4	KF7R
MTN	99	178	30	N7AIK
IMN	213	50	30	KA7EEE

Tfc: W7TGU 536, WB7WVD 72. PSHR: WB7WVD 82, W7TGU 95.

OREGON: SM, Randy Stimson, KZ7T—ASM: W7FBP. ASM: AL7IN. STM: W7VSE. SEC: KV7F. PIO: KC7YN. SGL: KA7KSK. ACC: WF7Q. OO: WN7W. STC: N7ENI. The OR Dept of Emergency Mgmt held a multistate mtg that involved ARES personnel & RACES officials; OR, WA, CA, ID & AL were represented. One reason for this mtg was to meet with the Federal Emergency Mgmt Agency (FEMA). They said they'd be taking a larger role in the 50-50 funding of amateur equipt in the EOCs around the state. They also said they would look into fees charged by other gov't agencies for our rptr sites. The OR Pkt Soc (TOPS) put on a pkt demo for Portland Gen'l Elec at the Communications Ctr in Salem; the reason for this demo is PGE is thinking about funding complete amateur pkt stations in the co EOCs surrounding the Trojan nuclear power plant. The demo went well & I'll keep you up on the progress. OR had a statewide SET last month—the scenario was a massive earthquake in the Salem area. Hams had HF, 2 mtrs & pkt running. All in all, it went well, especially in the city of Gresham, where Pat, N7KMN, the Multnomah Co EC was located— he impressed the officials at the EOC so well that they invited him to their critique & made a special point of thanking him; great job, Pat. Bob, KA7DEF, EC for Josephine Co, has a Memorandum of Understanding with the Siskiyou Nat'l Forest & the Grants Pass unit of the OR Dept of Forestry; I'm sure this will help during the fire seasons from now on. I can get a ready-made form of a Memorandum of Understanding; if any ECs would like them, please let me know. Tfc (P = pkt): W7VSE 343, N7BGW 258, KB7HOA 96, AL7IN 92P, N7JQK 90P, K7OVK 90, N7DXT 62P, WB7VMS 58P, W7ODG 51, N7DRP 50, W7ODG 51, N7DRP 50, K7NLM 48, KA7DEF 45, W7XI 35P, W6RLI 34P, KC7UF 26, WA7SHP 26P, KA7WFW 26, W7LNE 18, AA7CU 12P, KA6DNF 12P, N7KMJ 4P.

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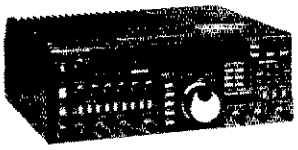

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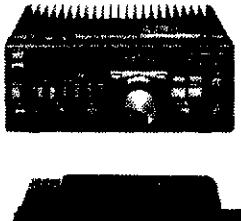
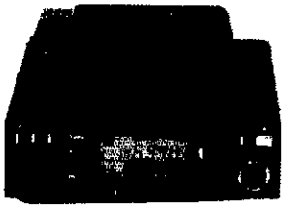


FT-757GX/II



FT-470



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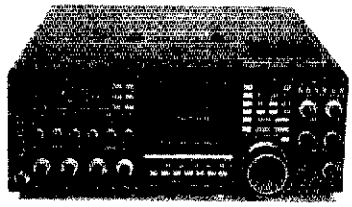
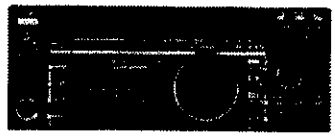


IC-765



IC-735



IC-725



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IC-3SAT
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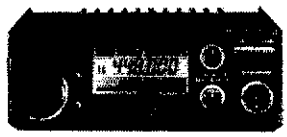

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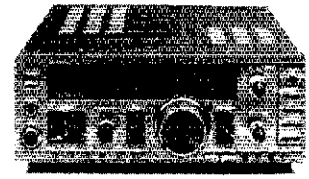

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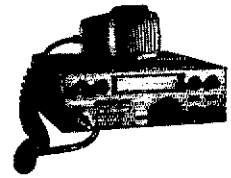

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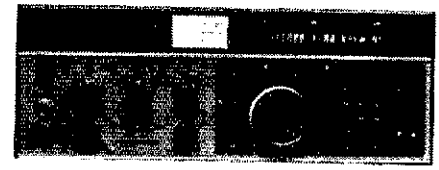

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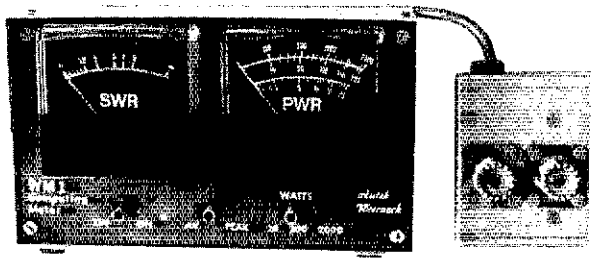

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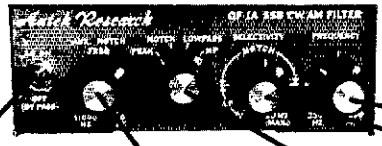

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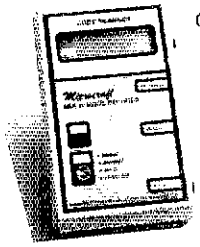

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EASTERN WASHINGTON: SM, Tom Plaisance, KC7PH—STM: W7GB. SEC: WA7CBX. OOC: W7LKR. ASM/ACC: NQ7M. SGL: KD7AC. ASM/WEN NM: KE7WG. BM: W7EQU. PIC: N7DWD. Congrats to Spokane-area Ham-of-the-Year award winners W7GBU, KA7VEQ & N7KYH. Sorry to report Spokane-area Silent Key W7HWG. Important dates for your calendar: Sept 22-23, Walla Walla Hamfest. SEC WA7CBX, OEC WA5ZAY & SM KC7PH attended a 4-state mtg of emergency services personnel. A new pamphlet is coming out that explains RACES & will be helpful to dirs of co emergency services. If you're a member of RACES, get signed up with ARES & vice-versa. Funds are avail on a 50-50 basis from FEMA for RACES equipment; if interested, contact State Radio Officer Gene Bostock, N7IZX. 73. KC7PH @ N7HHU PBBS. Tfc: K7GXZ 148, W7GB 94, W7LBK 75, WA7YEN 82, N7HXT 2.

WESTERN WASHINGTON: SM, Mary Lewis, W7OPG—STM: KD7ME @ WB7QUE. SEC: NM7N @ VE7VBB BC Can. SGL: KD7AC. ACC: W7QGP. TC: W7JWJ. BN: N7CAK @ W6LVJ. OOC: N7DVR. The big item in the NW has been the Soviet amateurs who returned the visit of W WA DX Club members to Zilan DX Soviet Union. Six additional WWDX ops left Seattle July 7 to visit clubs in the Soviet Union & operate in the IARU contest July 14 & July 19 HF World Radiosport team championship using the Soviet call sign U84P. World Radiosport for the Goodwill Games will be 1st time 11 countries' top DX ops meet face- to-face for 2 wks of social events & contesting. WWDX WRTC will journey to the Portland, OR, DX convention, where ops can eyeball-QSO other DX ops. Field Day is passed & conditions for 10 mtrs were not good for Novices—low scores were reported. VE sess ea Sat in Seattle area, all walk-ins; send me your listing of VE sess times & places—this info is passed on to the FCC & other VEs. 50 hrs. Clark Co 40. Thurston Co 177. Total 267. New ECs N7AZO Pierce Co, WB7CLF King Co, DEC (Mt Vernon) KB7DCD. STM Report: NTN Sess 30/tfc 184; NWSSB Sess 29. Tfc 33, PSTS Sess 60/tfc 34; WARTS Sess 30/tfc 148; WSN Sess 60/tfc 74; Net reports NTN QNI 1659/QTC 184/QNS 30; NWSSB QNI 588/QTC 33/QNS 29; PSTS QNI 87/QTC 34/QNS 60; WARTS QNI 2360 QTC 148 QNS 30; WSN QNI 432/QTC 74/QNS 60. PSHR W7TVA 103; Late May N7CSP 69, WB7WOW 82; Activity reports: W7AZU 12, K7CLL 9, KA7CRN 23, KR7F 43, KF7FF 84, W7IGC W7LG, KA7TTY 9, W7TVA 243, WB7WOW 127.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, WB3FCV. SEC: W6LKE. STM: K6APW. OOC: K6TI. TC: N6AMG. I received Field Day msgs from SBARA, EBARC & NALCO/UCARC. Because of personal commitments, I was unable to get on this yr, but I think most everyone else in EB did! NBARA ARES members NH6CN, W6RJY, W6LRT, WF6C, K6EHR, WQ6N, WA6IEC, AA6QJ, N6BLG & KB6UJ took part in a "tabletop" disaster drill at the Vallejo EOC. SBARA's *The Ground Plane* was devoted to the minutes of the Volunteer Emergency Comms Committee; it's clear that they have a strong commitment to providing 1st-class Amateur Radio comms to the Tri-City area. BARC mtgs have moved to the 2nd Thurs ea month at the W End Hose Co (Fire Station), Benecia. They, too, are involved in providing emergency comms. LARK is busy finding civic events in which they can participate while promoting Amateur Radio. The LARK RACES group is an outstanding example of what can be done by involved clubs & individuals. VVRC received front-page coverage in the *Vacaville Reporter* for their many civic activities. Their latest Novice class has 17 members & their support of RACES/ARES is paying dividends to all. MDARC is celebrating their 43rd anniversary with a picnic & pot luck for the whole family—congrats! They welcomed new members N6VIJ, W6ORR, KC6HUE, N6GRJ, W6QIF, AA6VN, KC6JMN & Charles Wall. CCCC welcomed new members W6OHX, NA6B, KC6FAW & KC6DRX. EBARC published an excellent 3-part series in *The Blown Fuse* on neighbors & Amateur Radio. It's excellent & I recommend an SASE to them at PO Box 1393, El Cerrito, CA 94530, with a request for a copy for your club newsletter. Jun tfc: None.

NEVADA: SM, Joe Lambert, W8IXD—ASM: Curly Silva, K7HRW. TC: NW7O. STM: KK4M. SEC: K7HRW. Thanks to Curly, K7HRW, for organizing a section mtg July 8 in Reno; thanks to Gene, WA7BWF, for organizing a section mtg in Elko, also. First reports indicate that many Nevada clubs had a bang-up time on Field Day, although propagation was not outstanding. Although many clubs have cut back their mtg scheds for summer, there have been many public service activities for which hams provided comms. In N NV these included during June, the Pony Express Run & Tour of the Comstock in Virginia City, the Ameriglide Sail Plane Races in Minden & the Valley Off-Road Races in Virginia City. In July, TARA supported the Death Ride & the Carson City Fair. Hams, as usual, played a pivotal role in the recent spate of fires—stay tuned until next month for details. Hope to see as many NV hams as possible at the Pacific Div Conv—Pacificon in San Jose. Marty, KK4M, is dropping his phone bulletin service for the Las Vegas area because of lack of use; perhaps if enough people contact KK4M to show an interest & learn the usefulness of his system, he may reconsider.

PACIFIC: SM, Ron Phillips, AH6HN—ASM's: KH6FKG, WH2AEN. STM: WV6K. SEC: AH6GG. TC: KH6AFQ. OOC: KH6B. BM: KH6H. PIC: KH6IJ. ACC: AH6J. New ATC: AI, KH6IAA. It is with deepest regret that I note the passing of Earl J. Gallian, NH6GQ, Honolulu ARC. He will be missed by all. Dean, KH6B's program for new and interested OOs is moving well. Bob, KH6J, visited Oahu to get 1st hand info on things of importance for ARRL. Bob spoke with many hams from among the ARCs. He also attended 4 Field Day setups. Thanks to all stations for good showing on Field Day. Congratulations to the new section ARRL members. They are WH6CIC, WH6CHN, WH6CHS, WH6CIE, WH6CHT, WH6CHQ, WH6CHM, WH6CID, WH6CHP, WH6CHR, WH6CHZ, WH6CIB, WH6CHO, WH6CHY, WH6CIA, NH6WM. Traffic: KH6S 31, WV6K 12, KH6B 4.

SACRAMENTO VALLEY: SM, Jettie Hill, W6RFF—STM: WA6WJZ. TC: W6IEW. ACC: KB6COH. SGL: N6IG. SEC: KE6EP. PIC: WA6OWH. BM: WB6FIX. OOC: WY6O. The Yuba/Sutter ARC hosted the summer SV section mtg & special thanks to Kristin, KB6RHL. Be at the Pacificon conv in San Jose, Oct 12-14 at the Le Baron Hotel—see you there! SEC KE6EP has been working hard to fill some of the ECs in the cos that have none. The SV section has 20 cos & ECs are

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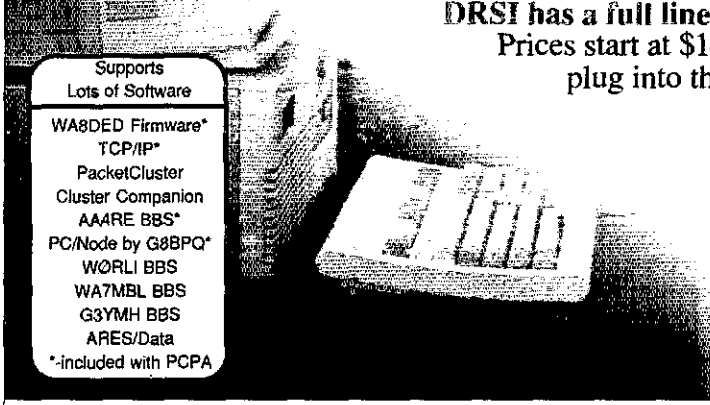

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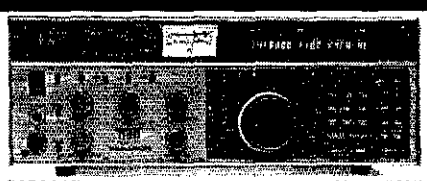

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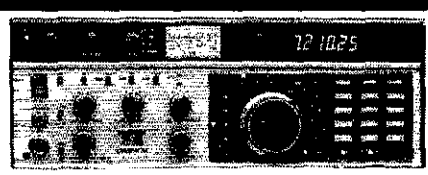

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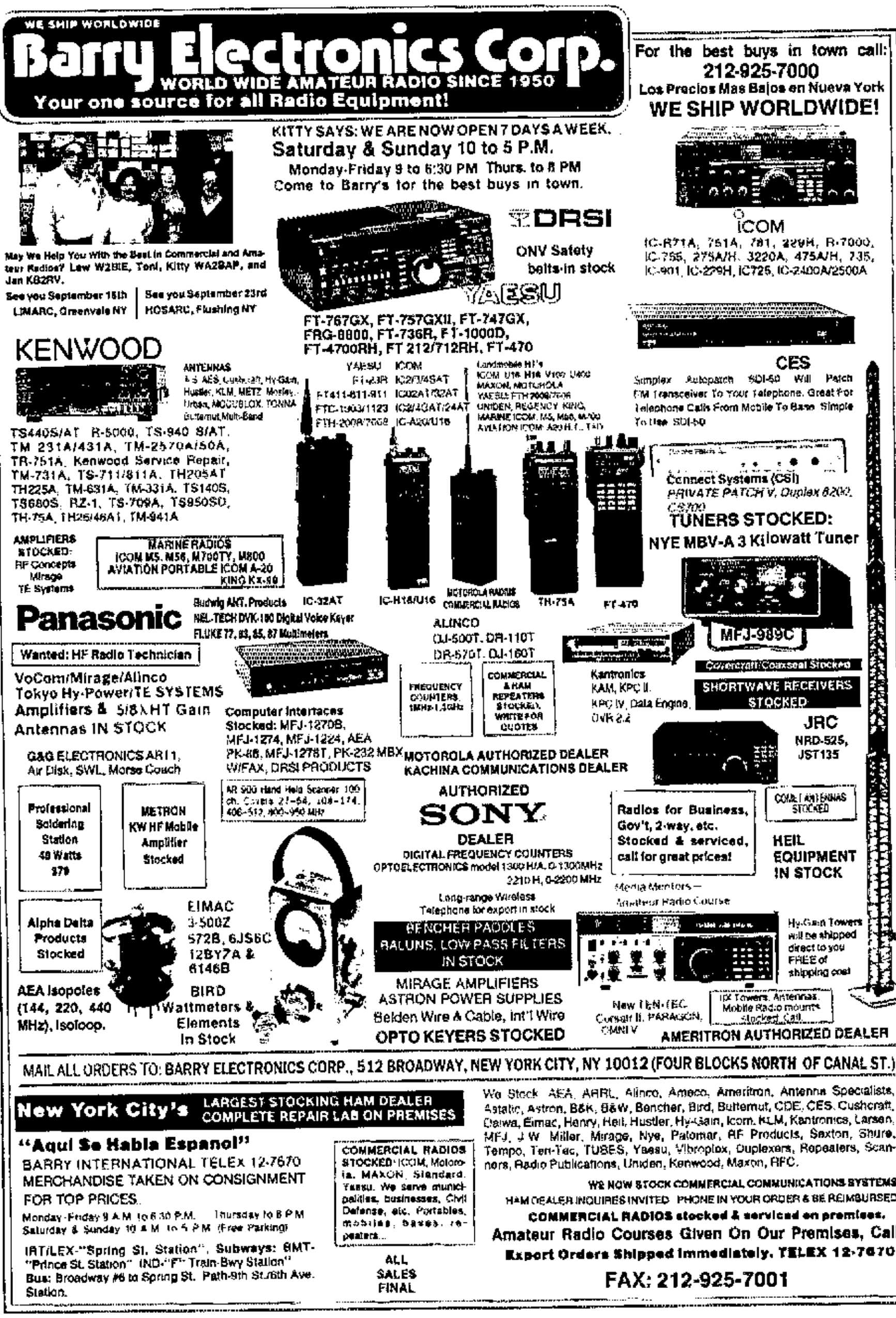

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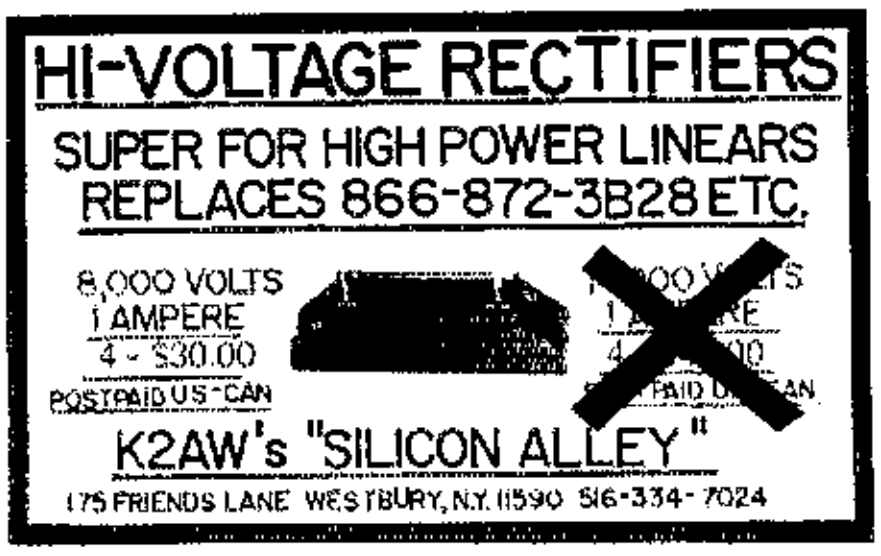

needed in those cos that have a small ham population. If you can help, contact Walt, KE6EP. River City ARCS VE sess Sept 8 in Sacto, new classes start Sept 12-13; 63 people took their last series of tests! A very active club—call 916-483-3293 for more info. Please send me reports of your activities & keep me informed on any special club functions. Tfc: K9JM 92, WA6WJZ 74, W6CFQ 42, K6SRF 41, WA6ZUD 22, W6RFF 15, KB6WIJ 5, WB6SRQ 3.

SAN FRANCISCO: SM, D. Wilson, K6LRN—Ron Baker, KE6IT, passed away in June. He was an active VE, public service/emergency op & active club member; he is missed already. Ray Miller, KB6HT, became a Silent Key in April. K6OHE had a hip replaced. NK6Z had a major heart attack & was flown to Medford for bypass surgery & is mending. W6NAT is moving to ID. Thanks & congratulations to all for putting something back into Amateur Radio. VEs. WN6D, WA8LLY, N6PHP (Sta Rosa area) WR6D & crew San Rafael area; Lambda ARC (bike-a-thon/booth, etc); WA6CBQ, WA6PAC, WB6TKD & WB6AQW (also 1st aid) (Human Race), WB6FRZ, N6AQY, W6FCQ, K6SEX (classes). You & I know there are more of you out there; let me know & get your well-deserved recognition. Be prepared for emergencies: summer/fall means fires, fall/winter-bad weather, etc; contact your local EC/DEC: SF AA6RM, Marin WA6VOI, Sonoma WB6PER, Mendo WA6QXV, Humboldt K6VHP, Del Norte NK6Z, Lake WG6Y. Anchor Bay ARC has rptr on 147.00/146.40 in SW Mendocino Co. Field Day msgs/reports received from: REDXA, Lambda ARC, SFRC, Marin. Tfc: N6FWG 105. Tfc: N6FWG/T 105.

SAN JOAQUIN VALLEY: SM Byron Smith, WA6YLB—ASMs: K6YK & W6TRP. SEC: WC6U. STM: N6AWH. Thank you to the club stations that sent me a msg during Field Day. With the dry season upon us, how are local hams doing with fire watches & Volunteers in Prevention? Contact CDF if you or your group would like to form such a affiliation. Attention club presidents: Please check into obtaining a copy of the ARRL *President's Workbook*; it's full of helpful info to assist you with your club. Sorry to report Bill, KA6YAW & WA6JII as Silent Keys. KC6ESL/T led the SJV section in the 1990 Novice Roundup. Upgrades: WA6ZRZ Extra, WB6VPG Adv, N6YWQ Gen, KC6KTN Tech. WA6YAB & WD6GVS on Pkt. WA6U has an FT127RA, WA6OIB has a FT720RU. Tfc: K6RAU 87, W6DPD 5, KC6ESL 2.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—SEC: N6JQJ. TC: WA6PWW. STM: N6JLJ. PIO: N6HMO. ACC: W6MKM BM: (vacant) OOC: KA6S. June—This is my final *QST* column as SM; my term of office ended June 30. It's been an exciting 4-½ yrs, exciting things have happened in our section; they've been mainly the result of many highly motivated & talented people who have served as section staff. I'd love to take credit for it, but I can't—credit is due to you who did the work. There are too many to list all of you here, so I thank you for your continued excellence & dedication. The ARES organization has blossomed as never before. We've pushed back the envelope with programs such as FINDER & ARES-data on pkt (WN6I/N6KL/N6MWD). The Emergency Response Inst has provided leadership training at levels of depth & sophistication never before attained in the Amateur Radio community (N6JQJ et al). It also provided a forum for inter-organizational comms unequaled elsewhere. Also, the Section Training Forum has provided training in public service comms techniques to members in the section as a whole (N6JQJ/NG6A). The sectionwide ARES organization has become more unified thanks to many of you & especially thanks to the SECs who served during my term of office: K6ITL, WA6OCV & N6JQJ. Although it's organized differently from the way sections are organized in CA, NTS has continued to serve as a major artery for health & welfare tfc. In the past 4 yrs, pkt radio technology has begun to replace skill- intensive phone/CW nets with a more user-friendly PBBS net capable of handling msgs faster & more reliably than ever before; the SysOps of the N CA Pkt Assn (NCPA) are to be congratulated on their patience & ingenuity in developing a tfc-handling medium without equal—this is the way of the future in Amateur Radio. The OO/FCC Amateur Aux program has been rebuilt from the ground up in the past few yrs—last yr we signed a Memorandum of Understanding between the OO/AA & the San Francisco FCC Field Office; this has proven instrumental in correcting a few problems we had in our own house & will serve us well in the yrs ahead—thanks to KB6BA, KA6S & KB6ZV for this. Next month's column will be written by your new SM, Steve Wilson, KA6S. Steve works as an electronics engineer & is a Life Member of the ARRL. He has been active in most areas of amateur activity at one time or another. Steve was the ARES EC for the City of Milpitas & OOC before becoming SM. I was also Steve's predecessor as Milpitas EC, & know for a fact that he did a better job as EC than I did. I have every expectation that he will continue this trend & be an even better SM. He deserves your continued support. It would be helpful if all clubs in the section would add Steve to their mailing lists. SEC N6JQJ & I received Field Day msgs from the following stations: AA6BS (Tandem ARC), AA6DE (Mad Scientists ARC), AA6OZ (ESL ARC), K6FB (Las Cumbres ARC), K6YA (Foothills ARS), N6KL (IBM ARC), N6TU (Lotsa Beer, Several Dogs & 2 Kittens), W6OTX (Palo Alto ARA), W6PIY (W Valley ARA), W6UW (SCCARA), W6YL (SJSU ARC), WA6GFY (Lockheed ARC), WB6ZQZ (Found on Remote Mtns). If your group isn't in the list, don't worry—it's possible I have not yet received it (as of June 30) or that it was sent to the SEC instead. That's all for now. See you on the air! 73 de Glenn, WB6W. Tfc: NR7E 86 (0). Phone nos.: Amateur Radio classes/clubs 408-971-1424. License exams 408-984-8353 (ARRL VEC) or 408-255-9000 (Sunnyvale VEC).

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W— ASM: AB4S. SEC: N4MYB. STM: KI4YV. ACC: WC4T. TC: KM4OX. SGL: KE4ML. PIC: WA9NEW. Congratulations to all NC amateurs who were involved in SET 1989 & especially to WB4HRR who compiled the report. Our section placed 2nd in Section-Local Net activity & 5th in Local ARES activity; let's try to match or improve on this performance this Oct in SET 1990 (see p 45)! NC Section had a high level of Field Day participation; radiograms were received by SM from: Alamance Co ARS, Blue Ridge ARC, Bright Leaf ARC, Cape Fear ARS, Cary ARC, Forsyth ARC, Iredell Co ARES, Kinston ARS, Lee Co, Mecklenburg ARS, New Bern ARC, Onslow ARC, Raleigh ARS, Stanly Co ARC, Wayne Co ARC, W Carolina ARC, Wilson ARS/Rocky Mtn ARC joint effort &

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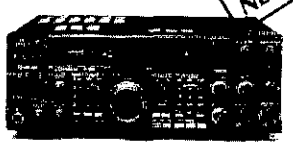

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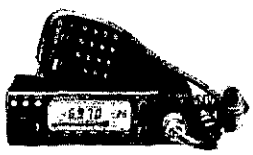

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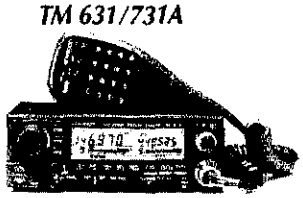

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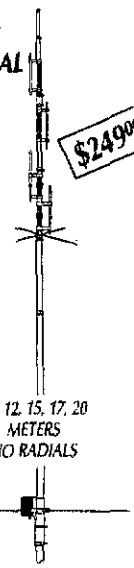

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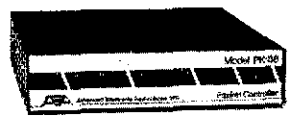

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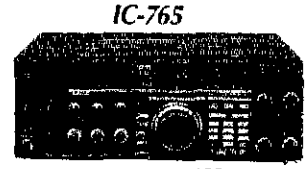

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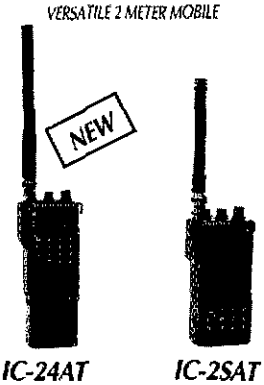

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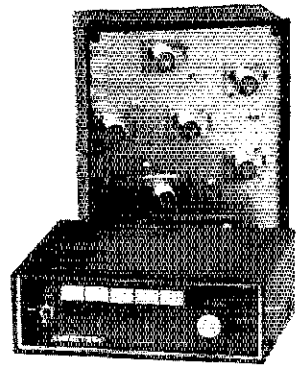

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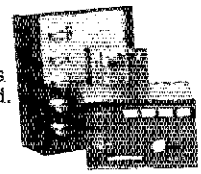

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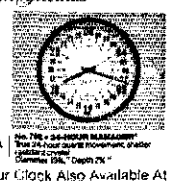

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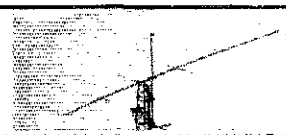

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K4PB, AB4DG, Union Co EC, provided interesting report on 8 ARES members involvement in Catawba Nuclear Exercise June 7 in UCARS *Transmission Line*, the club newsletter. Newsletter editors are interested in reports of ARES activities & ECs are encouraged to use this publicity to increase knowledge of & participation in their local ARES groups. Shelby Hamfest, Sept 1-2. Spruce Pines Hamfest, Sept 22. Johnston ARS JARS Fest in Benson, Sept 30. Maysville Hamfest, Oct 14. Triangle E ARA in Smithfield, Oct 20. Net reports, April-June:

Net	*QNI*	*QTC*	*TFC*	*QND*	*Sess*	*NM*
NCEN	1480	391	334	1595	90	WB4WII
NCMN	1136	315	274	1089	91	WD4MRD
CN	1803	612	567	3482	180	K4IWW
CSN	789	111	97	2227	91	AA4MP
CNCTN	2870	205	173	1402	91	WA4MNR
PCTN	1374	424	371	1498	91	KB7LX
RARS	1239	61	61	1821	88	K4ABJ
M2MEN	1234	112	96	851	85	KF4MZ
CFEN	1546	84	81	1897	91	W4EHF
PETN	1422	90	69	1187	84	WB4HRR
THEN	1289	121	101	917	91	N4UMI
ACARES	83	11	8	76	9	K4ULA
PCECN	178	2	2	235	9	KA4KGZ
DAN	69	6	6	108	7	KB4WGA

Totals 19,740 2,535 2,240 18,385 1,098 Jan2 June tfc: K4IWW 237, K4NLK 138, W4EAT 80 (Apr-56), KA4EYF 74, KB7LX 72, KI4YV 71 (May-36), WD4MRD 63, N9OGD 44, W4EHF 41, WD4LOO 40, N4YRD 39, N4LST 38, AA4ZV 36, WB4WII 35, N4UMI 34, N4JTG 33, N4SSX 26, N4SHE 26, N4VVX 23, WA2EDN 20, WA4MNR 20, KC4GCK 20, N4WFU 20, AB4W 20, WA9UTM 19, N4VHU 18, N4SVZ 16, W4LWZ 16, W8KLF 14, N4UE 13, N4VUI 12, N4XUN 7, KA4KGZ 7, K4AIF 3, NT4K 2.

SOUTH CAROLINA: SM, Ned Moeller, N4FVU—OOC: W4NTO. PIC: AB4ID. SEC: K8AFP. STM: W4ANK. TFC: WA4UNZ. ACC/SGL: N4FVU. Our Governor Campbell, in his proclamation, paid homage to the hundreds of hams who *demonstrated their value in public assistance. Their services* are free of charge to the state. They're alert for any emergency, local or worldwide. They use their skills at Field Day exercises. The proclamation concludes, "I, Carroll A. Campbell, Jr, Governor of the state of SC, do hereby proclaim the week of June 18-24, 1990, as Amateur Radio Week in SC, in recognition of this important emergency preparedness exercise & call upon all citizens to pay appropriate tribute to the Amateur Radio operators of our state who demonstrated their finest communications efforts during Hurricane Hugo." Many FD stations received TV, radio & newspaper publicity. Spartanburg ARC public service included the June 10 Red Cross Beach Music Fund raiser & 2-meter hot-air balloon flight July 4. Jun traffic: W4ANK 102, KA4LRM 60, N4FVU 50, W4DRF 31.

VIRGINIA: SM, Ted Dingler, N4KSO—STM: N4GHI. SEC: WB4ZTR. ACC: KA4YUY. OOC: W8IRT. TC: N4UA. SGL: W4UMC. BM: W3ATQ. PIC: WB4QOJ. Would like to welcome KA4HBU to EC ranks as EC in Norfolk, VA. Congrats to the Albemark ARC for providing comms support for the MS-150 bike ride in their area— amateurs put in 13-1/2 hrs over the course of the day. The AT&T/ME RC provided comms support for the VA Dare 5th Annual Bike Tour. The Eshares crew provided comms for the Seafood Festival & March of Dimes WalkAmerica. Again the amateurs of the state have shown what a valuable resource we are by showcasing our capabilities; if your ARES group is closing similar things, be sure to let Steve, WB4ZTR, VA SEC, know. The reports sent to Steve let me know what's happening in the section. In the area of ARES, the total no. of members is 1196, an increase of 30 *from the previous month. Have you wondered about some of* the other amateur activities avail? Let me encourage you to try the VA tfc nets; this is an area of public service that goes unnoticed. It's a place to learn good net procedures so we know how to conduct ourselves in emergency nets. Join us on the nets, SSB & CW; see previous QSTs for times/freqs. Help get Amateur Radio into the public eye. Join ARES & assist with walkathons, bike rides, etc, by providing comms support; contact Steve, WB4ZTR, for more info & your area's contact person. Let's all make an effort to bring our hobby out so the public can see us. Tfc: WB8TAX 625, N4GHI 547, K4DOR 546, W4JLS 293, N4HOG 257, WD4MIZ 226, N4EXO 209, N4TJT 202, K4MTX 184, WD4MIS 109, W4LQF 108, W3ATQ 107, WB4KSG 106, WA4TVS 102, AA4AT 101, K4YVX 86, NW3K 83, KB4CAU 67, WB4PNY 65, WB4ZTR 64, W4FRR 64, KB4NGO 60, KJ4LQ 56, KI4BR 56, WB4ZNB 51, KB4PW 45, WB4FLT 39, W4TZC 37, KC4QJM 36, K4GR 29, WB4EDB 29, KN4DV 26, N4JSP 24, N4NIG 23, K8EI 23, K4JM 23, N4JEO 19, K4MLC 19, KB2CEV 14, N4ABM 14, WB4UHC 13, KJ4EK 12, N4KSO 11, KB4OPR 9, WB4KIT 9, K4MLD 9, W4HU 7, KC4JGC 7, K4VWK 6, N4FZA 6, NM4R 5, K4BGZ 4, WA4DTE 4, N4FNT 3, W4DM 2.

WEST VIRGINIA: SM, Karl E. Thompson, K8KT—SEC: K8QEW. STM: N8FXH. SGL: K8BS. TC: K8LG. ACC: WA8FLF. Rptr Coord: WB8GDY. Jax Mill Hi-Lites: Chuck McClain, K8UQY, is WV Outstanding Amateur for 1990. MARA received Field Day Plaque for 1989. Ollie, WD8V, was elected WVFN NM & KZ8Q was reelected WVN-E & WVN-L NM. Thanks to outgoing WVFN NM WD8DHC for FB job. N8FMD VHF group was active in VHF QSO Pty from Spruce Knob with 601 contacts. K8QEW & N Panhandle hams were active in Shadyside flood disaster.

Net	*Freq*	*Time*	*QNI*	*QTC*	*Sess*	*NM*
WVFN	3865	6:00	750	137	30	WD8V
WVN-E	3567	7:00	165	75	30	KZ8Q
WVN-L	3567	10:00	151	44	30	KZ8Q
WVMD	7235	11:45	519	63	30	WD8V
WVRN	3640	6:30	150	24	30	K8LG
WVNN	3730	7:15	60	30	27	KA8ZGY
Hillbilly	14290	Noon	132	16	4	W8YP

Tfc: WD8V 364, KA8WNO 222, K8QEW 174, WD8DHC 80, N8FXH 48, KA8ZGY 46, W8JWX 9, K8KT 8.

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. Since the Limon tornado, the SEN has been called up several times this month up & down the front range. In the metro area, ATV & Western Vision Network have been a big help along with all of the spotters. Thanks to all of the amateurs who have participated for long hrs of public service to the communities of southern & northern CO, the Denver metro area

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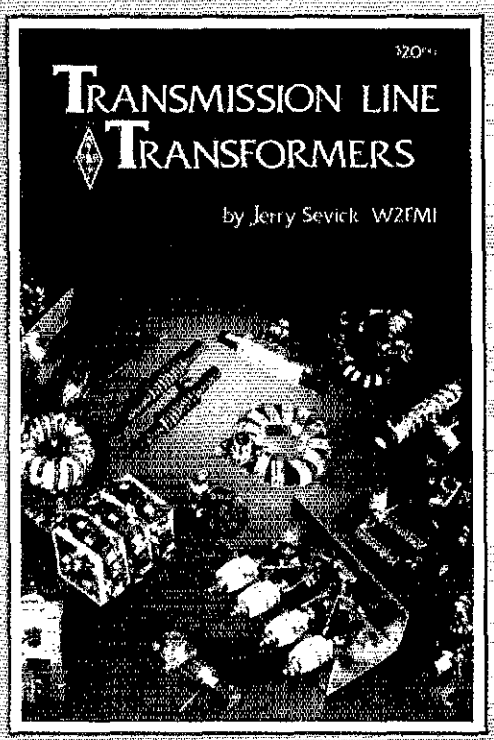

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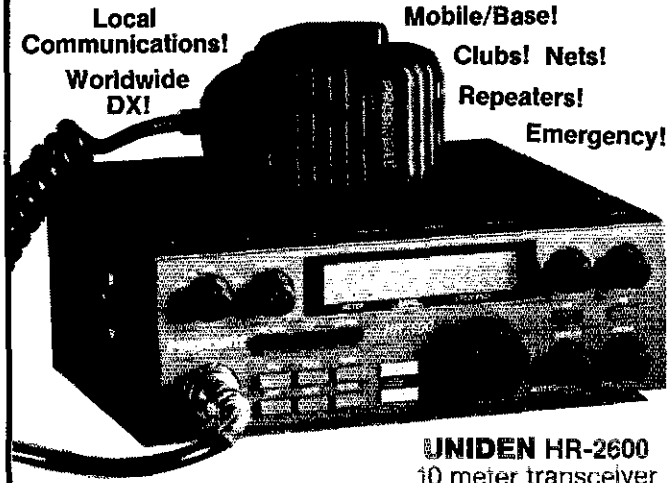

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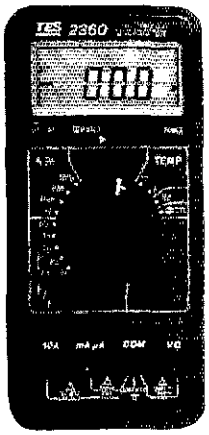

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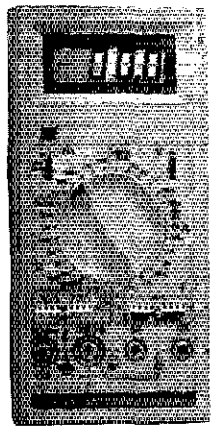

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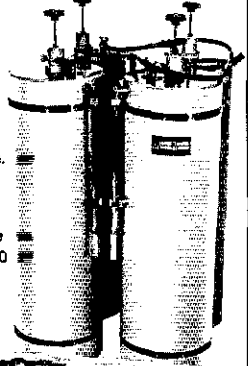

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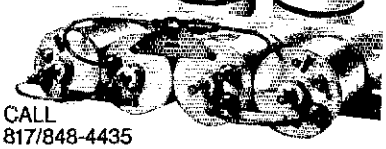

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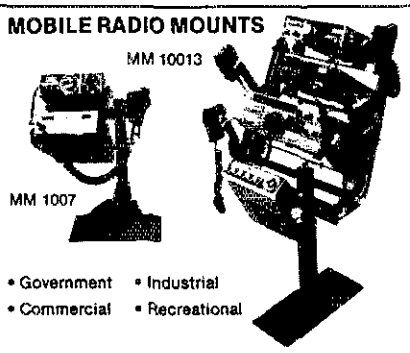

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& the eastern plains. Another big thanks to the ECs & ARES members who provided comms for the MS Bike-a-thon. K4UBU, SEC, WB4ETT, DEC, KC7QY, Dist 22, K8VQC, Dist 24, KØTER Dist 14, NØFGC, Dist 15, congrats to all for this 2-day comms effort. Congrats to WARC for their 50-yr plaque as an ARRL Affiliated club. Congrats to the Amateur of the *Year David Richendrfer, WDØHNQ, who received this award* for 1989 at the CO State Conv. BARCFest will be held Sept 23 at the Boulder Co Fairgrounds in Longmont—for info, contact NØBWS; hope to CU there. 73, KØDMQA. Nets: Col QNI 943, QTC 152-99, QNF 782, 30 Sess. CWN: QNI 56, QTC 64, QNF 200, 30 sess. HNN; QNI 1782, QTC: 127-500. QNF 963, 30 Sess. CWXN: QNI 1663, QTC: 1561, QNF 2700, 30 Sess. NCTN: QNI 225, QTC 29, QNI 165, 30 sess. SCTN: QNI 234, QTC 17, 24 sess. Tfc: NØBQP 1688, KØHQA 612, WØLVI 389, *NØHFZ 353, WTØG 338, KØYFK 308, WØACH 282, NØFCR* 230, NØGVC 222, WBØVET 189, WØLJF 141, WØGVT 140, NØCYR 82, WBØYNX 14.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K6YEJ. DEC: WD5HCB. STM: ND5T. NMs: WA5UNO, KA5NNG, W5QNR. TC: W8GY. ACC: KA5BEM. Lots of us looking forward to the Alamogordo 6th Annual Hamfest, Sept 1-2: ARRL HQ Deputy Field Services Mgr Luck Hurder, KY1T, plans to be there, along with ARRL Rocky Mtn Div Dir Marshall Quist, AGØX & your SM; hope you plan to be there. Tfc: KV5VF 128.

UTAH: SM, Rich Fisher, NS7K—SEC/STM: Jim Brown. PIO: Lon Stuart. Not much to report this month. Hope all had a good Field Day. Dan, N7JCO, has received his WAC Phone on 10. Please let me know what's going on so I'll have something to write about. SW Net meets dy, 3583 @ 0230 UTC, handled 66 msgs with 64 checkins. NM Roadrunner Net meets dy, 3939 @ 0100 UTC, handled 90 msgs with 1126 checkins. NM Breakfast Club meets dy, 3939 @ 6:30 AM, handled 117 msgs with 872 checkins. Yucca 2-mtr Net, 78/18, handled 19 msgs *with 334 checkins. Caravan Club 2-mtr Net, 66/06 handled* 19 msgs with 334 checkins. SCAT Net, 66/06 handled 9 msgs with 467 checkins. Into Net 12/72, with 48 checkins. ZIA Sun Noon Pkt Net with 54 checkins. Tfc: NS7K 44, N7ASY 19.

WYOMING: SM, Jim Raisler, N7GVV—ASM: Steve Cochrane, WA7H. SEC: Jim Anderson, W7TVK. STM: Dan Ransom, K7MM. PIC: Wilson Sellner, WB7RRZ. Shauna Richards, N7NGT, was nominated for the Hiram Maxim Memorial Award; Shauna recently completed her 9th year at E JHS in Rock Springs. Her "Tune In" science fair project was a study on 2-mtr antennas & she placed 1st in the regionals and took 3rd place in the state; it was a great way to expose people to ham radio. Please inform me of candidates for next yr—this has been the most rewarding "job" I've done since becoming your SM. By the time you read this, the results of the Volunteer Resources Committee should be known.

Net	*Freq*	*Time*	*Days*	*QNI/QTC*	*NM*
Cowboy	3923	6:45 PM-F		608/1	WB7K
Pony Express	*3923*	*8 AM*	*Sun*	*314/4*	*W7MZW*
Area 5 ARES	2 m			59/0	W7ILL
Albany ARES	2 m			18/0	WB7K

Tfc: W7SQT 116.

SOUTHEASTERN DIVISION

ALABAMA: SM, Mildred Cullen, AA4XF—The Bear Bryant Special Event sponsored by W AL ARS will be Sept 27, 1300-2300Z; listen on the lower-25 kHz on Gen'l portions of all bands, on 147.300, 146.820 & 145.350, or pkt 145.01 (connect WD4DAT-1 v TCL 1). For special certificate, QSL with 8-1/2 $X 11 SASE to WAARS, PO Box 1741, Tuscaloosa, AL 35403. HARC's *Ham of the Year awarded to Ed Sluka,* W4UQA. Ed is pres of Huntsville ARC, involved in SAREX planning & presenting ham radio to local schools & H'ville Space Camp. B'Ham Citizenship of the Year awarded to James Pilman, KA4ZQA. James is DEC & is active in emergency comms; congratulations to both & thank you for the good work. Fr Gerald Regan, WA4CZC, the Mobile & S Baldwin ARC, are to be congratulated on the assistance given to Greenpeace & the Dolphin Death Search along the Gulf. Hams manned the aircraft & search boats to enable speedy rescue & getting the dolphins to a lab—thanks for your help, a most worthy cause. Two SKs this month, Tommy Humphrey, W4CJZ & Eddy Walker, W4LNB; our sympathy to their families. Mobile Hamfest Sept 22-23. Good to hear Dudley, W4CKS & Joe, WA4RNP, back on the air & doing FB after heart surgery. BPL: WA4JDH. PSHR: WA4JDH KM4JD W4QAT WB4MMD W4PIM WB4IDB N4XFX KA4RZZ AA4XF W4IBU AB4EZ WA4RNP. Tfc: WA4JDH 651, W4IBU 252, W4PIM 192, KM4JD 192, W4QAT 98, AA4XF 91, WB4MMD 90, WA4RNP 47, KC4IVI 33, KA4RZZ 23, W4DGH 22, N4XFX 20, WB4IDB 13, WB4TVY 8, W4XI 8, AB4EZ 4.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM/BM: AA4UA. SEC: NC4E. STM: WB4WQL. Packet: W4QO. ACC: KM4IH. OOC: W8BLA. SGL: WB4UVW. TC: W4ZTL. Two more SKs to report this month: W4JNL & W4YFR; our sympathy to their families & friends. The SE Div Conv was another classic as usual. Most hams do not realize the efforts that started last yr to put on a Big One—hats off to all who dedicate their time for hamfests. It takes a lot of work. Congrats to the Atlanta Chapter 49 of QCWA on their celebration of the 20th anniversary. Our PSHR honorees have dwindled down to 3: WB4DVZ, KC4BHX & KA4HHE. Gainesville is the place to go Sept 23rd—it's their annual hamfest. I hope to make this one. This has been an unusually hot summer & we don't know what fall will bring as far as the WX goes. I know that GA is organized with one of the finest ARES programs in the country, thanks to the efforts of our SEC, NC4E, all the DECs, ECs & you FB hams in the section & let's not forget the rptr owners & people who keep them up so they're avail when needed. I get lots of copies of letters written to the Dir & ARRL regarding lots of issues. What we need is more letters from lots of people regarding these issues. Numbers carry a lot of weight when it comes to those who make decisions. So, next time something comes up, write! Tfc: WB4DVZ 124, KA4HHE 107, KC4BHX 63, WD4DSS 55, W4AET 40, N4MWR 8.

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—ASM Digital: Al, K4CY. SGL: John, KC4N. PIC: Petey, WA4PUO. BM: Dave, N4GMU. TC: Ed, W6RAO. ACC: Dick, WA4BIH. AAC/OOC: John, AB6I. SEC: Rudy, WA4PUP. This is N4ADI's final column for his SM term. Thanks to all who have commented on the column & especially to those who have sent me ideas. This month, KB9LT suggested I highlight the PSHR reports. The Public Service Honor Roll is published monthly in QST, listing those who have reported their activity on CW

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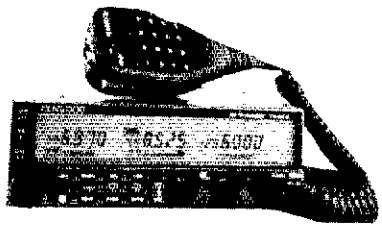

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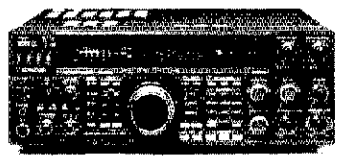

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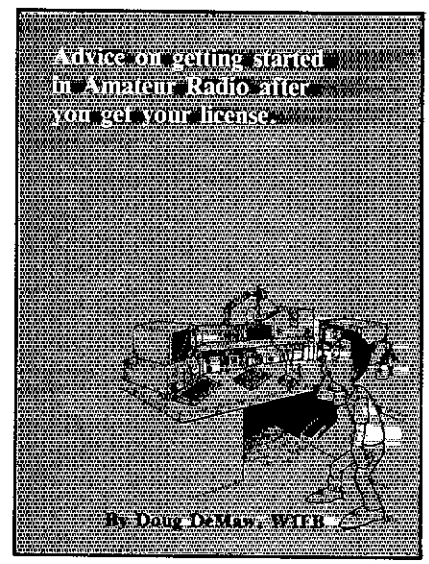
"Where do I begin? The license I worked so hard for is in my hands, and I want to get on the air!" Let W1FB tell you how to setup and operate your first station. Watch your apprehension be replaced by confidence as you get on the air and make contact after contact. This book answers basic questions about selecting equipment, laying out your station, constructing and using antennas, and operating. It also describes station accessories, logging and safety concerns. In this 155-page soft cover book, Doug acts as your personal consultant — your "Elmer" in ham radio jargon. A must for the new ham! Available at your dealer or from ARRL for $10 (add $2.50 for postage and handling, $3.50 for UPS).



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TECH TALK from ICOM

ICOM

VHF FM Specs Simplified

Our previous ICOM Tech Talk discussed equipment specifications related to HF transceivers. This month, we continue with a similar discussion of specs and measurements as applied to VHF FM transceivers. Hopefully this information will be beneficial for expanding your knowledge and enjoyment of amateur radio.

Let's begin by pointing out that FM and SSB/CW transceivers are quite different in their transmit duty cycle. SSB units deliver a varying amount of RF output as you talk: no speech, no output. FM units deliver full RF output during the full time their PTT switch is depressed, regardless of your voice. Transmit and receive current ratings are listed in specs so you can select proper DC connection points for mobile units and estimate operating times between rechargings of battery packs for handhelds. We should also point out that all ICOM base, mobile, and handheld FM transceivers include high efficient heat sinks to ensure full output without power reduction during extended operation. If you have experienced the "fading power syndrome" with less rugged rigs, you'll recognize the advantages of using a stouthearted ICOM transceiver.

Another transmitter specification to consider is spurious emissions. These undesired signals must be attenuated for minimizing interference to other VHF band systems, commercial services, etc. Superb -60dB attenuation of spurious emissions in ICOM transceivers results from extensive bandpass filtering in transmitter output stages. Additionally, their clean signals are complimented by professional grade modulating stages and an FM microphone element. The resultant clear, crisp FM audio continues to make ICOM the first choice among today's radio amateurs.

Since FM transceivers are used on open freeways and amidst congested city buildings alike, specs on receiver sensitivity are very significant for visualizing weak signal reception. FM sensitivity is measured according to the level of signal required to reduce or "capture" background noise by "X" number of dBs. The lower the incoming signal the greater receiver sensitivity. Highlighting specs of ICOM's popular IC-228A/H mobile unit or IC-2SAT handheld for example, an incoming signal of only 0.18uV will produce a receiver noise-to-signal change of an impressive 12dB. Study ICOM FM transceiver specs closely, and you will note their squelch threshold sensitivity is even lower. Only 0.11 uV of signal will open the squelch so you can copy stations right at the noise level! How is this possible?

First, high gain and low noise transistors are utilized in "front end" RF amplifying stages of all ICOM VHF FM transceivers. In addition to establishing superb sensitivity, they lower noise levels that mask weaker signals on frequencies above 100 MHz. This reduction of noise is a key factor for bringing signals in crystal clear.

Further, all ICOM FM transceivers with extended receiver coverage feature varicap tuning in "front end"/ RF amplifying stages to optimize their signal-to-noise ratio across the full 138 to 174 MHz range. Each time you shift frequency by several MHz, a different voltage is applied to the varicap. This changes the capacity of its tuned circuits and repeaks them for maximum sensitivity. This self-adjusting preselector design represents the best of innovative communications with top amateur band operation and general coverage reception without compromise.

The extreme popularity of VHF communications also demands superb receiver selectivity, particularly in intermod-prone areas. ICOM FM transceiver specs of 12.5 KHz at the -6db/ top and 25KHz at the -60db/bottom points on their I.F. response curve indicate a passband shaping factor of 2:1 for minimizing adjacent channel interference in a very effective manner. The varicap tuning of RF stages also minimizes both adjacent channel and well-off-frequency "hash" and even aids reduction of certain types of intermod.

Simply described, intermod results from the sum or difference of two or more off-frequency signals influencing performance of your VHF FM rig's receiver. It is usually characterized by howls, rumble and "call your office" messages when operating in metropolitan areas. Intermod falling squarely on your selected receive frequency obviously cannot be eliminated, but off-frequency intermod can be significantly reduced by ICOM's sharp IF filters and varicap-tuned RF stages.

This explains why ICOM's squelch does not open excessively in "intermod alley", and it is yet another reason why ICOM equipment is the first choice among amateurs. There is no substitute for top quality!

For a brochure on this or any other ICOM product, call our TOLL-FREE Literature Request Hotline, 1-800-999-9877

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All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emmisions. TT7

THINK OF IT AS A BASE STATION FOR YOUR CAR

ICOM's new IC-229 and IC-449 ultra-compact mobiles make you feel like you're sitting in your ham shack while driving your car! These transceivers fit almost anywhere!

The IC-229A measures just 5.5"W x 1.6"H x 4.1"D. The IC-229H and IC-449H measure only two inches deeper. Now that's small!

The IC-229A/H is available in both 25W and 50W versions and transmits 140-150MHz, receiving 136-174MHz. The IC-449H covers 440-450MHz and packs 35 watts of peak output power. So much power, you'll feel like you're using a base station!

Both units feature 20 memory channels and one call channel. Each memory stores operating offset and subaudible tone frequencies plus duplex shift direction. Auto dialing is simple with ICOM's new HM-56 microphone. Transmit up to 22-digit telephone numbers. It's ideal for autopatching and repeater control while driving safely.

Additional features include: Programmed memory scan, priority watch, memory skip, 7 tuning steps, 20 dB RF attenuator and a memory split function for split frequency operation. That's mobiling in style!

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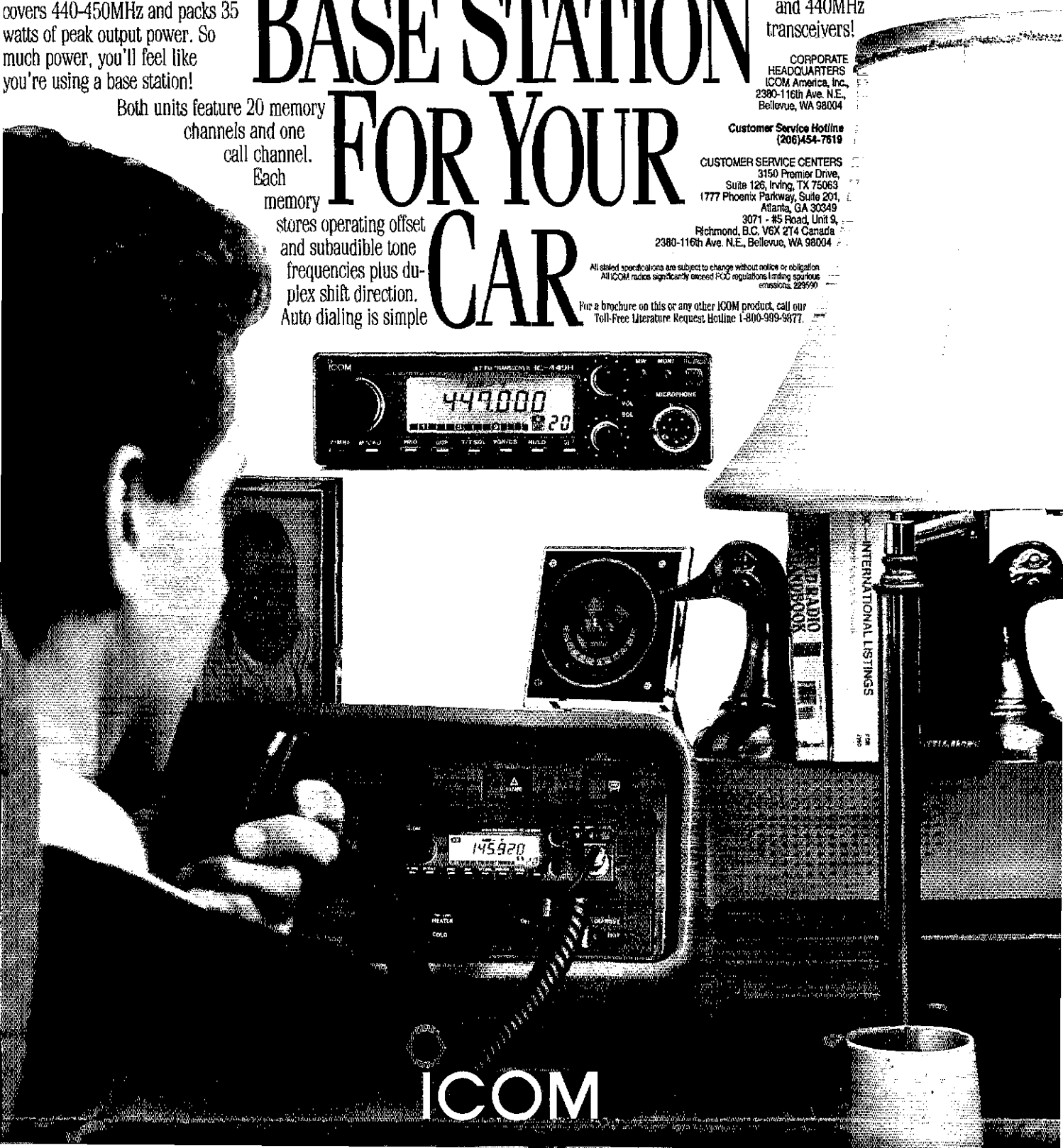

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ALL PURPOSE TERMINALS



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RCA's APT is a high quality, self-contained computer, a smart terminal, loaded with many features. Originally selling for about $300, this terminal is a super value for anyone needing a computer to access bulletin boards, word process, operate a TNC on PACKET RADIO or simply free up a larger PC.

- Built-in dual speed telephone modem with RJ-11 port for easy hookup.
- Composite video or RF (channels 3&4) allow use of either a monochrome or TV type monitor.
- Parallel printer port for connection of a Centronics type printer.
- Serial (DB-25) RS-232 port allows connection of TNC, hard drive, modem or other peripheral.
- Keyboard selectable 40 or 80 colum display.
- Built in word processor with word wrap feature.
- All terminal parameters are fully adjustable allowing emulation of many terminal systems.
- Also includes acoustical coupler input, auto log-on, 8 customizable function keys plus more!

Our APTs are very clean units removed from service. Instruction manual, wall cube power supply and TV/APT selector switch included. Optional 6' Centronics printer cable- $25. Optional DB-25 male/male Gender Changer- $7.95. Add $5 for UPS.

SPECIAL! Purchase our RCA APT today, along with a PK-232MBX Controller and we will pay the shipping anywhere in the cont. U.S., an $8 value (DX orders $8 credit).

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T-50	.500"	.18	.75	.75	T-94-2	.940"	.44	.75	.75	T-157	1.570"	.115	1.75	1.75
T-68-2	.680"	.30	.75	.75	T-106-2	1.060"	.60	1.00	1.00	T-200-2	2.000"	.130	4.00	3.50
T-80-2	.800"	.19	.75	.75	T-130-2	1.300"	.85	1.00	1.00	T-225-2	2.250"	.190	4.75	4.25
T-94-2	.940"	.44	.75	.75	T-184-2	1.840"	.90	1.00	1.00	T-300-2	3.000"	.290	5.00	4.50
T-106-2	1.060"	.60	1.00	1.00	T-200-2	2.000"	.130	4.00	3.50	T-375-2	3.750"	.355	6.00	5.50
T-130-2	1.300"	.85	1.00	1.00	T-225-2	2.250"	.190	4.75	4.25	T-400-2	4.000"	.400	7.00	6.50
T-157	1.570"	1.15	1.75	1.75	T-300-2	3.000"	.290	5.00	4.50	T-400-3	4.000"	.850	8.00	7.00
T-184-2	1.840"	.90	1.00	1.00	T-375-2	3.750"	.355	6.00	5.50	T-400-6	4.000"	1.700	12.00	11.
T-200-2	2.000"	.130	4.00	3.50	T-400-2	4.000"	.400	7.00	6.50	T-400-7	4.000"	1.700	12.00	11.
T-225-2	2.250"	.190	4.75	4.25	T-400-3	4.000"	.850	8.00	7.00	T-400-8	4.000"	1.700	12.00	11.
T-300-2	3.000"	.290	5.00	4.50	T-400-6	4.000"	1.700	12.00	11.	T-400-9	4.000"	1.700	12.00	11.
T-375-2	3.750"	.355	6.00	5.50	T-400-7	4.000"	1.700	12.00	11.	T-400-10	4.000"	1.700	12.00	11.
T-400-2	4.000"	.400	7.00	6.50	T-400-8	4.000"	1.700	12.00	11.	T-400-11	4.000"	1.700	12.00	11.
T-400-3	4.000"	.850	8.00	7.00	T-400-9	4.000"	1.700	12.00	11.	T-400-12	4.000"	1.700	12.00	11.
T-400-6	4.000"	1.700	12.00	11.	T-400-10	4.000"	1.700	12.00	11.	T-400-13	4.000"	1.700	12.00	11.
T-400-7	4.000"	1.700	12.00	11.	T-400-11	4.000"	1.700	12.00	11.	T-400-14	4.000"	1.700	12.00	11.
T-400-8	4.000"	1.700	12.00	11.	T-400-12	4.000"	1.700	12.00	11.	T-400-15	4.000"	1.700	12.00	11.
T-400-9	4.000"	1.700	12.00	11.	T-400-13	4.000"	1.700	12.00	11.	T-400-16	4.000"	1.700	12.00	11.
T-400-10	4.000"	1.700	12.00	11.	T-400-14	4.000"	1.700	12.00	11.	T-400-17	4.000"	1.700	12.00	11.
T-400-11	4.000"	1.700	12.00	11.	T-400-15	4.000"	1.700	12.00	11.	T-400-18	4.000"	1.700	12.00	11.
T-400-12	4.000"	1.700	12.00	11.	T-400-16	4.000"	1.700	12.00	11.	T-400-19	4.000"	1.700	12.00	11.
T-400-13	4.000"	1.700	12.00	11.	T-400-17	4.000"	1.700	12.00	11.	T-400-20	4.000"	1.700	12.00	11.
T-400-14	4.000"	1.700	12.00	11.	T-400-18	4.000"	1.700	12.00	11.	T-400-21	4.000"	1.700	12.00	11.
T-400-15	4.000"	1.700	12.00	11.	T-400-19	4.000"	1.700	12.00	11.	T-400-22	4.000"	1.700	12.00	11.
T-400-16	4.000"	1.700	12.00	11.	T-400-20	4.000"	1.700	12.00	11.	T-400-23	4.000"	1.700	12.00	11.
T-400-17	4.000"	1.700	12.00	11.	T-400-21	4.000"	1.700	12.00	11.	T-400-24	4.000"	1.700	12.00	11.
T-400-18	4.000"	1.700	12.00	11.	T-400-22	4.000"	1.700	12.00	11.	T-400-25	4.000"	1.700	12.00	11.
T-400-19	4.000"	1.700	12.00	11.	T-400-23	4.000"	1.700	12.00	11.	T-400-26	4.000"	1.700	12.00	11.
T-400-20	4.000"	1.700	12.00	11.	T-400-24	4.000"	1.700	12.00	11.	T-400-27	4.000"	1.700	12.00	11.
T-400-21	4.000"	1.700	12.00	11.	T-400-25	4.000"	1.700	12.00	11.	T-400-28	4.000"	1.700	12.00	11.
T-400-22	4.000"	1.700	12.00	11.	T-400-26	4.000"	1.700	12.00	11.	T-400-29	4.000"	1.700	12.00	11.
T-400-23	4.000"	1.700	12.00	11.	T-400-27	4.000"	1.700	12.00	11.	T-400-30	4.000"	1.700	12.00	11.
T-400-24	4.000"	1.700	12.00	11.	T-400-28	4.000"	1.700	12.00	11.	T-400-31	4.000"	1.700	12.00	11.
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T-400-26	4.000"	1.700	12.00	11.	T-400-30	4.000"	1.700	12.00	11.	T-400-33	4.000"	1.700	12.00	11.
T-400-27	4.000"	1.700	12.00	11.	T-400-31	4.000"	1.700	12.00	11.	T-400-34	4.000"	1.700	12.00	11.
T-400-28	4.000"	1.700	12.00	11.	T-400-32	4.000"	1.700	12.00	11.	T-400-35	4.000"	1.700	12.00	11.
T-400-29	4.000"	1.700	12.00	11.	T-400-33	4.000"	1.700	12.00	11.	T-400-36	4.000"	1.700	12.00	11.
T-400-30	4.000"	1.700	12.00	11.	T-400-34	4.000"	1.700	12.00	11.	T-400-37	4.000"	1.700	12.00	11.
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T-400-35	4.000"	1.700	12.00	11.	T-400-39	4.000"	1.700	12.00	11.	T-400-42	4.000"	1.700	12.00	11.
T-400-36	4.000"	1.700	12.00	11.	T-400-40	4.000"	1.700	12.00	11.	T-400-43	4.000"	1.700	12.00	11.
T-400-37	4.000"	1.700	12.00	11.	T-400-41	4.000"	1.700	12.00	11.	T-400-44	4.000"	1.700	12.00	11.
T-400-38	4.000"	1.700	12.00	11.	T-400-42	4.000"	1.700	12.00	11.	T-400-45	4.000"	1.700	12.00	11.
T-400-39	4.000"	1.700	12.00	11.	T-400-43	4.000"	1.700	12.00	11.	T-400-46	4.000"	1.700	12.00	11.
T-400-40	4.000"	1.700	12.00	11.	T-400-44	4.000"	1.700	12.00	11.	T-400-47	4.000"	1.700	12.00	11.
T-400-41	4.000"	1.700	12.00	11.	T-400-45	4.000"	1.700	12.00	11.	T-400-48	4.000"	1.700	12.00	11.
T-400-42	4.000"	1.700	12.00	11.	T-400-46	4.000"	1.700	12.00	11.	T-400-49	4.000"	1.700	12.00	11.
T-400-43	4.000"	1.700	12.00	11.	T-400-47	4.000"	1.700	12.00	11.	T-400-50	4.000"	1.700	12.00	11.
T-400-44	4.000"	1.700	12.00	11.	T-400-48	4.000"	1.700	12.00	11.	T-400-51	4.000"	1.700	12.00	11.
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T-400-46	4.000"	1.700	12.00	11.	T-400-50	4.000"	1.700	12.00	11.	T-400-53	4.000"	1.700	12.00	11.
T-400-47	4.000"	1.700	12.00	11.	T-400-51	4.000"	1.700	12.00	11.	T-400-54	4.000"	1.700	12.00	11.
T-400-48	4.000"	1.700	12.00	11.	T-400-52	4.000"	1.700	12.00	11.	T-400-55	4.000"	1.700	12.00	11.
T-400-49	4.000"	1.700	12.00	11.	T-400-53	4.000"	1.700	12.00	11.	T-400-56	4.000"	1.700	12.00	11.
T-400-50	4.000"	1.700	12.00	11.	T-400-54	4.000"	1.700	12.00	11.	T-400-57	4.000"	1.700	12.00	11.
T-400-51	4.000"	1.700	12.00	11.	T-400-55	4.000"	1.700	12.00	11.	T-400-58	4.000"	1.700	12.00	11.
T-400-52	4.000"	1.700	12.00	11.	T-400-56	4.000"	1.700	12.00	11.	T-400-59	4.000"	1.700	12.00	11.
T-400-53	4.000"	1.700	12.00	11.	T-400-57	4.000"	1.700	12.00	11.	T-400-60	4.000"	1.700	12.00	11.
T-400-54	4.000"	1.700	12.00	11.	T-400-58	4.000"	1.700	12.00	11.	T-400-61	4.000"	1.700	12.00	11.
T-400-55	4.000"	1.700	12.00	11.	T-400-59	4.000"	1.700	12.00	11.	T-400-62	4.000"	1.700	12.00	11.
T-400-56	4.000"	1.700	12.00	11.	T-400-60	4.000"	1.700	12.00	11.	T-400-63	4.000"	1.700	12.00	11.
T-400-57	4.000"	1.700	12.00	11.	T-400-61	4.000"	1.700	12.00	11.	T-400-64	4.000"	1.700	12.00	11.
T-400-58	4.000"	1.700	12.00	11.	T-400-62	4.000"	1.700	12.00	11.	T-400-65	4.000"	1.700	12.00	11.
T-400-59	4.000"	1.700	12.00	11.	T-400-63	4.000"	1.700	12.00	11.	T-400-66	4.000"	1.700	12.00	11.
T-400-60	4.000"	1.700	12.00	11.	T-400-64	4.000"	1.700	12.00	11.	T-400-67	4.000"	1.700	12.00	11.
T-400-61	4.000"	1.700	12.00	11.	T-400-65	4.000"	1.700	12.00	11.	T-400-68	4.000"	1.700	12.00	11.
T-400-62	4.000"	1.700	12.00	11.	T-400-66	4.000"	1.700	12.00	11.	T-400-69	4.000"	1.700	12.00	11.
T-400-63	4.000"	1.700	12.00	11.	T-400-67	4.000"	1.700	12.00	11.	T-400-70	4.000"	1.700	12.00	11.
T-400-64	4.000"	1.700	12.00	11.	T-400-68	4.000"	1.700	12.00	11.	T-400-71	4.000"	1.700	12.00	11.
T-400-65	4.000"	1.700	12.00	11.	T-400-69	4.000"	1.700	12.00	11.	T-400-72	4.000"	1.700	12.00	11.
T-400-66	4.000"	1.700	12.00	11.	T-400-70	4.000"	1.700	12.00	11.	T-400-73	4.000"	1.700	12.00	11.
T-400-67	4.000"	1.700	12.00	11.	T-400-71	4.000"	1.700	12.00	11.	T-400-74	4.000"	1.700	12.00	11.
T-400-68	4.000"	1.700	12.00	11.	T-400-72	4.000"	1.700	12.00	11.	T-400-75	4.000"	1.700	12.00	11.
T-400-69	4.000"	1.700	12.00	11.	T-400-73	4.000"	1.700	12.00	11.	T-400-76	4.000"	1.700	12.00	11.
T-400-70	4.000"	1.700	12.00	11.	T-400-74	4.000"	1.700	12.00	11.	T-400-77	4.000"	1.700	12.00	11.
T-400-71	4.000"	1.700	12.00	11.	T-400-75	4.000"	1.700	12.00	11.	T-400-78	4.000"	1.700	12.00	11.
T-400-72	4.000"	1.700	12.00	11.	T-400-76	4.000"	1.700	12.00	11.	T-400-79	4.000"	1.700	12.00	11.
T-400-73	4.000"	1.700	12.00	11.	T-400-77	4.000"	1.700	12.00	11.	T-400-80	4.000"	1.700	12.00	11.
T-400-74	4.000"	1.700	12.00	11.	T-400-78	4.000"	1.700	12.00	11.	T-400-81	4.000"	1.700	12.00	11.
T-400-75	4.000"	1.700	12.00	11.	T-400-79	4.000"	1.700	12.00	11.	T-400-82	4.000"	1.700	12.00	11.
T-400-76	4.000"	1.700	12.00	11.	T-400-80	4.000"	1.700	12.00	11.	T-400-83	4.000"	1.700	12.00	11.
T-400-77	4.000"	1.700	12.00	11.	T-400-81	4.000"	1.700	12.00	11.	T-400-84	4.000"	1.700	12.00	11.
T-400-78	4.000"	1.700	12.00	11.	T-400-82	4.000"	1.700	12.00	11.	T-400-85	4.000"	1.700	12.00	11.
T-400-79	4.000"	1.700	12.00	11.	T-400-83	4.000"	1.700	12.00	11.	T-400-86	4.000"	1.700	12.00	11.
T-400-80	4.000"	1.700	12.00	11.	T-400-84	4.000"	1.700	12.00	11.	T-400-87	4.000"	1.700	12.00	11.
T-400-81	4.000"	1.700	12.00	11.	T-400-85	4.000"	1.700	12.00	11.	T-400-88	4.000"	1.700	12.00	11.
T-400-82	4.000"	1.700	12.00	11.	T-400-86	4.000"	1.700	12.00	11.	T-400-89	4.000"	1.700	12.00	11.
T-400-83	4.000"	1.700	12.00	11.	T-400-87	4.000"	1.700	12.00	11.	T-400-90	4.000"	1.700	12.00	11.
T-400-84	4.000"	1.700	12.00	11.	T-400-88	4.000"	1.700	12.00	11.	T-400-91	4.000"	1.700	12.00	11.
T-400-85	4.000"	1.700	12.00	11.	T-400-89	4.000"	1.700	12.00	11.	T-400-92	4.000"	1.700	12.00	11.
T-400-86	4.000"	1.700	12.00	11.	T-400-90	4.000"	1.700	12.00	11.	T-400-93	4.000"	1.700	12.00	11.
T-400-87	4.000"	1.700	12.00	11.	T-400-91	4.000"	1.700	12.00	11.	T-400-94	4.000"	1.700	12.00	11.
T-400-88	4.000"	1.700	12.00	11.	T-400-92	4.000"	1.700	12.00	11.	T-400-95	4.000"	1.700	12.00	11.
T-400-89	4.000"	1.700	12.00	11.	T-400-93	4.000"	1.700	12.00	11.	T-400-96	4.000"	1.700	12.00	11.
T-400-90	4.000"	1.700	12.00	11.	T-400-94	4.000"	1.700	12.00	11.	T-400-97	4.000"	1.700	12.00	11.
T-400-91	4.000"	1.700	12.00	11.	T-400-95	4.000"	1.700	12.00	11.	T-400-98	4.000"	1.700	12.00	11.
T-400-92	4.000"	1.700	12.00	11.	T-400-96	4.000"	1.700	12.00	11.	T-400-99	4.000"	1.700	12.00	11.
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T-400-98	4.000"	1.700	12.00	11.	T-400-102	4.000"	1.700	12.00	11.	T-400-105	4.000"	1.700	12.00	11.
T-400-99	4.000"	1.700	12.00	11.	T-400-103	4.000"	1.700	12.00	11.	T-400-106	4.000"	1.700	12.00	11.
T-400-100	4.000"	1.700	12.00	11.	T-400-104	4.000"	1.700	12.00	11.	T-400-107	4.000"	1.700	12.00	11.
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T-400-102	4.000"	1.700	12.00	11.	T-400-106	4.000"	1.700	12.00	11.	T-400-109	4.000"	1.700	12.00	11.
T-400-103	4.000"	1.700	12.00	11.	T-400-107	4.000"	1.700	12.00	11.	T-400-110	4.000"	1.700	12.00	11.
T-400-104	4.000"	1.700	12.00	11.	T-400-108	4.000"	1.700	12.00	11.	T-400-111	4.000"	1.700	12.00	11.
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T-400-106	4.000"	1.700	12.00	11.	T-400-110	4.000"	1.700	12.00	11.	T-400-113	4.000"	1.700	12.00	11.
T-400-107	4.000"	1.700	12.00	11.	T-400-111	4.000"	1.700	12.00	11.	T-400-114	4.000"	1.700	12.00	11.
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T-400-121	4.000"	1.700	12.00	11.	T-400-125	4.000"	1.700	12.00	11.	T-400-128	4.000"	1.700	12.00	11.
T-400-122	4.000"	1.700	12.00	11.	T-400-126	4.000"	1.700	12.00	11.	T-400-129	4.000"	1.700	12.00	11.
T-400-123	4.000"	1.700	12.00	11.	T-400-127	4.000"	1.700	12.00	11.	T-400-130	4.000"	1.700	12.00	11.
T-400-124	4.000"	1.700	12.00	11.	T-400-128	4.000"	1.700	12.00	11.	T-400-131	4.000"	1.700	12.00	11.
T-400-125	4.000"	1.700	12.00	11.	T-400-129	4.000"	1.700	12.00	11.	T-400-132	4.000"	1.700	12.00	11.
T-400-126	4.000"	1.700	12.00	11.	T-400-130	4.000"	1.700	12.00	11.	T-400-133	4.000"	1.700	12.00	11.
T-400-127	4.000"	1.700	12.00	11.	T-400-131	4.000"	1.700	12.00	11.	T-400-134	4.000"	1.700	12.00	11.
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T-400-133	4.000"	1.700	12.00	11.	T-400-137	4.000"	1.700	12.00	11.	T-400-140	4.000"	1.700	12.00	11.
T-400-134	4.000"	1.700	12.00	11.	T-400-138	4.000"	1.700	12.00	11.	T-400-141	4.000"	1.700	12.00	11.
T-400-135	4.000"	1.700	12.00	11.	T-400-139	4.000"	1.700	12.00	11.	T-400-142	4.000"	1.700	12.00	11.
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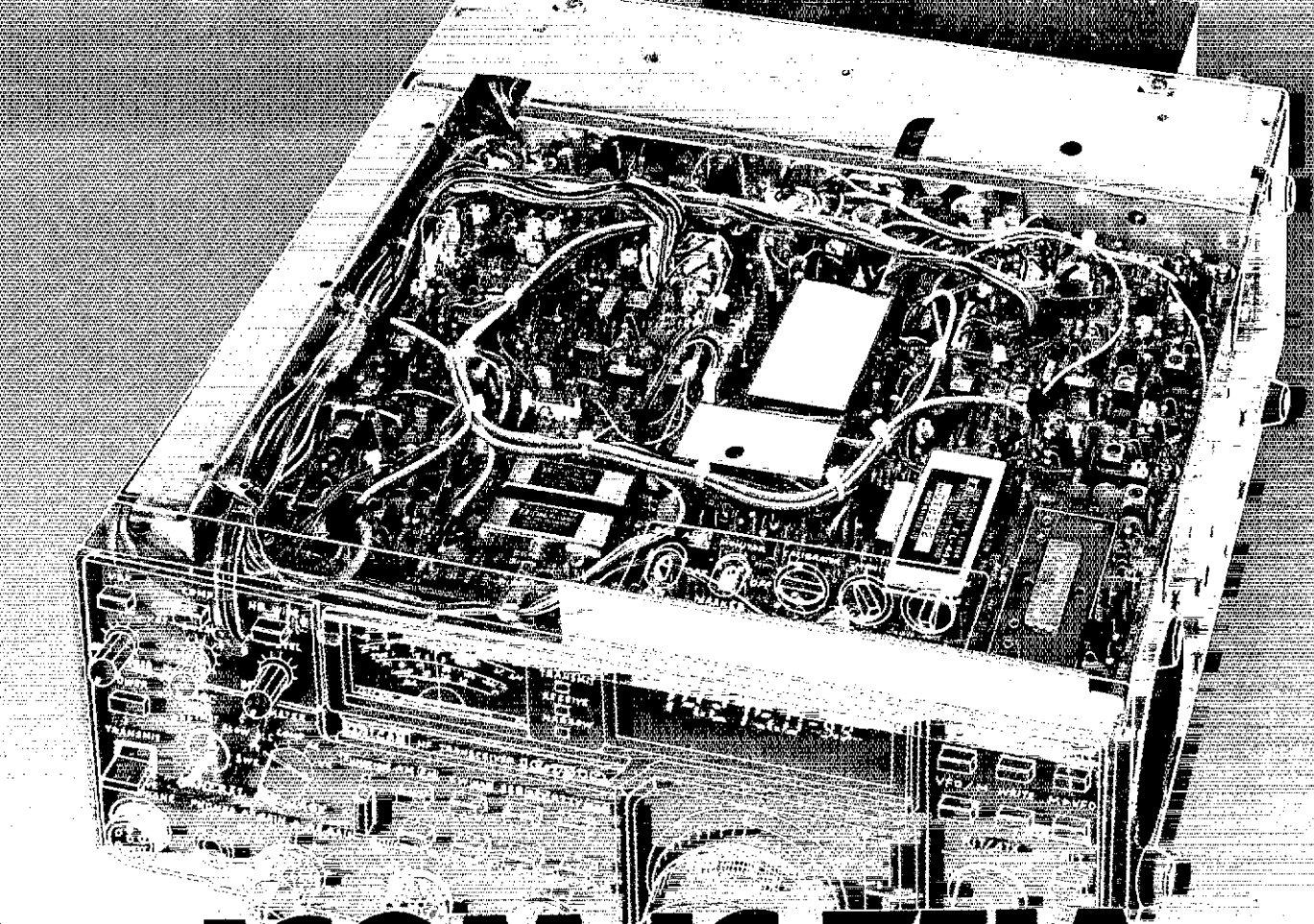
T-400-152	4.000"	1.700	12.00	11.	T-400-156	4.000"	1.700	12.00	11.	T-400-159	4.000"	1.700	12.00	11.
T-400-153	4.000"	1.700	12.00	11.	T-400-157	4.000"	1.700	12.00	11.	T-400-160	4.000"	1.700	12.00	11.
T-400-154	4.000"	1.700	12.00	11.	T-400-158	4.000"	1.700	12.00	11.	T-400-161	4.000"	1.700	12.00	11.
T-400-155	4.000"	1.700	12.00	11.	T-400-159	4.000"	1.700	12.00	11.	T-400-162	4.000"	1.700	12.00	11.
T-400-156	4.000"	1.700	12.00	11.	T-400-160	4.000"	1.700	12.00	11.	T-400-163	4.000"	1.700	12.00	11.
T-400-157	4.000"	1.700	12.00	11.	T-400-161	4.000"	1.700	12.00	11.	T-400-164	4.000"	1.700	12.00	11.
T-400-158	4.000"	1.700	12.00	11.	T-400-162	4.000"	1.700	12.00	11.	T-400-165	4.000"	1.700	12.00	11.
T-400-159	4.000"	1.700	12.00	11.	T-400-163	4.000"	1.700	12.00	11.	T-400-166	4.000"	1.700	12.00	11.
T-400-160	4.000"	1.700	12.00	11.	T-400-164	4.000"	1.700	12.00	11.	T-400-167	4.000"	1.700	12.00	11.
T-400-161	4.000"	1.700	12.00	11.	T-400-165	4.000"	1.700	12.00	11.	T-400-168	4.000"	1.700	12.00	11.
T-400-162	4.000"	1.700	12.00	11.	T-400-166	4.000"	1.700	12.00	11.	T-400-169	4.000"	1.700	12.00	11.
T-400-163	4.000"	1.700	12.00	11.	T-400-167	4.000"	1.700	12.00	11.	T-400-170	4.000"	1.700



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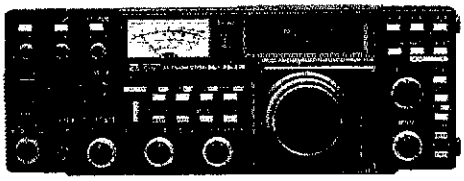

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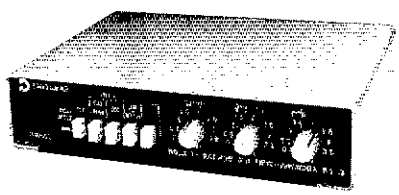
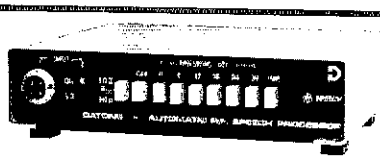
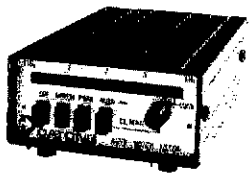
GILFER - Datong filter headquarters.



Datong FL-3 Automatic Audio Filter with Automatic Notch. Rich. Arland, K7YHA, in **World Radio** called it "the Cadillac of audio filters...nothing can touch it in price, features, flexibility and ease of use." He stated, "if I had only one active filter to use for the rest of my life, it would be the Datong FL-3." Digs out weak SSB, CW, RTTY 6 ways; the best hands-off QRM remover, its Auto Notch detects and attenuates heterodynes by 40 dB in milliseconds; also has 12 pole tuneable hi/lo pass and a manual 200-3500 Hz second notch. **FL-3, $259.95 (+$4), 12 VDC supply $15.95.**



Datong Automatic Speech Processor. Up-dates your transceiver with boosted talk power by just connecting in series with microphone and mic. input. Instant push-button choice of 0, 6, 12, 18, 24, or 30 dB of true RF clipping. Hi or Lo mic. impedance matching. Uses batteries (not inc.) or optional power supply. **ASP, $159.95 (+$4), 12 VDC supply $15.95.**



Datong Automatic Notch Filter with CW Filter. Removes 270-3500 Hz whistles and other heterodynes automatically within one second with its 40 dB notch. The 4-pole CW filter center frequency can be tuned over the full 270-3500 range. 10 LED bar-graph display shows audio notch freq., CW filter center freq., and search & lock mode in action. **ANF, $139.95 (+$4), 12 VDC supply $15.95.**

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THE AMERICAN RADIO RELAY LEAGUE
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W7EP. NMs: K6LL, K7POF. Acting SEC: W7FF. Field Day reports received indicate at least 9 clubs or groups participated, with a total of 122 ops, 33 of whom were ARES members. Clubs reporting by radiogram were: Catalina ARC, N7WS; AzPRA, W1FJI; Mogollon Monsters, WB7CAG; Kachina ARC, WA7GWG; London Bridge ARC, WB7DSW; Old Pueblo RC, W7GV; AzARC, W7IO; E Valley Radio Grp, KE7PE; & the duo-some N7OJI, WO7F. Congratulations for such an FB turnout again this yr. Hope a good time was had by all, as well as a few learning experiences for the future. The AZ winner will be announced in a future *QST* article. ATC appts in Tucson are Gail, N7BXX; Bill, WB0KSW; & Tom, WB7NXH. They'll work with the OPRC-sponsored RFI-Reduction Committee—congrats. This experimental program is a cooperative one with the FCC's Douglas office to help amateurs solve interference problems caused by amateurs. It should enhance the image of Amateur Radio to the public if we do it right. EC reports received from W6VHB, S Mohave Co; N7JWM, Coconino Co; WI6S, Yavapai Co; & KA7JLV in Kingman, Mohave Co. WI6S reported their ARES group performed public service activities in Prescott & Verde Valley. WF7G, K7OIG, KA7YCI WB7TNC & KB0CVC provided comms for Prescott Valley Days parade. KB7IWU, W7JAE, KC2EN, WI6S, KA6RCM, W7GCJ, KA7TOT & KA7TOU provided Special Olympics coverage. They are all AZ Ham Sams, with RVs. It was a great pleasure for me to present a 70-yr ARRL Member award to Leon A. Faber, W7EH. Lee is 90 yrs young & still very active in ham radio. He built his 1st spark set in 1913, was 1st licensed as 9EH in 1917, served in US Navy during World War I and joined the ARRL in 1919. What a guy! Congrats, Lee from all of us. Regret to report that W7JQE, Tucson, has become a Silent Key. Ken was active, particularly in RACES, & other tfc nets. We'll miss him. KB7INH & I attended luncheon meet in of AZ Cactus Keys in Show Low. 16 XYL's & 10 OMs showed up. While this is a ladies club, they graciously invite the OMs along as long as we sit at separate tables & pick up the checks! That's all; hope to see you at our SW Div Conv Aug 24-26 in San Diego. 73 Jim. Nets: (Name/QNI/QTC/Sess) ATEN/847/62/30 SWN/64/66/30 Tfc: W7OIF 60, K7RLL 45, W7EP 42, W7AMM 32, K7POF 24, N7ETP 11, W7KXE 7.

LOS ANGELES: SM, Phineas J. Icenbice, Jr, W6BF—ASM/FCC/Gov't: Joe Merdler, N6AHU. ASM/ADM Clubs & Conventions: Ken Wahrenbrock, KF6NC. OOC: David Morse, WW7K. SEC: Ron Boan, AK6Y. TC: Edgar Brown, N6OU. PIO: Michelle Epstein, N6RFD. The illegal intrusion reports for the past few weeks are not good. ZS5WX, the well-known Manny, has a friendly net on about 14.236 MHz dy with W6VZZ & a group of about 30-40 check-ins. Considerable TTY multi-channel illegal interference has been on this freq for wks. After listening for several wks to the complaints; it seemed like a good idea to check in & ask each member of the net to send a QSL card to me with the (1) times, (2) dates, (3) freqs & if possible the signal strength & direction of the interference. I waited 10 days & no mail so I checked in again & requested the same info. After 3 days, 2 letters arrived—the same type of TTY mux. (R7B) signals have been on 14.223 MHz near Jim Smith's normal net freq. Other gov't, military & commercial TTY mux. (R7B & F1B) signals have dy operated on our exclusive 20-mtr band, typically on the following freqs: 14.218 14.212 14.210 14.171 14.159 14.150 MHz & many other freqs. Any gov't agency or politician is impressed when they see a stack of cards or letters on 1 subject! Apathy & indifference to these illegal problems by all concerned at all levels has now been experienced by yours truly. The NRA Institute for Legislative Action recently printed in large red letters The Anti-Gunners Won by 1 Vote in the Senate...Your 1 Call Could Mean the Difference in the House! We only had 2 hams who even wanted to vote! Think about it! Who do we have in Washington, DC, working for us & understanding our problems? It is not Herbert Hoover or Barry Goldwater anymore, poised & ready to help the cause of the Amateur Radio service. How about your city, co & state politicians? The ARRL must not be political (5% max) or lose their 501(c)3 status. Think about it! Where do we get help for our new antenna-tower ordinances & RFI laws. Goldwater was the last to help our cause! Every FCC license should have a "thank you, Barry Goldwater" just above the signature line! Now you have the status of the Nation of Amateur Radio. Ted Sharp (K6UYK) & I had lunch together at the Porter Valley Country Club to honor our local citizens. It was a grand affair, but best of all, I got to know Ted just a little bit. Ted is the only station that sends in an official ARRL Station Activity Report every month; also, his tfc report is always tops—this month Ted has a total of 771 for his tfc count. Ted is retired from CSUN (our 30,000 + local university) & the US Navy. Ted has schedules & net affiliations with SCNI, SCNV, RNG, PAN, DRNG, DPAN & the 20-mtr Interstate Mission Trail nets. Ted is an ARRL ORS. The SSB 40-mtr tfc net Region 6 needs help dy on 7275 kHz at 9:45 AM local & 7278 kHz at 3:30 PM local. Activity keeps our bands open & our minds active. 73, W6BF

ORANGE: SM, Joe Brown, W6UBQ—ASMs: Riv Co Bob, W6LKN, 714-686-3823; Org Co Ralph, WB6JBI, 714-778-9272; SB Co Ken, WA6ZEF, 714-983-1272; Inyo Co Steve, WV6T, 619-872-1199; Section News/PIC: Jerry, AD6A, 714-351-8824. Support your local ARES: contact the following DECs for info: Riv Co John, WA6BFH, 714-685-0485); SB Co Tony, WB6QHB, 714-981- 1636; Org Co H. Corcorran, N6HQI; Inyo Co Johnny, KE7CC, 619-873-3416. Other section officials are ASM Dig Comm Mike, N6KZB, 714-682-6212; STM Dan, WF6O, 714-778-4896; ACC Sandy, WA6WZN, 714-549-8516; BM Fred, W6TKV, 714-687-8145; OOC Nick, KA6GVY, 714-897-9424; SGL Larry, N6HIQ, 714-962-3453; TC John, WA6BFH, 714-685-0485; RACES Officials: Org Co Chief Radio Officer Ken, W6HK. San Berdo Co, Dave, WB6JZJ 714-356-3811. Riv Co Reorganization accomplished with John, WA6BFH Chief Radio Officer, W Riv Co Asst & EC Dean, KG6YS, 714- 687-8878; E Riv Co Asst & EC Brett, N6NLN, 619-346-9291. Tnx to all these dedicated amateurs for their SVC to the public & Amateur Radio. PIO Mark, KC6CUB reports on an FB article that appeared in the *Indio Daily News* re amateur Radio support to an earthquake drill—we can never do enough of this, gang! The exercise involved about 30 hams with EC N6NLN & NCS KB6NCM at the helm; good work! Also, the Corona Norco ARC voted to demo ham radio during Corona's Heros Day—another great PR effort; the club is also forming a CW net on 28.290 MHz at 2000 hrs on Wed. New officers of the Coachella Valley ARC: pres KB6FUB, vp N6WWE, secy KB6HGS & treas KA6IYS. The Fullerton FC has been chosen to run a transmitter hub for the Hamcon 92



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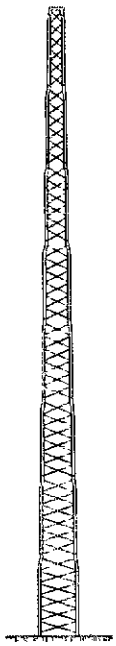

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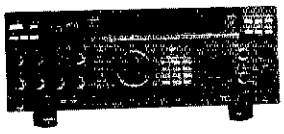

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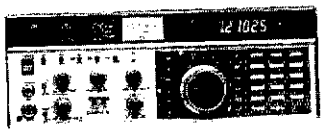

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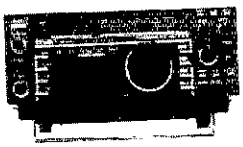

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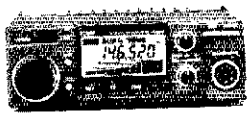

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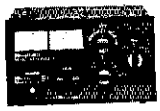

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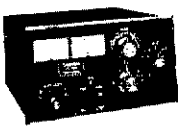

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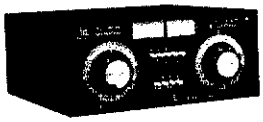

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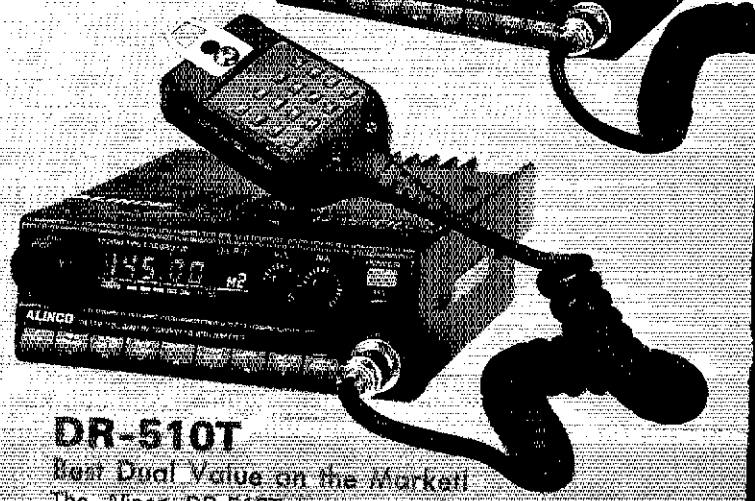
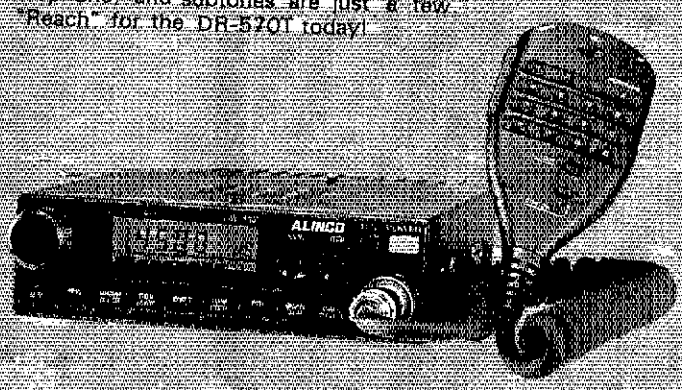


DR-510T

Best Dual Value on the Market!

The Alinco DR-510T has most of the outstanding features of it's sister the DR-570T, including 14 memory channels, cross band duplex and cross band repeat. The multi color LCD display and simple tune control panel makes simplicity the key word. The DR-510T with 45/35 watts is the best, featurepacked dual bander on the Amateur market today. See the DR-510T along with the other Alinco "Magnificent" ones at your favorite dealer today!



DR-112T(NEW)

Full Featured 2M Power Pack

The DR-112T is a "True FM" full-power (45 watts) transceiver. The back-lit LCD display is ideal for bright or dim lit conditions. And, as with most Alinco products, the control panel is engineered to be "User friendly" and still offer a full range of features.

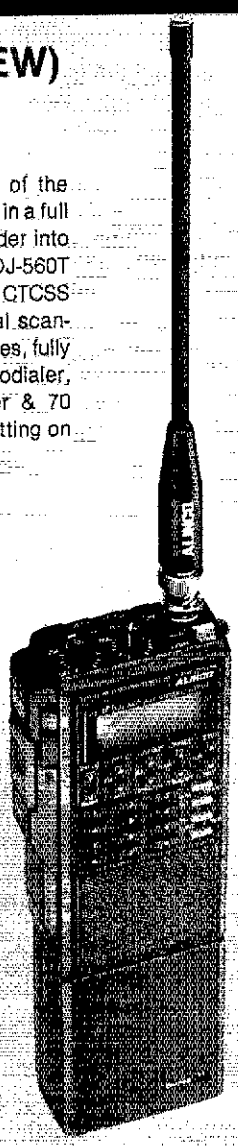
ALINCO ELECTRONICS INC.



DJ-560T (NEW)

Full Featured Twin Band Handy

We packed almost all of the features you would find in a full sized mobile Twin Bander into this compact HT. The DJ-560T has key board entry, CTCSS encode built in, several scanning modes, 40 memories, fully programmable, Autodialer, Dual Display (2 Meter & 70 Cm). The DJ-560T is sitting on top of the mountain.







DJ-100T & DJ-120T & DJ-200T

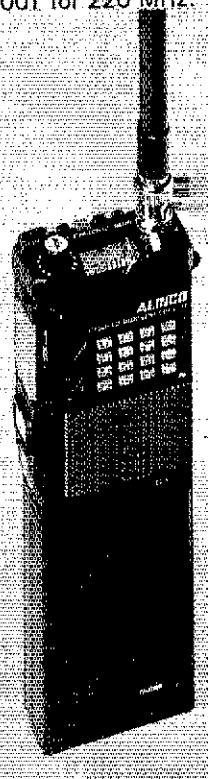
Best 2M Micro Value

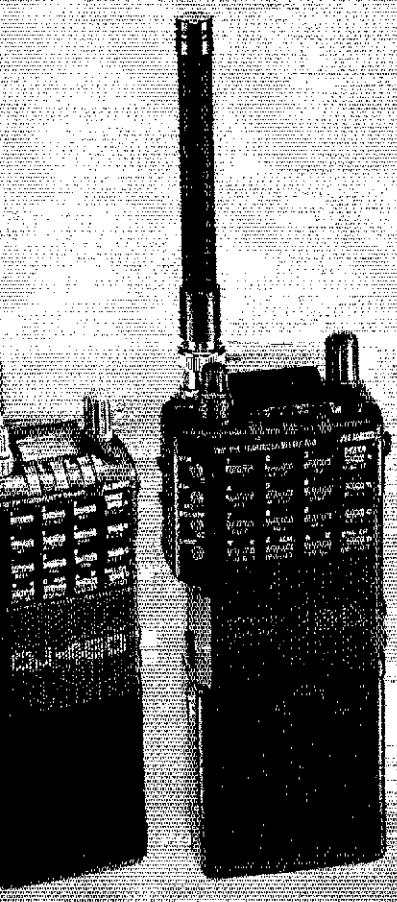
The Alinco DJ-100T/DJ-120T is "Magnificent" for its tiny size, but stands up to the competition with power and capability. 10 memory channels store offsets and subtones. Has LCD readout with call channels and reverse at your fingertips. 500 mah battery with direct DC to DC is standard. 3W on standard battery, 6W on optional battery leaves the competition in the dust! DJ-200T for 220 MHz.

DJ-500T

Power-Packed Dual Handi!

20 Memory channels, subtones, built-in DC to DC, 700 mah nicad battery, LCD readout with 6W on 2M and 5W on 70cm (with optional battery) call channels, DTMF Touchtone, and direct keyboard entry, are just the few winning features of the Alinco DJ-500T Dual Band Handheld. Easy to use, and Value Priced at your Alinco Dealer.





DJ-160T & DJ-460T

2M H/T is here! And wow!

"Bells & Whistles" is a tame word to use for the new DJ-160T, newest "Magnificent" one from Alinco. Keyboard entry is just one of four ways to enter a frequency in the extended receiver (137-173.995 Mhz) of the DJ-160T. You can store duplex /simplex pairs in any of 20 Memories, or Call Channel, with offsets, and any of 38 encoding subtones. Choose one of 3 scan modes, "Band" "Program" or "Memory" and one of five step ranges in VFO. Priority mode can be used in VFO, Memory or Call. "Dual Watch" allows the DJ-160T to scan 3 seconds alternately on CALL, VFO or one MEMORY. "Pager" is for group or single person alert. Other features include: Auto "Battery Save", Auto "Power Off", and 2-Memory Autodialer. Get 3-watts on standard 700 mah battery, or increased power from built-in DC to DC, or optional 12V battery. The Alinco DJ-160T, now the "Top Gun" with the competition today! DJ-460T for 70 cm.

ALINCO ELECTRONICS INC.
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TEL: (213) 618-8616 FAX: (213) 618-8758

...Brings You A

Keyers



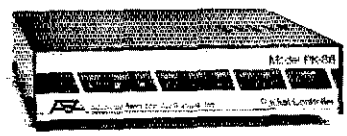
The Morse Machine MM-3 Keyer

The Morse Machine has all the features you need in a memory keyer, including 2 to 99 WPM speed selection and over 8,000 characters of soft-partitioned memory. Twenty memories store your messages...as short or as long as you like. Memory can be expanded to 36,000 characters. All memory is backed up by an internal lithium battery.

Comprehensive Morse training facilities are built-in. **A Proficiency Trainer** for random code group practice. **A Random Word Generator** which generates four-letter words and **A QSO Simulator** which allows you to call stations, answer a CQ or listen to realistic on-the-air QSO's.

The MM-3 also features automatic serial number insertion and incrementing in any memory message. Use the front panel knob to adjust your sending speed or enter a precise speed with the keypad, toggling between the two at any time. Exchanges can be expedited by having parts of your message sent at a higher speed. You can even add remote switches for four of the memories to send your response or call CQ. The MM-3 can also be programmed for automatic beacon use. The RS-232 compatible serial I/O port provides computer control of the MM-3 and monitoring of the Morse training features.

Packet

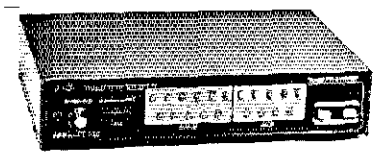


PK-88 Packet Radio TNC

Unique operating features with a proven hardware and software design make AEA's PK-88 your best choice in packet radio--now with MailDrop, an 8KByte efficient personal Mailbox. The PK-88 also allows multiple single frequency QSO's, digipeating and networking. It's a superb value, packed with all the most needed packet radio features such as direct interface capability with NET/ROM and TCP/IP. In addition to all the features of a "standard" TNC, the PK-88 offers features not found in any other TNC:

- WHYNOT command - Shows reasons why some received packets are not displayed.
- "Packet Dump Suppression" - Prevents dumping unsent packets on the radio channel when the link fails.
- CUSTOM Command - Allows limited PK-88 customization for non-standard applications.
- Enhanced MBX command- Permits display of the data in I- and UI-frames, without packet headers and without packet headers or retried frames.
- Enhanced MPROTO command - Suppresses display of non- ASCII packets from Level Three switches and network nodes.

Multi-Mode



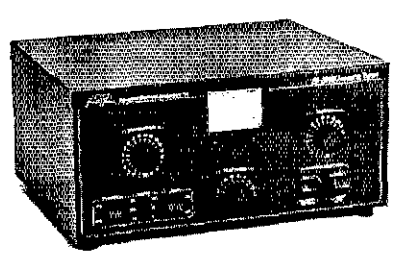
PK-232MBX Multi-Mode Data Controller

With over 40,000 units sold worldwide, the PK-232MBX is the world's leading multi-mode data controller. Combining all amateur data communication modes in one comprehensive unit, the PK-232MBX offers Morse Code, Baudot, ASCII, AMTOR/SITOR 476 and 625, HF and VHF Packet, WEFAX receive and transmit, TDM, as well as commercial standard NAVTEX automated marine information services.

All software is on ROM.

- 20 front panel status and mode LED indicators
- RS-232 compatible
- Exclusive SIAM™ Signal Identification and Acquisition Mode
- TDM Time Division Multiplex decoding
- PakMail™ mailbox with selective control of third-party traffic
- FAX printing - supports most printers
- Two radio ports
- Host mode for efficient program control of the PK-232MBX
- KISS mode for TCP/IP networking protocol compatibility
- 32K RAM lithium battery-backed
- Many features for the digital SWL

Antenna Tuners



AT-300 and AT-3000 Antenna Tuners

For tuning perfection, choose AEA's AT-300 (300 watt) or AT-3000 (3 kW) antenna tuners. Quality and exceptional engineering are built-in for maximum performance and long operating life.

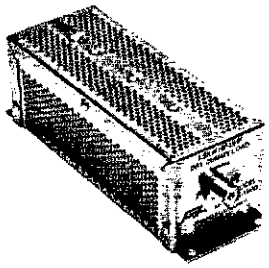
The low-pass design provides more harmonic attenuation for lower TVI and allows matching to a much wider range of antenna impedances than common high-pass designs.

The AEA tuners feature a frequency compensated dual-movement SWR meter for ease of tuning with a front panel power range switch. Minimal SWR is achieved by inductors with 18 (AT-300) and 20 (AT-3000) taps. AEA's exclusive patent pending CAM switch design on the AT-3000 provides accurate tuning. The built-in front panel antenna switch allows you to easily select two unbalanced (coax-fed) antennas, a dummy load or a balanced antenna.

Advanced Electronic Applications, Inc. 2006-196th St. SW/P.O. Box 2160 Lynnwood, WA 98036 206-775-7373

Better Experience

Dummy Load

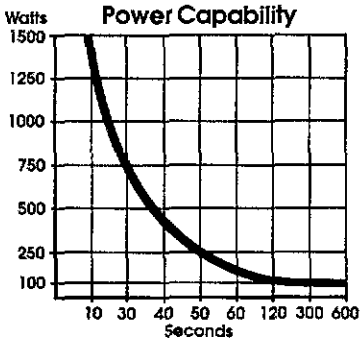


DL-1500

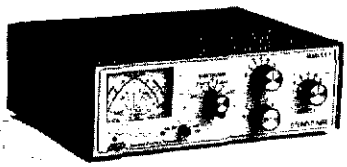
DC-650 MHz Up to 1500 Watts

AEA's dry dummy load simulates a perfect 50 ohm antenna up to 650 MHz so you can test your transmitter without radiating a signal on the air.

- DC-650 MHz
- Simulates matched 50 ohm transmission line to test your transmitter
- Handles short-term RF power up to 1500 watts
- VSWR of less than 1.3:1 at 650 MHz
- Compact and lightweight
- Air cooled dry load



Econo Tuner



ET-1 Antenna Tuner

300 Watts of All-Band Tuning

Meet your match with AEA's new ET-1 Econo-Tuner™. A quality, economical antenna tuner for under $150, the ET-1 Econo-Tuner is designed to match virtually any receiver, transmitter or transceiver from 1.8 to 30 MHz with up to 300 watts of RF power.

Compatible with almost ANY antenna including verticals, dipoles, inverted vees, beams and mobile whips that are fed by coax cable, balanced lines or a single wire. For easy connection to balanced lines, a 4:1 balun is built-in.

A front panel switch control allows you to switch between two coax-fed antennas (direct or through the tuner). You can also switch to a balanced line or wire antenna. The BYPASS position allows you to switch to a dummy load (such as AEA's DL-1500 dry dummy load) or a direct connected coax antenna. In the BYPASS position, COAX 1 OUT or COAX 2 OUT can be selected so that the tuner is bypassed, but not the meter circuit.

The ET-1 features a precision dual-movement meter to simultaneously monitor power and SWR.

Unique engineering designs have made AEA one of the leading innovators in the amateur radio industry. That same quality and superior technical support make the ET-1 your best deal for an antenna tuner.

Antennas

IsoPole™ Omni-Directional VHF and UHF Base Station Antennas

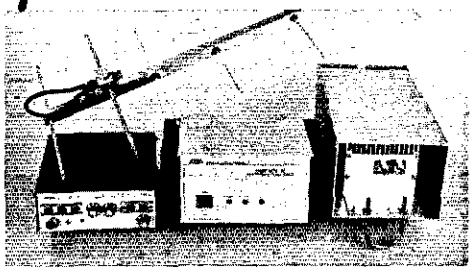


An outstanding mechanical and electrical design make the IsoPole the best choice for an economical omni-directional VHF or UHF base station antenna. All IsoPole antennas yield the maximum gain attainable for their respective lengths and a zero degree angle of radiation which puts the most signal on the horizon. Exceptional decoupling results in simple tuning and a significant reduction in TVI potential. Decoupling cones offer great efficiency over obsolete radials which radiate in the horizontal plane. The IsoPoles also have a broader frequency coverage than any comparable antennas. Typical SWR is 1.4 to 1 or better across the entire band!

All mounting hardware is stainless steel. The decoupling cones and radiating elements are made of corrosion-resistant aluminum alloys. Aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast, not supplied).

IsoPoles are ideal for packet radio. The decoupling cones stop computer hash picked up by the outer shield of the coaxial cable from being passed to the receiver.

Amateur TV



AEA's New ATV System

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

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

Specifications subject to change without notice or obligation. Dealer inquiries invited. Copyright 1990.

KENWOOD Newsletter

KENWOOD U.S.A. CORPORATION Vol. 1 Issue No. 2

Accurate and timely information for the active Amateur Radio Operator from Kenwood U.S.A.

Kenwood's 24 Hour Bulletin Board System (Part 2)

Last month we introduced you to some of the features of the Kenwood Bulletin Board System. This month we will complete our description of the board features and cover how to log on to the system.

Board Features

- **Files Section**

Information on the board is not limited to Kenwood Specific topics. Files sections are provided for those interested in Games, Graphics, Communications, Utility Functions, Marine Radio, and others. Most files on the board are for the IBM PC and compatibles, but file areas are also provided for the Macintosh, and Commodore computers.

- **Message Section**

A message area is provided so that you can request information on just about any subject you desire. Folders are provided for New Equipment, QRP, Shortwave Listeners, Marine Radio, and General Mail, just to name a few.

Coming Next Month

Next Month: Part 1 of Interfacing Packet TNC's to Kenwood Equipment.

If you have a comment about a column, or have a question about any ham radio subject please let us know. We will select topics for the newsletter that have the widest appeal.

An offline message reader option is available to save time. You can download all new messages and then, by using one of the available offline file readers, you can review the messages, bulletins, and file descriptions at your leasure.

Sign On Procedure

To sign on to the Bulletin Board you should first set up your modem for 8 Data Bits, No Parity, and 1 Stop Bit. You should select a speed of 300, 1200 or 2400 Baud.

The telephone number for node one is (213) 761-8284. The telephone number for node 2 is (213) 761-8292. Both lines have access to the same information. If one is busy try the other.

Once the connection has been established you will be asked to enter your name and select a password. You may enter any password you wish, but we would recommend against using your callsign since this is easily guessed.

Write the password down where you can find it later, because each time you sign on to the board you will be asked for this password. If you don't respond exactly as you did on this initial call you will not be able to logon! (If you forget the password leave a comment to the SYSOP. He will delete your name from the database and you can sign on again.)

The BBS will ask several questions to help it communicate with you. One question deserves special attention. The program will ask you if you want color. If your computer cannot display IBM ANSI color do not select yes! If you do, and your computer doesn't support IBM ANSI color, you will not be able to read the screen.

After completing the questions you will find yourself at the Main Menu. Each menu option starts with a letter, followed by a space, and then the rest of the description. To select a particular option just type the first letter of the selection and press RETURN on your computer.

We recommend that you press the [?] key, if you have never been on a bulletin board system before. This will take you to the command help menu and explain the functions of the various Main Menu Selections. In fact, if you want more information about the choices available from any menu just press [?].

When you have completed your visit to the board you will need to end your call. This is done by pressing G (for Goodbye) and then hanging up your modem.

Next month we will begin a series of articles that will describe how to hook up Packet TNC's, RTTY, and SSTV equipment to a wide variety of Kenwood transceivers. We will see you then.

73 Craig (KR6T)



Kenwood U.S.A. Corporation
Amateur Radio Customer Service
P.O. Box 22745
Long Beach, CA 90801-5745

Bulletin Board: (213) 761-8284
(213) 761-8292
On line 24 hours a day, 7 days a week.
Customer Service: (213)639-7140
Press 9 during the recording.
8:30 AM-5:00 PM Pacific time Mon-Fri.
Parts: (800) 637-0388
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The HT with More!

- Priority alert function.
- Large, easy-to-read multi-function LCD display with night light.
- Audible beeper to confirm keypad operation.

DTMF monitor also included.

- BT-5: AA cell manganese/alkaline battery case.
- BC-7: rapid charger.
- BC-8: compact battery charger.
- SMC-30: speaker microphone.
- SMC-32: mini speaker microphone.
- SC-12, 13, 27: soft cases.
- RA-35, 5: telescoping antennas.
- RA-38: Stubby Duk antenna.
- TSU-4: CTCSS decode unit.
- VB-2530: 2m, 25 W amplifier (5 W input).
- LH-4, 5: leather cases.
- MB-4: mobile bracket.
- BH-5: swivel mount.
- PG-2V: extra DC cable.
- PG-2E: cigarette lighter cord with filter.

TH-225A

The all new TH-225A brings you all the convenience of a mobile rig, with the portability of an HT.

- Five watt output battery pack (PB-12) supplied.
- Odd split on all ten memory channels.
- Six watts with 13.8 VDC input.
- Wide receiver frequency range. Receives from 141–163 MHz. Includes the weather channels. Transmits from 144–148 MHz. Modifiable to cover 141–151 MHz (MARS or CAP permit required).
- CTCSS encoder built-in. TSU-4 CTCSS decoder optional.
- 10 memory channels.
- Nine types of scanning! Including new "seek scan" and priority alert. Also memory channel lockout.
- Intelligent 2-way battery saver circuit extends battery life.
- Easy memory recall. Simply press the channel number!
- DC input terminal for direct mobile or base operation.
- New Twist-Lok Positive-Connect locking battery case.
- Monitor switch to defeat squelch. Used to check the frequency when CTCSS encode/decode is used.

- Supplied accessories: Belt hook, rubber flex antenna, wall charger, DC cable, and dust caps.

Optional Accessories:

- PB-1: 12 V 800 mAH NiCd pack for 5 W.
- PB-2: 8.4 V 500 mAH NiCd pack (2.5 W).
- PB-3: 7.2 V 800 mAH NiCd pack (1.5 W).
- PB-4: 7.2 V 1600 mAH NiCd pack (1.5 W).
- PB-12: 12 V 500 mAH NiCd pack.

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

TH-315A/TH-415A

- TH-315A covers 220–225 MHz.
- TH-415A covers 440–449.995 MHz.
- 5, 2.5, or 1.5 W output, depending on the power source. Supplied battery pack (PB-2) provides 2.5 W output.

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
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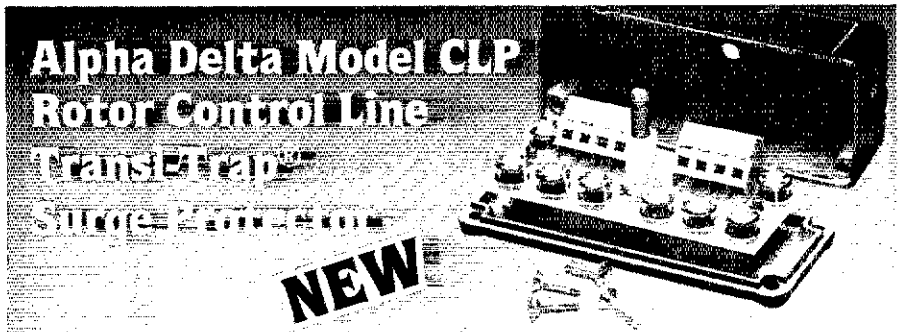
KENWOOD

The best there is in Amateur Radio.



Protect your valuable communications equipment against destructive lightning-induced surge voltages that occur on the control lines to your rotor control and remote antenna switch boxes. Straightforward installation — no soldering.

- Protects up to eight 16 AWG wire control line cables . . . covers the most commonly used rotor and remote switch models. Requires no modification to control boxes.
- Utilizes eight NEMP-rated high surge current field-replaceable gas tube Arc-Plug® cartridges. Each line is individually protected.
- High quality G-10/FR4 glass epoxy printed circuit board construction. Your control line connects directly to special industrial grade PC mount connectors for best low inductance discharge performance. Computer designed. No soldering required.
- Equally effective for modem/phone line protection. The low capacitance gas tube Arc-Plug cartridges accommodate high baud data transmission and greatly outperform competitive MOV models.

Model CLP Control Line Transi-Trap Protector $49.95

Also check out our line of time-proven Transi-Trap coax cable surge protectors. At your Alpha Delta Dealer. Or order direct in U.S.: add $4.00 for postage and handling. MasterCard and VISA accepted. Ohio residents add Sales Tax. Exports quoted.

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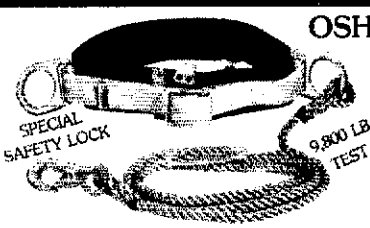

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YAGI OPTIMIZER $65

YOjr has everything you need to design and optimize HF or VHF Yagis with up to 10 elements. YOjr automatically maximizes forward gain and F/B, and minimizes SWR. You may choose the tradeoff among these 3 factors. YOjr models tapered elements, optimizes simultaneously at 3 frequencies across a band for broadband designs, and can scale any design to a new band. Polar patterns are displayed and printed. YOjr is extremely fast, and can compute several trial designs per second. YOjr is intuitive, graphical, and interactive. 8087 and extra-fast no-8087 versions both included. YOjr 1.0, $65. Full credit toward YO 3.0, with much more, $130. Add 6.25% CA. $5 overseas. U.S. check, cash, or money order. For IBM PC, 5.25" or 3.5" disk.
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NETWORK QSL CARDS

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convention—something they do well. Loraine, N6CIO, was chairman of the ham radio booth at the Orange Co Fair in July, which featured many different themes to attract newcomers to ham radio—a great undertaking. The Morongo ARC provided comms for the local Grubstakes Day parade; participating were KB6ISC, N6YIE, KB6OEK, K4RWM, KA6JGP, WA6MBK, K6MFE, W6HKZ and club prez N6VBM. Huntington Beach RO Mark Oppenheim says although he was in Sudan, Africa, at the time, HB RACES did an excellent job supporting clean-up operations after the tanker oil spill; special thanks to Tim, WD6AWP & Dutch, WB6OSM, for organizing the 8-day effort. A correction on the PBBS for Cent Org Co: N6RYK should have read N6RKY (Thanks, Bill). All indications are that Field Day was active by clubs throughout the Section. Yours truly (AD0A) had fun feeling like a rare DX station on 20-mtr CW at 2 AM. Vy 73! WF6O, STM reports: PSHR: WF6O, W6RE, KA6TND, KA6HJK. PBBS QTC: WF6O-1 80. Individual QTC: WF6O 481, K6ZCE 117, KA6TND 67, W6SX 48, KA6HJK 39, N6VEV 29, W6RE 25, KA6GND 22, AD0A 18, KA6JOB 14, K6PGG 12, KD6GX 4.

SAN DIEGO: SM, Arthur R. Smith, W6INI—STM: N6GW. TC: N6JZE. SEC: W6INI. SCN/1 NM: KI6ZH. Success of comms at Blue Angels Air Show was due largely to KF6HU. Ramona Outback ARS has club net on 147.03(+) Wed at 1930; visitors welcome. Call sign changes: KC6FEF to N6WLX, WA0ABX to N6YWW, WB0WGU to N6YVX. Upgrades: N6SYF to Extra, KC6JJE to Adv. Poway ARS ops made the Painted Rock Fun Run a success with K6CD, KA2EVE, KF6HU, N6IMV, N6JHR, N6OHS, KB4OPF, KB7VE assisting. A training sess at the CA Dept of Forestry brought 30 more ops into the Volunteers In Prevention program, which provides Red Flag Patrols in severe fire-hazard weather. N6WUY has gone to greener pastures at the NY Medical College; good luck, Mike. Also leaving the area are N6CEK for Tijeras, NM & N6UZG for OR. KC6GZU (N Shores ARC) will have an Amateur Radio class at Mission Bay High this fall. Need code practice? Palomar ARC runs code practice ea Fri at 2100 on 146.73(-). W9FQN IS NCS. SCN/1 30 sess, QNI 285, QTC 206. SDCTN: 29 sess, QNI 293, QTC 119. ARES/CW: 4 sess, QNI 14, QTC 3. Tfc: KI6ZH 299, KT6A 188, WA1ZEN 60, KC6LEX 15, N6GW 14.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA—ACC: KB5AH. ASMs: N Vntra N6MA, S Vntra W8AKF, Sbar WB6BYU, SLO WB6IIY. BM: N6TNG. STM: N6NLW. OOC: W8AKF. TC: W6KFV. DECs: Vntra WB6RVA, S Sbar KA6KGF, SLO W7AZF. On Tues, June 26, at approx 5:30 PM, a brush fire started by arcing power lines, was spotted in the hills near Ojai. Almost immediately, the Ventura Co Fire Dept requested establishment of a Red Cross 1st-aid station & support by Ventura Co ARES. Two ops were dispatched to provide comms at the 1st-aid station, 1 to the Red Cross Chapter House & another to the base camp. At its peak, the fire threatened 300 homes in Ojai; only quick & decisive action by the Ventura Co FD saved the city from a horrible nightmare. The fire was finally controlled & all forces, including amateur ops, were released by 6 PM Fri, June 29. In all, 20 ARES ops assisted in the emergency. Meanwhile, an arson fire was set some time around 6 PM Thurs, June 27, in the Painted Cave area near Santa Barbara. The conflagration raced down the mtns towards the city & travelled 6 mi to Cathedral Oaks in only 30 minutes, leaving terrible destruction in its wake & beginning 1 of the worst nightmares in Santa Barbara section history. In another half-hr, it sped a mi to Hwy 101 & by 8:30 PM had jumped the freeway in the Holister/Modoc area. S Santa Barbara Co ARES responded immediately, while already embattled Ventura ARES, N SB Co & San Luis Obispo prepared to send aid. Here's the story as reported by Santa Barbara EC Bill Hoover, KB5AH: "Fanned by screaming sundowner winds & with firestorm temperatures sometimes exceeding 1000°, the disastrous Painted Cave Fire raged through Santa Barbara for 3 days, destroying everything in its path before hard-pressed ground crews & fire-suppression aircraft finally began to get it under control. Fearful of the ominous fire danger in the scorching, parched downslope winds Wed afternoon June 27, the US Forest Service mobilized the Santa Barbara S Co SAFE (Special ARES Fire Emergency) Team just mins before the 1st harmless-looking wisps of smoke were reported rising above the mtntops N of the city. Already staged at the Los Padres Nat'l Forest HQ in Goleta, the SB ARES Emergency Comms Van instantly became the net control nerve ctr for a growing list of hams checking into the ARES tactical net for assignment. As the fire gathered speed, devouring homes & displacing residents at an alarming rate, the Red Cross brought up its own ham net, vastly increasing the already pressing need for emergency ham ops. With the city slashed into ragged pieces by the fire, movement was severely restricted & deployment of communicators became a difficult task. Ultimately, however, including NCSs at the van & the Red Cross, a total of 98 hams staffed city & co EOCs, co fire, USFS Fire Base Camp & several Red Cross shelters. Of these 98 hams, Santa Barbara Co gave us 76, Ventura Co sent 14 & the rest came from all over S CA. We would have run out of ops long before the welcome stand-down, had it not been for the magnificent response from neighboring hams, clubs and ECs. Santa Barbara S Co ARES sends grateful thanks to all the exhausted hams who worked this horrifying emergency. Special thanks & recognition for extraordinary assistance to Santa Barbara S Co DEC Don Fuller, KA6KGF; Ventura Co DEC Paul Ryan, WB6RVA; Santa Maria EC Esther Miller, KK6AD; Santa Ynez EC Dave Lamb, WB6BRW; Lompoc EC Marilyn Hains, N6LFJ; the Hughes Aircraft El Segundo ARC, AA6MX, in Simi Valley & the rest who came through when we needed them desperately." My thanks also, to those who worked so hard in this extreme situation. Special thanks to KB5AH, who worked nearly 24 hrs straight to keep things moving smoothly; to AA6MX, who hung in for so many hrs as NCS while still recovering from recent surgery & to the Ventura Co ARES ops, who had barely left their own fire lines to help in Santa Barbara. It is with pleasure that we welcome Steve Majcewsky, WB6DXY, to the Field Organization leadership. Steve has assumed the duties of NM for SCN/SB. Testing successes for May: Santa Barbara ARC (ARRL/VEC) Extra KF6DI; Adv N6VNN; Techs N6ZKJ, KB6NXV, Edward Bailey, Karl Buchmiller, Lalith Karunaratne, Phil Lubin, Gerald Richard, Ted Stryker; Nov Michele Hale & Louise Petersen. VEs KB5AH, AA6MX, AA6OT, AA6JG, N6NLW, KI6XG, KK6AD, AA6QD, WD6ETK. Congratulations to those who upgraded & thanks to all those fine VEs. 73 for now. Ttc (May): W8AKF/P 7981, W6NOR 109, N6NLW 49. (Jun) W8AKF 7089, W6NOR 80, N6NLW 45. PSHR (May) W8AKF/P 533. (Jun) W8AKF/P 620.

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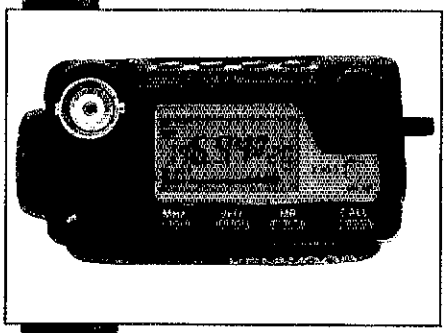

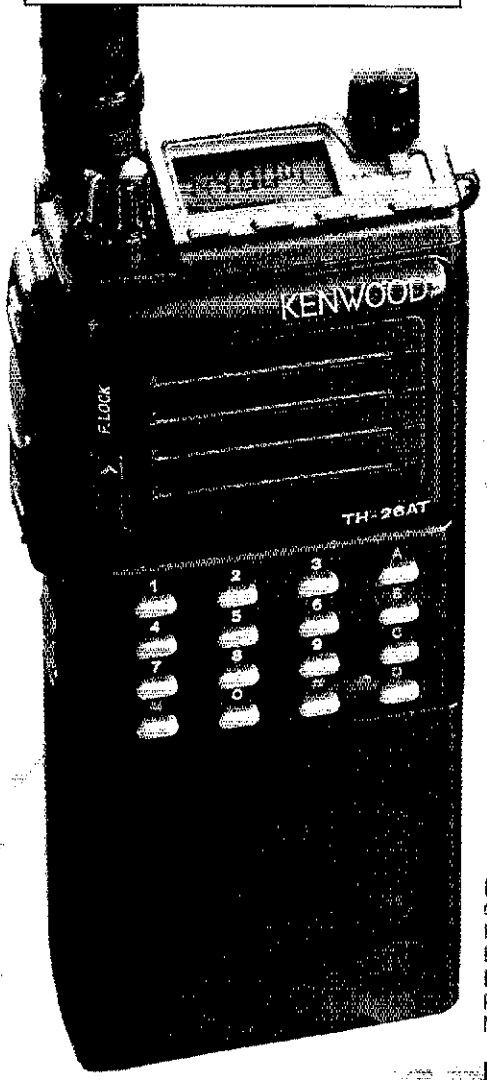

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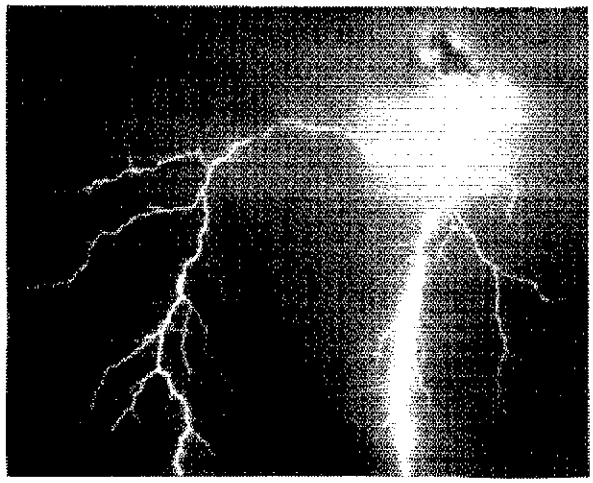

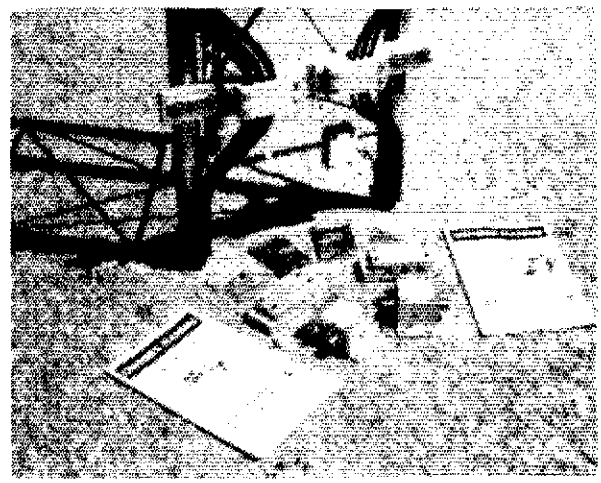

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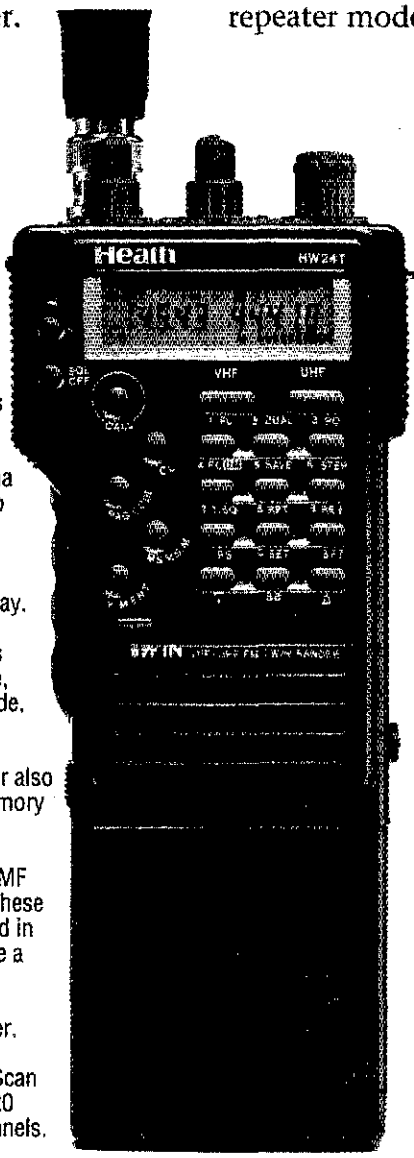

Extremely sensitive at .158 µV for 12 dB SINAD, this receiver is a big plus when you're using a rubber duck antenna. Superb out-of-band sensitivity and frequency coverage from 130 MHz to 174.995 MHz and from 400 MHz to 469.995 MHz. The HW-24-T can even be modified for MARS and CAP TX, provided you show proof of participation.

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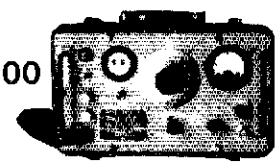

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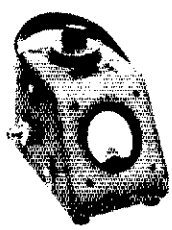

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WEST GULF DIVISION

NORTH TEXAS: SM, Dan Dansby, W5URI—It seems a week hasn't gone by lately that we don't have to stop & pay tribute to a great ham who has become a Silent Key. The other day, another one was taken from us, Ed Johnson, W5INT. Ed was a ham for more than 43 yrs. Along the way, he was a Marine Corps vet in WW II, received his BSEE from the Univ of Houston, a member of the Masonic Lodge & for more than 3 yrs, Scoutmaster of Boy Scout Troop 374 in Whitehall. All this & raised a wonderful family, too. What not many people know is he contributed financially to supporting Amateur Radio in the Boy Scouts through K2BSA ARA. His financial support tremendously helped put the msg about ham radio to many Cubs, Scouts & Explorers in the Scouting program. Ed was always the quiet one to set back in the middle of the group & seldom spoke, but his appearance gave strength to all of us. We will miss Ed. As I was writing this article, the mail brought the *McKinney Newsletter* with an insert about the local recyling program. Ft Worth is starting recycling in 3 ZIP codes, including mine. This is coming to all of us, get ready, we need it before we are buried in our garbage. Nearly every country I've visited still uses returnable bottles & no paper plates or cups & has far less refuse. Bedford Ordinance, as approved, provides up to 65 ft in height, but they caught us asleep when they charged us $75/yr safety tower inspection fee. Further course of action has not been announced. Field Day a huge success; I was able to visit 6 clubs before the wknd ran out & everyone was trying to figure how to make as many pts as possible in the time allotted. KD5I was at the Arl ARC with a satellite rig & W5IU was at the GDRA club with another satellite rig. I'll be in NM at the Philmont Training Ctr next month so you will have a guest conductor for this column. BPL: KF5BL. Tfc: W5YQZ 289, KD5RC 143, KN1K 131, W9OYL 124, WI5J 120, W5TOO 89, N5PGZ 65, KC5NG 61, AC8Z 36, KB5BNU 28, KB5AE 25.

OKLAHOMA: SM, Joe Lynch, N6CL—Frances Harding, wife & best friend of Joe Harding, WA5ZNF, passed away June 1. She was the "behind the scenes" person for the *Collector & Emitter*, folding, inserting, sticking on labels & on occasion, mailing it for Joe. Joe, we are saddened with you for your loss. It seems like last wk was Ham Holiday. Now it's time to think about prereg for Texhoma; in a couple of wks you'll receive a prereg form in the mail. If you haven't received 1 in the next month, contact your SM. W5UGO has received a QSL confirming state no. 45 on 2 mtrs; K5ZXE has applied for WAS on 6 mtrs; K5CPZ placed 3rd in the world on CW in a recent YLRL contest. Your SM visited Field Day sites of Wheatstraw, Autopatch & Edmond ARS. The fellowship & hamburgers were excellent at Wheatstraw, the operating was superb at Autopatch & the fun & operator training was great at Edmond. Chisholm Trail ARC provided comms & tfc control for a Webelos Camporee at Duncan Lake in late May. 73 for now de Joe, N6CL. Tfc: K5CXP 317, WA5OUV 117, N5IKN 88, W5RB 78, K5GBN 41, AA5GI 35, WA5ZOO 30, WA5OGC 28, NQ5Y 4. PSHR: K5CXP 1/30, 2/30, 3/12, 5/12, 6/145, T/229.

SOUTH TEXAS: SM, Arthur R. Ross, W5KR—OOC: K5SBU. SEC: K5DG. STM: WD5GKH. PIC: WA5UZB. ACC: WB5YDD. TC: NZ5U. BM: WA5WCY. SGL: K5KJN. ASM, all above plus N5TC. KF5ZL rprts hams were busy during Trinity River flooding, helping local officials keep sightseers & looters under control; KG5LN & KB5AME organized coverage; tornado in W Harris Co occupied hams the 1st few hrs, with KF5ZL, K5STR & W5DWI working Houston EOC, while SKYWARN provided the only direct comms with the stricken area; KB5DNT, K5HUT, K5RVK & other ops whose calls were not recorded provided needed comms & other help. ACC WB5YDD rprts Beaumont ARC renewed as SSC. Brazos Valley ARC, Ft Bend & Harris Cos, rprts upgrade KB5MKM, KB5MKJ, KB5LUZ, KB5MAX, KB5SBX & 5 unlicensed to Techs; KB5LFU & KB5MKI to Gen; 1 unlicensed to Nov—very good! Several clubs in the Houston & Harris Co area operated special-event stations during the World Economic Summit. Clear Lake ARC has renamed its club news letter; *Chronicles* has served its purpose, now the *Radio Amateur Gazette* quickly states its purpose; CLARC also had plenty of publicity for PIO KB5AWM, CLARC & Amateur Radio with its news release concerning KB5AWM being the recipient of the AEA Amateur Ambassador Award; congratulations to Jim & to CLARC. PIO KA5EEQ, Brenham ARC, sent newsclip & copy of document in which the City of Brenham declared the week of June 18-24 to be Amateur Radio Week; the skill & dedication of Amateur Radio ops is praised & honored. Austin ARC bulletin, *ARC-OVER* rprts LY2BIG (formerly UP2BIG) was guest of honor at a party held at home of WH5J; LY2BIG is station mgr & chief op at Lithuanian club station LY2ZZ (formerly UB2ZZ); that's having DX drop in for a visit! *NARS NEWS* NW ARS (Houston) rprts upgrades: N5NPS to Adv, N5PBD to Gen, KB5MKM & KB5MKS to Techs—nice follow-through. San Benito ARC president WA2VJL announced the awarding of the 1st annual college scholarship; the award is available only to San Benito HS seniors who have been accepted by an engineering college & plan to pursue a career in engineering.

WEST TEXAS: SM, Milly Wise, W5OVH—It has been a busy time for the amateurs in the WTX section, as it probably was in the other sections of the state. During May, the town of Spearman, TX, was hit by a tornado & hams in the area, Don, N5OUG; Hoot, WB5GKM; Ray, W5FMY; Bill, NQ5I; Guy, WZ5C; W5IEA; K5BLB & others, helped relay comms out of Spearman. The following hams provided comms for the Funfest Marathon & 10k race in Amarillo: KA5PTG, N5OIJ, WB5OII, KB5FBB, KB5AZA, N5NLL, N5PVU, KA5TEY, WZ5C & WB5PUM. It's wonderful that we have dedicated hams to help. El Paso-area hams are proud of Dr Laurance Nickey MD, KB5BDY, the new president-elect of the US/Mexico Border Health Assn; he's El Paso's Health Dir. STM Gene Smith, AE5I, has appointed Scott Heimer, N5OKW, as an ORS; Scott is 18 yrs old, holds an Amateur Extra Class license & is going to college as an Engineering Major. Jim Lotspeich, N5PKW, has reason to be bragging, as his daughter, Catrina, a jr at NMSU, was awarded a $1500 music scholarship. The WTX DX Club PacketCluster operates on 144.91 & will serve the Midland & Odessa areas & will include cluster data from Dallas, Austin, OK, Tulsa & Lubbock. Watch for the El Paso/Juarez "Int'l Hamfiesta," as the hams across the border in Juarez have shown an interest in helping the El Paso hams put on an "Int'l Hamfiesta," Oct 20-21. The 1990 Worked All El Paso contest will be Nov 3-4, 8 AM to 8 PM local time on 10 mtrs only. 73, Milly, W5OVH. Tfc: AE5I 27, K5UYH 12, W5OVH 16.

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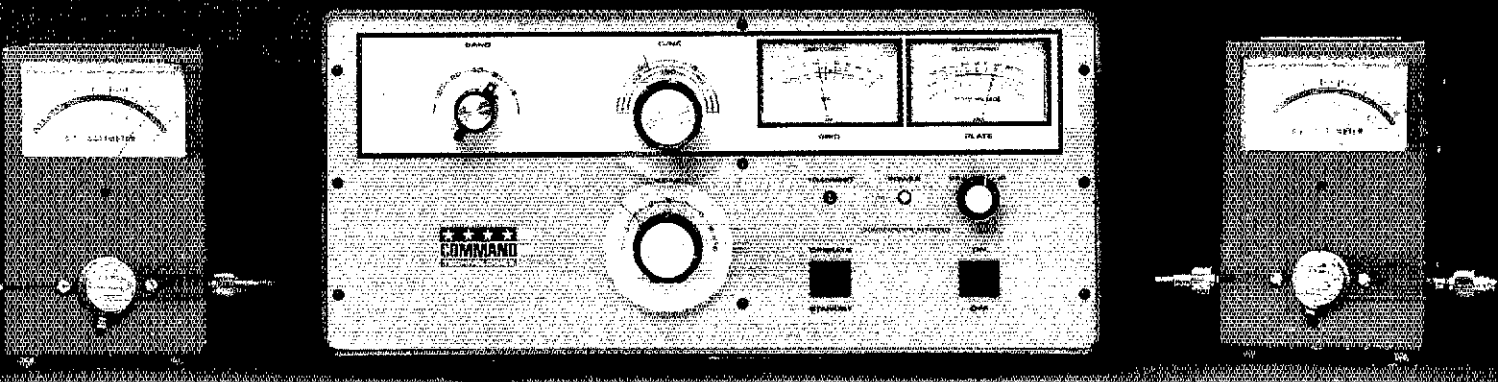

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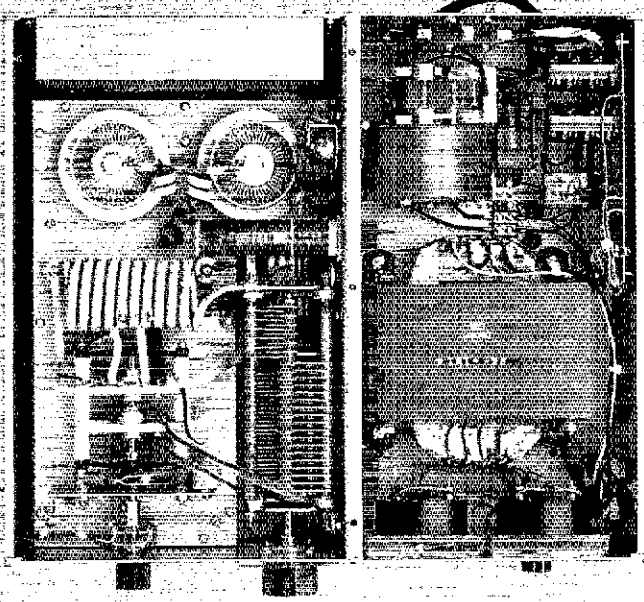

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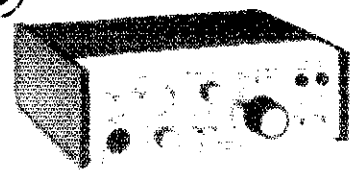

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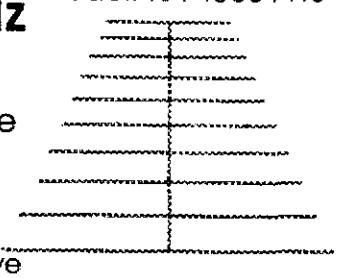

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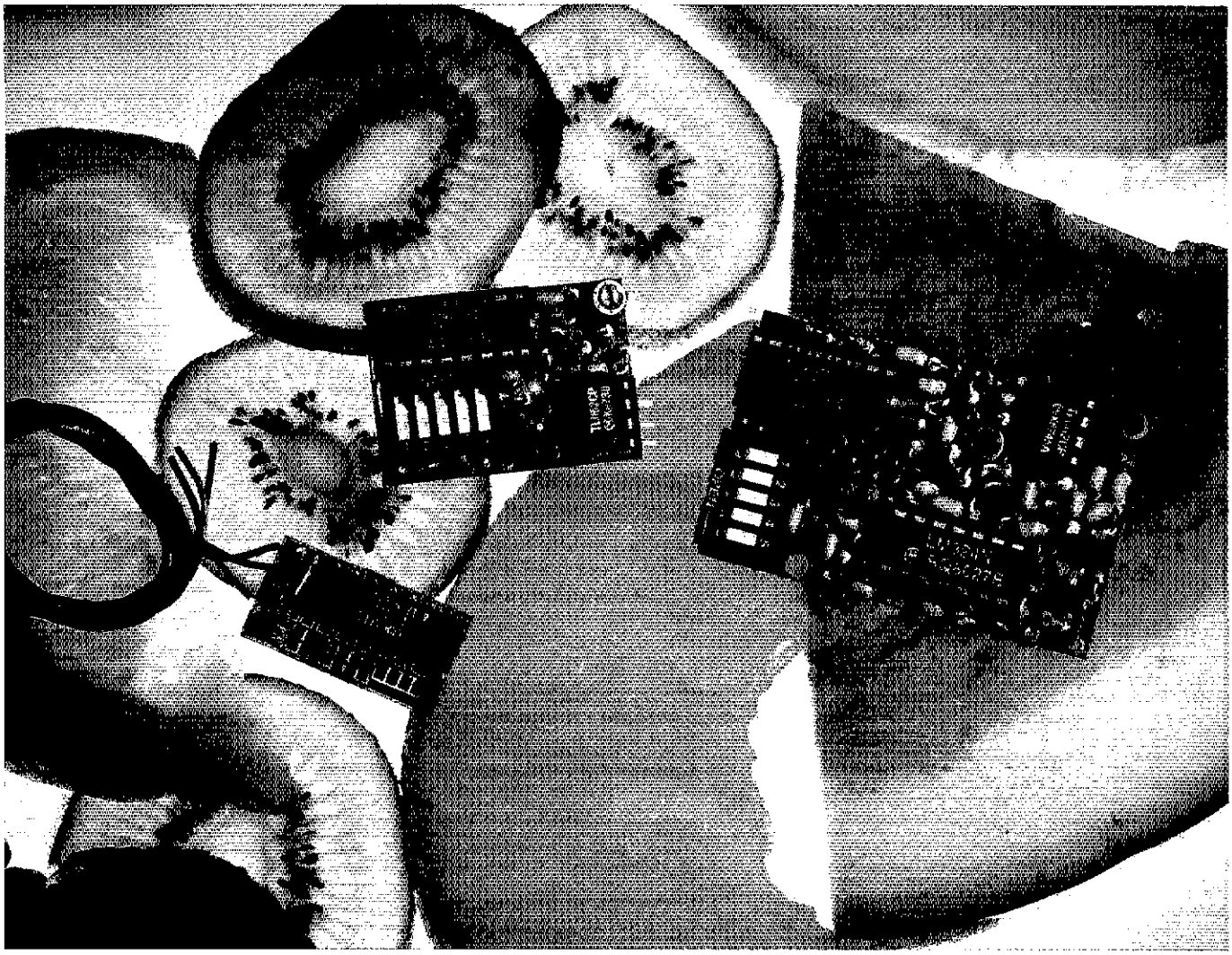

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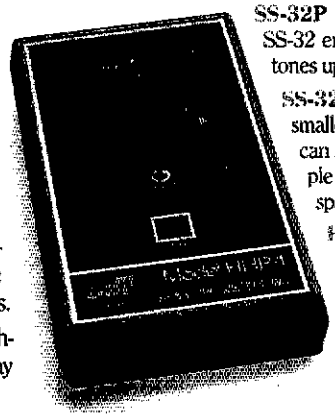

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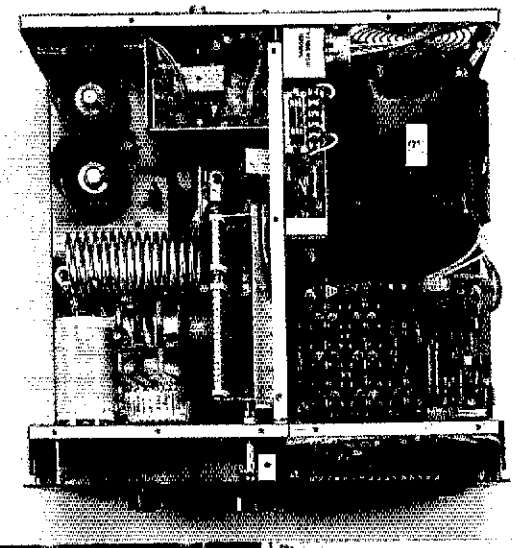

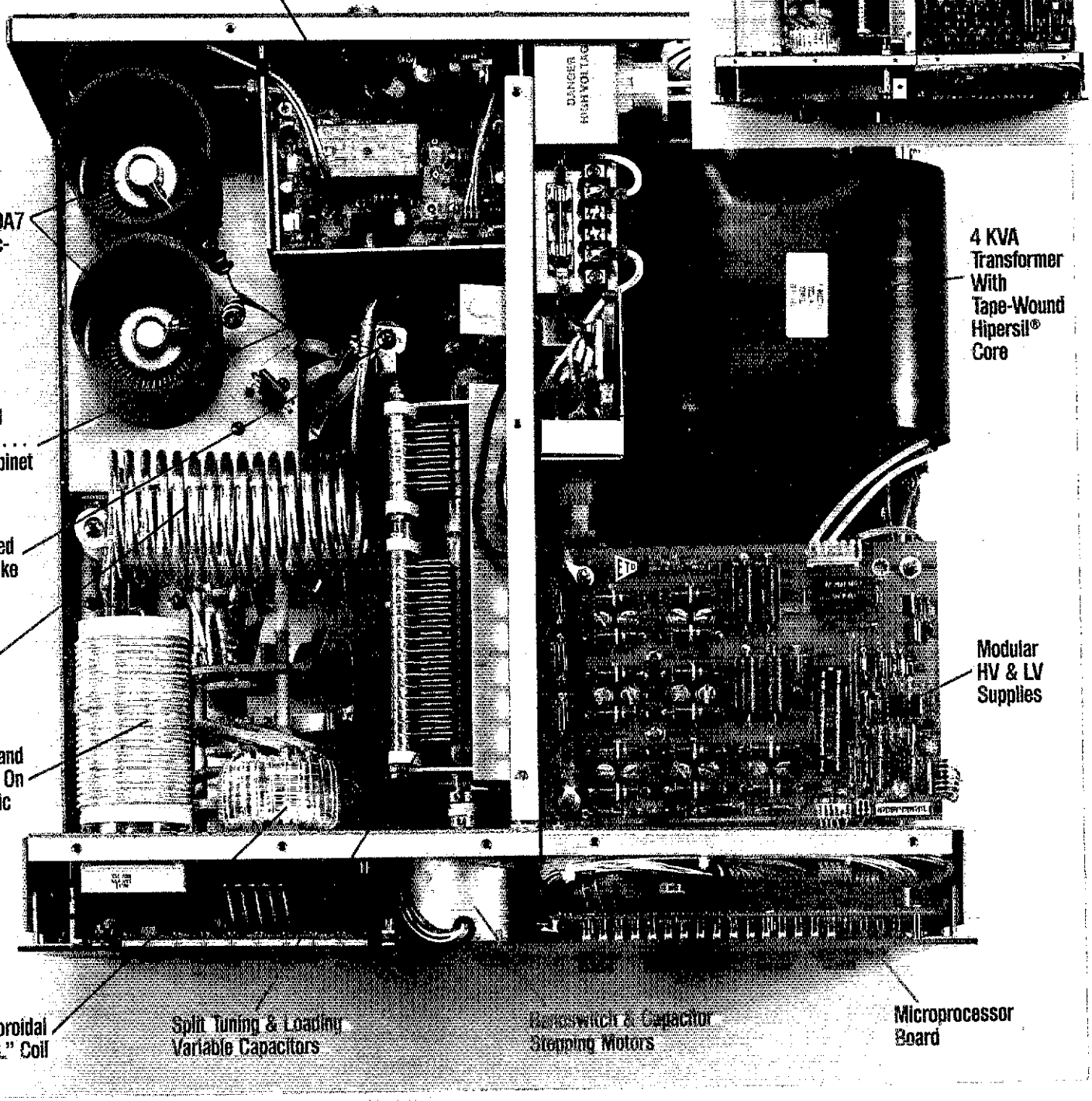

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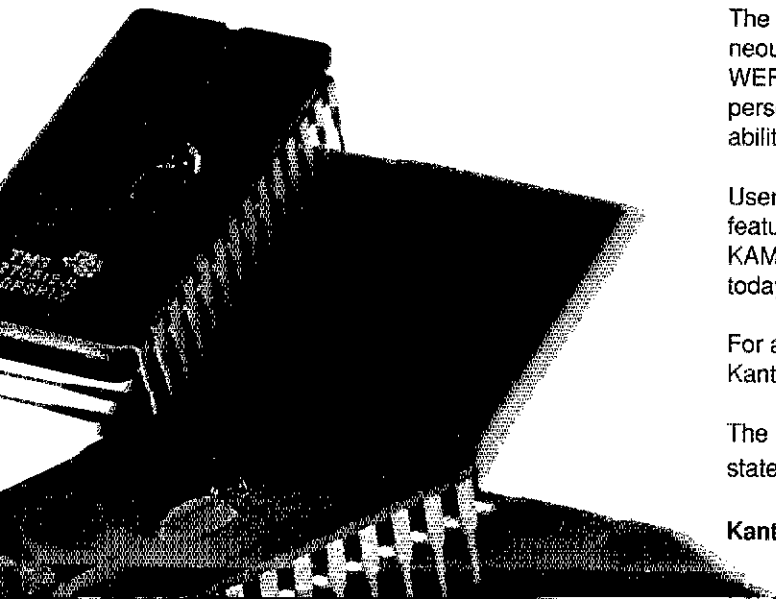

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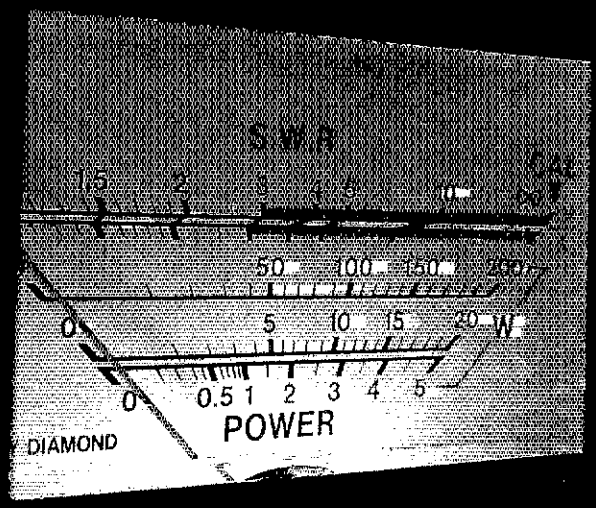

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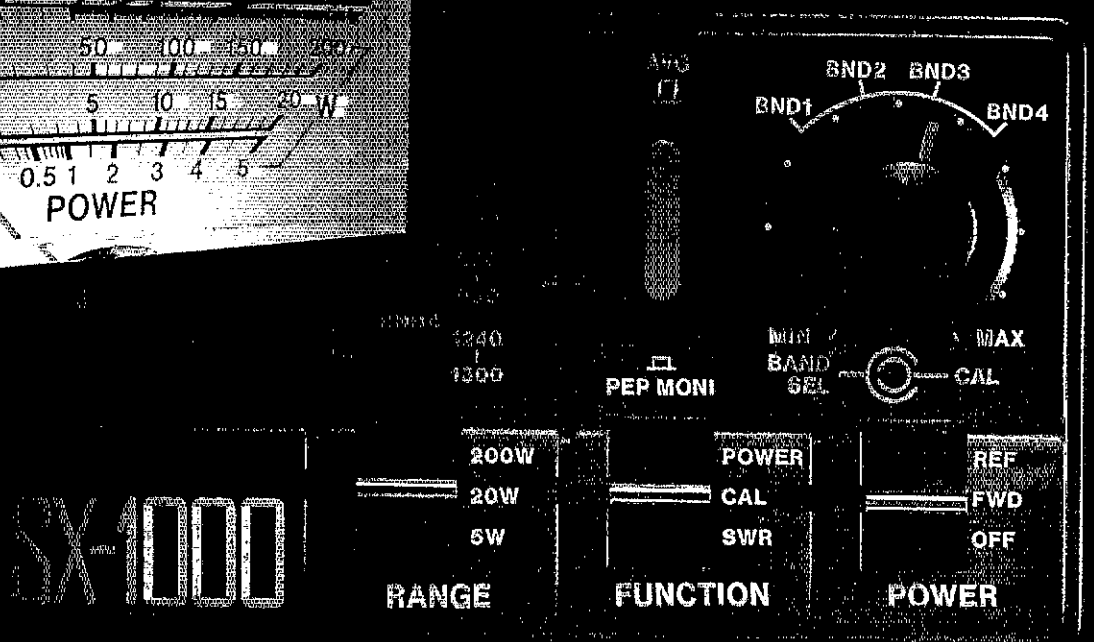

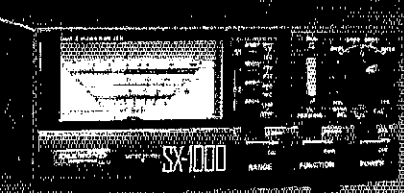

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Accuracy FS: 10%
Insertion Loss : 0.2dB
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REFLECTIONS –Transmission Lines and Antennas

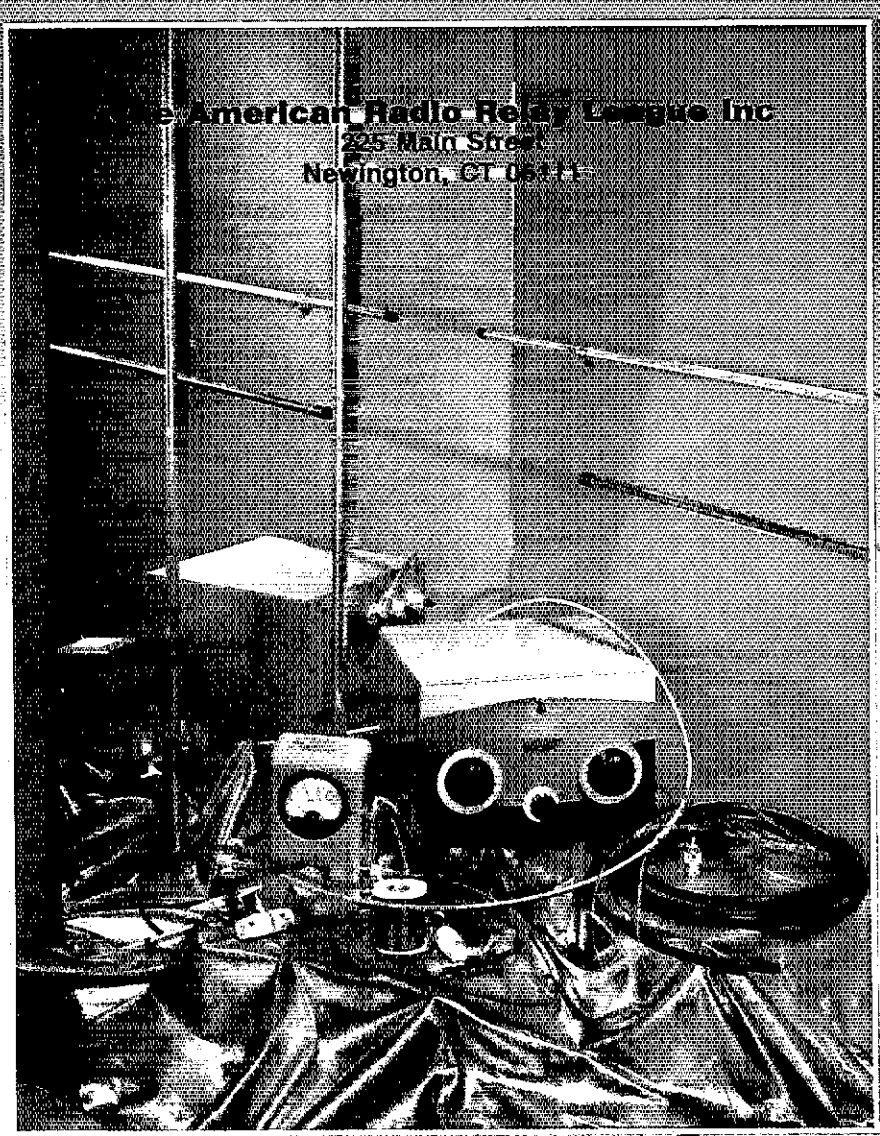
by M. Walter Maxwell, W2DU

A Book that puts "King SWR" in perspective

Reflections is written to clear the air of the half-truths and outright myths we hear these days about transmission lines, standing waves, antenna matching, reflected power and antenna tuners. The first seven chapters are based on "Another Look at Reflections"—one of the most popular series ever published in *QST*. The remaining seventeen chapters contain new and previously unpublished material which concludes the series. Besides giving "King SWR" a serious cross-examination, the book has a wealth of information on matching networks, antennas, and use of the Smith Chart. Software, described in Chapter 15, is available separately.

In order to improve knowledge of reflection mechanics and transmission-line propagation, Maxwell explains: Why reflected power by itself is an unimportant factor in determining how efficiently power is being delivered to the antenna. The effect of line attenuation to discover why it is the key factor which tells us when and how much to be concerned with reflected power. Why all power fed into the line, minus the amount lost in line attenuation, is absorbed in the load regardless of the mismatch at the antenna terminals. Why reflection loss (mismatch loss) is canceled at the input of the line by reflection gain. Why a low SWR reading by itself is no more a guarantee that power is being radiated efficiently than a high SWR reading guarantees it is being wasted. Why SWR is not the culprit in transmitter-loading problems—why the real culprit is the change in line-input impedance resulting from the SWR and why we have complete control over the impedance without necessarily being concerned with the SWR. The importance of thinking in terms of resistive and reactive components of impedance instead of SWR alone, and why SWR by itself is ambiguous, especially from the viewpoint of the selection and adjustment of the coupling and matching circuitry of an external line-matching network.

Reflections—Transmission Lines and Antennas was written by Walt Maxwell, W2DU, a noted antenna designer for RCA Laboratories. From 1960 until retirement in 1980, Walt was in charge of the Astro-Electronics Division Space Center Antenna Laboratory and Test Range.



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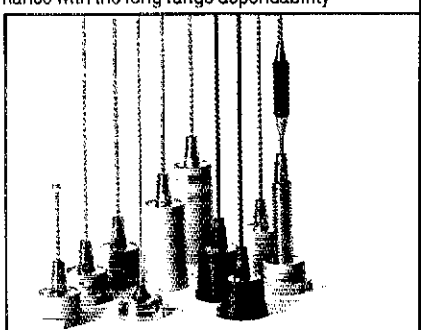

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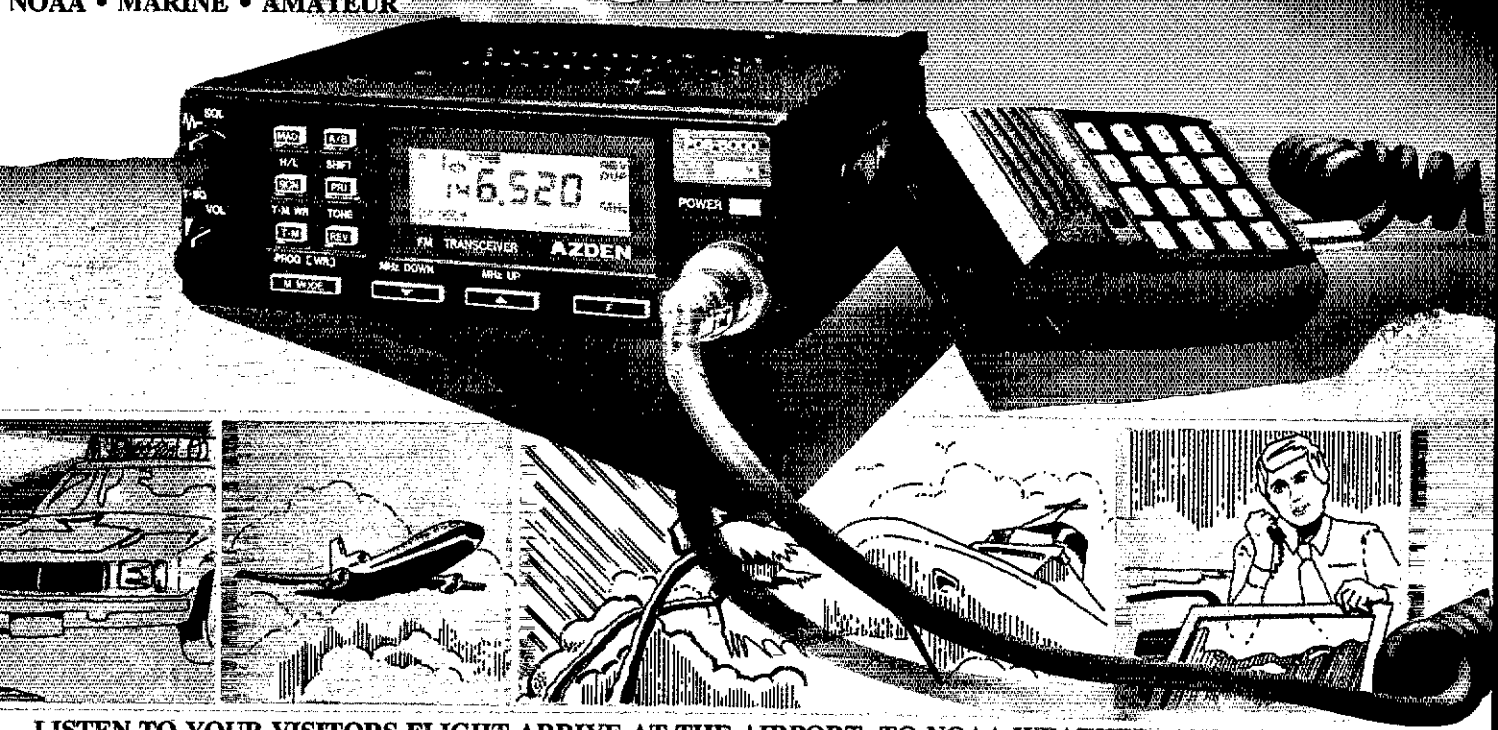

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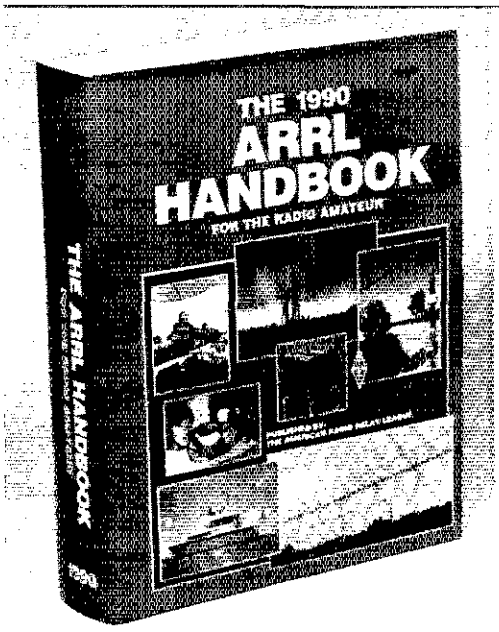

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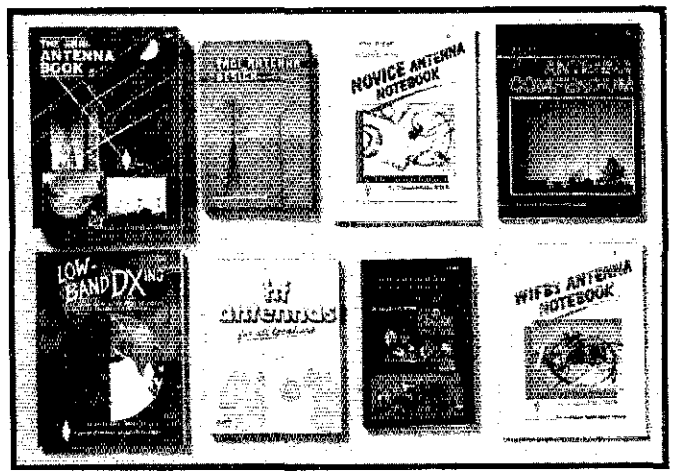

Novice Antenna Notebook is written by Doug DeMaw, W1FB, for the beginner Amateur Radio operator. With this book you can choose which wire, vertical or beam antenna suits your needs, and you'll be ready for all of the fun of seeing that the antenna you put up really works! Don't let the lack of an antenna keep you from getting on the air. Contains pictorial drawings that show dimensions for Novice and Technician band use.....**#308-8 $10.**

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221S-1	TH3JRS Thunderbird, 750W PEP	403.00
390S	TH2MKS Thunderbird, 2 elements	378.00
396S	30/40 Meter Kit for Exp. 14	162.00

MODEL	MONOBAND BEAMS	AMATEUR NET
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236S	153BAS 3 element 15 meter	200.00
226S	203BAS 3 element 20 meter	325.00
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377S	205BAS Long John 5 element 20 meter	713.00
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371S	Discoverer 7-1 Rotary dipole 30/40 meter	294.00
372S	*Discoverer 7-2 2 element 40 meter*	662.00
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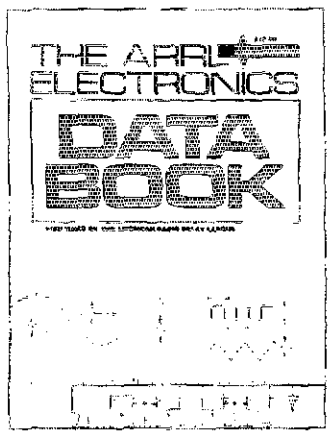
Other Publications

ARRL Data Book is a valuable aid to the RF design engineer, technician, radio amateur, and experimenter. All those commonly used tables, charts, and those hard-to-remember formulas are found in this one source. You'll also find hundreds of popular circuit diagrams of oscillators, mixers, amplifiers, other devices and their operating parameters. Written by Doug DeMaw, W1FB .....**#219-7 $12.**



Hints and Kinks offers hundreds of ideas contributed by individual authors. Ideas such as setting up your gear for comfortable and efficient operation, solving interference problems that sometimes crop up, and tailoring your equipment to your individual operating preferences are just some of what makes up this edition. You're sure to find the answer to that tricky problem that has been bothering you, or a simple project that you can build which will add to your operating convenience.....**#300-2 $8.**

DX Power written by Eugene B. Tilton, K5RSG, is the complete survival manual for every radio amateur entering the competitive fray of DXing! This is your chance to learn all the tricks, techniques, and operating methods used by experienced DXers the easy way—without having to suffer the frustrations and setbacks that usually plague beginners at this aggressive Amateur Radio sport.....**#T74-0 $10.**

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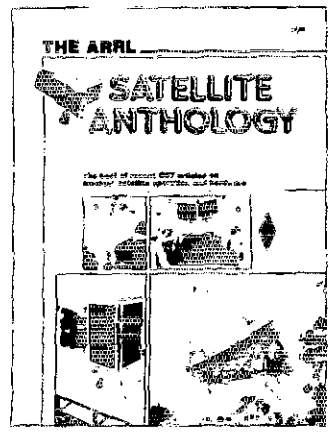
QRP Notebook written by Doug DeMaw, W1FB, presents construction projects from a simple 1-watt crystal-controlled transmitter to more complex transceiver designs for the low power operator. Doug guides you through the projects "building block" style. This way, you gain an understanding of how the building blocks might be put together in other configurations. Experience firsthand the thrill of a contact using equipment you built .....**#306-1 $ 6.**



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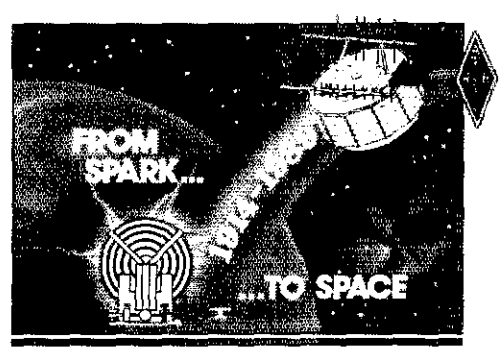

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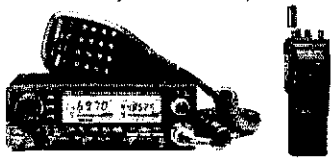

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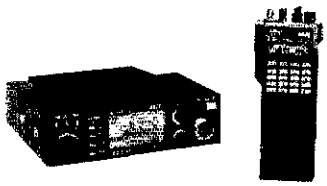

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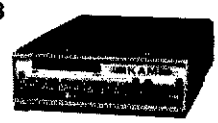

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This book is a collection of projects published in *QST* publications over the past 15 years. You will learn how to build receivers, transmitters, transceivers and accessories. There's a chapter on portable antennas. Power supplies, and a host of accessories are described. The chapter on design hints covers amplifiers, antenna networks, electronic switching and direct-conversion receivers.

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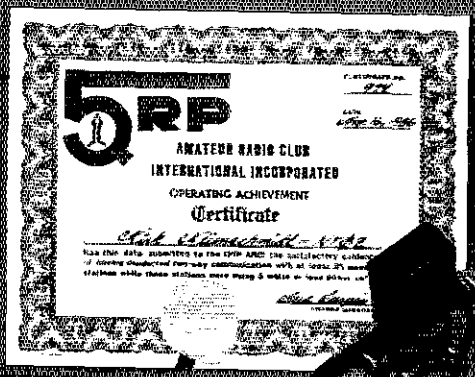

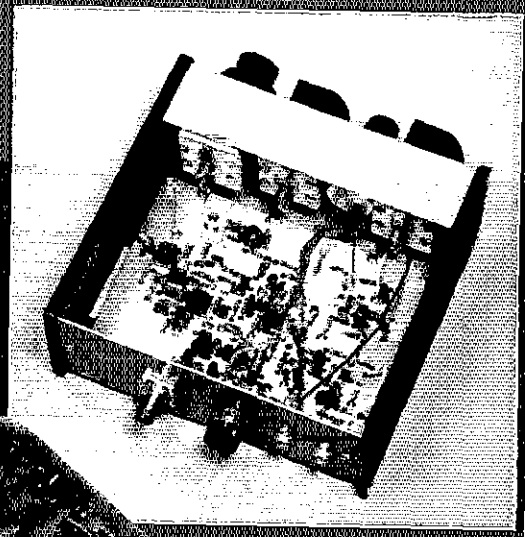

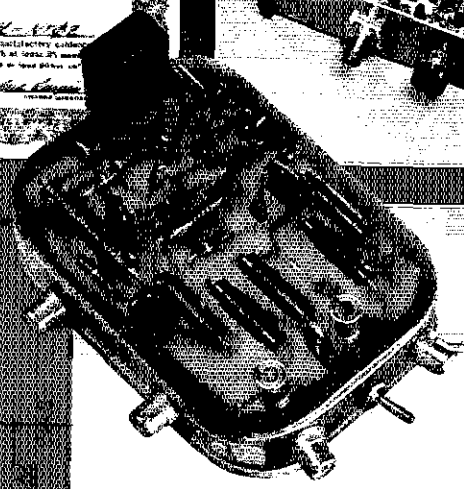

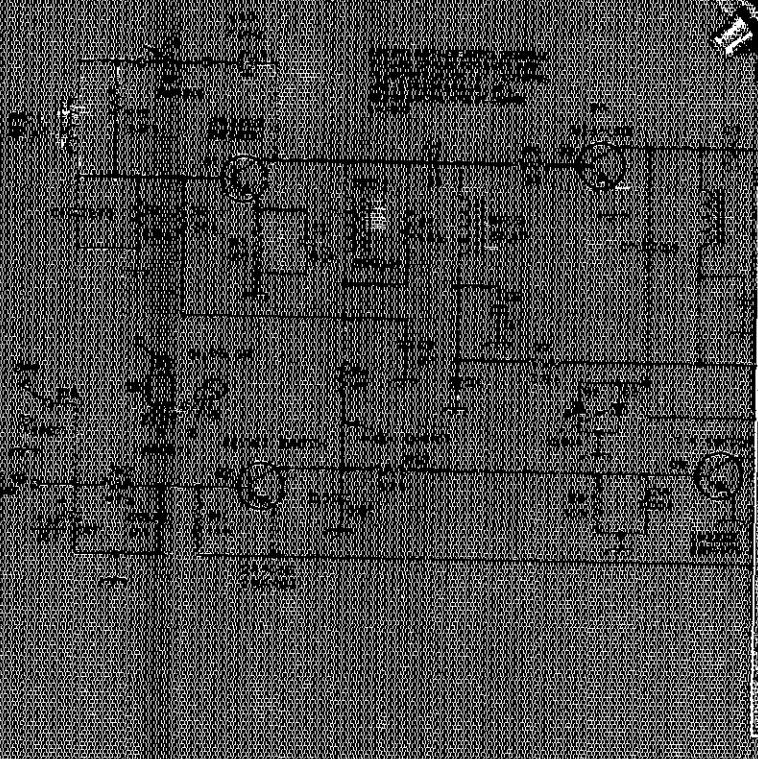

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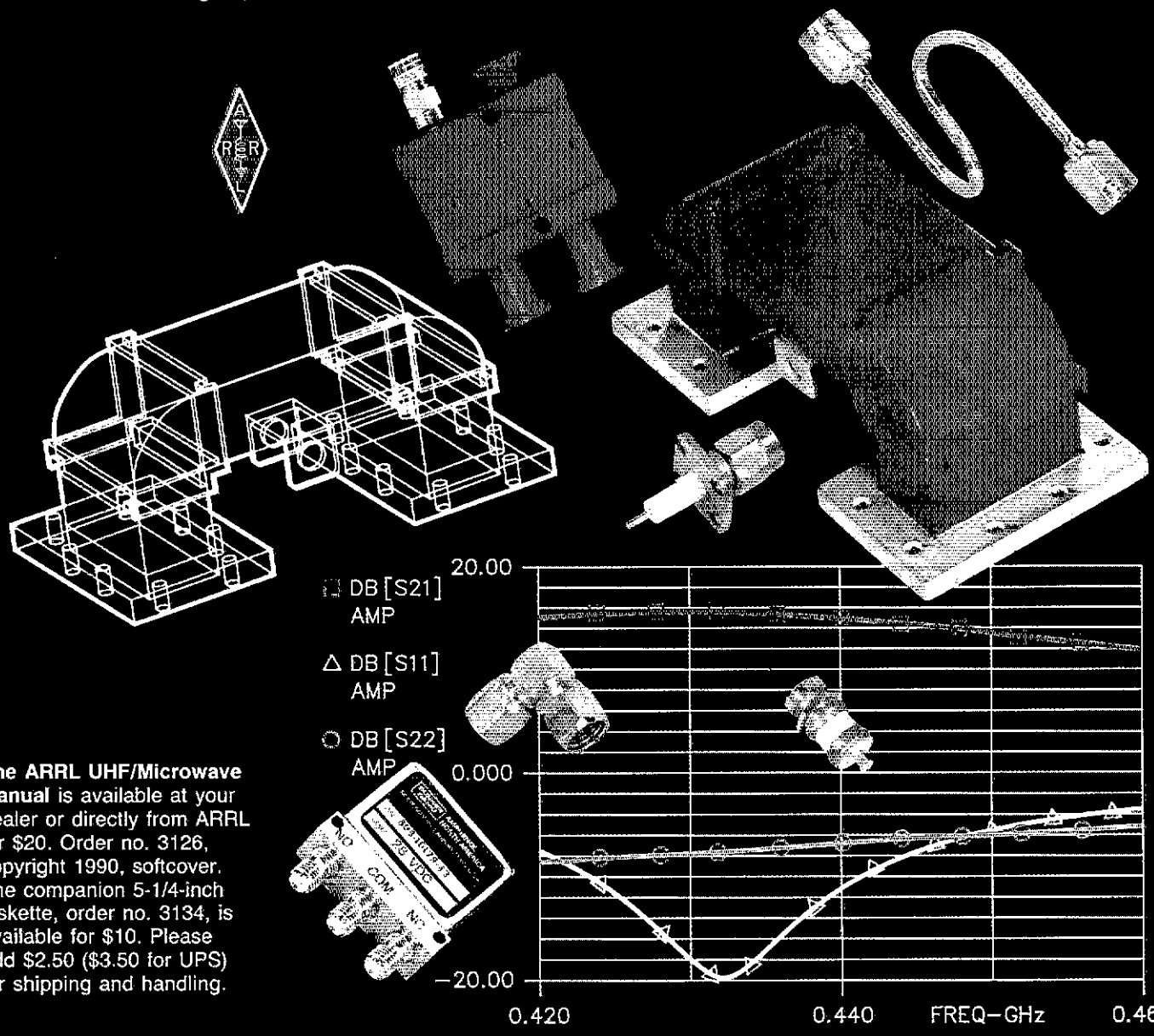

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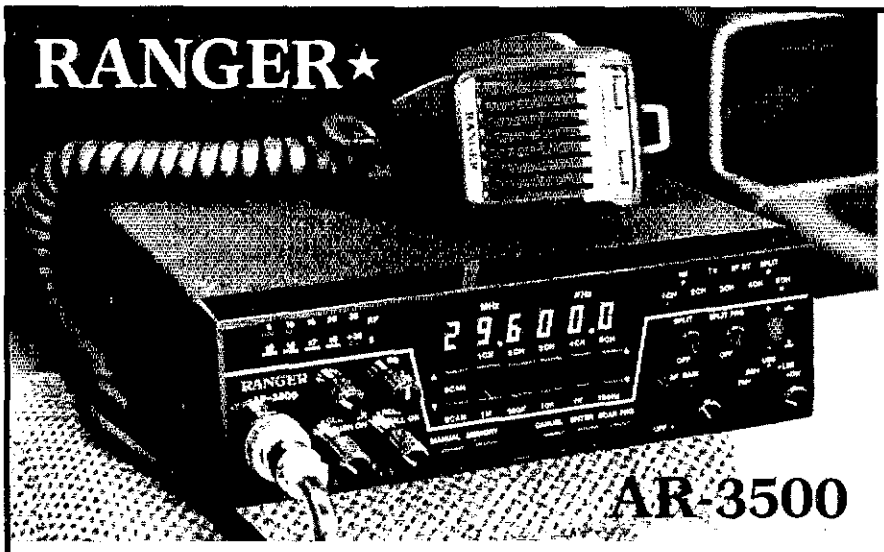

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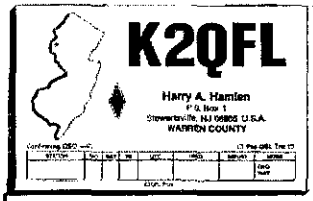

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3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash 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 September 14th through October 13th will appear in December *QST*. If the 13th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

6) New firms or individuals offering products or services for sale must submit a production sample (which will be returned) for our examination. Dealers are exempted, 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

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.

PROFESSIONAL CW operators, retired or active, commerical, military, gov.'t, police, etc. invited to join Society Of Wireless Pioneers - W6WOW, 146 Coleen Street, Livermore, CA 94550.

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.

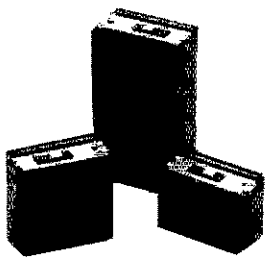
QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed for entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA Inc., 1409 Cooper Drive, Irving, TX 75061.

HAMS FOR Christian Missionaries and Blessings for Obedience serve many needs of missionaries and churches. Net skeds are M-F @ 0.002 UTC, 14.320 MHz 9:00 PM CST/7:00 PM PST/Sn 28.400 2:200 CST, 21.330 4:00 CST. Teach all nation Sat. 21.365 10:00 EST. Contact HCM, 3120 Ryan Drive, Escondido, CA 92025, 619-480-4477.

LITTLE BIG HORN NETS. Sundays: 21.352-2130Z and 14.057-2200Z. WA2DAC/Nm.

BATTERIES "R" US...

You've bought our replacement batteries before...
NOW YOU CAN BUY DIRECT FROM US, THE MANUFACTURER!



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CM2, BP2 7.2v @ 500MAH
CM5, BP5 10.8v @ 500MAH
SUPER
7S 13.2v @ **1200MAH** **$63.95**
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(base charge only - 1" longer)
ICOM CHARGES AVAILABLE

For ICOM: Convertible Battery



8 Cells Alkaline or Nicad Holder
$26.00 COMPLETE WITH (8) ALKALINE BATTERIES



BP-7 13.2v @ 500MAH **$61.95**
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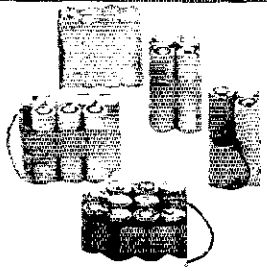
SEPTEMBER
Special of the Month

YAESU FBA-17
Convertible Holder
(9V Alkaline)



SPECIAL PRICE: $13.50

Look for October's *Special of the Month*



CUSTOM MADE BATTERY PACKS & INSERTS
Made to your specifications.
Introductory Offer!
KENWOOD INSERTS
PB-21 - $13.75, PB-25 - $20.00,
PB-26 - $20.00
ICOM INSERTS
BP-5 - $23.00, BP-3 - **$17.45**
BP-7, BP-8

Prices subject to change without notice.

MasterCard and Visa cards accepted. NYS residents add 8¼% sales tax. Add $3.50 for postage and handling.

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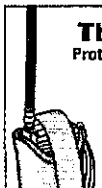
The Pouch
Protection for your ham-held!
Tough..... resilient..... black neoprene



For Every Portable
Every Battery

"S" "Short" - 6".
"SS" New Super-Slim-7".
"G" "Generic" - 8"
"L" "Long" - 9".

A sturdy web belt-loop sewn on the back extends over the top and is secured on the front with a velcro tab.

The Pouch

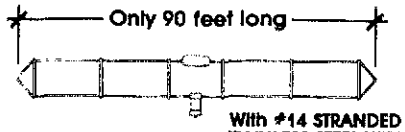
1-800-72-Pouch (Dealer Information)

CONTINUOUS COVERAGE ANTENNAS FOR COMMERCIAL & AMATEUR SERVICE

Model AC 3.5-30

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

US Patent No 4,423,423



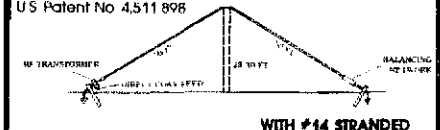
$198.00 SHIPPING & HANDLING ADD $4.00

NEW **$273.00** SHIPPING & HANDLING ADD $4.00
With #14 STRANDED STAINLESS STEEL WIRE

Model AC 1.8-30

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

US Patent No 4,511,898



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- COMPLETE DXCC RULES
- SHOWS COUNTRIES WHERE CARDS MAY BE SENT THROUGH THE ARRL OUTGOING QSL BUREAU
- LISTS ITU AND CQ ZONES PLUS THE CONTINENT OF EACH COUNTRY
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Now keep all of your DXCC records on this handy and complete 16 page book. Available postpaid for $1.00 a copy.

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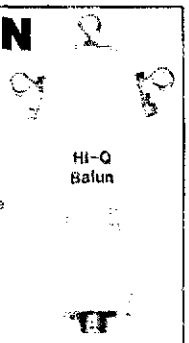
- For dipoles, yagis, inverted vees and doublets
- Replaces center insulator
- Puts power in antenna
- Broadbanded 3-40 MHz.
- Small, lightweight and weatherproof
- 1:1 impedance ratio
- For full legal power and more
- Helps eliminate TVI
- With SO 239 connector
- Built-in DC ground helps protect against lightning



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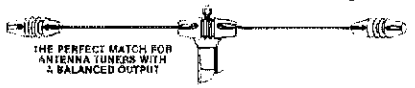
- Small, rugged, lightweight, weatherproof
- Replaces center insulator
- Handles full legal power and more
- With SO 239 connector

$6.95

THE ALL-BANDER DIPOLE



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- Includes custom molded insulators molded of top quality material with high dielectric qualities and excellent weatherability
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- Handles 2 kw PEP & covers 160 through 10 meters
- May be trimmed to fit small city lots

Only $29.95

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MODEL	BANDS	LENGTH	PRICE
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D-80	80/75	130'	$31.95
D-40	40/15	66'	26.95
D-20	20	33'	27.95
D-15	15	22'	26.95
D-10	10	16'	25.95
Shortened dipoles			
SD-80	80/75	90'	35.95
SD-40	40	45'	33.95
Parallel dipoles			
PD-8010	80,40,20,10/15	130'	43.95
PD-4010	40,20,10/15	66'	37.95
PD-8040	80,40/15	130'	59.95
PD-4020	40,20/15	66'	33.95
Dipole shorteners — only, same as included in SD models			
S-80	80/75		$13.95/pr.
S-40	40		12.95/pr.

All antennas are complete with a HI-Q Balun. No. 14 antenna wire, insulators, 100' nylon antenna support rope (SD models only 50'), rated for full legal power. Antennas may be used as an inverted V, and may also be used by MARS or SWLs

Antenna accessories — available with antenna orders	
Nylon guy rope, 450 lb. test, 100 feet	$4.49
Molded Dogbone Type antenna insulators	*1.00/pr*
SO-239 coax connectors	55
No. 14 7/22 Stranded hard drawn copper antenna wire	08/ft.

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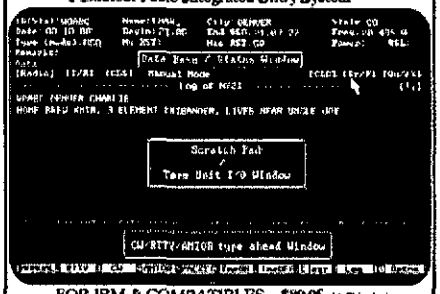
Dealer Inquiries Invited

Aries-2

Amateur Radio Integrated Entry System



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> Logging / Terminal / RC / Contest program (simultaneously)
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> Reads and controls *Icom, Kenwood, Ten-Tec, Yaesu Xcvrs**
> Automatically inserts Freq. / Mode / Date / Time into Log
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> Scrollable QSO buffer > Selectable disk capture
> Sort and Print logs by Date, Prefix, Country > QSL labels
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> User defineable colors for all foreground / background
> Dupe checking, logging, Radio Control during digital QSOs
> Scan Radio based on Log search. Change freq, mode, VFO, TU mode, etc, with mouse or keypress. (MPU's interface required)*

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- Packet/Computer forums
- Commercial/Manufacturer exhibits
- Acres of flea market
- Women's craft demos
- Saturday night banquet
- Sunday exam session, walk-ins OK!

Admission: $4 advance; $5 at the gate. Banquet: $12 per person, reservations req.
Write: Superfest '90, P.O. Box 3461, Peoria, Ill. 61614. Call: 309-674-5656.
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ENGRAVING: Callsign/Name Badges by WØLQV. SASE for price sheet. Box 4133, Overland Park, KS 66204.

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QSL's — Quality for less is back! See our display ad in this issue of *QST*. Harry A. Hamlen, P.O. Box 1, Stewartsville, NJ 08886.

QSLs & RUBBER Stamps. Top quality QSL samples and stamp information $1 (refundable with order). Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

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QSL SAMPLES send $1 (refundable with order) Box 1262, Point Roberts, WA 98281.

DON'T Buy QSL Cards until you see my free samples. Also I specialize in custom cards and QSL business cards. Write or call for Free Samples and custom card ordering information. Little Print Shop, Box 1160, Pflugerville, TX 78660, 512-990-1192.

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RAISED Printed QSLs. Very unique. You can feel the type! Our new laser technology produces exotic callsign type effects. Super high quality. Standard designs or use your own artwork/computer graphics to create a really personal QSL. We now offer state outlines in 3-D. $1 for samples & information. Dennis, WA5QMM, Network QSLs, P.O.B. 13200, Alexandria, LA 71315-3200, 318-443-7261, FAX: 318-445-9940.

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CANADIAN QSL Cards, send $1 for samples refundable with your order. M. Smith, VE7FI, 18610-62nd Avenue, Surrey, BC CANADA V3S 7P1.

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QSLS — 1) Famous KØAAB custom with background collection. 2) Railroad employees and railfan's specials. 3) Front report styles. 4) Multiple callsigns. 5) Ham business cards. State your sample wants. 45 cent self-addressed business size envelope required for free samples and catalog. Mahre & Sons Print Shop, 2095 Prosperity Avenue, Maplewood, MN 55109-3621.

QSL SALE! 100 cards $8, 200/$11, 300/$14, 500/$20, 1000/$33. Shipping included. Guaranteed correct. Free AM radio with 1000 card order! Phone or write today for samples or ordering. Shell Printing, KD9KW, Box 50, Rockton, IL 61072, 815-629-2193.

QUALITY QSLs At A Quality Price. For samples send $1 (refundable with order) to S & S Printing, P.O. Box 843, Cabot, AR 72023.

LAKESIDE QSLS—sixteen full picture color designs. Samples $1 (refundable). P.O. Box 43043, Seven Points, TX 75143.

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PIN-FEED continuous 90# white card stock for computer generated QSL's or MRC's. 3-1/2 × 5-1/2 finished size: 500/$10, $3.50 shipping; 1000/$18, $4.50 shipping US. Mobile Bureau Press, Box 6436-C, Florence, SC 29502.

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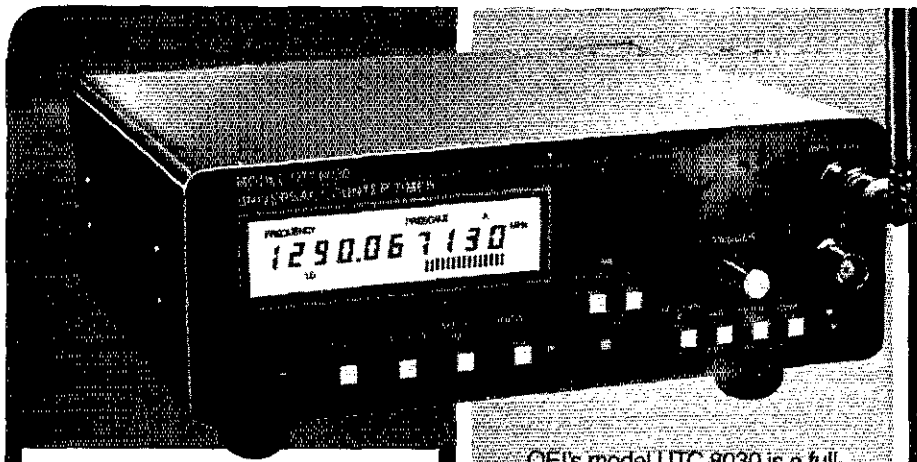
WANTED: Old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Avenue, Milw., WI 53204.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. Q, Berwyn, IL 60402.

WANTED: Radio, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond, Glendale, CA 91201, 818-242-8961.

WANTED: *QST* VOLUME 1. W6ISQ, 82 Belbrook Way, Atherton, CA 94025.



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QEI's model UTC 8030 is a full-featured Universal Counter-Timer with a Frequency Finder built in a unique bench/portable enclosure.

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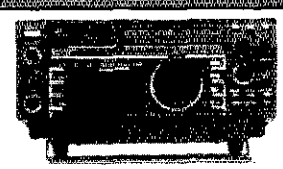

ICOM IC-735

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MULTI BAND TRAP ANTENNAS

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Model	Bands	Traps	Length	Price
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D-52	10/15/20/40/80	2	105'	69.95
D-56	10/15/20/40/80	6	82'	114.95
D-68	10/15/20/40/80/160	8	146'	149.95

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VS-41	10/15/20/40	1	28'	49.95
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VS-53	10/15/20/40/80	3	42'	74.95
VS-64	10/15/20/40/80/160	4	73'	94.95

*Can be used without radials
**Feedline can be buried if desired ***Permanent or Portable Use

ALL TRAP ANTENNAS are Ready to use - Factory assembled - Commercial Quality - Handle full power - Comes complete with: Deluxe Traps, Deluxe center connector, 14 ga Stranded CopperWeld ant. wire and End Insulators. Automatic Band Switching - Tuner usually never required - For all Transmitters, Receivers & Transceivers - For all class amateurs - One feedline works all bands - Instructions included - 10 day money back guarantee!

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Model	Band	Length	Price
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D-15	15	22'	18.95
D-20	20	33'	19.95
D-40	40	66'	22.95
D-80	80/75	130'	25.95
D-160	160	260'	34.95

Includes assembly instructions, Deluxe center connector, 14ga Stranded CopperWeld Antenna wire and End Insulators.

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LS-40K	40	36'	$44.95
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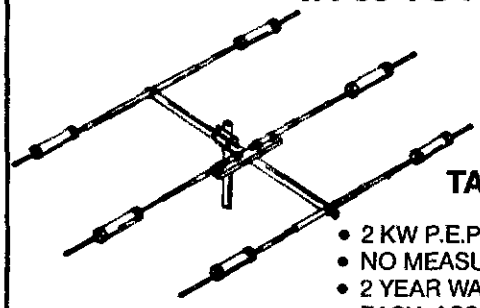

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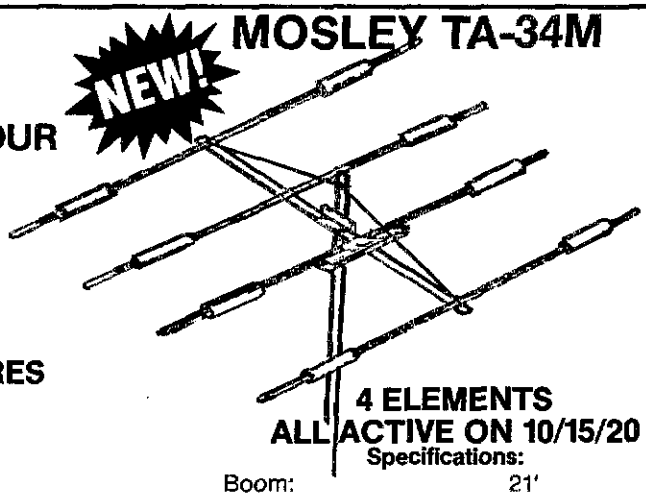

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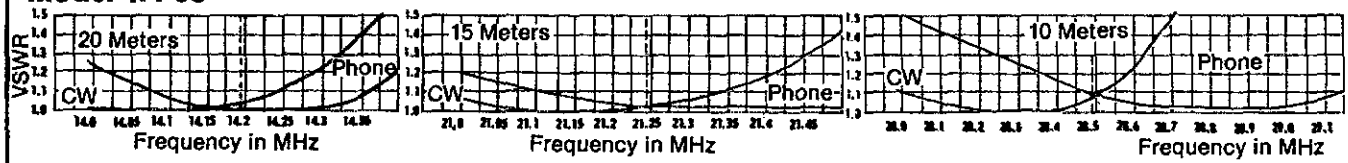

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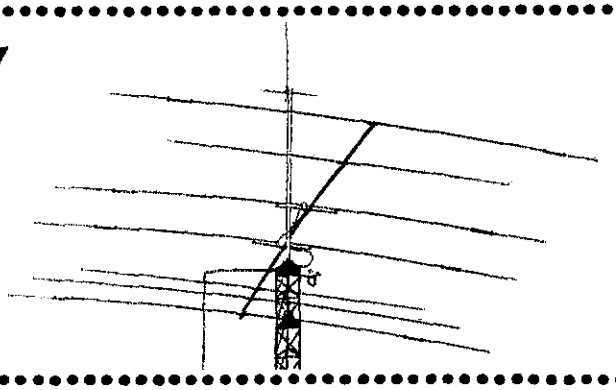

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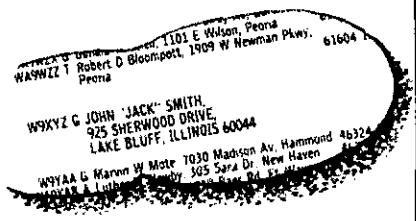

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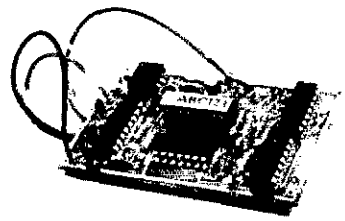

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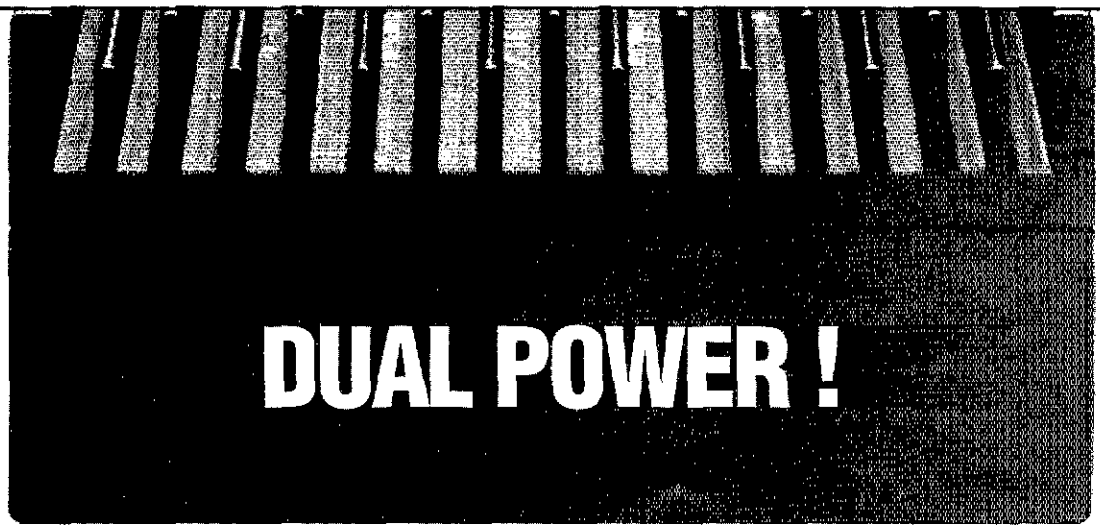

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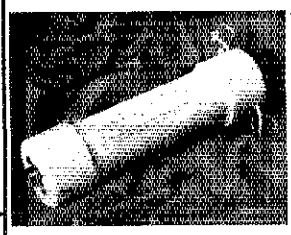

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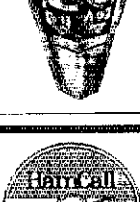

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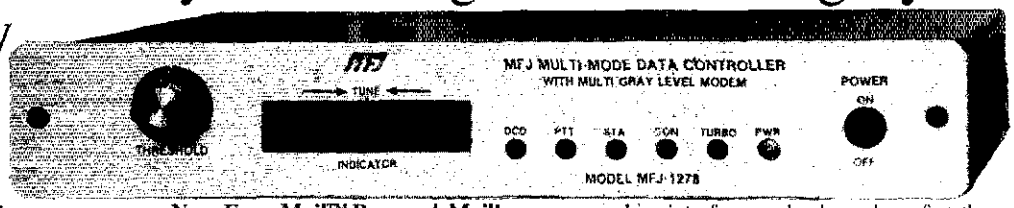

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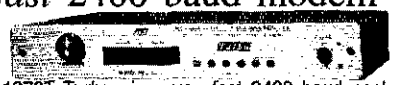

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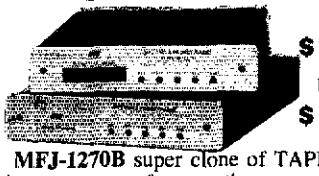

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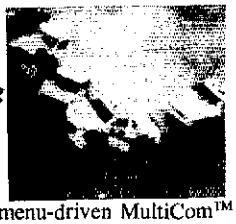

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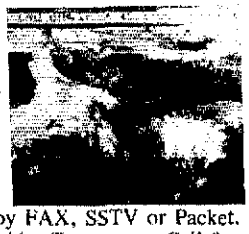

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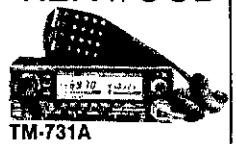

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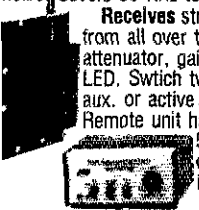

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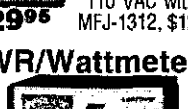

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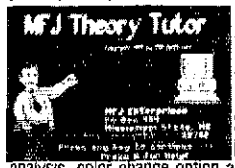

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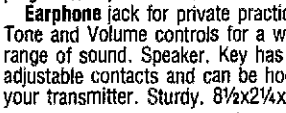

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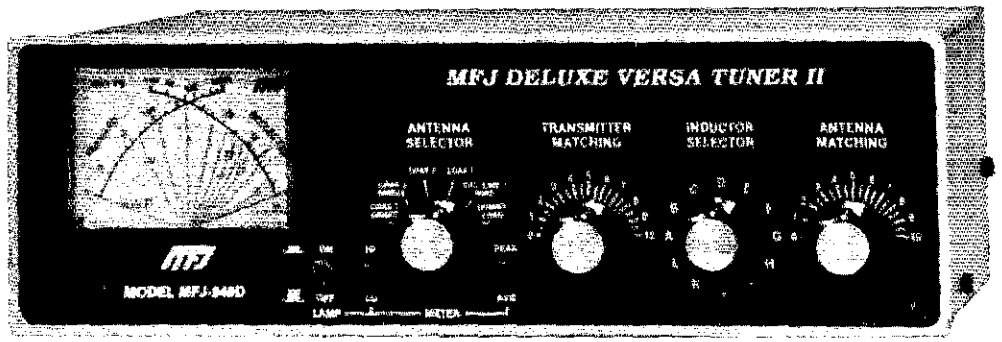

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Put the most power into your antenna

The MFJ-949D Deluxe 300 watt tuner matches your rig to virtually any antenna from 1.8-30 MHz so you get maximum power out.

It tunes out SWR on verticals, dipoles, inverted vees, random wires, beams and mobile whips fed by coax, balanced lines and wire.

Lighted peak reading meter

MFJ's *peak* (and average) reading Cross-Needle meter shows you SWR, forward and reflected power — all in a glance. Shows peak SSB power.

The meter is illuminated for easy reading in dim light. Has light switch. Lamp requires 12 V.

Built-in dummy load

A built-in 300 watt 50 ohm dummy load makes tuning up your rig soooo *easy*. It reduces needless QRM and saves your finals.

You'll find it handy for testing and repairing your rig, setting power level adjusting your mike gain and more.

An external dummy load can cost you ***another $30*** — plus it takes up valuable space at your operating position and requires another cable.

Full 1.8 to 30 MHz coverage

Make sure the tuner you're considering covers *all* the HF bands . . . the MFJ-949D does.

Plus more . . .

You get an antenna switch that lets you select 2 coax lines (direct or thru tuner), random wire or balanced lines and built-in dummy load. You get a 4:1 balun for balanced lines.

Unconditional Guarantee

You get a full one year unconditional guarantee. We will repair or replace your MFJ-949D (at our option) *no matter what* for a full year.

Others may give you a 90 day limited warranty. What do you do after 90 days? Or before 90 days if they say, "Sorry, it's your fault"?

Precise control for minimum SWR

The MFJ-949D gives you more precise control for minimum SWR than any tuner that uses two tapped inductors.

Why? Because the two continuously variable capacitors in the MFJ-949D give you infinitely more positions than the limited number on two switched coils.

This gives you precise control to get minimum SWR and maximum power into your antenna.

After all, isn't that why you use a tuner?

High efficiency and a compact size

The MFJ-949D uses a single high-Q airwound coil that takes up a minimum of space without mutual coupling problems.

You get a highly efficient tuner that puts maximum power into your antenna *and* a compact 10x3x7inch size that 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.*

Easy to tune

With the MFJ-949D once you select the correct inductance, you can turn on your transmitter and tune *both* capacitors for minimum SWR.

Tuners *with two tapped coils* make tuning clumsy, slow and tedious.

You have to turn off your transmitter *each time* you adjust either of the two inductors. Then turn it back on to readjust the capacitor and to check for acceptable SWR.

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Why settle for an imitation when you can own an MFJ original? Get your MFJ-949D today!

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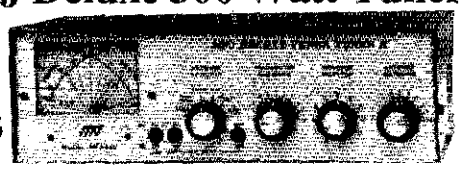


If you don't need a dummy load but want **all** the other features of the MFJ-949D choose the new MFJ-948 for only $129.95.

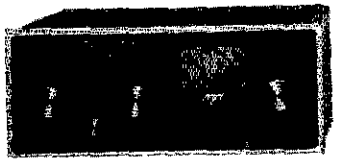
The MFJ-948 features a **peak** reading **lighted** meter with a built-in lamp switch, a one year unconditional guarantee and is made in the USA.

Remember, with MFJ you're getting proven performance and reliability from the most trusted name in antenna tuners.

MFJ's 1500 Watt Tuner

MFJ-962C

$229.95



For a few extra dollars the MFJ-962C lets you use your barefoot rig now and have the capacity to add a 1.5 KW PEP linear amplifier later. It covers 1.8 to 30 MHz.

You get MFJ's new peak and average reading Cross-Needle SWR/Wattmeter.

You also get a 6-position antenna switch and a teflon wound 4:1 balun with ceramic feed-thru insulators for balanced lines. Measures just 10¾x4½x14 7/8 inches.

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Why Choose an MFJ Tuner?

Hard-earned Reputation: There's just no shortcut. *MFJ is a name you can trust* -- more hams trust MFJ tuners throughout the world than all other tuners combined.

Proven Reliability: *MFJ has made more tuners for more years than anyone else* -- with MFJ tuners you get a highly-developed product with proven reliability.

First Rate Performance: MFJ tuners have earned their reputation for being able to match just about anything -- *anywhere.*

One year *unconditional* guarantee: That *means* we will repair or replace your MFJ tuner (at our option) *no matter what* happens to it for a year.

Continuing Service: MFJ Customer Service Technicians are available to help you keep your MFJ tuner performing flawlessly -- no matter how long you have it -- just call 601-323-5869.

Your very best value: MFJ tuners give you the most for your money. Not only do you get a *proven* tuner at the lowest cost -- you also get a one year *unconditional* guarantee and *continuing* service. That's how MFJ became the world's leading tuner manufacturer -- by giving *you* your very best *value.*

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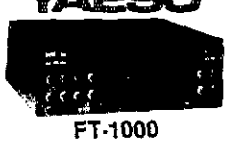

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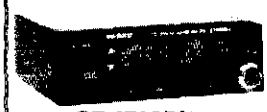

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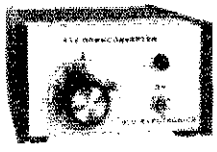

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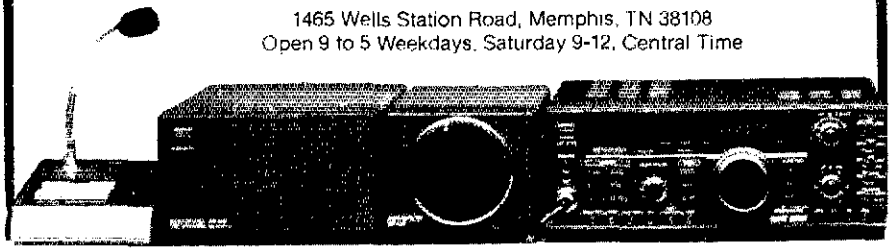

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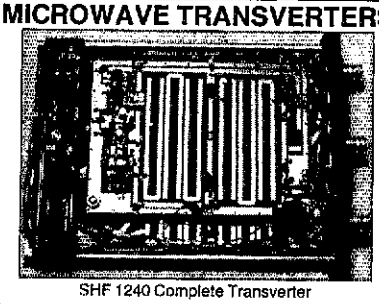

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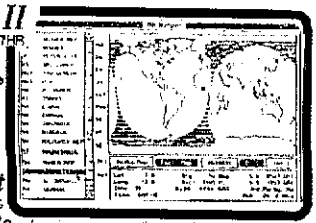

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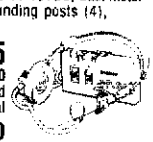

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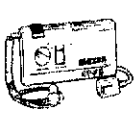

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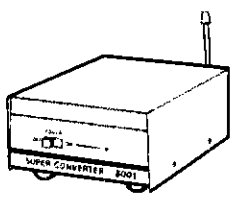

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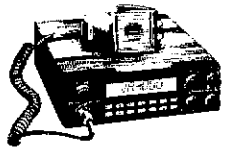

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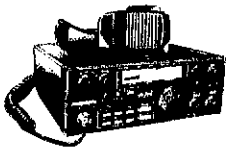

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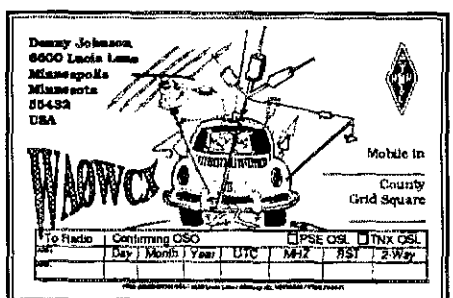

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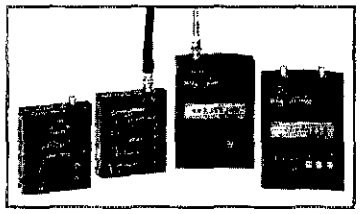

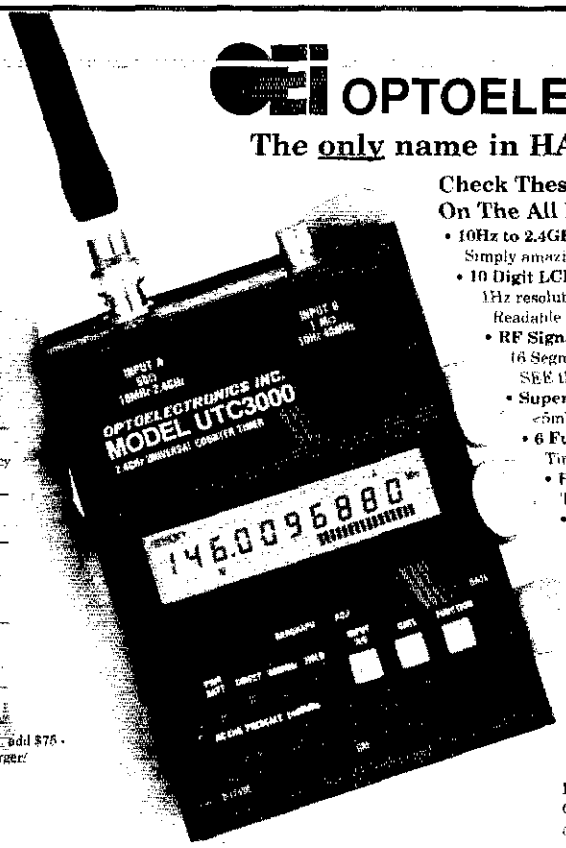

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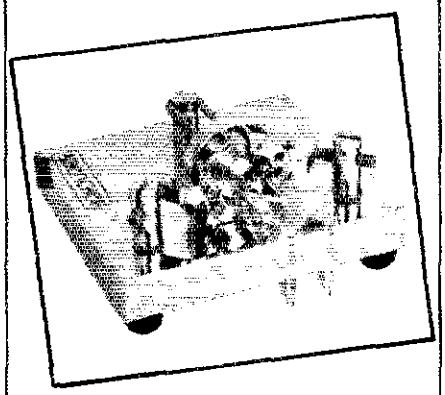

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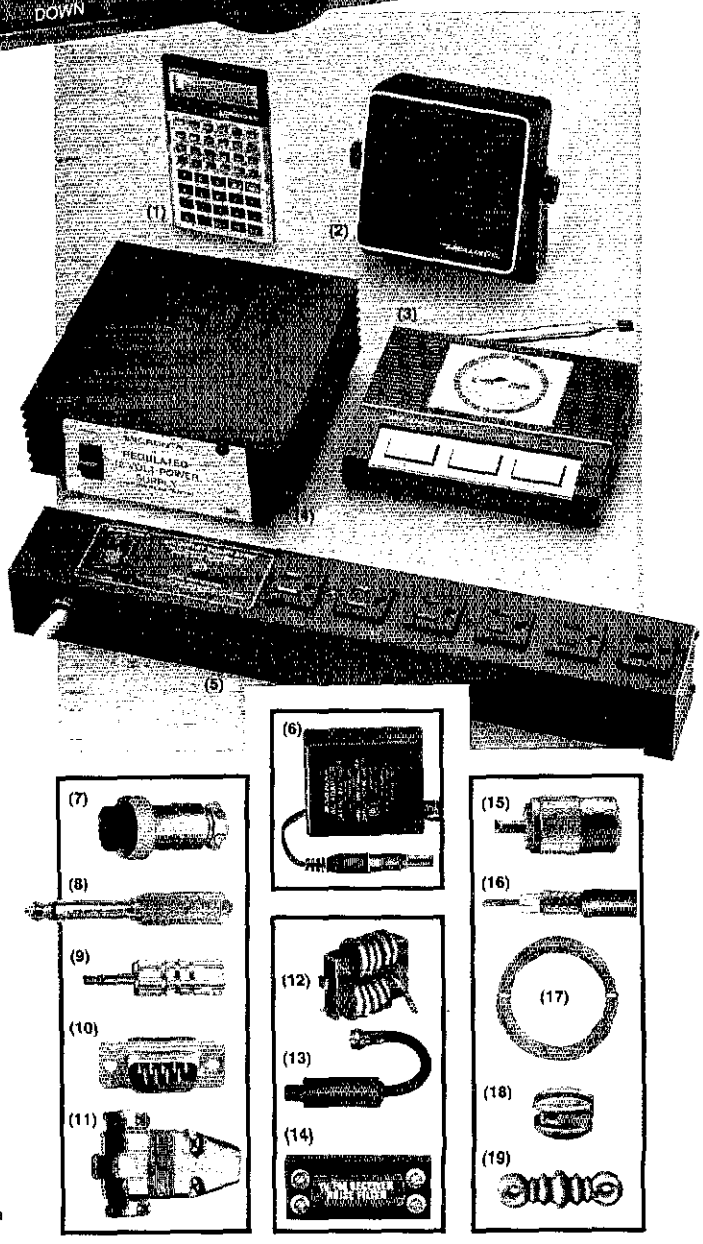

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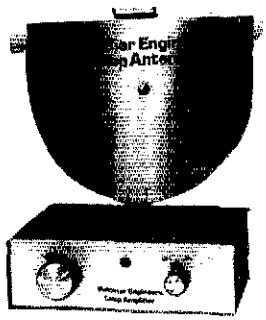

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TM-331A - 220, 25W TM431 - 70CM, 25W
TM-2530A - 2M, 25W TM-2550A - 2M, 45W
TM-2570A - 2M, 70W TM-3530A - 220, 25W
TR-751A - 2M, SSB TH-75 - 2M / 70CM HT
TH-26 - 2M Tiny HT TH-25 - 2M Tiny HT
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IC-228H - 2M - 45W Mobile Xcvr.
IC-32AT - VHF / UHF - 2M Talkie.
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MODEL	AMPS	ICS	PRICE
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RS12A	9	12	79
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RS20M	16	20	119
RS35A	27	35	159
RS35M	27	35	179

Models With "M" Suffix Have Meters.

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KANTRONICS KAM - All Mode
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Telex HAM4 - 15 SQ. FT.
Telex TAILTWISTER - 20 SQ. FT.
Telex HDR300 - 25 SQ. FT.
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cushcraft

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A4S - 4 Element Triband Beam.
A743 / A744 - 30/40 Kit For Above.
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AP8 - 80-10M Vertical Antenna.
D40 - 40M Rotatable Dipole.
40-2CD - 2 Element, 40M Beam.
A50-5 - 5 Element, 6M Beam.
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230WB - 30 Element, 2M Beam.
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All Models Shipped Factory Direct - Prepaid.
Features: All Steel - Hot Dipped Galvanized - Self-Supporting - With Rotor Shelf and Winch.

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HG52SS	52 FT.	9 S.F.
HG54HD	54 FT.	16 S.F.
HG70HD	70 FT.	16 S.F.

Accessories For Hygain Towers Are Also Available For Immediate Delivery. CALL FOR PRICE!

TELEX HYGAIN ANTENNAS

New DX88 HF Vertical Antenna.
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QK710 - 30/40M Add-on Kit.
V2S - V3S - V4S - VHF/UHF Vert.
TH5MK2S - 5 El., Triband Beam.
TH7DXS - 7 El., Triband Beam.
205BAS - 5 El., 20M Beam.
155BAS - 5 El., 15M Beam.
105BAS - 5 El., 10M Beam.
204BAS - 4 El., 20M Beam.
64BS - 4 El., 6M Beam Antenna.
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18HTS - 80-10M Hylower Vertical.
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ROHN
GUYED TOWER PACKAGES

HEIGHT	25G	45G	55G
50	849	1229	1549
60	939	1389	1939
70	999	1719	2159
80	1199	1869	2369
90	1289	2039	2579
100	1369	2199	2969
110	1449	2459	3209
120	1569	2619	3429

These Towers Are Shipped Complete With The Following: All Guy Hardware, Base Section, Rotor Plate, According To ROHN Specifications. 70 MPH Design. Towers Are Shipped Freight Collect From Plano, TX. **IN STOCK NOW!**

FOLDOVER TOWERS

Model	Height	Load Cap.
FK2548	48 Ft.	15.4S.F.
FK2558	58 Ft.	13.3 S.F.
FK2568	68 Ft.	11.7 S.F.
FK4544	44 Ft.	34.8 S.F.
FK4554	54 Ft.	29.1 S.F.
FK4564	64 Ft.	28.4 S.F.

GGK25GII - Double Guy Kit $ 299.
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The Above Specifications Are At 70 MPH, With The Above Double Guy Kit Properly Installed. ROHN Foldover Towers Are Drop Shipped Freight Paid; Cost 10% Higher West Of The Rockies.

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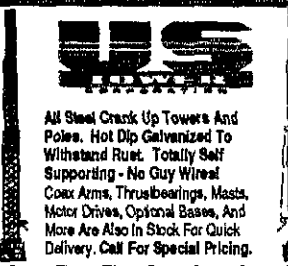

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MA50	22 Ft.	50 Ft.	10 Sq.'	999
TX438	22 Ft.	38 Ft.	18 Sq.'	919
TX455	22 Ft.	55 Ft.	18 Sq.'	1385
TX472	22 Ft.	72 Ft.	18 Sq.'	2279
HDX555	22 Ft.	55 Ft.	30 Sq.'	2079
HDX572	22 Ft.	72 Ft.	30 Sq.'	3559

Shipping On US Tower Models is Collect From Visalia-California. Calif. Residents Please Add 6% State Tax.

ROHN SELF SUPPORTING BX TOWERS

Model	Height	Load	Weight	Price
HBX40	40 Ft.	10 Sq.'	228	$ 449
HBX48	48Ft.	10 Sq.'	303	589
HBX56	56 Ft.	10 Sq.'	385	699
HDBX40	40 Ft.	18 Sq.'	281	569
HDBX48	48 Ft.	18 Sq.'	363	689

All ROHN BX Series Towers Are Shipped Freight Prepaid In The Contenental United States. These Towers Come With The Base Stubbs At No Additional Charge As Well As The Rotor And Top Plates. The Above Antenna Load Ratings Are At 70 MPH. Please Note That ROHN Does Not Reccomend Using This Tower With Antennas That Have A Boom Length Exceeding 10 Foot.

GUY WIRE AND HARDWARE

3/16 EHS Guywire (3990 Lb. Rating)	.15 / Ft
1/4 EHS Guywire (6650 Lb. Rating)	.18 / Ft
5/16 EHS Guywire (11,200 Lb. Rating)	.29 / Ft
5/32 (7X7) Aircraft Cable (2700 Lb. Rating)	.15 / Ft
3/16 CCM - Cable Clamp For 3/16 or 5/32	.45
1/4 CCM - Cable Clamp For 1/4	.55
1/4 TH - Thimble For All Guywire Listed	.45
3/8 EE - 3/8 X 6 Eye And Eye Turnbuckle	6.95
3/8 EJ - 3/8 X 6 Eye And Jaw Turnbuckle	7.95
1/2 X 9 EE - 1/2 X 9 Eye And Eye Trnbkl.	9.95
1/2 X 9 EJ - 1/2 X 9 Eye And Jaw Trnbkl.	10.95
1/2 X 12 EE - 1/2 X 12 Eye And Eye Trnbkl.	12.95
1/2 X 12 EJ - 1/2 X 12 Eye And Jaw Trnbkl.	13.95
5/8 X 12 EJ - 5/8 X 12 Eye And Jaw Trnbkl.	16.95
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500D - Guy Insulator (Up To 3/16)	1.99
502 - Guy Insulator (Up To 1/4)	3.49
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.25	69	109	129	159	189	249

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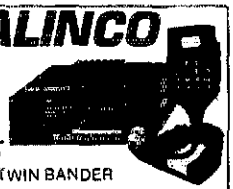

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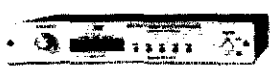

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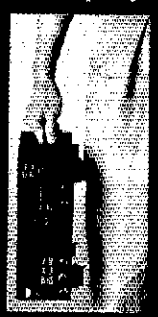
The three-frequency operation lets you win the battle of the bands and communicate clearly on 6m, 10m and 12m frequencies. These less crowded bands put your transmission high in the sky and above the noise.



The FT-650 packs substantial communications power in a stream-lined, compact case. A flip-out handle makes it the perfect portable, while a built-in power supply (AC or DC) lets it function as a base station. Broadcast from anywhere–mountain tops, remote islands, boats, vehicles or just the suburbs—and hear the difference with the FT-650.

Jump on the FT-650 three-band wagon and get above the crowds and noise.

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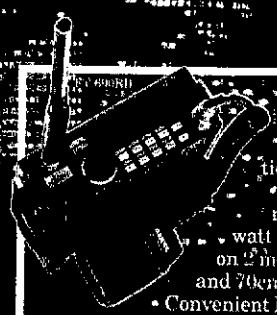
- Extended receiver coverage—24.5 to 56MHz.
- Automatic seeking IF Notch Filter.
- 100% continuous operation duty cycle.
- 105 Memory channels: 99 channel memories, 4 programmable scan memories and 2 priority channels.
- All mode operation (SSB, CW, FM & AM).
- Optional accessories: DVS-2 Digital Voice Recording System module • MD-1B8 Desk top microphone • SP-5 External speaker with AF filter.

For complete information about these and other Yaesu products, call your local Yaesu dealer today.



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- **CTCSS encode built-in, selectable from the front panel.**
- **Selectable frequency steps** for quick and easy QSY.
- **TM-241A provides 50 W. TM-441A 35 W, and TM-541A 10 W.** Three power positions, 5, 10, and full. The TM-541A has two power positions, 1 and 10 watts.
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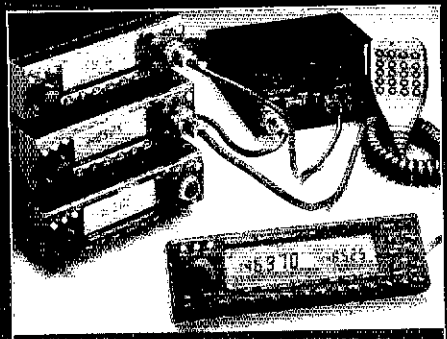
- **Tone Alert System with Elapsing Time Indicator.**
- **Auto-power off function, and time-out timer.**



RC-20 Remote Control Unit
As supplied, one RC-20 will control two transceivers. **Most often-used front panel functions** are controllable from the RC-20. The RC-20 and IF-20 combine to allow control of up to four radios.

- **Selective calling and pager option.** The DTU-2 option enables the Dual Tone Squelch System (DTSS), allowing selective calling and paging using standard DTMF tones.
- **Digital recording system option.** Used in conjunction with the tone alert system, the DRU-1 allows message storage of up to 32 seconds.
- **Multiple scanning functions.** Band and memory scan, with selectable scan stops and memory channel lock-out.
- **Large LCD display with four-step dimmer control.**
- **Automatic Lock Tuning (ALT) for the TM-541A.** Compensates for drift.
- **Supplied accessories.** Mounting bracket, DC cable, fuses, MC-44DM multi-function DTMF mic.

Optional accessories

• **DRU-1** Digital Recording Unit • **DTU-2** DTSS unit • **IF-20** Interface unit, used with the RC-20, allows more than two transceivers to be remotely controlled • **MA-700** 2m/70cm dual band antenna with duplexer (mount not supplied) • **MB-201** Extra mounting bracket • **MC-44** Multi-function hand microphone • **MC-55** (8-pin) Mobile mic. with time-out timer • **MC-60A, MC-80, MC-85** Base station mics. • **PG-2N** Extra DC cable • **PG-3B** DC line noise filter • **PG-4G** Extra control cable • **PG-4H** Interface connecting cable • **PG-4J** Extension cable kit • **PS-50/PS-430** DC power supplies • **RC-10** Handset remote controller • **RC-20** Remote control head • **SP-41** Compact mobile speaker • **SP-50B** Mobile speaker • **TSU-6** Programmable CTCSS decoder

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