45241

Amateur Radio

http://www.cq-amateur-radio.com

SERVING AMATEUR RADIO SINCE 1945

AUGUST 2000

CQ

Solar Cycle Peak
See p. 124

In This Issue:

Plus...

On the cover: Ed Krome, K9EK, of Columbus, Indiana, [illegible] antenna array while "Uncle Sol" [illegible]nd, "heating up" Earth's ionosphere.

AMATEUR'S JOURNAL

U.S. $3.99 / Can

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ICOM IC-207H

Dual Band Features at a Single Band Price

ICOM RUGGED
One piece, die cast aluminum chassis makes a large heat sink.

REMOVABLE, REMOTABLE CONTROL HEAD. An optional feature of the '207H lets you separate the control head from the main unit. Only 4.3 inches wide, this little powerhouse is easy to fit on even the most crowded dashboards.

WORKS ONE BAND AT A TIME. Changing bands is as easy as entering the desired frequency.

SMALL SIZE, BIG VALUE. ICOM's most affordable mobile dual bander features 50 watts of power (35W UHF), multiple power settings, 182 memory channels, PC programming, and much more.

SPECIFICATIONS

Transmit: ..... 2 Meter, 440 MHz (70 CM)
Receive: ..... 118-174 MHz*, 440-450 MHz
Includes Air Band (*guaranteed 144-148 MHz)
Mode: ..... AM (Rx only), FM
Power: ..... 2 Meter: 50W/20W/10W/5W
440 MHz: 35W/20W/10W/5W
Power Supply Requirement: ... 13.8 V DC
Memory Channels: ..... 182 Total,
150 regular, 10 scan edges, 2 call
20 scratch pads
Size (approx): .. 5.5(W) x 1.6(H) x 7.3(D) in.
140(W) x 40(H) x 185.4(D) mm.
Weight (approx): ..... 2 lb, 6 oz /1.17 kg

FEATURES

- **Removable, Remoteable Control Head (optional operation)**
  - Super compact size
  - Big keys, big dials, big bright LCD
  - Optional separation cable required
- **Tone Squelch (CTCSS Encode/ Decode) and Tone Scan Standard**
  - 50 independently programmable tone frequencies for repeater and tone squelch use, respectively
- **Built to Military Specifications (MIL STD) 810 C/D/E shock/vibration**
- **On-Screen Menu "Soft Keys"**
- **Up to 9600 BPS Packet Capable**
- **Fast Scanning**
- **RF Attenuator (Variable)**
- **Auto Repeater Function**
- **Built-in Duplexer**
- **Wireless Mic Operation (optional)**

ONE TOUCH BAND SWITCHING
Easy operation on the go. Work one band at a time.

PACKET CONNECTION PORT
A 6-pin connection point on the back panel is provided for up to 9600 packet operation.

LARGE LCD DISPLAY
Contains "soft keys" menu information, SWR meter, big-sized frequency identification, and more.

50 WATTS
A full 50 watts of output power on 2 meters gives you a commanding on-air presence. 35 watts on 440 MHz.

DTMF MIC
Allows for easy control of most rig functions. Optional wireless mic available.

MIL STD 810 C/D/E

ISO 9002 SGS

ISO 9001 SGS

PC Ready!

ICOM options required for PC cloning:

CS-207 Cloning Software
OPC-646 Cloning Cable

A third party 6-pin serial cable is required for PC packet connection

WORK THE MAGIC ICOM

The '207H head will fit just about anywhere, whether in a boat, plane, motorcycle, car or truck. The IC-207 could be your next rig! Visit your ICOM dealer today or call our 24-hour free brochure line. **425-450-6088**

ICOM®
www.icomamerica.com

ICOM IC-Q7A

Get Higher Performance in a Pocket Size Dual Bander for a Lower Price!

SIMPLICITY
Large tuning knob, speaker mic jack and SMA antenna. Perfect for fun on the go!

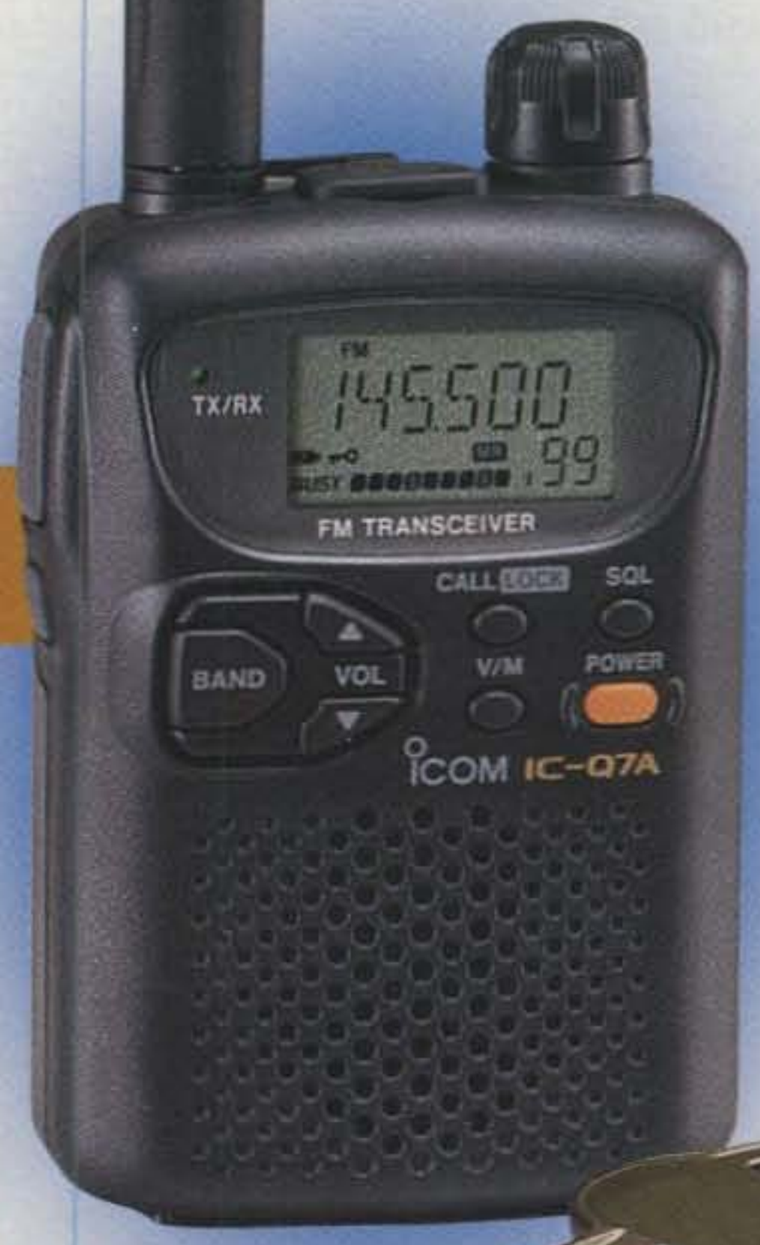
MORE WIDE BAND RECEPTION Hear what you've been missing! With frequency coverage of 30 to 1300 MHz*, you'll get more police, fire, aircraft, and other wireless communications.

GO BEHIND THE SCENES Take the 'Q7A to sporting events to hear the behind the scenes action, as well as communicate with others.

LESS STRAIN ON YOUR WALLET If you're looking for solid performance in a pocket size, the 'Q7A is your radio.

*Cellular frequencies blocked

POCKET SCANNER & TRANSCEIVER
Small enough to take almost anywhere. The 'Q7A's wide band receiver picks up more than other, larger multi-banders.



SHOWN AT ACTUAL SIZE

SPECIFICATIONS

Transmit ..... 144-148, 440-450 MHz
Receive ..... 30-1309.995 MHz*
The 'Q7A is a dual bander ham radio and a wide band RX scanner all in one!
Mode ..... FM, AM (WFM Rx)
Power ..... 350 mW (VHF), 300 mW (UHF) @ 3.0 V DC
Memory Channels ..... 200 total
2 banks of 100 memory channels include 10 edge scan channels & 2 call channels
Size ..... 2.3(W) x 3.75(H) x 1.1(D) in. 58(W) x 86(H) x 27(D) mm.
Weight ..... 6 oz / 170 g

FEATURES

- **Superior Receive System**
  - Triple conversion superheterodyne
- **Built to Military Specifications (MIL STD) 810 C/D/E Shock/Vibration**
- **One-Touch Band Selection**
  - Work one band at a time
- **CTCSS Encode/Decode (Tone Squelch)**
  - Fully adjustable, with pocket beep
  - 50 distinct encode frequencies
- **CTCSS Tone Scan**
- **Dual Watch**
- **Auto Repeater**
- **Numerous Scan Modes**
  - Including 3 priority scan modes
- **10 Tuning Steps**
- **Auto Power OFF and Power Saver**
- **Backlit LCD Display**

COMES WITH 2 RECHARGEABLE AA NI-CD BATTERIES AND CHARGER**
Total power control! Use either the supplied AA Ni-Cds or slip in a couple of alkalines. If you're on the road and your batteries run out of juice, fresh replacements are just a convenience store away.

Get more performance in a tiny pocket radio. Contact your authorized ICOM dealer today, or call ICOM for a free brochure. **425-450-6088**

WORK THE MAGIC ICOM

ISO 9002 SGS

SHOCK MIL STD 810 C/D/E VIBRATION

ICOM®

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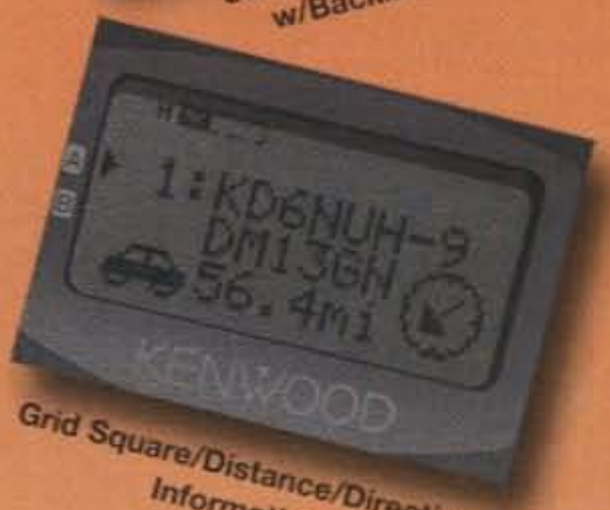
DEPARTMENTS

TH-D7A(G)

The Best Just Got Better

Unique Jog Controller w/Backlite Keys

Emergency Communications and Position



Grid Square/Distance/Direction Information

Monitor DX Packet Clusters

Complete Line of Accessories

PC Connectivity Used For Programming APRS®/Packet

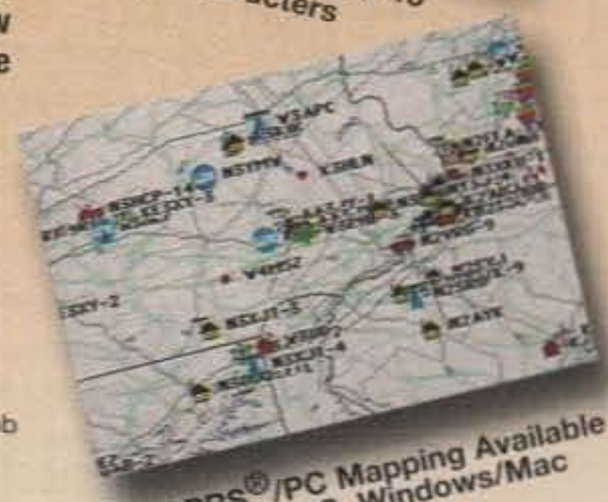
Advanced VC-H1 Controller

MIL-STD 810 C/D/E Water Resistance

Weather Station & PHG Data Reception

APRS® Messaging Up To 45 Characters

Great Companion for the TH-D7A



APRS® /PC Mapping Available For DOS Windows/Mac

- FM dual-band (144MHz/440MHz) hand held
- 5.5 Watts @ 13.6 volts
- 200 memory channels w/8 alpha display
- Built-in 1200/9600bps TNC (AX.25 protocol)
- Built-in APRS® (Automatic Position Reporting System) software
- GPS interface for position/directional data (NMEA-0813)
- Dual RX on the same band for voice and data (VHF only)
- PC Programmable for frequency and name (PG-4W required)
- 16-digit 10-channel DTMF memory
- Monitor DX Clusters
- DTMF remote control (TM-742A/TM-V7A)
- Dual receive on same band V+V/V+U
- AIP (intermod rejection)
- Free Operation manual at ftp://ftp.kenwood.net

NEW UPGRADE VERSION NOW AVAILABLE FOR SALE
"The TH-D7A was by far one of the most successful revolutionary radios ever produced by Kenwood. Now it has gotten even better. The New TH-D7A(G) has many of the same advanced features of the new TM-D700A mobile that includes selectable position memories, text memories, position ambiguity, new audible beeps and visual indicators, auto response message, to name just a few...You can even upgrade your current TH-D7A by sending it to a Kenwood Service Center for only $60 plus shipping. Visit http://www.kenwood.net to see a complete list of detailed upgrade features the new TH-D7A(G) offers and learn about our upgrade offer."

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Ham Radio News

From The CQ Newsroom

Breaking the (Light) Speed Limit

Scientists in the United States and Italy have independently succeeded in accelerating light beams and microwave radio signals well beyond the commonly accepted "speed of light" of 186,000 miles per second. While this is not directly related to amateur radio, it may force a basic change in thinking about the nature and limitations of all electromagnetic waves, including radio waves.

According to the Reuters news agency, scientists at the NEC Research Institute in Princeton, New Jersey, transmitted a pulse of light toward a chamber filled with specially treated cesium gas. Before the pulse had fully entered the chamber, the scientists say, it had gone all the way through it and 60 feet beyond it as well. Dr. Lijun Wang, who conducted the experiment, said the light pulse had traveled 300 times faster than usual and essentially existed in two places at the same time. Meanwhile, a group of physicists in Italy reported propagating microwaves 25% faster than normal light speed.

Scientists believe the most likely application of this work will be in further speeding the flow of signals through computer circuits. One scientist is quoted as saying he doubts this will change our fundamental views of the laws of physics. Another, however, says it's further evidence that the world may not actually operate according to any accepted conventions. (For hams, the ultimate result may be receiving a QSL card before making a contact!) Stay tuned for updates!

Phase 3D Now Slated For Autumn Launch

AMSAT's international Phase 3D satellite has been definitely scheduled for launch aboard Ariane 507, the seventh launch of the Ariane 5 booster system. That launch is tentatively scheduled for September or October. See the "Amateur Satellites" column in this issue for complete details.

FCC, VECs, Start Catching Up On License Applications

The huge influx of license applications brought about by restructuring has caused a significant backlog among both Volunteer Examiner Coordinators (VECs) and the FCC. The ARRL VEC reports that it received nearly 23,000 license applications between April 15 (when restructuring took effect) and May 26. As of June 15, it still had a backlog of more than 2000 applications, but the number was shrinking. Since ARRL VEC historically accounts for roughly half of all license exams given in the US, that would suggest that nearly 50,000 hams submitted applications for new or upgraded licenses in the first six weeks after restructuring. The FCC said it had processed over 9000 upgrades between April 15 and May 19, six times the normal numbers.

If the widely accepted estimate that only 100,000 to 150,000 licensed amateurs are actually active is true, then upgrades by 50,000 would mean that one-third to one-half of *all* active hams have upgraded as a result of restructuring. Another possibility is that thousands of inactive hams have "come back to life" and are upgrading and returning to the air.

WRC 2000 Sets Ham Items On 2003 Agenda

The 2000 World Radiocommunication Conference (WRC 2000) did very little that directly affected amateur radio. However, the committee setting the agenda for the next conference, in 2003, agreed to consider several issues important to hams. At the top of that list is a possible revision of Article S25 of the International Radio Regulation, which includes the requirement for Morse code proficiency as a condition of access to HF ham bands. Other ham-related topics that could be on the agenda in three years include realigning broadcast and amateur allocations on 40 meters to create a single, worldwide 40 meter band, greater flexibility in callsign assignment, and the possibility that "Little LEO" satellites will be back looking for more frequencies. In 1997 the satellite folks asked, among other frequencies, for the 2 meter and 70 cm ham bands.

The only action at WRC-2000 that affected hams directly, according to the *ARRL Letter,* was an agreement to protect the amateur satellite allocation at 1240–1300 MHz when several European countries implement a new radionavigation system, called Galileo, later this decade. Galileo is intended as a civilian supplement to the US Global Positioning System and Russia's GLOSNASS satellite navigation system, both of which were designed primarily for military use.

Frequency Changes Around the Globe

Hams in Australia will be getting another 25 kHz on 80 meters—three and a half years from now. According to the *ARRL Letter,* the Australian Communications Authority has okayed a reallocation that will expand the top end of 80 meters down under to 3800 kHz from its current 3775 kHz—effective January 1, 2004!

France has authorized amateur operation on the LF frequencies of 135.7 to 137.8 kHz, effective April 21, 2000, with a maximum ERP (effective radiated power) of 1 watt. The rule applies to French possessions overseas as well, including those in North and South America. This marks the first amateur LF allocations in the Western Hemisphere.

Moving even farther *down* the dial, the United Kingdom's Radiocommunications Agency has extended to June 30, 2001, special authorization for amateurs there to operate on the VLF frequency of 73 kHz. Experiments so far, according to the *ARRL Letter,* have resulted in reception of signal distances of greater than 1000 km, with all signals having an ERP of less than 100 mw.

Mir Vacant Again

The crew of cosmonauts that had reactivated Russia's Mir space station, and its ham station (see last month's issue), returned to Earth on June 16 after 10 weeks in orbit, leaving the station vacant again with plans for its future uncertain. Before leaving, though, the *ARRL Letter* reports that the crew held a 10-minute ham radio QSO with students at the Schnecksville School in Pennsylvania. Russian space officials say another mission to Mir might be possible if financing can be found.

New Record Claimed on 76 GHz

Meanwhile, at the opposite end of the radio spectrum, *Newsline* reports that a group of British hams has extended the distance record on 76 GHz to 17 km, following a successful contact between G3PYB, operating near Portsmouth, and two other hams, G8BKE and G8ACE, both near Winchester. The mid-day contact was made under variable weather conditions, with a constant mist and visibility of 5 km or less at all times.

New Neighbors on 902–928 MHz

Texas Instruments and two partner companies have unveiled a new UHF radio frequency identification (RFID) system for tracking merchandise in large warehouse settings. According to a statement from the companies, the system will operate in the 862–928 MHz range, beginning later this year with operations in North America on 902–928 MHz. This band is allocated to hams on a secondary basis, and non-licensed users may operate on a non-interference basis. This new system is one of a multitude of commercial low-power wireless applications being brought to this band, and is a mixed blessing for hams.

On the one hand, the noise floor is increased even if there is no direct interference, and the likelihood of direct interference grows with every new user on the band (and it's highly unlikely the FCC will tell a big company it has to reoutfit its warehouse RFID system because it's causing you interference). On the other hand, the growing popularity of this band means that a lot of commercially built equipment is available for it at low prices; equipment that hams can then modify to run at higher power and use in a wide variety of amateur applications.

FCC Goes After Uncoordinated Repeaters

The FCC has reminded the operators of three unocoordinated repeaters—one in Arkansas, one in New Jersey, and one in

(Continued on page 119)

An APRS® transceiver built for tomorrow's communication needs with advanced features available today.

NEW!

TM-D700A DATA COMMUNICATOR 144/440MHz FM Dual Bander

Conspicuous with its extra-large amber & black display, Kenwood's new TM-D700A is fully equipped to make the most of the exciting opportunities offered by the Kenwood Skycommand System, SSTV, GPS and APRS® –the Automatic Packet/ Position Reporting System that is rapidly gaining popularity worldwide. This mobile transceiver with built-in TNC offers a wide range of data communications options, including simple packet operation using the AX.25 protocol. You can also send and receive SSTV images using Kenwood's VC-H1. Ham radio is truly entering a new era.

APRS® (Automatic Packet/Position Reporting System)

- **Position/directional data**
  With an NMEA-0183 compatible GPS receiver you can transmit position data for automatic calculation of distance, current speed and heading. Last 4 digits can be masked for position ambiguity. Manual input of latitude/longitude is also possible.
- **Versatile messaging**
  Transmission of position data can be accompanied by a choice of programmable status text (up to 28 characters), position comments (15 settings), icons and bulletins. For added messaging flexibility, individual alpha messages (up to 64 characters) can also be sent.
- **Station list**
  Store received APRS® data in up to 40 station reports.
- **Grid square locator**
  Position data is displayed on the grid square locator for visible reference.
- **BCON TX interval (0.2/0.5/1/2/3/5/10/20/30 min.)**
- **Packet path selection for Digipeat**
- **Weather station & PHG data reception**
- **Digipeat station and DIGI function capability**
- **Auto Message Reply**
- **Audible APRS® message receive (call sign) notification (requires VS-3)**
- **Waypoint position data output**

FEATURES

◗ Full Dual-band operation: VHF x VHF/ VHF x UHF/UHF x UHF ◗ Wide-band receive: 118–524, 800–1300 MHz (excluding cellular blocked + frequencies) ◗ Detached panel (extension cable and panel holder supplied) with extra-large (188 x 54 dots) backlit LCD and multifunction key display (reversible) ◗ Improved key operation announcement with optional VS-3 voice synthesizer ◗ Built-in 1200/9600bps TNC compliant with AX.25 protocol and KISS mode ◗ Simplified packet monitoring ◗ SSTV functions with Fast FM for transmission of images in just 14 secs (approx.) and dual receive for voice and image transmissions (two frequencies simultaneously) ◗ 200 memory channels with 8-character memory name input ◗ Up to 10 programmable memory scan banks ◗ Easy-to-use menu system similar to the TH-D7A ◗ Built-in DCS (Digital Code Squelch) and CTCSS encode and decode ◗ CTCSS tone frequency scan ◗ DCS code scan ◗ 9600bps PC-based packet communications for chat, BBS ◗ Kenwood Skycommand System (KSS) II for remote control of fixed HF transceiver (TS-570S/D(G) or TS-870S) ◗ DX packet cluster monitoring ◗ Cross-band repeater ◗ Wireless remote controller ◗ 1750Hz tone burst ◗ D-sub 9 pin terminal (for PCs) ◗ GPS input terminal (NMEA-0183) ◗ Visual band scope ◗ Mute function ◗ Memory control program available via Internet access ◗ New backlit microphone with alphanumeric message input.

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Zero Bias

BY RICH MOSESON, W2VU

An Editorial

"I Never Knew People Could DO That!"

What is W2I*13 = 325^{H}? It's a ham radio equation, where W2I is the special event callsign of the Watsessing School International Festival, 13 is the number of contacts made when the station was set up at the school, and 325^{H} is the number of students raised to a new level of awareness about ham radio. I had a personal stake in this particular operation. It's my daughter's school, and my wife was co-chair of the week-long festival to celebrate the diversity of the school's families, which come from at least 20 countries. The ham radio station was set up on the final day as part of an all-day International Fair featuring booths from countries all over the world, generally staffed by parents and students whose families came from those countries. The ham station was off by itself, in the school library. A schedule was worked out to assure that each class would get to see and hear us.

This being a school, there were some lessons I learned that can benefit anyone interested in introducing kids to ham radio:

1. Ham radio is a welcome addition to any sort of special event. I expected apathy at best when I asked the planning committee if I could do a ham station as part of the festival. Quite the contrary. Both parents and faculty reacted enthusiastically. "Would you *really* be willing to do that?" they asked.

2. Getting a 1-by-1 special event callsign is as easy as asking for it. You don't need any special "connections." I just logged onto the ARRL website, saw that the callsign I wanted (W2I for Watsessing International, second call area) was available during the time frame of the festival, and filled out the online application form. A couple of days later I checked back and it had been approved.

3. Ham radio standards of "success" don't apply when doing a demo station. Thirteen contacts may not seem like a lot for a 6-hour operation, but they were spaced out so that we made at least one contact during each class visit. As far as the kids were concerned, that's what was important. Likewise, distance doesn't have to be all that *distant* to impress. The kindergartners had much more fun talking to each other on HTs than listening to us (I was helped by local ham Greg Nitkowski, N2BSA; tnx, Greg) talking to some guy in Texas. And while the sixth graders were duly impressed by our contact with the Netherlands, they jumped at the chance to talk with a ham in Brooklyn, New York, about 20 miles away. He spent at least 20 minutes listening to them and chatting with them. Common element here: letting the kids actually *talk*. You can tell them about computers and tell them about satellites and tell them about public service, and they'll listen politely (if you're lucky), but when you stop telling and start *doing*—and most important let *them do* the doing—then you've got a roomful of excited kids.

4. Take advantage of any opportunity to teach. We made sure to show kids on a map or globe where we were, and where the person we were talking to was. When the third grade talked about studying the solar system and a kid asked if we could talk to other planets, we said we hadn't found anyone to talk to on other planets (yet), but that we could use our radios to *listen* to Jupiter (at about 20 MHz, listen for the sound of waves crashing in the distance), and proceeded to do a mini-lesson on radio astronomy. That got the attention of the teachers as well as the students. That leads us to the next lesson.

5. You've got to interest the grownups, too. You can get the kids all excited, but they're generally not going to be the ones buying the radios. Mom, Dad, and teacher have to understand the value of ham radio as well. Therefore, your mission in any youth demonstration is two-fold— generate excitement in both kids and adults.

6. Follow-up is vital. You must build on any excitement you generate. Our event was too close to the end of the school year to put together any large-scale program before school let out for the summer, but the chief custodian, who decided while helping me put up the antenna the night before that he wanted to be a ham, is around all summer and I have every intention of helping him fulfill his goal. Once a staff member is licensed, you're in a much better position to start something permanent in the school.

7. Never underestimate the power of wonderment and the magic of radio. The principal and several teachers and parents told me afterward that the ham station was the hit of the International Fair day, and at least one child had commented, "I never knew people could *do* that!"

Beyond Demos

Demonstrations are one excellent way to generate awareness of amateur radio and excitement about its magical powers. But they're not always practical, and we need additional ways to attract new people—young people in particular—to our hobby. This was the theme of an amateur radio industry meeting held in June at the Dallas Ham Com hamfest. ARRL President Jim Haynie, W5JBP, set forth details of a program he's promoting to get ham stations into schools across America. Very briefly, the goal is to promote ham radio in schools by offering to provide any school that requests it a "turn-key" ham station, at no cost to the school. This concept was innovated some 20 years ago by Apple Computers, which offered a free computer to any school that asked for one. This is why so many school computer labs today are filled with Macs, not PCs.

The program Jim is promoting is a good idea, a very good idea. In fact, it's nearly identical to one that *CQ* Publisher Dick Ross and I first put together about five years ago. The big difference, and the reason our idea has remained just an idea, is that we weren't sure where the money could come from to pay for the project. We figured we could start with schools that already had technology budgets (as many do), but would still need to hire at least one full-time person and one part-time person to spread the word, help put together equipment packages to meet a variety of budgets, and seek out additional funding to expand into schools without technology budgets. We figured that starting up and running such a program would cost about $250,000 in the first year, without the cost of any equipment for the schools. We didn't (and still don't) have a spare quarter-million dollars to put into such a program, no matter how worthwhile.

Jim Haynie thinks he's got the money angle solved: the tremendous gains of the stock market in the past several years have resulted in foundations and companies that are flush with cash. Foundations must give away a certain percentage of their money each year to maintain their tax status, and companies with big profits often look to make charitable contributions to reduce their tax bills. The ARRL has two things going for it that can help this project succeed. First, it is a "501(c)3" tax exempt organization, meaning contributions to it are tax-deductible. Second, it has the capability to add staff members to promote and administer this project. In fact, Haynie is planning to ask the League board of directors to approve hiring two new people in support of this program—

BIG THUNDER SERIES

10, 15, 20 Meters
9 Elements on a 28 ft (8.6m) Boom
Optional 40 Meter Kit

X9

Boom to Mast Clamp

Element to Boom Mounting

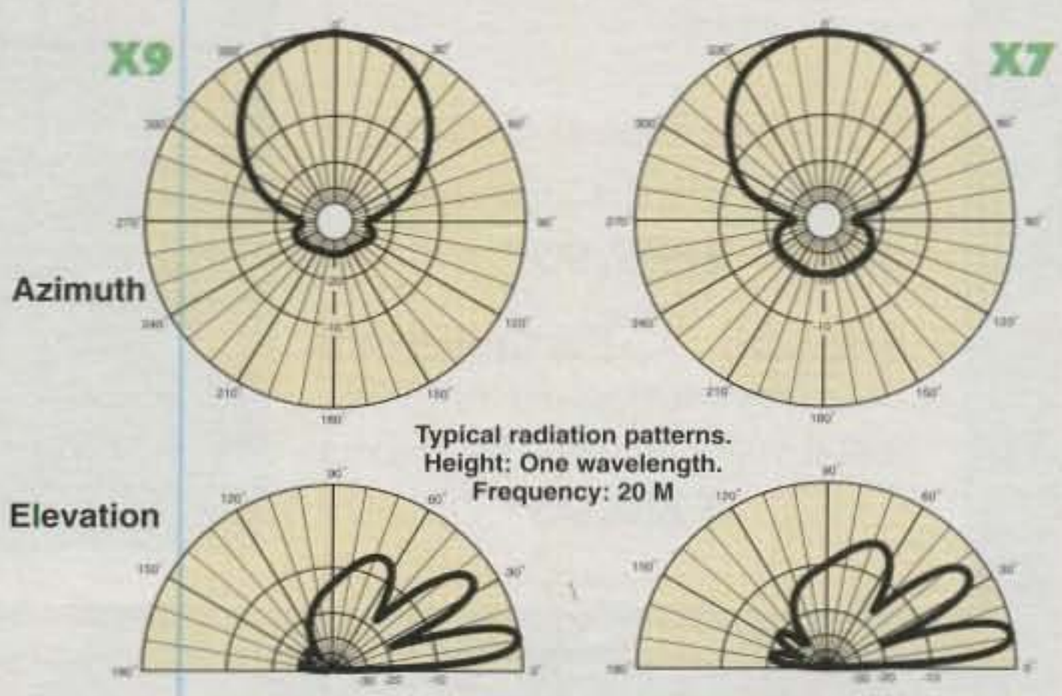
The Performance Tribander for the DX Years Just Ahead

- **New High Efficiency Computer Optimized Design for Maximum Gain and Ultra Clean Radiating Pattern**
- **100+ MPH Construction for Best Reliability and Long Life**
- **NEW *4L Log Cell* Driven Elements for better VSWR Bandwidth**
- **Trapless Driven Elements and Reflectors for Reliable Power Handling**
- **Interleaved Element Design for Mono-Band Performance**
- **Add-on kits available for 40 Meters**

The new X9 and X7 Triband Yagis are geared to set new standards in both radiating performance and mechanical reliability. Cushcraft's product development team has employed the latest computer modeling technology to achieve a superior electrical design as well as elegant new mechanical hardware and assembly techniques.

Each mechanical component was designed to 100+ MPH wind survival with a 1.25 safety factor. Traps were eliminated from the high current driven elements and reflectors using the new *4L Log Cell* design, which yields virtual monoband performance and maximum power handling capability. Traps are employed only in the lower current directors for increased gain and sharper pattern. The result is a truly high performance antenna family which will easily handle the legal limit.

SPECIFICATIONS		X9	X7
Frequency Coverage (Meters)		10, 15, 20	10, 15, 20
Total number of Elements		9	7
Maximum Gain (dB)	20M	13.0 @ 14 deg	12.5 @ 14 deg
@ One Wavelength	15M	13.9 @ 12 deg	13.0 @ 12 deg
	10M	14.0 @ 15 deg	12.9 @ 14 deg
Maximum Front to Back Ratio (dB)		30	30
Number of Elements per Band		4	3
VSWR Minimum		1.1:1	1.1:1
VSWR 1.5:1 Bandwidth (KHz)	20M	350	600
	15M	450	750
	10M	1500	1700
Longest Element, ft (m)		36.5 (11.12)	37.2 (11.33)
Turning Radius, ft (m)		21.7 (6.61)	20.0 (6.09)
Boom Length, ft (m)		28 (8.53)	18 (5.49)
Boom Diameter, in (cm)		2-1/2 (6.35)	2-1/2 (6.35)
Maximum Mast Diameter OD, in (cm)		2-1/2 (6.35)	2-1/2 (6.35)
Maximum Wind Survival, mph (kph)		>100 (>161)	>100 (>161)
Maximum Wind Surface Area, ft² (m²)		9.9 (.92)	7.9 (.73)
Windload @ 80 mph, lb (kg)		255 (116)	202 (92)
Maximum Power Handling (KW)		2	2
Weight, lb. (kg)		85 (38.5)	60 (27.2)
List Price		$995	$675



Typical radiation patterns.
Height: One wavelength.
Frequency: 20 M

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a grant writer and a professional fund-raiser. We hope the board goes along, and also provides enough seed money to begin promoting this project on a large scale.

Beyond Licensing

Okay, let's say we're successful in getting more young people to (a) know ham radio exists, (b) get interested in becoming hams themselves, (c) persuade their parents it's a good idea, and (d) learn the material and pass their license exams. Now what?

Now these kids get on the air and, in many cases, are met by closed doors, with signs on them reading, "No Lids, No Kids." Welcome to ham radio. Think it doesn't happen? Our webmaster, Doug, KØFO, was having a CW QSO one night with a local ham, who turned out to be a teenager, one of a group of teenaged hams in the area. In the course of the QSO, the young ham mentioned that he and all of his friends operate exclusively CW. Doug asked why. The response: "Nobody wants to talk to us on phone. As soon as someone hears a young voice, we're either curiosities or we're ignored. On CW, no one can tell how old you are. Everyone's equal on CW."

Then we wonder why we have trouble attracting young people to ham radio. "Come, learn, join us. Now go away and leave us alone. No lids, no kids." No sense.

Young Ham of the Year

On a much more positive note, we are pleased to announce that Christopher Arthur, KT4XA, of Russellville, Alabama, has been named this year's Newsline Young Ham of the Year. *CQ* and Yaesu USA co-sponsor the award with Amateur Radio Newsline. Yaesu provides the winner with radio equipment and *CQ* provides a week at SpaceCamp in Huntsville, Alabama. For the second time in three years, the award winner has asked that his SpaceCamp prize be donated to the Make-A-Wish Foundation.

Chris is 17 years old, holds an Extra Class license, and has just finished his junior year in high school. He's been licensed since 1996, and is devoted to bringing more young people into amateur radio. He co-founded the League of Young Radio Amateurs, a club with over 100 members across the U.S., and also co-founded the International Youth Communications Council, dedicated to helping young hams in other countries start their own amateur radio organizations. Chris is also webmaster for both groups, as well as the Alabama Radio website and the Franklin County Amateur Radio Club, which he has served as an officer. In addition, Chris is "ringmaster" of the Young Amateur Radio Operators' Webring, which links 25 web pages created by young hams on the internet.

Chris is also Alabama's ARRL Assistant Section Manager for Youth Services, and serves as a "Community Leader" on America Online's Radio Communications Forum, where he helps run the Youth in Radio Communications Forum.

The runner-up for this year's award was David Ziskind, KE4QLH, of Atlanta, Georgia. David is 18 and holds an Advanced Class license. He is very active in public service communications, organizing as well as working on events. Currently, he is head of communications for the 2000 Georgia Games, responsible for coordinating 150 ham volunteers in 35 event locations. Once again, the Young Ham of the Year Award will be presented this month during the Huntsville (Alabama) Hamfest. Congratulations to both of these outstanding young amateurs.

73, Rich, W2VU

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You can tune any *real* antenna from 1.8 to 30 MHz, including all MARS and WARC bands.

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Select two coax fed antennas (tuned or bypassed), balanced line/wire or bypass.

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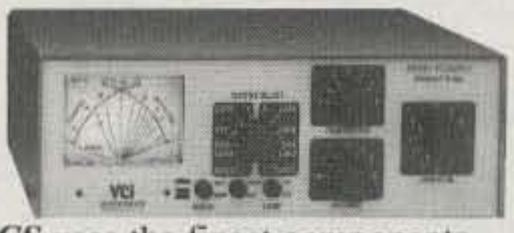

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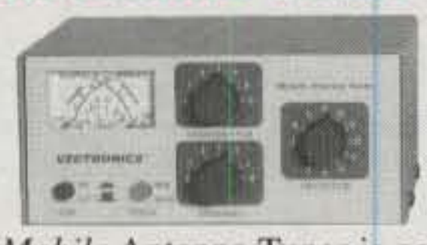

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CIRCLE 114 ON READER SERVICE CARD

Announcements

•The 45th VHF Convention, in Weinheim, Germany – This annual event will take place on September 9–10 in the Mannheimer Maimarkhalle, Weinheim, Germany. Featured are guest speakers, commercial exhibits, and fleamarket area. Contact Gerald Emig, DK8IT, e-mail: <eyrie@t-online.de>, fax ++49-6201-23983; web: <www.ukw-tagung.de>.

•The following Special Events will take place during August:

2-land, from National Lighthouse Weekend, Delaware Bay area lighthouses; Delaware Bay "Ham Radio" Lighthouse Assn.; Aug. 5–6; phone and CW. QSL to John Calhoun, KC2ATK, P.O. Box 265, Heislerville, NJ 08324. For more info check out: <http://www.waterw.com/~weidner/lh-ham.htm>.

K2L, from Buffalo, NY Harborfest and Lighthouse/Lightship Weekend; W. New York DX Assn.; Aug. 6–18 on CW, SSB, RTTY all bands, including WARC; Aug. 19–20 CW and SSB. QSL via WB2YQH, P.O. Box 73, Spring Brook, NY 14140 (SAE/SASE). All DX QSOs automatically QSLed via the bureau. For more info contact Bob, WB2YQH, e-mail: <the599rpt@aol.com>, or phone/fax 716-677-2599.

W2GSA, from 75th anniversary of dedication of Ft. Monmouth, New Jersey; Garden State ARA; 1200Z Aug. 6 to 2000Z Aug. 7; on 7240, 14240, 21240, 28340 kHz. QSL to GSARA, P.O. Box 34, Fairhaven, NJ 07704.

W2GSB/Lighthouse, from Lighthouse Lightship Activity Weekend, Fire Island Lighthouse, New York (IOTA NA-026); Great South Bay ARC, Islip ARES Group, Suffolk County RC; Aug. 21–22; QSL to W2GSB, P.O. Box 1356, West Babylon, NY 11704 (SASE). DX QSL via the bureau. For more info: <www.gsbarc.org/ FI0899.htm>.

W3P, from Fort Delaware Garrison Weekend, Pea Patch Isl., Delaware; Delaware ARA; 1600Z Aug. 19 to 2100Z Aug. 20; on 14.260, 21.260, 28.260 MHz. QSL with SASE to Dan Cashin, N3LMY, 1335 Harrington Rd., Havertown, PA 19083.

W4B, from anniversary of Bristol Motor Speedway and NASCAR, Bristol, Tennessee; Bristol ARC; 0001Z Aug. 21 to 2359Z Aug. 27; on 3.860, 7.245, 14.237, 21.305, 28.310 MHz (±QRM). For certificate QSL with SASE (#10 or larger) to William D. Price, W4CZ, 232 Cherry St., Blountville, TN 37617.

W8F, from 50th anniversary of city of Fairborn, Ohio; Upper Valley ARC; 1700Z Aug. 19 to 2100Z Aug. 20; on 3.860, 7.260, 14.260, 28.360 MHz. For certificate send QSL and 9×12 SASE to Upper Valley ARC, P.O. Box 2000, Fairborn, OH 45324.

W9HAB, from Centralia, Illinois Balloonfest; Centralia Wireless Assn.; Aug. 18–20; on 12, 15, 17, 20 meters, phone only. For certificate send QSL and SASE (9×12) to CWA, P.O. Box 1166, Centralia, IL 62801.

N9RJV, from 25th anniversary of Schaumburg ARC, Barrington, Illinois; 1300Z Aug. 20; on 10–80 meters, plus 2 meter simplex. For certificate send SASE to Twenty-fifth Anniversary, c/o Schaumburg ARC, P.O. Box 68251, Schaumburg, IL 60168-0251.

W9CEQ, from Lighthouse/Lightship weekend, Fabyan Island Lighthouse on IL-032R, Illinois; 1500Z Aug. 19 to 2200Z Aug. 20; on 7.250, 14.250, 28.450 MHz. For certificate send QSL and SASE to FRRL, P.O. Box 673, Batavia, IL 60510.

W9GFZ, from dedication of Green Bank Telescope, Green Bank, West Virginia; National Radio Astronomy Observatory ARC; 1600Z Aug. 25 to 2000Z Aug. 27; on 3.940, 7.245, 14.275, 21.375, 28.350 MHz. For QSL send QSL and SASE to W9GFZ, P.O. Box 2, Green Bank, WV 24944.

VE3MIN, from Haliburton County Fair, Minden, ON, Canada; Minden ARC; 1500–2200Z Aug. 19–20; on 14.190±. For certificate send QSL to MARC, c/o Wally Bunn, VE3VHH, P.O. Box 392, Minden, ON Canada K0M 2K0.

•These hamfests, etc., are slated for August:

Aug. 5, **Roswell Hamfest 2000**, Roswell, New Mexico Fairgrounds. Contact Vernetta, KC5WKA, e-mail: <kc5wka@dfn.com>. Talk-in 147.180.

Aug. 5, **Finger Lakes Ham-In 2000**, Tompkins County Airport, Ithaca, New York. Contact Richard Spingarn, AA2UP, 607-387-5251, 607-387-3195; <www.compcenter.com/~tcarc>. Talk-in 146.97. (Exams)

Aug. 5–6, **Rassemblement International**, Marennes, France, near "Intermarché," rue Louis Jouvet. Sponsored by REF-Union 17. Contact Christiane le Mercier, F8AED, Résidence Chante Alouette, 11 Avenue Pasteur, 17460 Vaux Sur Mer; e-mail: <christiane.le-mercier@wanadoo.fr>.

Aug. 6, **Land of Lakes Hamfest**, Steuben County Fairgrounds, Angola, Indiana. Contact Bill Brown, 905 W. Parkway Dr., Pleasant Lake, IN 46779 (219-475-5897; e-mail: <sharon.1.brown@ gte.net>). Talk-in 147.180, 444.350.

Aug. 12, **Western Illinois ARC Swapfest 2000**, Eagles Alps Grounds, Quincy, Illinois. Contact WIARC, P.O. Box 3132, Quincy, IL 62305. Talk-in 147.63/03. (Exams 12:30, contact NA9Q, phone 217-224-8526; <mnowack@rnet.com>)

Aug. 12, **TARA Hamfest & Computer Show 2000**, Veterans Memorial Field House, Huntington, West Virginia. Contact Dwight Smith, WB8JPJ, 817 W. 13th Street, Huntington, WV 25704 (304-522-7865); e-mail: <tara.amateur.radio@juno.com>; web: <www.qsl.net/tara>. Talk-in 146.76. (Exams, contact W8OI, 304-733-1300)

Aug. 12, **St. Cloud ARC Hamfest**, Del-Win Ballroom, Hwy 75 & 88th Ave., near St. Joseph, Minnesota. See <www.w0sv. org> for details. Talk-in 147.015. (Exams 1 PM)

Aug. 13, **Greater Buffalo Summer Hamfest**, Leonard Post VFW, Cheektowaga, New York. See <http://hamgate1.sunyerie.edu/~larc>; e-mail: <lcalianno@freewwweb.com>.

Aug. 13, **Greentown, Indiana Hamfest**, Grentown Lions Club Fairgrounds, Greentown, Indiana. Contact L. B. Nickerson, K9NQW (phone 765-668-4814; e-mail: <ka6nqwnick@netusa1.net>; on web: <www.netusa1.net/~ka6nqwnick/greentown.htm>. Talk-in 146.91. (Exams sign up by 8:30 AM)

Aug. 19, **Lower Columbia ARA Ham, Computer, Electronic Swapmeet**, Cowlitz Co. Expo Center, Longview, Washington. Contact Bob Morehouse, KB7ADO, 360-425-6076 eves.; e-mail: <kb7ado@aol.com>; <www.qsl.net/nc7p/>. Talk-in 147.26+, PL 114.8.

(Continued on page 119)

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SS-30	25	30	3¼ x 7 x 9⅛	5.0

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MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
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SS-30M*	25	30	3¼ x 7 x 9⅛	5.0

MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅜	6.5
SRM-30	25	30	3½ x 19 x 9⅜	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅜	6.5
SRM-30M	25	30	3½ x 19 x 9⅜	7.0

MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
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SRM-30-2	25	30	3½ x 19 x 9⅜	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅜	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅜	11.0

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GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
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Most of us know that the 11-year sunspot cycle, thought to be reaching its peak right now, has a great impact on radio propagation. However, very few of us really understand the complex relationship between the Sun, the Earth, and the ionosphere. That's about to change...

Uncle Sol's Solar Wind and the Earth's Magnificent Magnetosphere Part I

BY KARL T. THURBER, JR.,* W8FX

Earth's "space weather" is getting rather turbulent as we rapidly approach the 11-year solar cycle peak. Here's a millennial look at the solar-terrestrial phenomena involved: the Sun itself, the solar wind, and the Earth's magnetosphere.

This article touches on space physics and solar-terrestrial dynamics, a timely inquiry as we reach the peak of the 11-year solar cycle. Part I focuses on the *solar wind*, which streams from the Sun and bombards the Earth with high-speed, electrically charged particles. The article also discusses electromagnetic (EM) radiation and the EM spectrum, the Sun's complex structure, the Earth's magnetosphere and lower atmosphere, the Van Allen Radiation Belts, and the aurora.

In Part II we will examine the effects of the solar wind on Earth, notably geomagnetic storms and disturbances, plus tracking and forecasting solar dynamics, and the Solar and Heliospheric Observatory (SOHO) satellite. The Sun and the Earth are coupled by complex processes, and we'll explore these (see fig. 1). First, however, we must discuss just what EM radiation and the EM spectrum are.

Solar physicists divide the Sun into four domains: the interior, the surface atmospheres, the inner corona, and the outer corona (see discussion in text). [Photo courtesy NOAA Space Environment Center)

Just What is Electromagnetic Radiation?

EM radiation refers to the propagation of energy through space by means of varying electric and magnetic fields. The theory of EM radiation was developed by James Clerk Maxwell and published in 1865, but was not accepted until Heinrich Hertz proved the existence of radio waves in 1887. Today, the individual quantum of EM radiation is known as the *photon*.

In order of decreasing wavelength and increasing frequency, the types of EM radiation are radio waves, microwaves, infrared radiation, visible light, ultraviolet (UV) radiation, x-rays, and gamma rays. Fig. 2 depicts the total EM spectrum.

The Sun's EM Spectrum. The EM spectrum is the continuum of EM waves from the longest waves to the shortest. The Sun's EM spectrum spans not only infrared, visible, and UV wavelengths, but also the "low" radio portion of the spectrum, all the way to x-rays and beyond. Solar emissions in these categories are EM in nature, and they move at the speed of light.

Each type of solar radiation—radio, infrared, visible light, x-rays, and gamma rays—originates predominantly from different layers of the Sun. This characteristic complicates solar analysis and understanding of the processes involved.

The Sun's Complex Structure

Now that we have some idea of what EM radiation and the EM spectrum are all about, let's turn to the Sun's structure.

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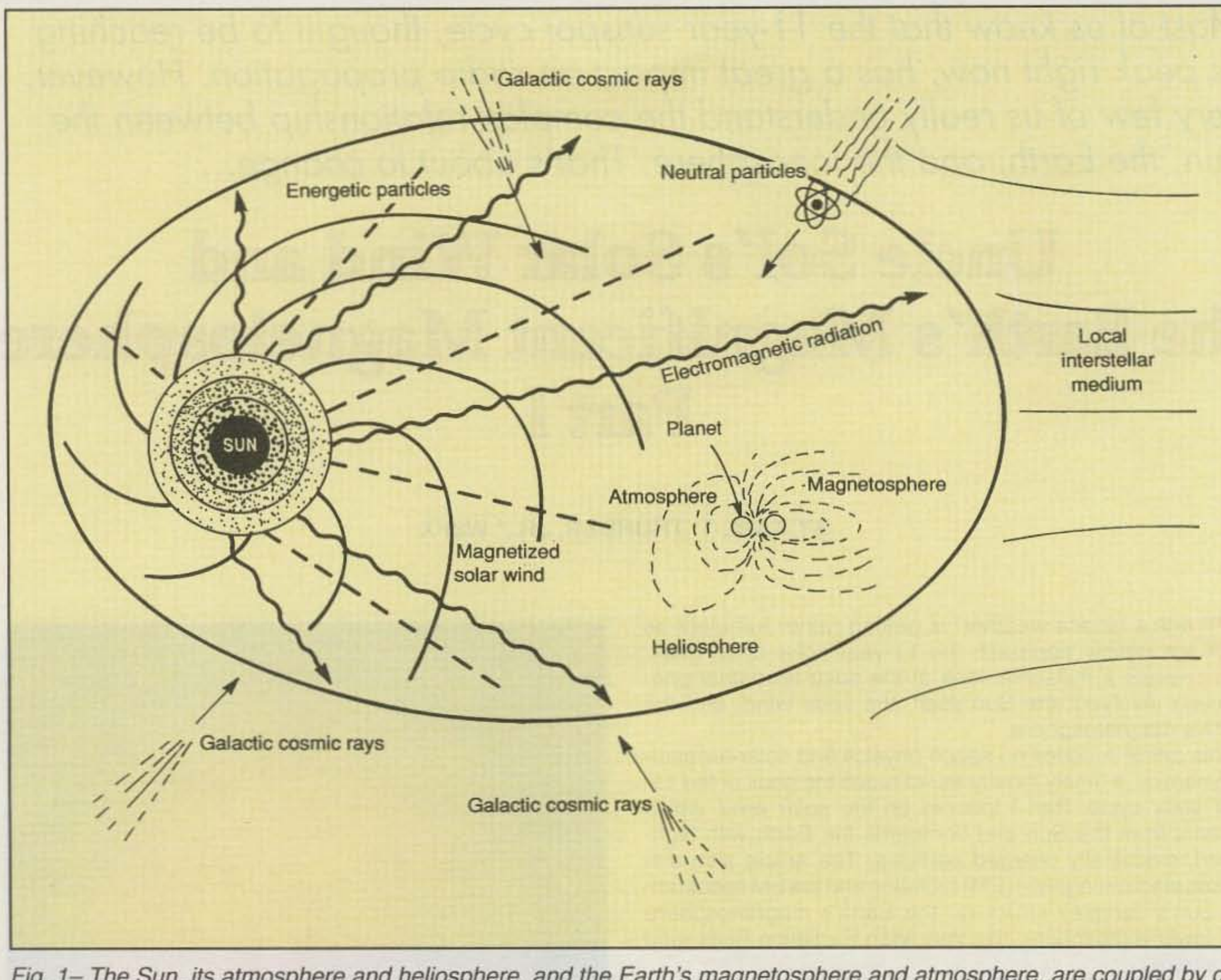

Fig. 1– The Sun, its atmosphere and heliosphere, and the Earth's magnetosphere and atmosphere, are coupled by complex physical processes that are only partially known. This sketch shows a variety of Sun-Earth connections.

Uncle Sol's Diminutive Vital Statistics. Sorry, but our all-important "Uncle Sol" is a dwarf star of "average" temperature, size, and brightness, just past middle age. It has a diameter of about 870,000 statute miles (mi), or 1.4 million kilometers (km). It doesn't have a real surface. though; instead, it's a "boundary" extending into the solar system.

Solar physicists divide the Sun into four domains—the interior, the surface atmospheres, the inner corona, and the outer corona—the latter two domains making up the outer solar atmosphere.

The Sun's Angry Interior. The interior of the Sun includes the *core,* the *radiative layer,* and the *convective zone* (fig. 3). The central core is the source of the Sun's energy and the site of thermonuclear fusion, a type of nuclear reaction that produces the Sun's energy. At about 15,000,000 degrees Kelvin (nearly 27,000,000 degrees Fahrenheit), matter is in a plasma (charged particle) state, promoting fusion.

The tremendous energy produced by the Sun's core is bounded by the surrounding radiative layer, which has an insulating effect to help maintain the core's high temperature. By the time the gamma ray photons produced by the core leave the Sun, their wavelengths for the most part are in the visible (white light) range.

Above the radiative layers is the convective zone. Hot regions at the bottom of this layer become buoyant and rise, while cooler material from above descends. Large convective cells are formed: The tops of convective cells can be seen on the photosphere (the Sun's visible surface) as patches of gas called *granules.* Convective circulation produces large magnetic fields that help produce sunspots and solar flares.

The Sun's Surface Atmospheres. The Sun's surface atmospheres are composed of the *photosphere* and the *chromosphere.* Beyond them lies the outer atmosphere, known as the *solar corona.* These areas are where sunspots, solar flares, and coronal mass ejections occur.

The Photosphere. The thin photosphere is the part of the Sun that we can see with our eyes, since it produces most of the visible (white) light. Bubbles of hotter material well up from within the Sun, dividing the photosphere's surface into bright granules that expand and fade in several minutes.

The Sun's next most visible feature is that of sunspots, or "blemishes" in the photosphere. Sunspots probably result from intense, localized magnetic fields trapped below the surface. Sunspots have a dark central region, called the *umbra* (shadow), surrounded by a lighter region, the *penumbra.* Sunspots, occurring in pairs, move across the Sun as it rotates, grow in clusters over days or weeks, and gradually disappear. Bright patches of gas variously called *plages, flocculi,* or *faculae* appear above groups of sunspots. Sunspots

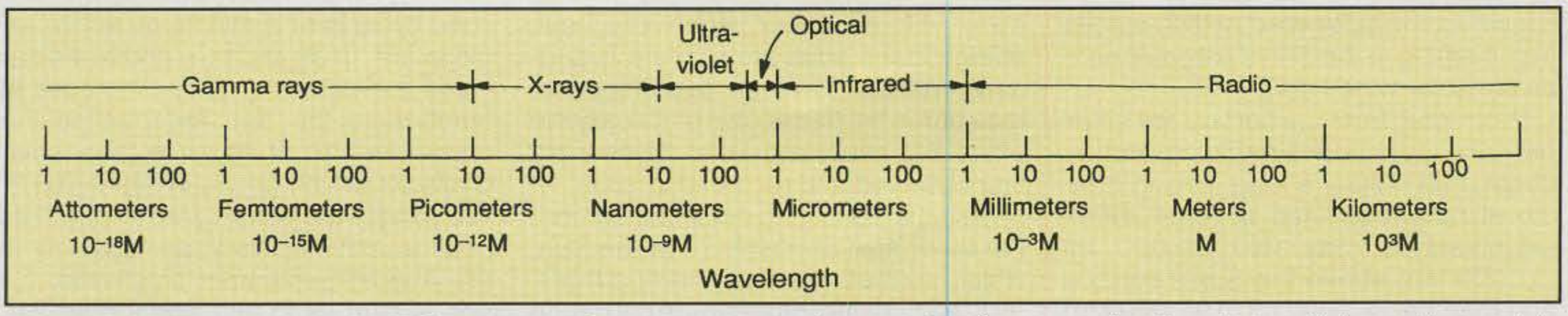

Fig. 2– The electromagnetic (EM) spectrum is an array or continuum of radiant energies from DC to light and beyond. In order of decreasing wavelength and increasing frequency, EM radiation includes radio waves, microwaves, infrared radiation (IR), visible light, ultraviolet (UV) radiation, x-rays, and gamma radiation/cosmic rays.

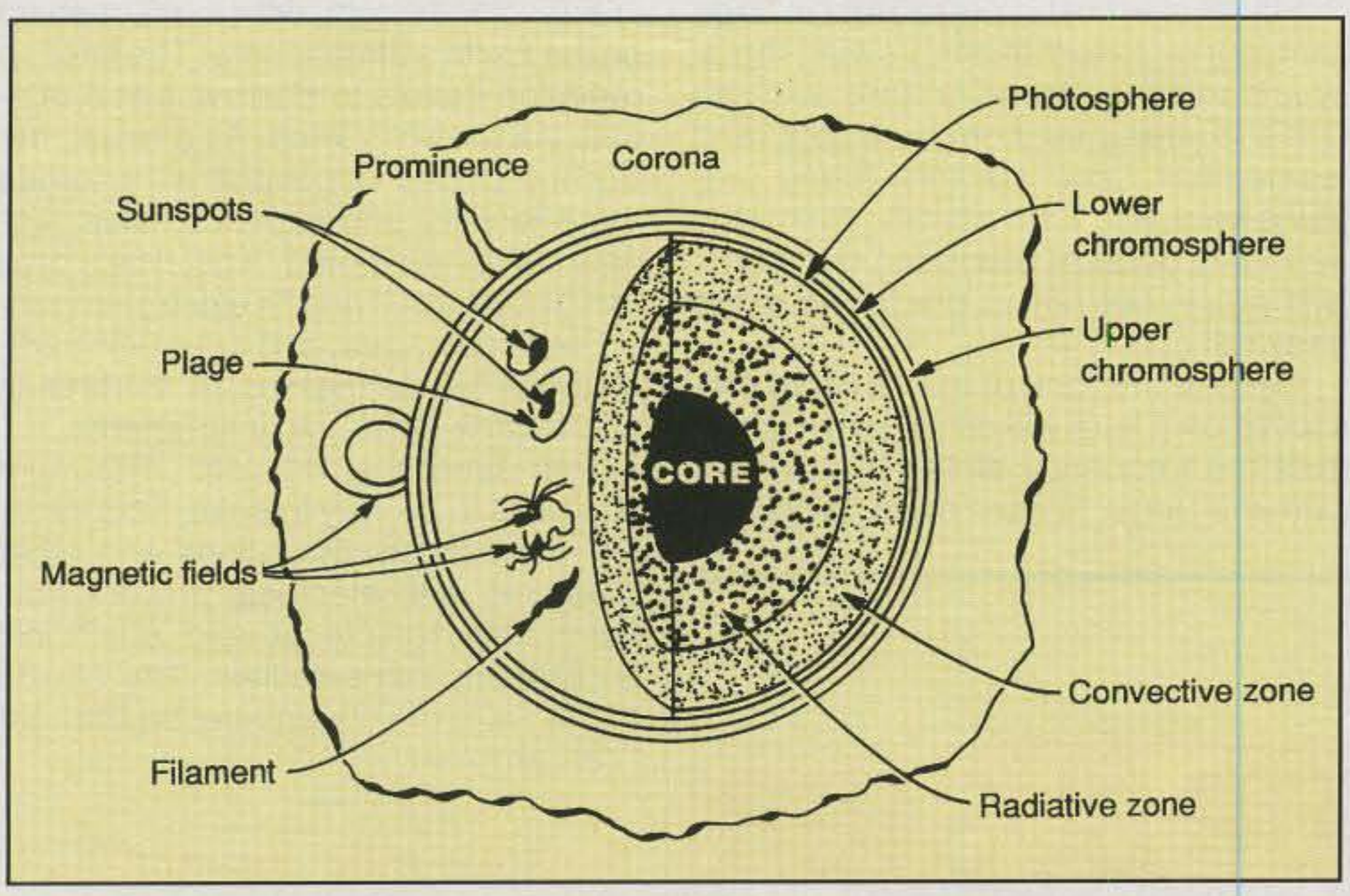

Fig. 3– Our Sun has a very complex structure. This sketch shows its four domains, with special emphasis on the interior domain, which includes the core, the radiative layer or zone, and the convective zone.

reach a cyclical maximum about every 11 years. The cycles have been numbered since 1755, and we are currently in Cycle 23.

Sunspots are sources of flares, violent solar events that produce a variety of radiation, including high-energy types of radiation, low-energy particle radiation, and EM radiation. Thus, sunspot observations are good tools for solar flare prediction; there have been many attempts to classify sunspots according to the likelihood of producing flare activity.

The Chromosphere. The middle region of the atmosphere, the chromosphere, lies just above the photosphere. The low part of the chromosphere is characterized by red hydrogen-alpha spectral lines, while the upper chromosphere produces UV radiation.

There is a great deal of solar activity in the chromosphere, which is characterized by very large cellular convection patterns. Near the boundaries of these cells are concentrated magnetic fields that produce large vertical jets of material known as *spicules,* typically about the size of the Earth!

The number of sunspots and active regions rises and falls in an 11-year cycle, with violent coronal eruptions occurring often near the peaks of the cycle. Behind these phenomena and time scale are the Sun's changing magnetic fields, which derive their energy from the Sun's rotational and convective motions, resulting in an underlying 22-year magnetic cycle. Thus, the activity we observe on the photosphere and chromosphere is just a symptom of what actually is happening within the Sun.

The Solar Corona. The Sun's outer atmosphere, the corona, extends to many times the Sun's diameter and is characterized by strong x-ray radiation. However, you only can see the corona well during eclipses of the Sun by the Moon, because it is much fainter than the photosphere, the Sun's visible surface. In between eclipses, coronagraphs are used to study the corona.

Because of its high temperature, the coronal plasma is highly ionized. Thus, it is visible in a variety of spectral emission lines, but mostly outside the visible spectrum. To observe coronal lines in the UV and x-ray ranges which are absorbed by the Earth's atmosphere, you must observe from space.

The corona is not uniformly bright, but it is concentrated around the solar equator in loop-shaped features. These bright loops connect areas of strong magnetic fields called *active regions.* Sunspots are located within these active regions.

The Inner Corona. The Sun's inner corona extends over 623,370 mi (1 million km) into space. You can see it when the disk (the part of the Sun you can see from Earth) is blocked by the Moon during a total eclipse. The corona, at about 2,000,000 degrees Kelvin (3,600,000 degrees Fahrenheit), is a major source of x-rays. The Sun's corona is permeated by magnetic fields that in some regions form closed loops. In other regions the fields are essentially open to the external space. The open magnetic field regions are less dense and cooler than the closed ones, and thus appear darker; they are called *coronal holes.* Most of the coronal material is confined by closed magnetic-field structures, but in the coronal holes, material can escape from areas with open magnetic-field lines to form fast, low-density streams of electrified gas—a major source of the solar wind.

The Outer Corona. The outer corona streams outward, extending to Earth and beyond as a "coronal outflow" at about 450 mi/sec (725 km/sec). It can't be seen directly, and it wasn't even known until the 1950s. This outflow is a magnetized, continuous flow of gases

known as the solar wind, which results from heating in the Sun's corona (more on the solar wind later).

Protruding from the corona are *solar prominences*, brightly shining arches of gas that outline a long, strong bundle of magnetic lines of force. Such prominences may rise 20,000 mi (32,000 km) above the Sun's surface and may be 120,000 mi (193,000 km) in length. There are both *quiescent prominences*, which change little over their two- or three-month life, and *active prominences*, which may appear to erupt and change rapidly over just a few hours.

Solar Waves and Solar Flares. Solar waves move through the Sun like sound waves through the air. Temperature, composition, and motions deep within the Sun influence the oscillation periods. A solar flare is a short-term brightening, a sudden, rapid, and intense variation in brightness. Flares begin in seconds and end after minutes or hours. Active regions last weeks and may flare many times before they fade away. Flares occur when magnetic energy in the solar atmosphere is suddenly released. When this happens, radiation is emitted across practically the entire EM spectrum. Solar flares were first observed and recorded in 1859.

Solar flares extend out to the corona, the outermost atmosphere of the Sun, which consists of highly rarefied gas. Inside a flare the temperature can reach 10 or 20 million degrees Kelvin (18 to 36 million degrees Fahrenheit) and can be as high as 100 million degrees Kelvin (180 million degrees Fahrenheit).

Flares are most likely to erupt in large sunspot regions that are growing rapidly and rotating. However, they also can arise in areas far from sunspots, and sometimes large sunspot areas produce very little flare activity. Scientists are fairly good at predicting that flares will erupt, but not at predicting when they will occur.

Despite this lack of the ability to predict when a flare will occur, we do know that the frequency of flares coincides with the Sun's 11-year cycle. When the solar cycle is at a minimum, active regions are small and rare and few solar flares are detected. These increase in number as the Sun approaches the maximum part of its cycle (now solar Cycle 23, which began in 1996–1997). We expect the solar cycle to reach its peak sometime this year—possibly in the August-September timeframe. No one is sure as to just when, however, and that cannot be determined until well after the peak occurs.

We also know that solar flares are among the most energetic explosions in the solar system, with a direct effect on the Earth's atmosphere: The intense radiation travels to Earth in just 8 minutes via the solar wind. As a result, the Earth's upper atmosphere becomes more ionized and expands, radio signals can be disrupted, a satellite's orbit can be disturbed and its electronic components damaged, and energetic particles can be dangerous to astronauts and to their electronic instruments.

This time the 11-year maximum promises to be very intense. This intensity may cause disruptions and other problems with electrical power grids, computers, electrical and electronic equipment, and satellites. The effects of the solar maximum may be the *real* "Y2K problem."

The Solar Wind: Interactions and Environment

Besides EM radiation, atomic and subatomic particles stream continuously from the Sun as the fountain-like *solar wind*. Consisting of electrons, protons, and helium nuclei, this tenuous gas is accelerated to speeds in excess of the Sun's gravitational escape velocity, moving outward into the solar system, even shaping the "ion tails" of comets that traverse the solar system.

The stream of ionized hydrogen and helium that radiates outward from the Sun carries away about 1 million tons of gas per second. Near the Earth, the solar wind normally has a velocity of about 450 mi/sec (725 km/sec). The solar wind likely extends to between 100 and 200 Astronomical Units (AU) from the Sun (one AU is equivalent to 149,501,201 km or 92,895,711 mi. Multiply by 100 to 200 for the actual distance.).

The composition of the solar wind is determined by the Sun's activity, and its speed and density are a function of the conditions on the Sun. During times of high activity, very energetic plasma is hurled off the Sun in vast eruptions energized by the turbulent magnetic fields in the corona. These extremely

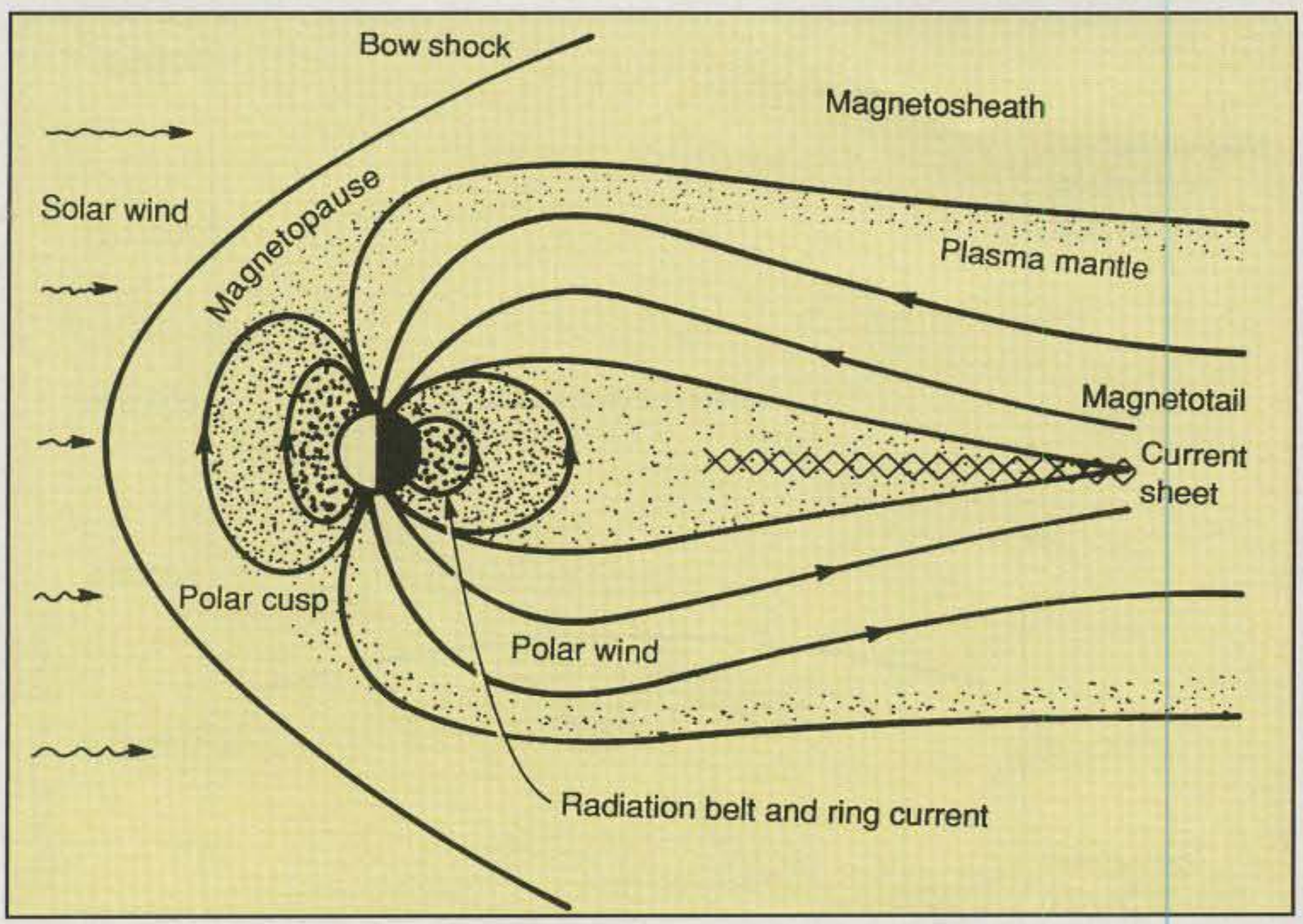

Fig. 4– A side view of the Earth and its magnetosphere showing some of the important regions. The magnetosphere looks like a cavity carved out of the solar wind stream of plasma going by. You can even see a sort of "wake" behind an object fixed in a stream, complete with a magnetotail pointing away from the Sun.

violent solar eruptions are known as *coronal mass ejections*, or CMEs, in which vast bubbles of gas burst from the Sun and release waves of charged particles into space, greatly bolstering the "normal" solar wind.

The solar wind also impacts swarms of charged particles that move in broad belts around the Earth in its *magnetosphere* (which we'll discuss later in greater detail). By interacting with the Earth's magnetic field, the solar wind can also affect anything relating to that field, including the aurora, geomagnetic storms, and the ionosphere. The solar wind can even influence "pole wandering," short-term shifts of up to 50 mi (80 km) in the Earth's magnetic poles, as well as "pole reversal" every 500,000 years or so.

The Earth's Magnificent Magnetosphere

Geomagnetic Activity and Solar Wind Coupling. As we have seen, when solar disturbances occur, high-energy particles are blasted away at great velocities. As these solar particle clouds encounter the Earth's magnetosphere, they perturb it, changing the intensity and direction of the Earth's magnetic field.

What exactly is the magnetosphere? It is the magnetic envelope surrounding the Earth, a region of strong magnetic forces far above the surface, driven by the solar wind. The magnetosphere is filled with plasmas of different densities and temperatures, all of which originate with the solar wind. The magnetosphere (fig. 4) envelops the Earth in an elongated doughnut shape with "holes" at the north and the south magnetic poles. The solar wind exerts a pressure on the Earth's magnetic field which compresses it on the side facing the Sun and trails into a comet-like "tail" on the side away from the Sun.

Thus, the magnetosphere is distorted into a comet shape with the head of the comet pointing directly into the solar wind and the tail directly away; the Earth's magnetic field actually is pushed away from the Sun. The charged particles (ions) caught in the magnetosphere collect and align along the magnetic field "lines" stretching between the north and south magnetic poles.

The magnetosphere lies higher than the Earth's lower atmosphere and the ionosphere, at 400 mi (644 km) to 100,000 mi (161,000 km). The ionosphere lies closer to the Earth, but there's much coupling, electric and magnetic, between the two.

The magnetosphere catches harmful charged particles and other rays from the Sun, significant for human survival. It protects life on the surface from

this lethal radiation, forming a sort of asymmetrical "magnetic envelope" that shelters the Earth from the ionized blast of the solar wind by deflecting it.

Solar Wind Coupling is the name applied to studies of the relation between phenomena on the Sun and in the solar wind, to various terrestrial measures of geomagnetic activity. This field of study often treats the Earth's magnetosphere as a "black box," the properties of which can be determined from its past behavior. These properties are then used in conjunction with measurements of the Sun and solar wind to predict future geomagnetic activity.

The Van Allen Radiation Belts and the Aurora

The Van Allen Radiation Belts. Special features of the magnetosphere are the two Van Allen Radiation Belts which lie outside the Earth's atmosphere, extending from about 400 to 40,000 mi (about 644 to 64,400 km), in part of the magnetosphere. The high-energy protons and electrons that comprise the belts circulate along the Earth's magnetic lines of force. These particles are emitted by the Sun through its solar flares and are captured by the Earth's magnetic field.

The belts were discovered by detectors developed by American physicist James Van Allen and colleagues aboard Explorer 1, the first U.S. artificial satellite. A belt of high-energy oxygen, nitrogen, and neon ions within the inner Van Allen Radiation Belt was detected in the late 1980s and identified in 1993.

Awesome Auroras. Auroras are luminous displays of forms and colors in the night sky. They occur at altitudes of 35 to 600 mi (56 to 965 km) around Earth's north and south geomagnetic poles in regions known as *Auroral Ovals*. The *Aurora Borealis* (Northern Lights) and *Aurora Australis* (Southern Lights) usually are visible at latitudes within the Arctic and Antarctic Circles, respectively, but sometimes are seen in middle latitudes as well, especially after a major solar flare or CME.

Auroras are caused by sudden outbursts of solar activity in which particles are ejected from the Sun. Some particles reach the Earth's atmosphere about 24 to 36 hours later via the solar wind, where they are channeled to the polar regions by the Earth's magnetic field. This results in a reaction with the magnetosphere and its magnetic field in which the high-speed particles effectively "overload" the lower Van Allen Radiation Belt, luminescing after colliding with air molecules.

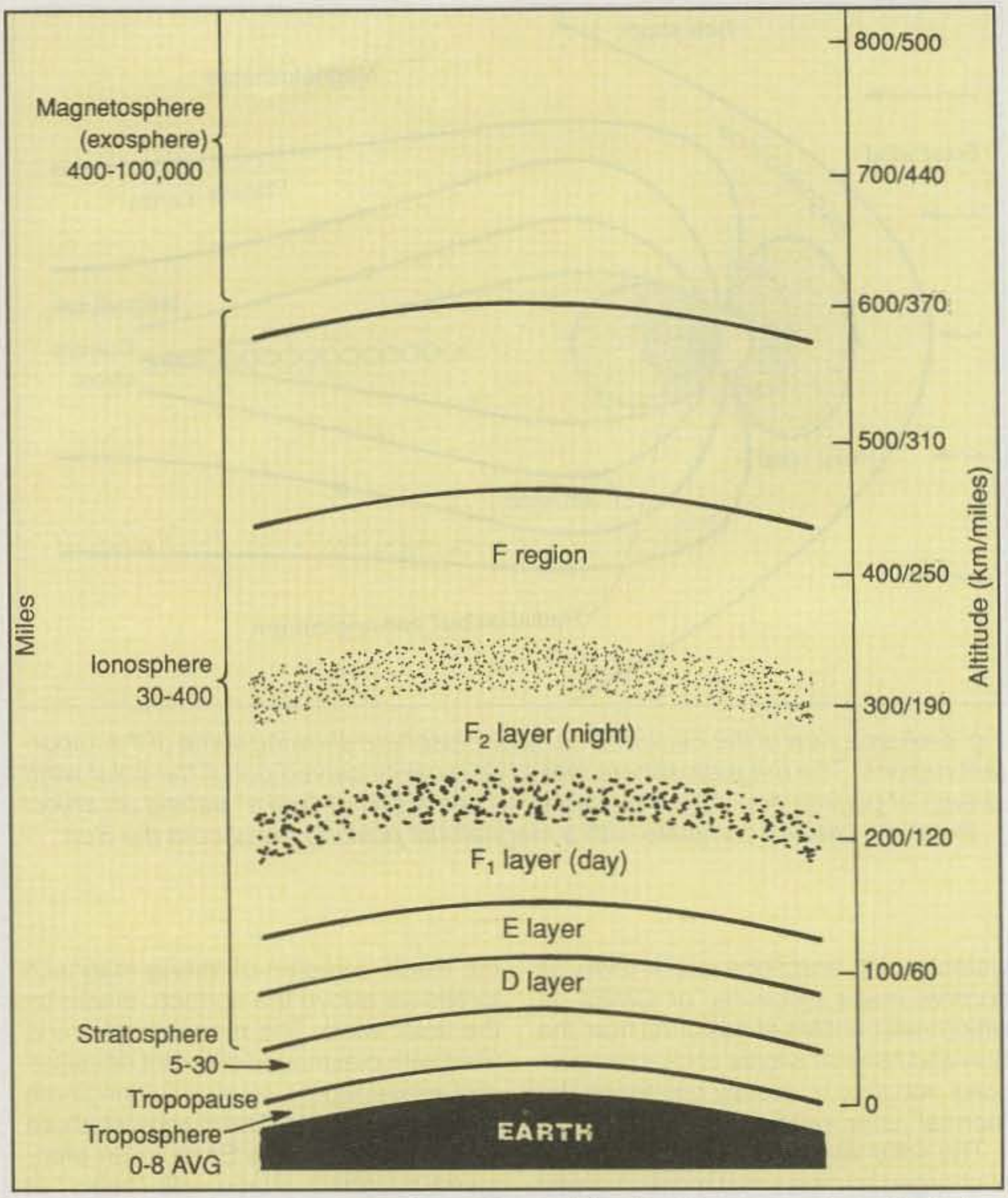

Fig. 5– Shown here are the major regions of the Earth's atmosphere, including the troposphere and tropopause, the stratosphere, ionosphere (with its various sub-regions), and ultimately the magnetosphere or exosphere.

Visible Auroral Characteristics. Auroral light is seen as charged particles, particularly electrons, rain down along the Earth's magnetic field lines. The color of the aurora depends on the type of atom or molecule struck by the charged particles. Each atmospheric gas glows with a particular color.

Auroral displays vary from night to night and even during a single night. Often a diffuse patch of glowing sky will be seen first, followed by a discrete arc that brightens very rapidly. As an arc moves toward the equator, new ones may form. Appearing within arcs are upward-reaching *striations* aligned with the magnetic field, giving the impression of curtains of light. Ripples dance along the arc curtains, and pulsating patches of light may appear in the morning. Besides the visible auroral display, there also may be a Radio Aurora, which we will discuss in Part II.

Earth's Lower Atmosphere

The Earth's atmosphere further protects the planet, absorbing and scattering harmful radiation and causing most extraterrestrial solid matter (meteors) to burn up from heat generated by air friction. Fig. 5 is a simplified view of the lower atmosphere.

Each of the layers of the Earth's atmosphere retains its own physical and chemical properties. Within the first 40 to 50 mi (64 to 80 km) above the surface of the Earth the mixture is of uniform composition, with the exception of a concentration of ozone at about 30 mi (48 km).

The Troposphere. The troposphere extends from the Earth's surface to about 5 mi (8 km) at the poles and 11 mi (18 km) at the equator. Clouds and

other weather phenomena occur here. Above the troposphere, the stratosphere extends to some 30 mi (48 km). It is followed by the ionosphere, in the range 30 to 400 mi (48 to 644 km), and finally the exosphere or magnetosphere, at about 400 to 100,000 mi (644 to 161,000 km).

The Stratosphere. The stratosphere lies just above the troposphere, separated from it by a boundary known as the *tropopause*. The stratosphere is a calm region that shows little temperature change throughout its height. About 99 percent of all the Earth's atmospheric gases are found in the troposphere and the stratosphere.

The Ionosphere. The ionosphere has a high concentration of electrically charged particles (ions) which are responsible for reflecting radio signals. Most long-distance HF communication depends on the bending, or refraction, of waves in the ionosphere.

The ionosphere is divided into three major layers: *D*, *E*, and *F*, in order of increasing altitude and electron density. Each layer plays a distinct role in ionospheric propagation. The two useful lower layers of the ionosphere, the *D*- and *E*-layers, are absorbing layers, while the *F*-layers are reflecting layers. (*The E-layer can also become reflective in patches for brief periods, resulting in sporadic-*E *propagation on 10, 6, and 2 meters —ed.*)

Above the ionosphere, to about 40,000 mi (64,400 km), in the lower part of the magnetosphere or exosphere, charged particles are trapped by the Earth's magnetic field (see "Van Allen Radiation Belts and the Aurora," discussed previously).

Summary, Part I

So far we've explored the composition of the Sun and the solar wind, and of the Earth's magnetosphere and atmosphere, including the ionosphere, which is of greatest interest for long-distance radio communication. We have also touched on the interactions between the solar wind and Earth's magnetic field. In Part II we will take a closer look at how these interactions can affect radio communication and other aspects of life on Earth. We'll also learn how scientists track and predict solar activity, and how hams can make use of this information. Finally, we'll introduce a new space-based observatory (SOHO) that has already been responsible for many new discoveries about the Sun, and promises to revolutionize our understanding of the Sun-Earth relationship. Stay tuned.

Raising The Standard for Toughness

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The affordable FT411MKII is compact and durable. This 5 Watt VHF FM Handheld features a die-cast case, 40 memory channels, 10 DTMF memories, built-in VOX, and multiple scan modes.

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This miniature Handheld Receiver provides FM, AM, SSB and CW reception on 100 kHz–1300 MHz, with 1091 memory channels, Smart Search,™ versatile Dot Matrix display, Band Scope, and Dual Watch.

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YAESU ...leading the way.

The Kingdom of Bhutan, Number 2 on the Most Wanted List, opened its doors to amateur radio with new legislation in March of this year. A52A was on the air within six weeks of the announcement.

The Thunder Dragon—A52A

BY THE A52A TEAM*

The Kingdom of Bhutan finalized the Telecommunications Act late in March of this year, permitting nationals and foreigners to become licensed and operate from Bhutan.

In the late 1950s and into the '60s, Gus Browning was active from Bhutan. In the early '70s, Pradhan, A51PN, and Yonten, A51TY, were somewhat active. A51JS made over 14,000 contacts in 1990, and A51/JH1AJT made over 3000 contacts in 1995. Because of such limited amateur radio activity over the past few decades, Bhutan has risen to near the very top of the Most Wanted list, being Number 2 for Europe and most other parts of the world.

A Major DXpedition—In Less Than Two Weeks

With the news of the new legislation, Glenn Johnson, WØGJ, immediately contacted several DXers with the goal of activating Bhutan during the first two weeks of May, just one month away, and then returning in time for the Dayton Hamvention to hand out A5 cards.

A52A ended up as a team of 15 operators from six countries: James Brooks, 9V1YC; Yuu Yoshitani, JA3IG; Mac Shimamoto, JA3USA; Jin Fujiwara, JF1IST; Al Hernandez, K3VN; Bob Allphin, K4UEE; Vince Thompson, K5VT; Mark Johnson, NØMJ; Don Greenbaum, N1DG; Jari Jussila, OH2BU; Mark Demeuleneere, ON4WW; Harry Booklan, RA3AUU; Andy Chesnokov, UA3AB; Glenn Johnson, WØGJ; and Wes Lamboley, W3WL.

With a barrage of e-mails, faxes, phone calls—and sleepless nights—things quickly came together. We especially want to thank Zorro Miyazawa, JH1AJT, and Jim Smith, VK9NS, for their support and helpful suggestions in the planning stages.

There were many details to iron out all at the same time: visas, plane tickets, licenses, logistics, etc. Each one was every bit as complex and complicated as for any DXpedition, and perhaps even more so because all of these areas are so intertwined in Bhutan.

Visas

Bhutan has been very cautious in opening its doors to the outside world. Until just recently only 2300 visas were issued each year, with a daily visa fee of about $200 and a maximum stay of two weeks. An equipment list must be approved by the TAB (Tourism Authority of Bhutan), then approved by the MOC (Ministry of Communications), and then back to the TAB, where a visa clearance number is issued which one uses to make reservations on Druk Air, the only airline that flies into Bhutan.

The A52A team in front of the Pine Wood Hotel in Bhutan.

If that isn't enough, Druk Air has a maximum of 20 kg (44 pounds) per person baggage weight allowance! There is essentially no chance of extra weight, unless one buys a business-class ticket with a 30 kg (66 pound) weight limit—still not enough for a major DXpedition.

The two Druk Air planes, BAe-146-100's, are four engine jets that can carry 50 to 60 passengers. The planes are ideal for the high-altitude short runway in Paro, Bhutan. Weight restrictions are carefully monitored. Plus, the maximum size for luggage, any dimension, is 40 inches, essentially eliminating beams and masts. Hence, the initial plan was to do a suitcase operation with small radios and dipoles.

The power limit in Bhutan is 120 watts maximum output, so amplifiers would not be a problem to consider. To be successful with the big pile-ups, it was obvious that Yagis would be needed for even a halfway decent signal from this mountainous kingdom. A shipping agent was found who could get our equipment on a single cargo flight from Bangkok on April 29th.

Down to the Last Minute!

Bob Allphin, K4UEE, and Glenn Johnson, WØGJ, were able to gather the equipment just in time! The antennas had just

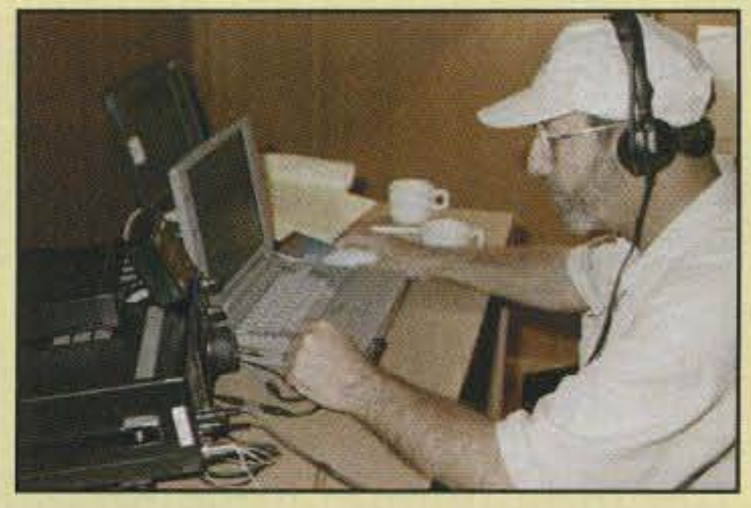
**Submitted by Glenn Johnson, WØGJ/A52GJ, 14164 Irvine Ave. NW, Bemidji, MN 56601*
e-mail: <w0gj@arrl.net>

The antenna farm. In mountainous Bhutan it is virtually impossible to have a perfect location with unobstructed views to all areas.

The beams were taken down at the end of the operation, and the elements were strapped to the booms. Mark, NØMJ, is standing next to the donated beams.

returned from Clipperton Island and were shipped to Bob's home in Georgia and crated. Don Greenbaum, N1DG, sent eight laptop computers via UPS Next Day Air to Georgia. The freight truck was in Bob's driveway waiting for this final crate. The computers were then moved from the freight truck to a UPS truck, next to head for Bangkok. Thanks, UPS!

By April 13th 19 crates of gear weighing 807 kg were on their way to Bangkok with *one* chance of making the April 29th cargo flight into Bhutan. If the equipment didn't make it, there would be no DXpedition. By that time all of



Al, K3VN, was one of the advance team who arrived in Bhutan early and picked up the licenses and began to assemble the antennas.

team would be traveling towards Bhutan, and there would be no possibility of going with plan A, the small radio and wire antenna scenario.

By April 20th the visa applications had cleared. Hoping for an April 30th flight into Bhutan, the team still had to get reservations on Druk Air! April is festival month in Bhutan, and no seats were available on that day. However, there just happened to be the required num-

The A52A Equipment

In the very initial planning stages, with the severe airline weight restrictions, we thought we would take small radios (TS-50, IC-706, FT-100's, etc.) and wire antennas (plan A). When it was found that cargo could be shipped and ICOM would supply radios, plan B went into effect:

Radios: Seven ICOM IC-756Pros with switching power supplies

Antennas: Titanex 160E 90 foot vertical, used on 160 meters; K9AY 80 meter inverted-L; two Butternut HF-2V's and two Cushcraft R8's for 40 and 30 meters; five Cushcraft A3S's for 20/15/10 meters (two for CW, two for SSB, one for RTTY); two Cushcraft A3WS's for 17 and 12 meters (one for CW, one for SSB).

Coax: 3000 feet of RG-8X (only a couple of hundred feet was left over!).

Headsets: Heil Pro-Micros.

RTTY: TNCs—Timewave DSP-599zx and RITTY; logging software—WF1B.

Notebook computers: Eight Compaqs with CT.

Bandpass filters: Several I.C.E. sets and one Dunestar set.

There were no equipment failures or any significant problems, except for one DOA notebook computer. With most of the antennas, ropes were run through windows so the antennas could be turned from inside the hotel. The maximum power was 100 watts, and all antennas were well within a 75 meter circle, except for the low-band antennas, which were a few hundred meters up on a clear ridge behind the hotel. All three modes (CW, RTTY, and SSB) could easily operate on the same band simultaneously without interference.

Members of the A52A team assembling the Titanex 160E 90 ft. vertical which was used on 160 meters.

ber of seats on the May 2nd flight from Bangkok. Three members of the team —Al, Jari, and Wes—were able to get seats on Monday, May 1st from Delhi, India, as they would be arriving from Europe and Katmandu. Since most of the team had hoped for April 30th flights into Bhutan, they arrived in Bangkok on April 28–29th.

On the morning of April 29th, the Shipco agent in Bangkok told us that only 17 of the 19 crates had made it onto the cargo flight. A couple of hours later, we found out that one of the missing crates had four radios and the other had the power supplies and headsets.

Somehow we had to get clearance to repack and send the equipment on the next flight, which was sure to be an almost overbooked passenger flight, leaving in three days. It took a full three days of work to repack the two crates, but there was *no* guarantee the crates would be on the plane! The team contacted Druk Air headquarters in Bhutan and received assurance that they would do everything they could to help the DX-pedition. Only as the shuttle bus pulled away from the terminal and headed for the plane did we learn that the crates had been loaded onto the plane.

The License

Each member of the team had to be licensed with a Bhutan callsign. We all received the A52 prefix with the two-letter suffix the same as our home callsign, with two exceptions. Jin somehow was assigned a three-letter suffix to match his own. Jin deserved it, however, because this was the second time he had operated from Bhutan (he was with Zorro in 1995). Wes, W3WL, requested the "GB" suffix in honor of Gus Browning. The team was assigned a group callsign, A52A, a very special callsign indeed! A *real* "A5" callsign, "2" for the new millennium and "A" for the first.

The Location

In mountainous Bhutan it is virtually impossible to have a "perfect" location with good unobstructed views to all areas. Some area will suffer because of some mountain in the way. From all the information we had received, however, it appeared that the Pine Wood Hotel would be a good location with room for antennas and good shots to Europe and North America, the high-demand areas. The top floor of the hotel had four rooms converted into ham shacks, away from the bedrooms on the floor below. The entire hotel staff and their families helped assemble masts and Yagis. The advance team picked up all the licenses.

The Arrival

Flying in just over the mountains, we landed smoothly in a beautiful valley. "Forbidden" for so many years to amateur radio operators, it was a thrill beyond description to arrive in Paro, Bhutan! A beautiful terminal building graces the airport grounds, complete with the detailing and painting the Bhutanese architecture is known for.

Passing through passport control and receiving the visas was fast! The team was officially into Number 2!

Customs was cleared easily and the luggage was loaded onto a waiting bus. The "missing" crates were found in the cargo area. We had made it with all of the gear!

At the Pine Wood Hotel most of the antennas and masts had already been assembled and were ready to go up. After finding our rooms and a quick lunch, we began to plan the antennas.

The goal was to have four stations on the air by dark. Antennas were set up in three areas: CW, phone, and RTTY. The low-band antennas would be a few hundred meters away, on a ridge, clear of trees and buildings. We worked hard until after dark. At 1600Z on May 2nd we were QRV on four bands.

The next day antennas were installed for seven stations: three CW, three SSB, and one RTTY. Low-band antennas were set up on the third day.

The Challenge

James, 9V1YC, was in charge of scheduling the operators and matching them to wants and needs for openings to different parts of the world. There would be near 24-hour propagation into Europe and twice daily openings into North and South America. James found the propagation patterns were the same as those he experienced in Singapore.

An Operations Manual, modeled after the VKØIR and 3B9R manuals, had standards of behavior and the rule to stick with a call until it was safely confirmed in the log. Seven stations worked steadily around the clock. At 8:30 AM local time each day *all* the bands died just for an hour or two, slowly picking up as the day progressed. The best time for all bands and modes was during the nighttime hours.

Four stations during the first 24 hours put 7800 contacts in the log. On the third and fourth days over 12,500 contacts went into the log each day! All of this was with only 100 watts!

A52A was soon approaching tenth place in a listing of the top ten DX-peditions of all time, ranked by number of contacts. This inspired the competitive edge in the team, and we all worked harder than ever, in spite of the poor solar flux. (During the first week of operation the solar flux was in the 120–125 range, slowly rising to 150–160 near the

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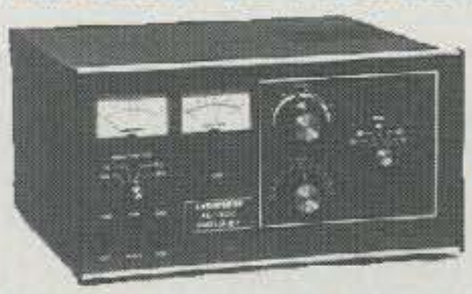

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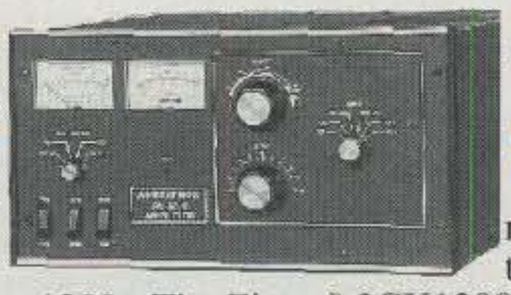
with Eimac® 3CX1200A7 tube



AL-1200

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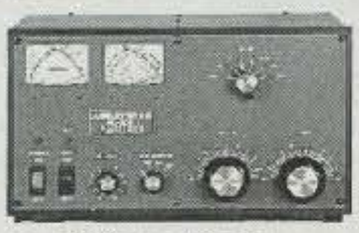
with 2 Eimac® 3CX800A7 tubes



AL-800H, $2395 suggested retail. Two Eimac® 3CX800A7 tubes produces 1500 *plus* Watts SSB PEP with 55 Watts drive. 52 lbs., 8½Hx16½Dx14¼W in. **AL-800, $1695** suggested retail, single 3CX800A7, 1250 Watts out with 70 Watts drive.

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CIRCLE 115 ON READER SERVICE CARD

The 6 meter antenna and view of the valley in which Paro is situated.

end. It rose to well over 225 after A52A went QRT.)

Our goal was to give A5 to as many hams as possible. It was obvious that the goal was being met. With only 100 watts, in mountainous terrain, and with a stubborn solar flux, 26,639 unique calls were in the log at the end of the operation.

Number 2

At 2:40 AM on the last night of operation A52A surpassed the VKØIR 80,630 total by 19 contacts! From Number 2 Most Wanted, A52A was now *Number 2* in all-time number of contacts generated by a DXpedition!

During the last 6 hours another approximately 1500 contacts were made. Shut down was at 0230Z on May 12th.

A52A was operational for almost 10 days, making 82,087 contacts with 100 watts. That's an easy average of about 8200 contacts per day. The continental breakdown was 62% Europe, 18% North/South America, and about 18% Asia. With 24-hour propagation to Europe, it was nice to have the Europeans standing by for the twice-daily openings into North and South America!

On May 12, 2000, A52A was history. The stations and antennas were disassembled and packed into crates. All too quickly goodbyes were said to gracious hosts and new friends. The team was in Paro by dark, and by 5:30 AM the next morning the team was at the airport for their return flights.

QSLs—Simple, Effective, Fast!

One of the goals from the very beginning was to provide *fast* QSLing. Thanks to Wayne Carroll, W4MPY, "The QSL Man," a simple but effective QSL card was designed that would be ready when the team returned home! The A52A card is not a fancy one, but it is attractive, neat, and tells a story about the country of Bhutan. The website <http://www.qsl.net/bhutan2000> and operators are identified.

Within 48–72 hours of arriving home, most of the team headed for the Dayton Hamvention. About 3500 cards were processed at Dayton, less than one week after going QRT! By May 31st, 2½ weeks after going QRT, over 14,000 A52A cards had been sent out! The QSL team primarily consisted of the Johnson family: Glenn, WØGJ; Vivien, KL7YL; Melissa, NØMAJ; Mark, NØMJ; Paul, WØPRJ; and Carrie, NØCMJ. Other QSL helpers were W9NT, KØKG, KBØROB, and NØWBS.

Acknowledgments

This was truly a team effort. Each person on the team had some expertise and important contribution to make:

James Brooks, 9V1YC, for support and operations planning and video.

Bob Allphin, K4UEE, for help with logistics, antennas, and fund-raising.

Jari Jussila, OH2BU, for planning and logistics.

Mark Demeuleneere, ON4WW, for CT merging and uploading logs.

Don Greenbaum, N1DG, for information technology and our website construction.

Doug Caron, N1IUN, for maintaining the website while A52A operated.

Glenn Johnson, WØGJ, for logistics and visa and licensing details.

The pilots, for interfacing with the public: Klaus Wagner, DL1XX; Garry

The Intrepid DXer

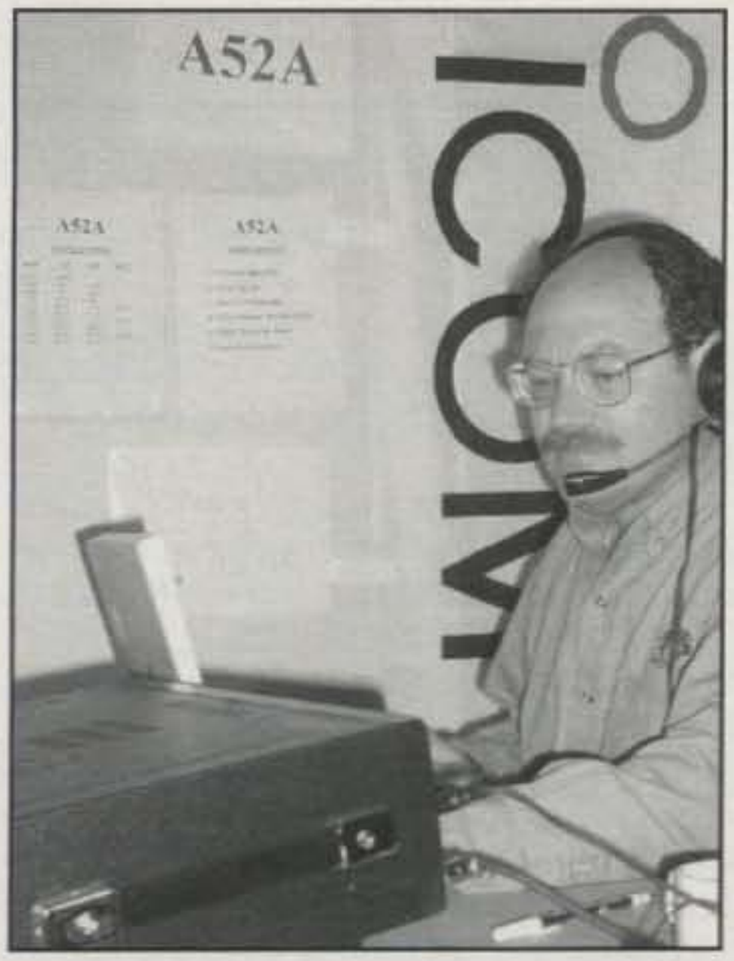
Excitement over the A52A operation was running high on the Minnesota Wireless Association reflector, in no small part because of the participation of fellow Minnesotans Glenn, WØGJ, and his son Mark, NØMJ. Caught up in the anticipation was Lynn, WØKHZ. Lynn had recently upgraded from Tech Plus to General and really wanted to work this one.

Several of us had helped Lynn assemble an HF station consisting of a Kenwood TS-820S and a homebrew, two-element 10 meter quad mounted on a roof tripod. Unfortunately for us here in the north, conditions had taken a turn for the worse. Factoring in the size of her station, there wasn't any possibility of propagation on 10 meters to Bhutan. I told Lynn that she could try to work A52A from my QTH, schedules and conditions permitting.

On Sunday A52A was hitting S-7 on 15 meter SSB. Now was the time! I immediately called Lynn and suggested she hurry, as the opening might not last very long. Even though Lynn lives less than two miles away, the minutes were ticking away and A52A's signal was starting to fade. Where was she? Thirty minutes later, Lynn appeared at my door breathless and exhausted. She couldn't find her car keys, so she had hopped on her bicycle. The bicycle had flat tires! Would a true DXer let these minor inconveniences stop her? Nope. She road the bike with the flat tires all the way to my QTH and jumped into the operator's chair.

By now the signal was just above the noise floor, making copy a little difficult. What a situation: Mark, NØMJ was the operator at A52A and sounded very excited to be holding a good rate into the States. Lynn trying to copy a weak signal, was unfamiliar with my station, and also was very excited. An "Elmer" was in the background trying to coach her without making it worse! After 10 minutes of calling, I heard Mark ask for "the WØ YL." Go Lynn, go, go, go! Taking a deep breath, Lynn repeated her call and completed the QSO. Congratulations to Lynn and to all who worked A52A. DX is!

Steve Root, KØSR
South Saint Paul, Minnesota



Seven stations were on the air around the clock. Shown here is Don, N1DG, who was also responsible for the construction of the A52A website.

Shapiro, NI6T; Doug Caron, N1IUN; Toshi Kusano, JA1ELY.

NCDXF and INDEXA for early financial support.

The multitude of individuals, clubs, and corporations for their financial and equipment support.

ICOM for the IC-756Pro radios.

Cushcraft for antennas.

Force 12 for masts.

The Pine Wood Hotel and staff for a most wonderful QTH and their support.

Bhutan Tourism Corporation, Ltd., for transportation and support.

Shipco Transport of Chicago and Bangkok for help with logistics.

Druk Air for helping to ensure A52A "arrived complete."

Zorro Miyazawa, JH1AJT, and Jim Smith, VK9NS, for encouragement.

The people of Bhutan, who have got to be the most beautiful, friendly people in the world.

Most of all, the people of the Ministry of Communications of the Kingdom of Bhutan for making all this possible.

And finally, Wayne Carrol, W4MPY, for helping make a reality the fastest QSLing ever after a major DXpedition!

Summary

The A52A operation was assembled and completed within about six weeks after the initial "go-ahead." A total of 82,087 contacts were made with 100 watts, making this the overall number two ranking DXpedition in history for number of contacts and the number one for low power. The majority of direct QSLing was accomplished within three weeks of going QRT.

For more details on the A52A operation, see their web page: <http://www.qsl.net/bhutan2000>.

The Future

ICOM Japan donated an ICOM 746 transceiver and Cushcraft donated an R8 multiband vertical for the establishment of a club station in Bhutan. The A52A team gave two A3S's, an A3WS, masts, power supply, etc.

Glenn, WØGJ, will return this winter to work at the hospital in Thimphu and to teach ham classes. Teaching materials are being gathered. Hopefully soon there will be many native A51 callsigns on the bands! ■

Our Readers Say

Deed Restrictions

Editor, *CQ*:

Just a note to tell you how much I enjoyed, and agree with, your editorial regarding deed restrictions (April issue). I happen to live in, and operate a ham station out of, a covenant deed restricted community, and your total coverage of the subject couldn't be better.

I just hope that you might, other than just the magazine article, have a direct way to forward your article verbatim to the powers that be at the FCC, so that they can truly see the entire picture and the total problem as you so aptly portrayed it.

Rich, I strongly believe that they have never gotten the message in total, and that if they do see all the aspects, as you outlined them so thoroughly, they really would "see the light" and revise PRB-1 so that the large number of us restricted hams will have a chance to utilize antennas that we need, for the public good, with no real effect on the so called "aesthetics" of the restricted communities—at least, no more than the federally mandated TV antennas, as you state in the editorial.

Even a routing through the ARRL to the FCC, as an addendum to their revision request may be a possibility, if you don't think a direct message would be in order. To me, any way would be very good, and would certainly be very appropriate. The FCC should be made aware of the total scenario, so that they can make the correct decision once and for all. Deed restricted communities do, in my experience as well as yours, operate on their own, above the law, with little governmental or municipal intervention, and will not provide any reasonable practical accommodation to a homeowner under any circumstance. I was even forced to remove my United States flag from the front courtyard of my condo because, according to my condo board's definition, "it altered the appearance of the front of my condominium," and as such, was "against the rules."

Rich, you certainly have my, and thousands of other hams' support, and I hope you can help to get the message through, for the benefit of all.

Craig S. Kidder, W8CK
via e-mail

Craig — I think that a magazine or newspaper's role in affecting public policy lies primarily in its editorial page. You, as a citizen, have a more direct voice. Should you, or any other reader, wish to copy this editorial to send to the FCC along with any personal comments of yours (which count for quite a bit), you have our permission. As for your flag, I'm no lawyer, but I seem to recall the courts telling condo associations in the past that they may not prohibit citizens from displaying the US flag. Check with a lawyer if you want to pursue it, and good luck.

Editor, *CQ*:

Congrats on your editorial. I moved recently into a retirement planned development and had to sign the usual CC&R. The FCC contention that these contracts are voluntary is ridiculous. They are required. I would state that all housing developments contain restrictions on antennas, transmitting and receiving. These developments must be 95% of all housing being built in the USA today.

The FCC on one hand says there is an interest in promoting amateur communications and the other hand will not take a position on the antennas required for said communications. I hope you take up the cause.

Addison Lake, KB6ICE
Tucson, Arizona

Editor, *CQ*:

I read your editorial while eating cereal this morning. I can't tell you how you've hit the nail on the head on this issue. Since relocating to Houston from New Orleans in 1982 this issue has hit me smack in the head. I must have looked at 30+ houses with and without real estate agents. I eventually settled into one of these "communist communities" (as an amateur in the Chicago area refers to them) with a "ten foot over the highest point of the roof limitation." This may be OK if you have three-story New England house and use a tri-bander, but with a two-story house with crouching attic and a two-element cubical quad, it does create "limitations" on the ability to communicate with the rights that the FCC granted when I was licensed back in October of 1963.

On and off over the past few years I have looked for a new QTH and always tried to meld the amateur's needs with those of the XYL with respect to location, plot size, etc. As time progressed, my knowledge and questions to the real estate agents became more and more detailed: what are the deed restrictions, can you get a copy of them, etc. Many of the agents just don't have the knowledge or in some cases don't really care about spending the time that amateurs now need to settle these issues with these "self-elected" committees in advance of closing a sale.

I applaud the ARRL for pushing the FCC with respect to PRB-1. Here in Texas, a bill was passed last year that "mimics" PRB-1. This law will help with respect to the any municipal governments, but I

doubt that it will have much effect on these "contracts" hidden attached to the property deed.

Hopefully, the FCC will reconsider and see the legal logic that you indicate in your editorial.

Ed Gerber, W5GCX
via e-mail

Restructuring Good For Disabled Hams

Editor, *CQ:*

This is to thank the FCC for the 1999 license restructuring. The 20% of Americans who are born with development problems can now join the ham community on the main bands. As a learning disabled Advanced class operator (no waivers), I can now reach Extra by means of exams in electronics. The FCC put our hobby in support of the Americans with Disabilities Act. The hobby should grow ... We are all the better for the FCC's actions. Let all hams join together and enlist more licensees.

Burton E. Eaton, N2FYT
Oceanside, New York

Let's Get With the Times

Editor, *CQ*:

I'm one of the *CQ VHF* subscribers who was changed over to *CQ*. I'm P-O'd. I chose *CQ VHF* because it didn't have half the editorial and technical articles devoted to archaic subjects like CW, keys, and QRP-CW rigs. The big worry about ham radio is its failure to keep up with, not to mention develop, new technologies. In the last year, here is a list of the articles on Spread Spectrum construction, modifying microwave gear into the ham bands, voice over packet, packet radio design and practice over 56Kb, multiple phase modulation techniques, microwave test gear and practice, waveguide construction techniques, etc.:

Big blank list, isn't it? Let's come up with some better material and leave the old technologies to the history books.

Jim, N7WVZ
via e-mail

Jim — It's curious that you find QRP archaic, as it's the fastest-growing segment of our hobby today. Plus, participation in our CW contests gets higher each year. These are all significant parts of our hobby that merit coverage in the pages of a general-interest ham magazine. As for the articles you say we're missing, you're absolutely right. They should be covered, too. But we can only print articles if people write them. You are cordially invited to become part of the solution. You'll find our writers' guidelines on our website.

A Very Special WAZ Award

Editor, *CQ*:

I wanted to thank you for the most special award I have received in my 43 years of hamming, 28 years of DXing, and 13 years of 80 meter DXing—my certificate #73 for 80 meter WAZ on SSB.

The award itself is special, but what makes it a treasure to me is that my cards were handled by Jim Dionne, K1MEM, during his last weeks with us, and my certificate is signed by Chod Harris, VP2ML, and Alan Dorhoffer, K2EEK. I'll remember them and how they helped me enjoy a great hobby a little bit more.

Neill Singletary, K4ESE
Clarkton, North Carolina

We continue our review of the Ten-Tec Pegasus computer-controlled HF transceiver with performance evaluations, both in the lab and on the air.

CQ Reviews:

The Ten-Tec Pegasus — Part II

BY SCOTT PRATHER,* N7NB

In Part I of this review we discussed the concepts behind the Ten-Tec Pegasus HF transceiver, as well as its construction and the features of both its radio side and the software that provides the graphical user interface. That's what you see on your computer screen as you operate the radio, and how you control it, because the Pegasus is completely computer-controlled. In fact, it won't work unless it's plugged into a personal computer. We conclude now with the "meat" of any product review: How well does it work? We start out with lab tests, and then put it on the air for the "real" test.

Lab Performance

The Pegasus was run through a battery of tests to quantify its performance in a lab environment. The results of these tests are summarized in this section.

Receiver. Measurements of the Pegasus receiver yielded the results listed in Table I. The receiver met or surpassed all factory specifications with the exception of 10 dB S+N/N sensitivity. While the receiver meets the 0.35 mV factory-specified sensitivity on all amateur bands from 80 through 12 meters, it did not meet spec on the 10 or 160 meter band. The delta (variation) from specified performance was a mere 1 dB at 28.5 MHz and a full 4 dB at 1.9 MHz. The receiver's 10 dB S+N/N sensitivity continues to deteriorate below 160 meters, rising to 3.8 mV at 700 kHz and 13 mV at 300 kHz.

Blocking dynamic range and third-order intercept tests were conducted using 100 kHz tone spacing instead of the 20 kHz typically used by other labs. This wider spacing was necessary to compensate for reciprocal mixing due to phase noise contributions from the Pegasus synthesizer. This reciprocal mixing (along with the fact that AGC cannot be disabled) also prevented measurement of the unit's DSP filter shape factors.

Proper design of the AGC circuitry is critical for optimal performance of a receiver using a DSP IF. The Pegasus AGC displays a very rapid attack time of 2.5 ms with very little overshoot (see fig. 8). No amplitude compression was noted until the input level was increased above –40 dBm, at which point the receiver began to show about 3 dB of amplitude compression for about 3 ms due to the analog AGC loop. The decay characteristics of the three AGC settings are listed in Table I. The Pegasus AGC has an unusually high

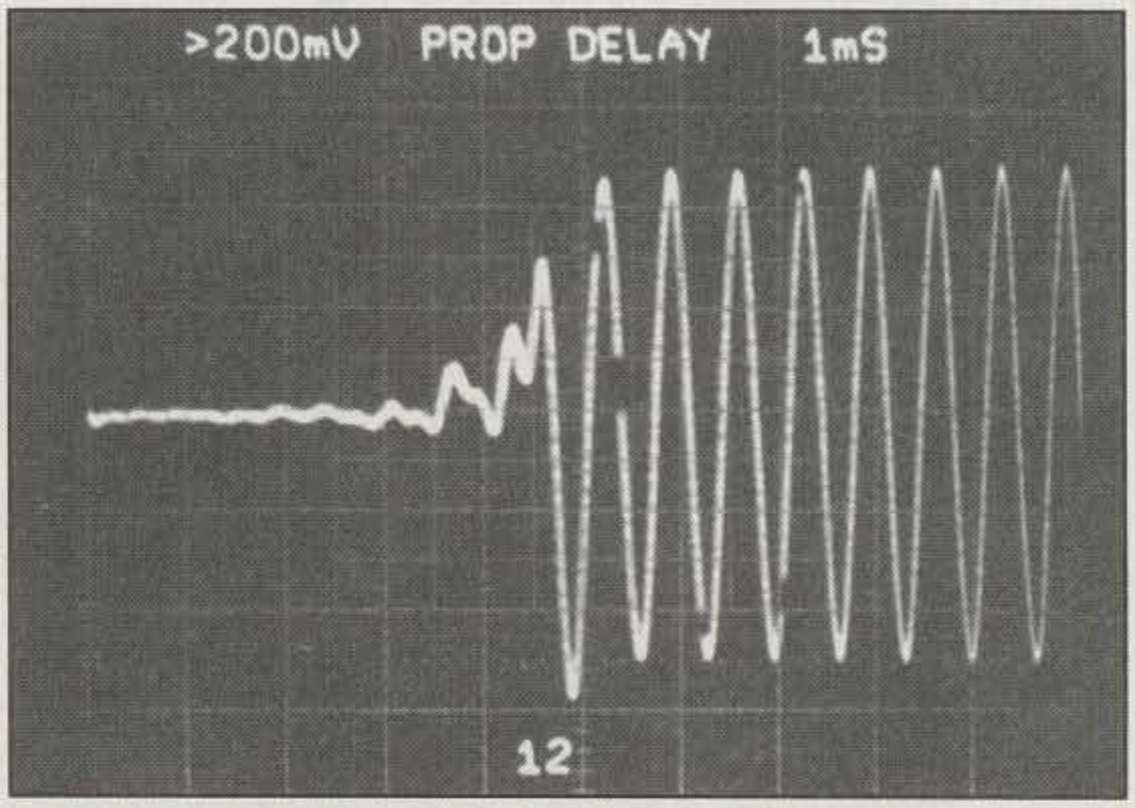


Fig. 8– Pegasus propagation delay and AGC attack time. Sweep triggered off of –70 dBm CW burst. X-axis = 1 ms/division.

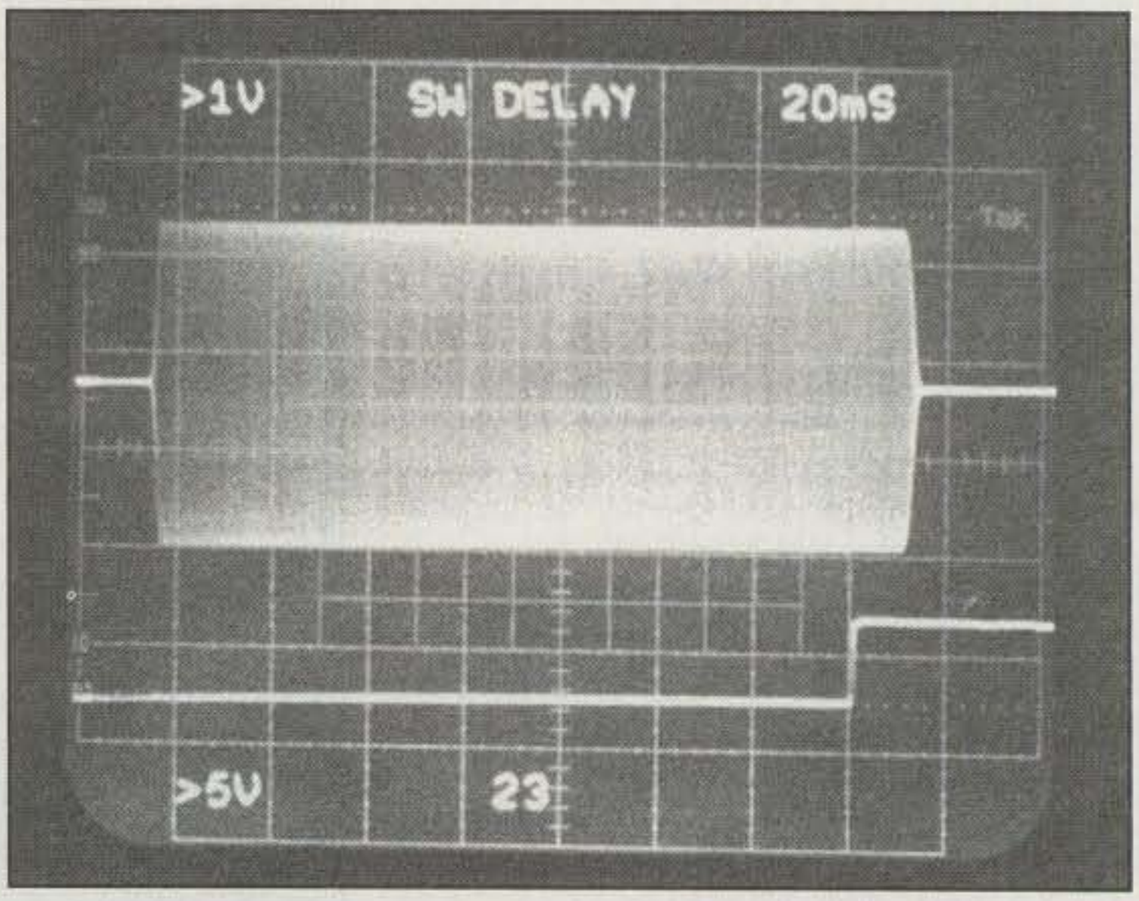


Fig. 9– Receive-transmit and transmit-receive switching delay. Sweep triggered off of keyline. Operating in CW mode on 14.1 MHz. X-axis = 20 msc/division.

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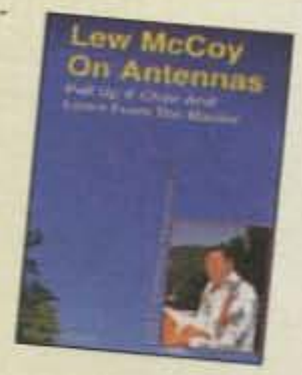

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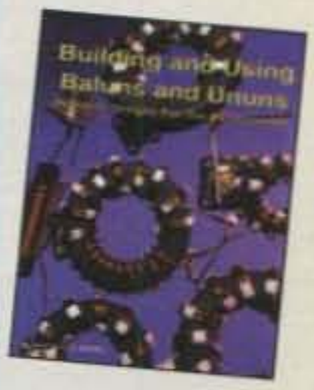

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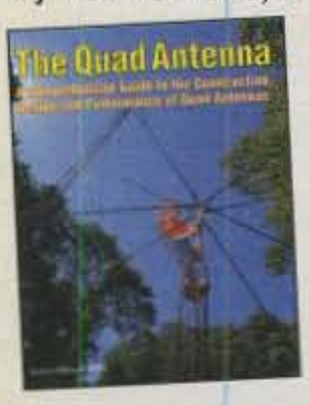

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Parameter	Measured Value	Ten-Tec Specification	Comments
Noise Floor	≤ 0.14 mV 3.5–30 MHz; 0.22 mV @ 1.9 MHz	–126 dBm (0.12 mV)	Measured in a 3 kHz BW
Noise Figure	≤ 14 dB 3.5–24 MHz; 18 dB @ 1.9 MHz, 15 dB @ 28 MHz	Not Specified	Measured in a 2.8 kHz effective noise BW
Two-Tone Blocking Dynamic Range	91 dB	90 dB	Measured at 100 kHz Spacing with 3 kHz BW @ 14.2 MHz
Third-Order Intercept	+11 dBm	+10 dBm	Measured at 100 kHz spacing with 3 kHz BW @ 14.2 MHz[1]
60 dB/3 dB RX Filter Shape Factors	Not Measured	1.5	Measurement not possible due to phase noise and AGC action
10 dB S+N/N Sensitivity	≤ 0.35 mV 3.5– 24 MHz; 0.55 mV @ 1.9 MHz, 0.38 mV @ 28 MHz	0.35 mV	Measured in a 3 kHz BW
AGC Threshold	5.6 mV (–92 dBm)	Not Specified	Measured in a 3 kHz BW
Audio Change for 100 dB Change in Input Level	23 dB	Not Specified	Measured from –120 dBm to –20 dBm at 14.2 MHz in CW mode
AGC Attack Time	2.5 msc	Not Specified	See fig. 8
AGC Release Time, Fast	80 ms	Not Specified	Measured at 14.1 MHz
AGC Release Time, Medium	600 ms	Not Specified	Measured at 14.1 MHz
AGC Release Time, Slow	5.5 sec.	Not Specified	Measured at 14.1 MHz
S-Meter (S-9 Level)	26 mV	50 mV	Measured at 14.1 MHz
Propagation Delay	5 ms	Not Specified	Includes AGC attack time. See fig. 8
Noise Reduction	19 dB	>15 dB	Measured in a 3 kHz receiver BW with Gaussian noise source of –85 dbm/Hz
Squelch Threshold	4.0 mV	Not Specified	Measured in FM mode at 29.5 MHz
Modulation Acceptance	±5.5 kHz	Not Specified	Measured at 29.5 MHz
Auto-Notch Rejection	>30 dB	Not Specified	Measured 1.5 kHz CW tone
Audio Distortion	1.2%	Not Specified	Measured at speaker output at full volume with 1.5 kHz tone using 3 kHz BW
IF Rejection	64 dB	>60 dB	Measured with 45 MHz input signal
Image Rejection	82 dB	>60 dB	104.1 MHz input, RX tuned to 14.1 MHz

[1] *Initial measurement was phase-noise limited at 50 kHz spacing.*

Table I– Pegasus receiver lab measurements.

threshold of 5.6 mV (–92 dBm). This is a full 34 dB above the receiver's typical noise floor, and as a result, all signals below approximately S-6 have no AGC.

FM reception on the Pegasus is somewhat disappointing, especially if the squelch control is used to eliminate noise between transmissions. With the squelch set to its threshold, an input signal of 4.0 mV (approx. S-5) at ±3.3 kHz deviation was required to open it. Even at this level, the squelch action was choppy. The characteristics of the squelch, combined with the receiver filters, result in a modulation acceptance of only ±5.5 kHz. Consequently, any 10 meter FM stations that frequently exceed a nominal deviation of ±5.0 kHz will cause moderate to severe clipping due to squelch action unless the signal is quite strong or the squelch is disabled.

Measurements of the receiver's propagation delay are listed in Table I and depicted in fig. 8. Note that propagation delay is quite constant at 5 ms, and that this delay includes AGC attack time. Receive to transmit and transmit to receive switching time were essentially the same in either case, measuring ≤15 ms (see fig. 9). The receiver recovery time measured 22 ms, which is 10% greater than Ten-Tec's spec of 20 ms when operating split with the transmitter on 29.5 MHz and the receiver on 3.7 MHz (see fig. 10).

The Pegasus receive audio quality is exceptionally good. At full volume, the THD (total harmonic distortion) measured at the speaker output was a mere 1.2%. This, along with an excellent signal-noise ratio in the audio stages, provides the user with clean audio that greatly minimizes listener fatigue. The Pegasus DSP noise reduction circuit is quite effective, lowering the level of wideband Gaussian noise about 19 dB. In addition, the DSP auto-notch circuit provided in excess of 30 dB of attentuation for a CW carrier in the receiver passband.

Transmitter. Measurements of the Pegasus transmitter yielded the results shown in Table II. The Pegasus transmitter met or exceeded all of its published specifications. Because the SSB signal is generated in DSP, carrier and unwanted sideband suppression are excellent, far better than can be achieved in an analog modulator.

Ten-Tec is noted for its CW QSK quality, and the Pegasus meets expectations here as well. The keyed CW waveform is very clean with no evidence of ALC-related overshoot. The leading and trailing edges of the CW signal are well-shaped, and display a rise time of about 1.4 ms and 1.8 ms, respectively (see figs. 11 and 12). The driver and PA stages are reasonably linear as well, with third-order IMD products 29 dB below one of two input tones (see fig. 13).

Spectral purity on the amateur bands above 14 MHz is not as clean as expected. This as especially true on 10 meters, where the transmitter produces a substantial spurious emission at approximately 17.3 MHz. However, the attenuation of this spur falls within Ten-Tec's specification of > –40 dBc.

On-The-Air Observations

After putting the Pegasus through the rigors of lab testing, there's really nothing to compare with actually using the radio on the air. In this section we will see how the results of our lab tests show up to the operator under normal amateur use.

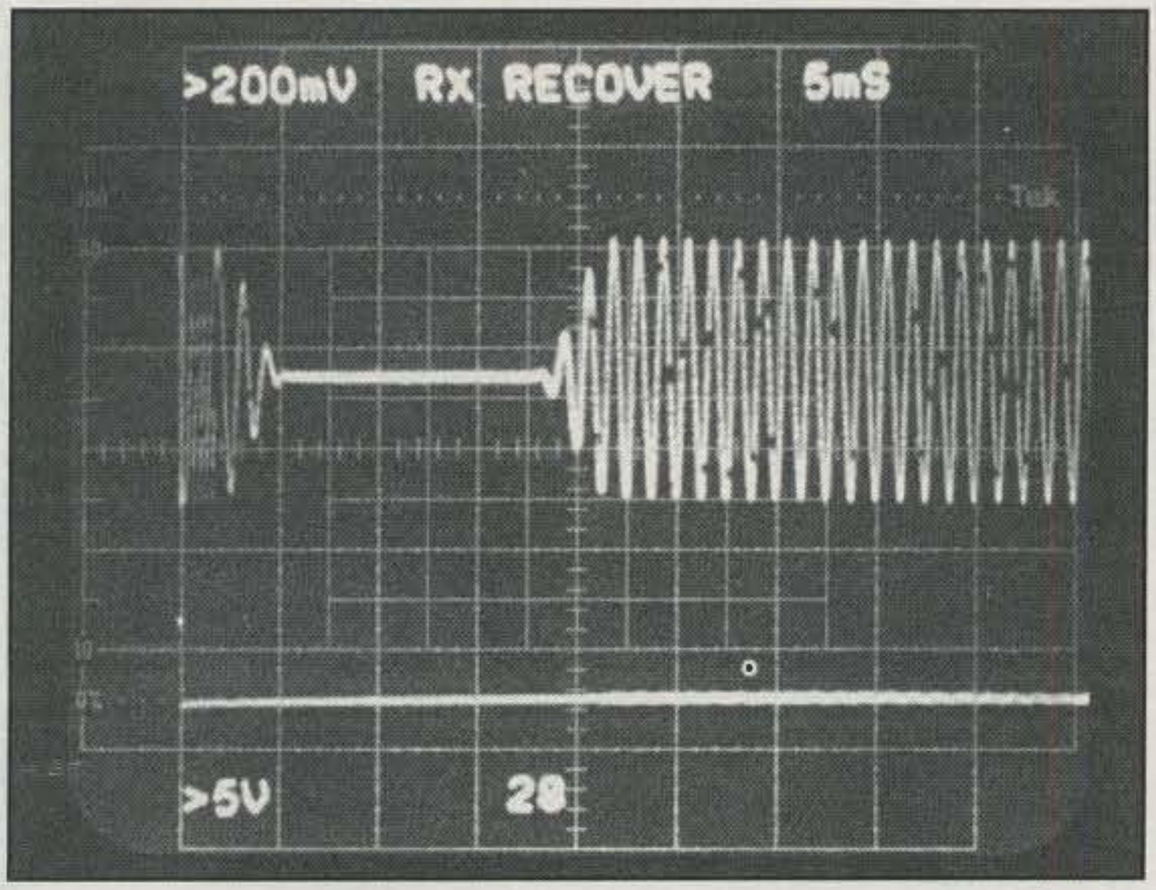

Fig. 10– Receiver recovery time, transmit on 29.5 MHz CW, receive on 3.7 MHz. Sweep triggered off of release of key. First tone in trace is TX sidetone; second tone is receive beat note from 3.7 MHz signal generator. X-axis = 5 ms/division.

First of all, I can safely say that the receiver in the Pegasus is both the strongest and weakest point of the product. While the DSP provides a wide range of filters with excellent shape factors, low-distortion demodulation, effective noise reduction, etc., the DSP cannot make up for the shortcomings of the receiver front end. In order to meet the price point originally established for this product, Ten-Tec was forced to use a synthesizer design that's lacking in terms of phase noise performance. In addition, the front end has inadequate linearity to support the high dynamic range and IP^3 numbers that amateurs expect in a current receiver.

What does this mean on the air? Surprisingly, there is really very little difference between the performance of the Pegasus and other receivers with more impressive numbers. The faults in the front-end design show up most readily during contests. For instance, I used the Pegasus on 20 meters during the CW Sweepstakes. The band was loaded with literally hundreds of signals, most over S-9. Several nearby stations were 30 and 40 dB over S-9, according to the Pegasus's S-meter. The extremely strong nearby signals would cause very noticeable AGC pumping. However, activating the 20 dB attenuator (along with judicious adjustment of the RF gain control in some cases) was sufficient to eliminate this problem with a minimal effect on usable sensitivity. While this approach may not work for the serious contester, it is a viable option for the more casual user.

With the exception of the scenario described above, the receiver performs very well in actual use. One aspect of the radio that becomes immediately apparent is that the receive audio is exceptionally clean, especially on SSB. Listening on 10 meters one morning, I found that the vast majority of SSB stations were received with audio quality one would normally associate with FM. However, the receiver's high-quality audio is not limited to SSB operation. The Pegasus provides excellent CW filtering as well, with no ringing at the narrow bandwidths. The low-noise, low-distortion audio chain makes weak signals stand out from the noise. Switching in the DSP noise reduction improves the signal-to-noise ratio substantially in either mode (although the noise-reduction algorithm has a tendency to create noticeable audio distortion under certain QRN conditions).

The Pegasus exhibits one idiosyncrasy on CW that the operator my not expect. When using wide bandwidths (say, 1 kHz or so, depending on the user-defined CW offset) the receiver will not provide single-signal CW operation. Instead, the user will find a signal on either side of zero beat. However, this is easily corrected by offsetting the passband tuning appropriately.

As the lab tests show, the Pegasus transmitter performs as well as most in its power and price class, and other than the fact that it's controlled via the virtual front panel, there's very little difference between it and a conventional amateur transceiver.

Operating the Pegasus takes a little bit of getting used to. The virtual front panel is quite intuitive and supports most functions quite well. However, I would strongly recommend that anyone contemplating the purchase of a Pegasus spend

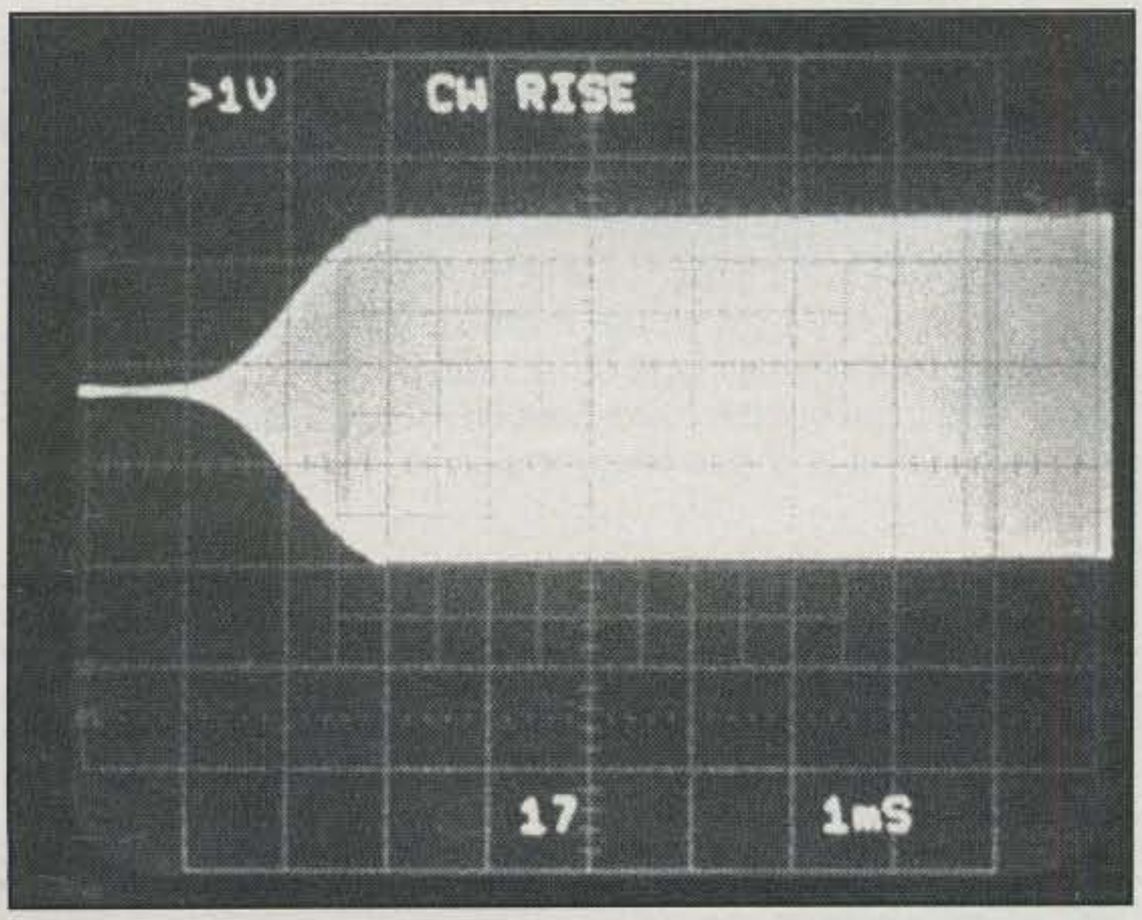

Fig. 11– CW waveform leading edge, risetime. X-axis = 1 ms/division.

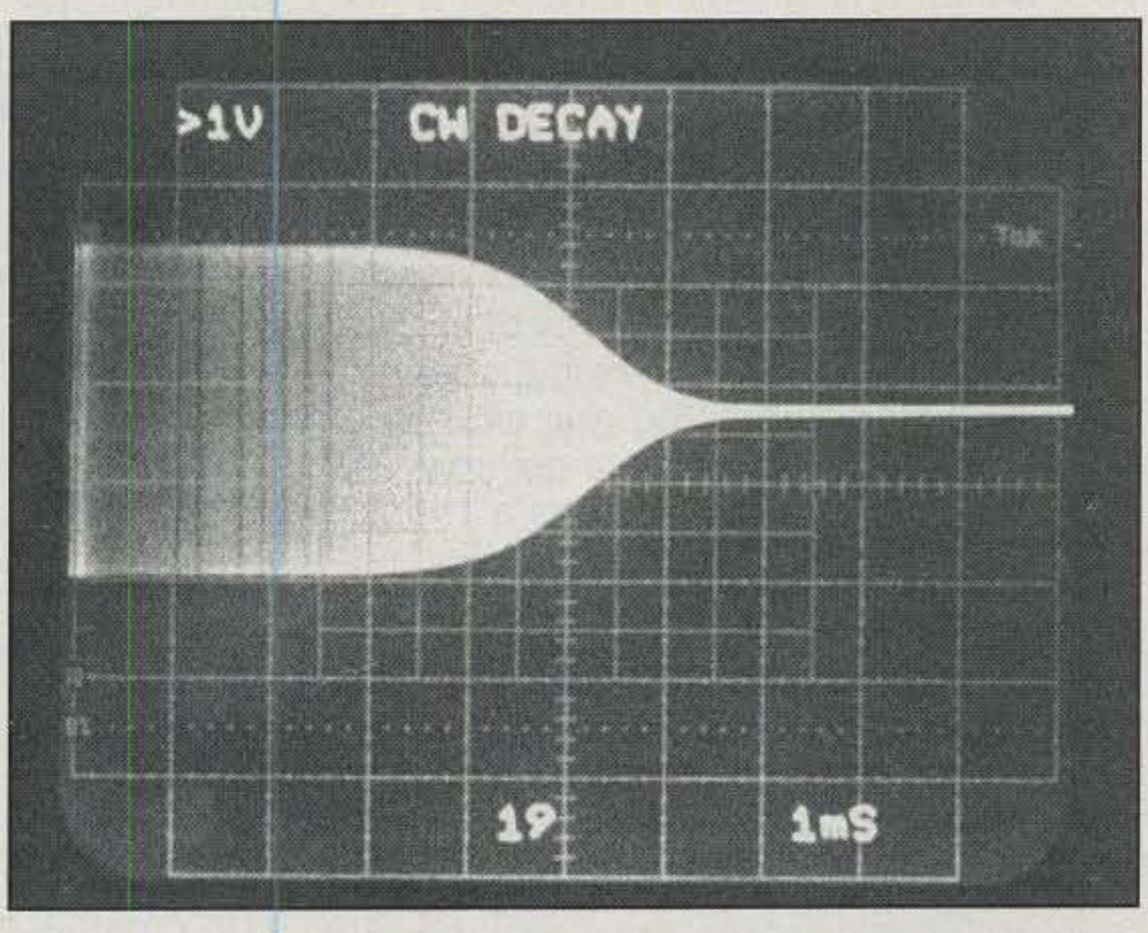

Fig. 12– CW waveform, trailing edge, decay time. X-axis = 1 ms/division.

Parameter	Measured Value	Ten-Tec Specification	Comments
RF Output Power (CW)	105 watts	100 watts	Measured into 50-ohm non-reactive load
Spurious Suppression	46 dBc @ 100W PEP	> 40 dBc @ 100W PEP	Measured with transmitter on 28.5 MHz, worst-case spurious at 17.3 MHz
Carrier Suppression	>70 dB	>50 dB	Measured at 7 MHz
Undesired Sideband Suppression	>60 dB (phase noise limited)	>60 dB	Measured at 7 MHz with a 1.5 kHz tone
Third-Order Intermodulation Product Attenuation @ 100W Output Power	29 dB	> 25 dB	IMD measured relative to desired tone level (desired tone 6 dB below PEP level) at 14.1 MHz (see fig. 13)
3 dB Transmit filter BW	2385 Hz	Not Specified	Measured using 2.4 kHz filter
60/3 dB Transmit Filter Shape Factor	1.34	<1.5	Measured using 2.4 kHz filter
Frequency Stability	6 Hz in 1st hour	Not specified	Measured at 25°C ambient from cold start at 7 MHz
FM Deviation	± 8 kHz	± 5 kHz	Measured at 29.5 MHz
Receive-Transmit Switching Time	≤ 15 ms	Not Specified	Measured switching between key-down and beginning of transmit CW wave form on 14.1 MHz, CW mode, QSK delay set to minimum (see fig. 9)
Transmit-Receive Switching Time	≤ 15 ms	Not Specified	Measured switching between key up and end of transmit CW waveform on 14.1 MHz, CW mode, QSK delay set to minimum (see fig. 9)
Receiver Recovery Time	≤ 22 ms	20 ms	Measured switching between transmit on 29.5 MHz and receive on 3.8 MHz, CW mode, QSK delay set to minimum (see fig. 10)
CW Risetime	1.4 ms	Not Specified	See fig. 11
CW Decay Time	1.8 ms	Not Specified	See fig. 12

Table II– Pegasus transmitter lab measurements.

the extra money for the remote encoder (see fig. 14). While the Pegasus can be tuned without it (using either the up/down arrow keys, direct frequency entry, or the mouse to "spin" the virtual tuning knob), use of the computer to perform this function takes too much of the user's attention away from operating. Trolling a band for weak signals requires concentration, and it's much easier to maintain that concentration while using an analog control for tuning. Some aspects of ham radio just weren't meant to be performed with a keyboard.

There is one aspect of the remote encoder that requires mention, however. Depending upon the characteristics of the host computer, the remote encoder is easily capable of outputting data faster than the Pegasus GUI can accept it. For example, if the tuning knob is rotated quickly (to make a fast QSY past several strong stations, for example) the Pegasus will change frequency in small, closely-spaced steps. This results in a total frequency excursion that's actually smaller than if the knob had been rotated slowly to begin with. According to Ten-Tec, the severity of this problem varies quite a bit from one host machine to another. Newer machines, as well as machines running graphics accelerators, seem to have less of a problem. The problem is caused in part by the fact that the GUI was written as a 16-bit application so that it could run on Windows 3.1 and Windows 95/98. The manner in which both the GUI and Windows manage the serial port potentially results in buffer overflows, effectively slowing down the tuning rate. Ten-Tec believes that developers who write a GUI for the 32-bit Windows platform will probably see this issue nearly eliminated due to the fact that this platform supports threads for the serial port drivers that are unavailable in the 16-bit environment.

Operators should be aware that the VOX, PTT, CW hand key, and CW keyer all share the same transmit keyline in the Pegasus. As a result, inadvertently pressing the hand key or keyer paddle during SSB reception will cause the radio to transmit. By the same token, phone operators who use VOX will want to make certain that they turn it off when operating CW, because any sounds in the room sufficient to trip the VOX will cause the radio to transmit a CW carrier while the audio is present.

One somewhat annoying aspect of the Pegasus hardware design is that there is no provision for an external speaker. Users who want an external speaker will have to use an amplified speaker on the Line Out jack, or feed receive audio into the host computer's sound card.

The Pegasus's receiver is certainly not limited to the amateur and shortwave broadcast bands, as its frequency coverage extends down to 100 kHz. However, my lab measurements indicate that as the receiver is tuned below the 80 meter band, the noise floor (or minimum discernible signal, if you prefer) of the receiver begins to rise above its specified value of –126 dBm. At 700 kHz, for example, the receiver noise floor is 21 dB worse than it is at 3.7 MHz. However, this loss of sensitivity in the broadcast band is of minimal consequence to all but the hard-core BCB-DXer, since the ambient noise level at these frequencies is normally quite high.

Conclusion

For the money, Ten-Tec definitely has a winner here. While the unit does not offer competition-grade receiver performance in strong-signal environments, it offers impressive performance under the vast majority of operating conditions. The receiver's sharp DSP-based filters, along with a low-noise, low-distortion audio chain, provide the user with receive signals that are easily copied and cause a minimal amount of listener fatigue, regardless of the operating mode. The transmitter will provide the CW user with the high-qual-

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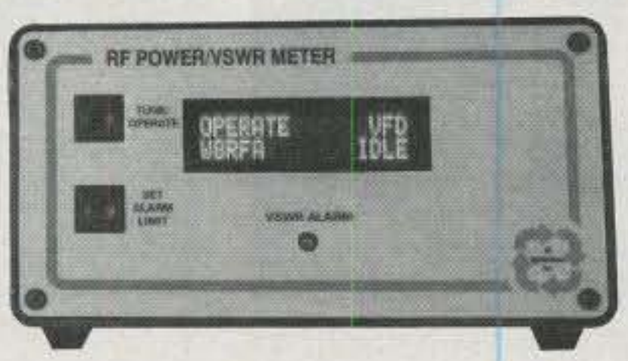

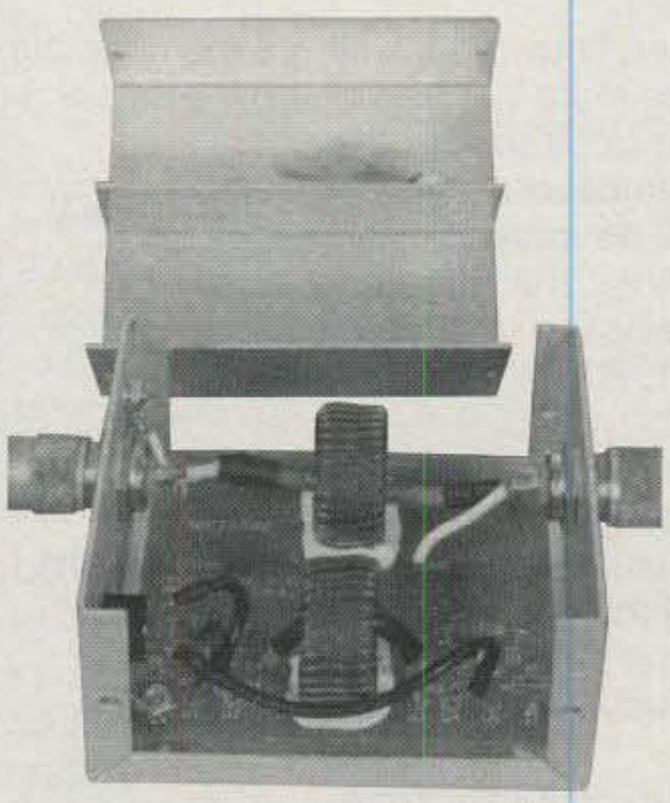

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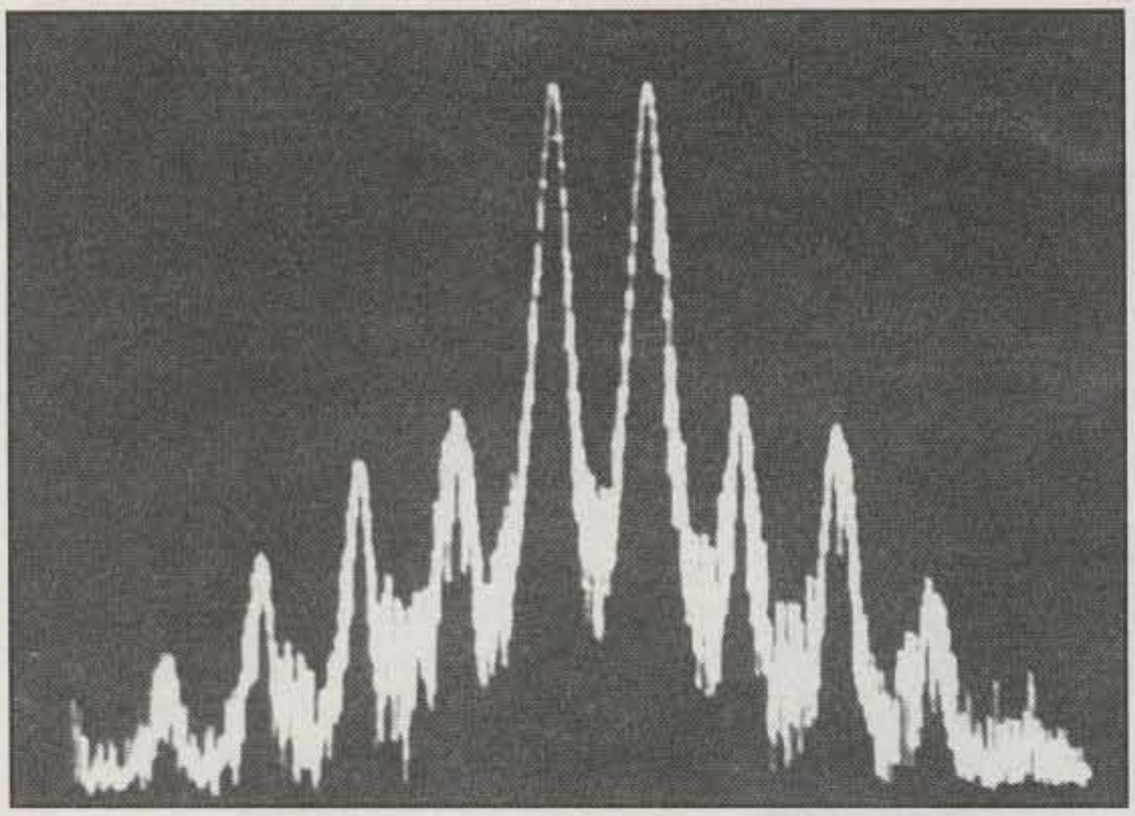

Fig. 13– Pegasus transmitter two-tone IMD measurement at 14.1 MHz. RBW = 100 Hz, video filter = 100 Hz.

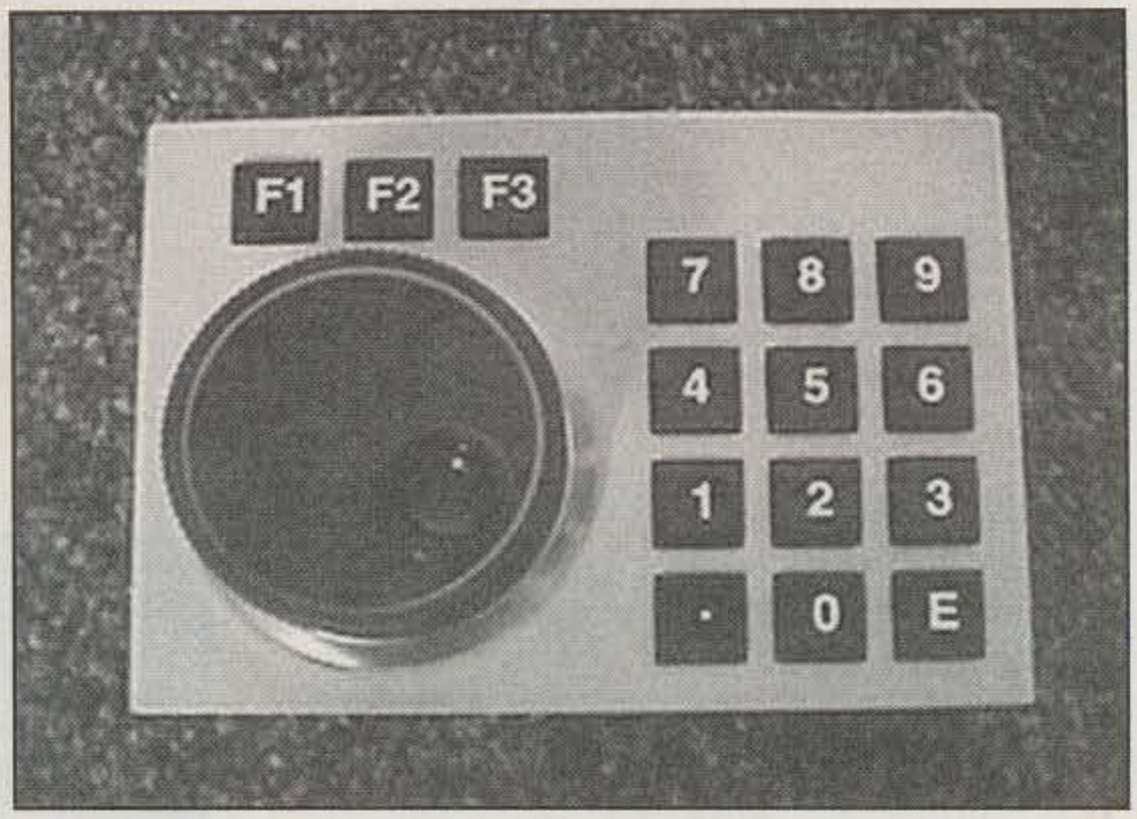

Fig. 14– Pegasus remote encoder.

ity QSK for which Ten-Tec has always been known, as well as clean transmit SSB audio. Operating the radio via the virtual front panel takes a little bit of getting used to, but the effort required is minimal. Addition of the remote encoder will provide the user with a radio that's almost as easy to operate as any with a "real" front panel. Because the Pegasus requires a host computer to operate, the radio is a natural for those interested in modes such as PSK-31, RTTY, AMTOR, PACTOR, etc.

Ten-Tec is also constantly improving its product. New application and firmware loads have frequently been made available from the Ten-Tec web site. Because these files are small, it takes very little time to download them, even if the user has slow Internet connectivity. Installation of new firmware loads is a breeze, since Ten-Tec includes a flash memory update utility with the GUI.

The Pegasus was specifically designed to make software-defined radios affordable to the average amateur. In meeting this price point, several compromises in the receiver design were required. As a result, the receiver's blocking dynamic range suffers, and the sensitivity does not quite meet what competitors are offering. No amount of software updates will change that. However, in a practical sense, the radio performs very well under a wide variety of conditions typically encountered during day-to-day operation.

Amateurs who would like to try their hand at improving the hardware design of the Pegasus should take note that such attempts will not void the factory warranty. Ten-Tec allows modifications to its equipment, as long as the modifications can be removed should factory service be necessary. The SMT components on the RF board, along with the need to fashion extension cables in order for this card to function outside the chassis, should prove challenging to those interested in making changes to the hardware. The option is there, however, for those who want to make a go of it.

The Pegasus represents a nearly ideal RF hardware platform on which to begin experimenting with DSP. As new applications are developed, the internet makes it possible for amateurs to exchange their software with others anywhere in the world, and the availability of flash memory allows users to define multiple operating environments without ever touching the hardware. The ultimate software-defined radio, DSP at the antenna, is still a while off. In the meantime, though, the Pegasus should give many of us the incentive we need to begin experimenting with current digital signal processing technology, whether it be at the physical or the application layer.

Summary

The Pegasus retails for $895. The remote tuning control is an additional $139. For more information, or to order, contact Ten-Tec at 1185 Dolly Parton Parkway, Sevierville, TN 37862; phone: 800-833-7373; e-mail: <sales@tentec.com>; web: <http://www.tentec.com>.

Acknowledgements

I would like to take this opportunity to thank several individuals at Ten-Tec: Scott Robbins, W4PA, for providing me with a Pegasus evaluation unit; Tom Salvetti, KC3NF, for his excellent research on the many questions that arose during the writing of this article; and Gary Barbour, AC4DL, for providing insight into several software issues.

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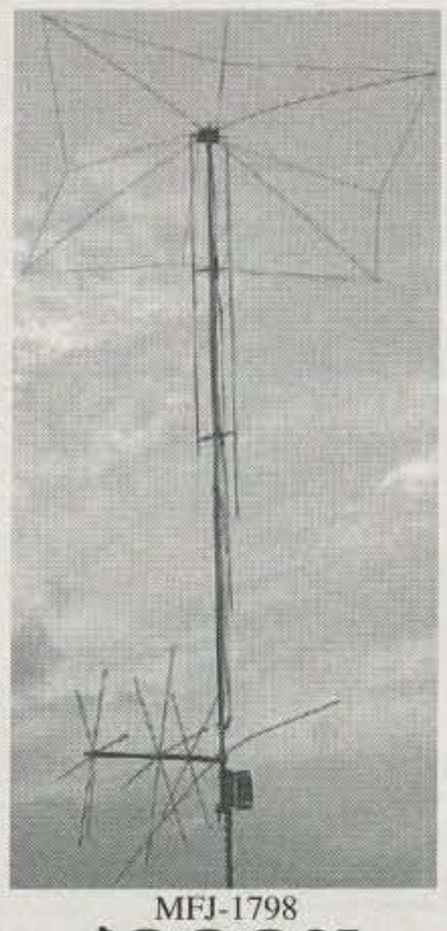

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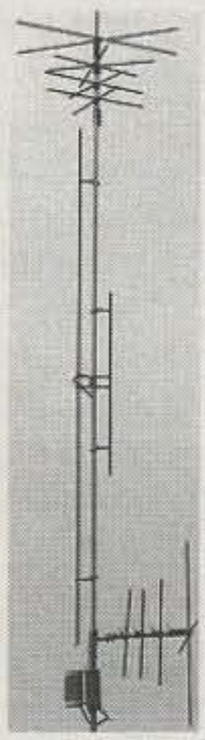

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Who Set the Stage for Radio?

BY SANFORD A. FRANZBLAU, M.D., Ph.D.,* KA9BBV

How did radio communication come into being? Almost everyone knows about Marconi, but what went on before him? Where did he get his ideas? How did it all begin?

As with all things in nature, magnetism and electricity existed from the beginning. They were not apparent to the naked eye, though. Man had to discover them and then work with them in order to understand them. It was not an idle choice of words when, in bygone days, the study of physics was called "natural philosophy." It is a tale of connections and relationships; one idea leading to another; one generation providing ideas and tools for use by the next.

What follows is a synopsis of some of the concepts that we hams take for granted, ideas such as induction, resonance, capacitance, resistance, tuned circuits, and yes, even electricity and magnetism. What led to their discovery? Who was involved? How did it all come about? What we enjoy today is the result of many little steps contributed by a myriad of people over hundreds of years, each experimenting to satisfy his curiosity and to test his ideas. Without that underpinning we'd still be using smoke signals or beating drums to communicate over long distances.

Starting with Magnetism

Magnetism was known to the early Greeks 500 years before the time of Jesus. There was a district called Magnesia in the northeastern part of Greece where one could find a type of ore that would attract pieces of iron. An ancient Greek by the name of Thales made note of it in his writings. It is a form of black iron oxide which we now call "magnetite" after its place of discovery.

It wasn't long before someone else discovered that if he stroked a steel needle with a piece of magnetite, the needle would be attracted to iron. Then somebody suspended the needle from a piece of thread tied about its middle and found that the needle consistently oriented itself in a north-south direction. It is said that Chinese sailors and Arabian caravan leaders floated a splinter of magnetite in a bowl of mercury and used it as an aid to navigation in crossing oceans and deserts when the sun and stars were obscured. It required only the inscription of direction markers on the rim of the container *encompassing* this arrangement to give us the compass.

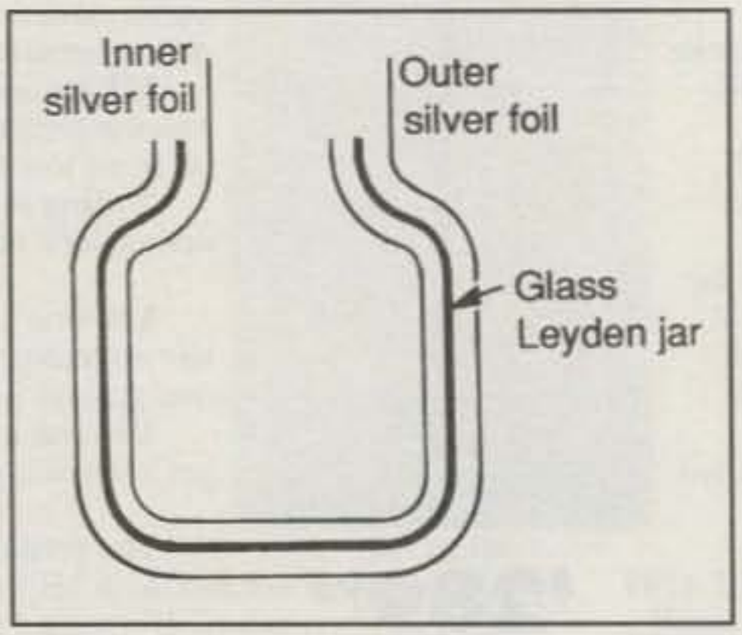

Fig. 1– The Leyden Jar, developed at the University of Leyden in Holland in 1745, was the first practical device for storing electric charges.

During the years from the time of Thales to about 1500 AD there was little in the way of what we today would call scientific progress. However, in the late 1500s Sir William Gilbert, physician to Queen Elizabeth I, published a book about magnets and put forth the idea that the Earth was a giant magnet with north and south poles. He said that was why magnetized needles oriented themselves the way they did. His proposal appears to have stood the test of time, although we now know that the magnetic poles of our planet do shift with time.

Sparks of Learning

The earliest studies of what we refer to as electricity were made in the early 1600s by a German named Otto von Guericke. He experimented with amber that he rubbed with a piece of silk. He noted that if he touched the amber to each of two little bits of cork suspended from threads, the two pieces of cork would repel one another. If he touched that amber to a metal rod stuck in the earth, he could produce a spark. He spoke of the transfer of an "invisible fluid" from the amber to the cork. Soon others began experimenting with materials such as glass, mica, hard rubber, and sealing wax. They found that resinous substances such as rubber, sealing wax, and amber produced charges that repelled each other. Glass and mica also produced charges that repelled one another, but those charges *attracted* the charges produced by resinous substances. Needing a name for these charges, and since amber was called "elektron" in Greek, the charges began to be referred to as electric charges.

Thus, matters remained for about 200 years until, by the mid-1700s, a few gadgets were introduced to allow further experimentation with these so-called "electric fluids." The first of these was built by a man named Haukesbee. It was called an electroscope and consisted of two straws hung side by side from a metal bar. If a charged piece of amber was touched to the metal bar, the two straws moved apart, and if the metal bar was touched to any metal attached to the ground, the straws came together. This provided a device whereby one could detect the presence of an electric charge.

The second device was the Leyden jar (fig. 1). It was built in 1745 by a group of students and teachers at the Univer-

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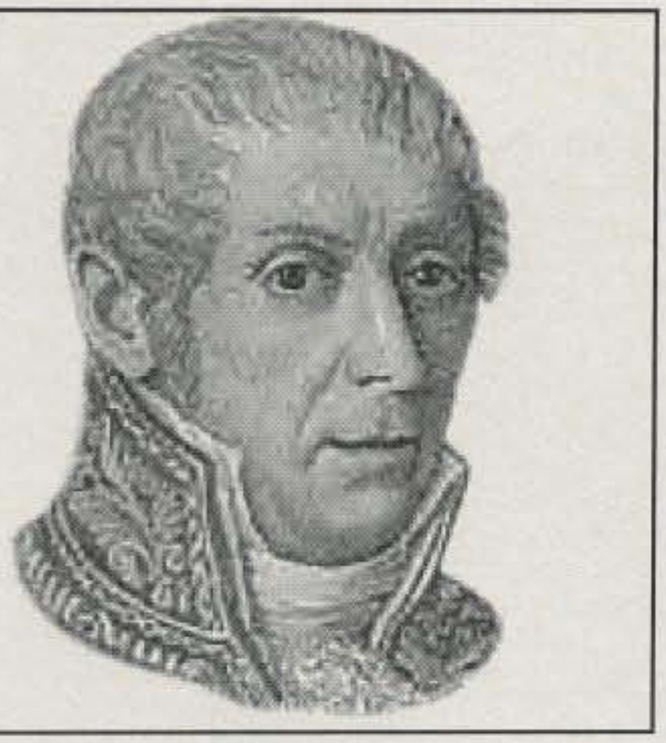


Fig. 2– Allesandro Volta discovered that strips made of dissimilar metals, connected via bowls of salt water, would create sparks when one end was touched to the other. The volt is named after him.

Fig. 3– Danish scientist Hans Christian Oersted was the first to discover and document the interrelationship of electricity and magnetism.

sity of Leyden in Holland. It consisted of a glass jar that was lined with thin silver foil. The outside of the jar was covered with a separate silver foil not contacting the inner one. This was the forerunner of our present-day capacitors. It enabled the storage of large quantities of electric charge, and if a wire from the inner foil was brought near a wire from the outer foil, a large spark could be obtained.

Benjamin Franklin used Leyden jars to store electric charges drawn from the clouds onto the wet string of his famous kite experiment. He wrote up his experiences in 1753 in a book entitled *Experiments and Observations on Electricity Made at Philadelphia in America. That book* earned him membership in the Royal Society of London and The Royal Academy of Science in Paris. These

were prestigious forums for the exchange of scientific information.

Charged Bodies

At about the time we Americans were revolting against British rule, in Europe there was a great surge of construction of machines to generate electric charges. These consisted of large rotating discs of glass or hard rubber, brushed by pieces of fur or silk. The charges could be bled off the discs by wire contacts to charge batteries of Leyden jars or to charge metal spheres to produce sparks.

It was a Frenchman named Charles Augustin de Coulomb who first defined the laws of interaction between electrically charged bodies. He used a torsion device to which he attached a charged ball. This ball was free to rotate away as he brought a similarly charged ball close to it. From these experiments he concluded that the force of repulsion is determined by the product of the two charges and is inversely proportional to the square of the distance between them. In similar experiments Coulomb studied attraction between opposite charges. He also studied magnetic forces in the same fashion. Today we define the electrostatic unit of charge as the charge that exerts a force of one

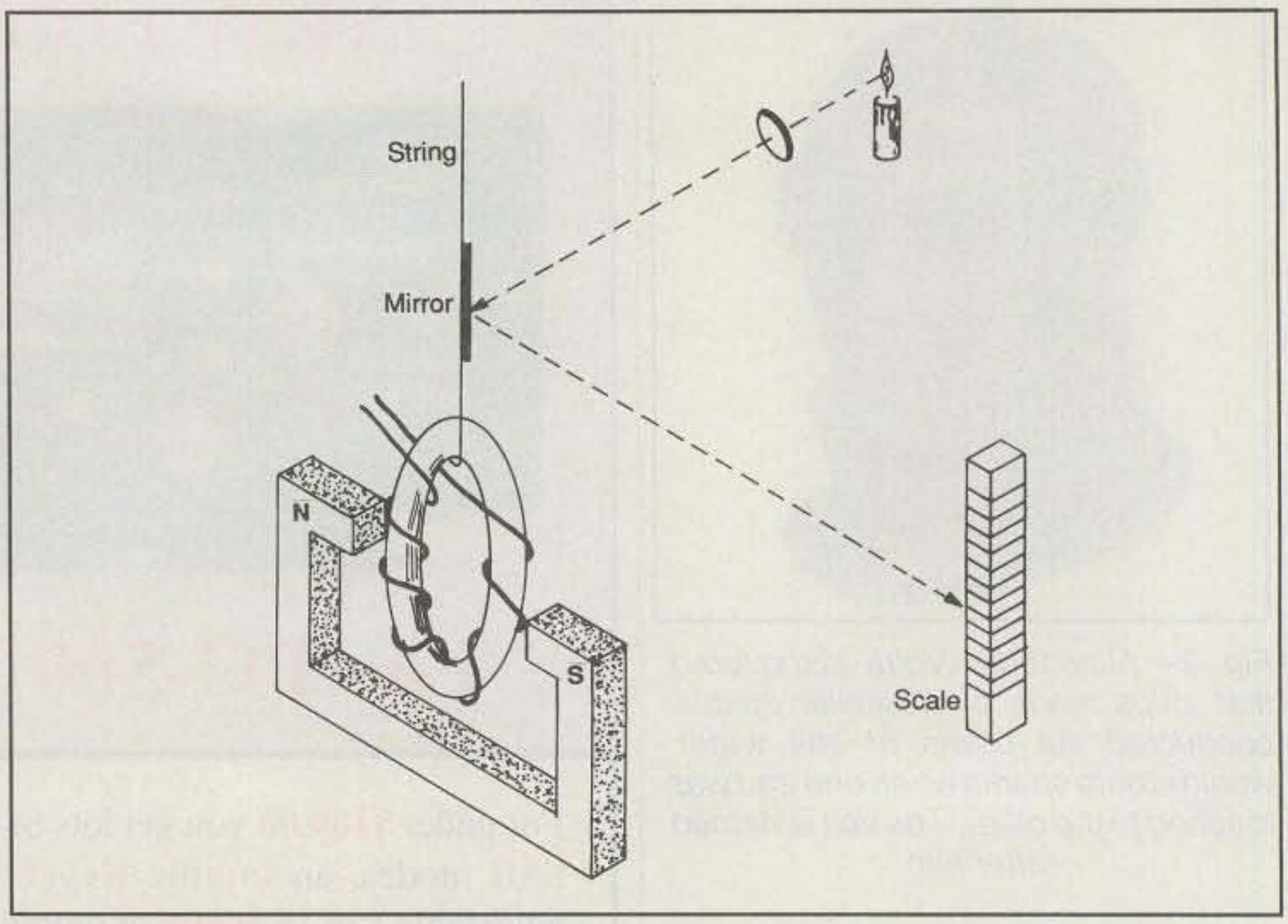


Fig. 4– The galvanometer, developed by French physicist André Marie Ampere, measured the amount to which varying degrees of electric current deflected a string attached to a coil suspended between two ends of a magnet.

dyne on an equal charge placed one centimeter away. The standard *coulomb* of today is that charge multiplied by three billion (3×10^9).

While Coulomb was doing his work in France, there was an Englishman by the name of Henry Cavendish working independently in his private laboratory on the same problem and coming to the same conclusions. Cavendish was somewhat of a recluse and did not publish his work or make presentations at learned societies, but about 100 years after he died, his laboratory notes were published and his genius was recognized. Subsequently, a laboratory of physics was named in his honor at Cambridge University.

Frog Legs and Batteries

In 1791 there were two friends living in Bologna, Italy. One was a physician named Luigi Galvani and the other was a physicist. Galvani was studying muscle contraction in frog legs. He was touching a muscle with a scalpel blade when a spark occurred from a nearby Leyden jar. The muscle contracted and the frog leg jerked. The spark was at a distance and did not touch the scalpel. This could be the first recorded instance of an induced current. It also may be the first inkling we have of any sort of radio transmission. He further noted that frog legs hung from copper wires on an iron rail would contract if the legs touched the iron rail. He constructed a fork with one copper and one iron prong and found that if both tines touched the muscle simultaneously, he could elicit a contraction.

Galvani told his friend, the physicist Alessandro Volta (fig. 2), about these

Fig. 5– British experimenter Michael Faraday discovered that a current passed through one wire induced a current in another wire that was nearby but not in contact with the first one.

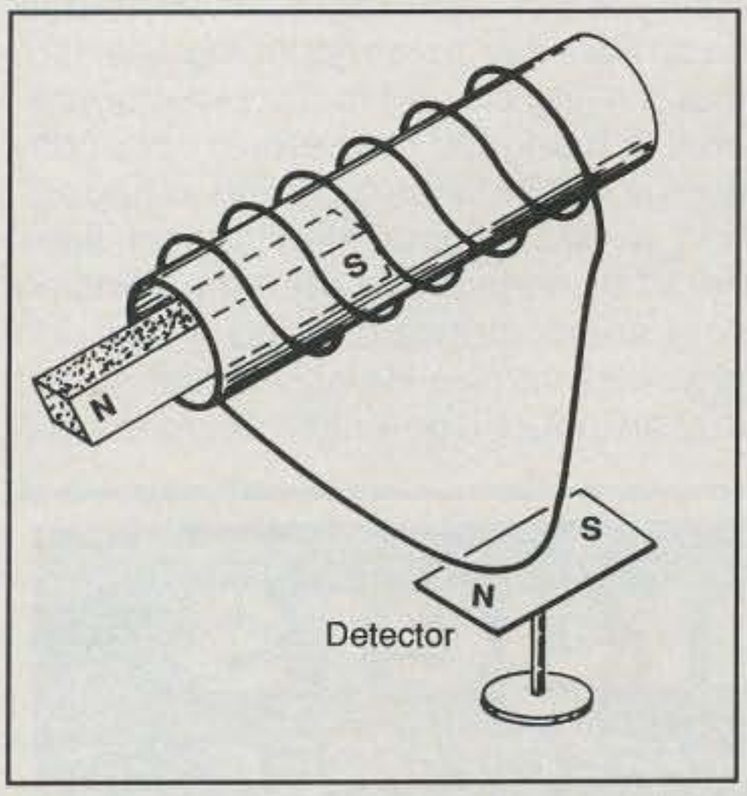


Fig. 6– Faraday used this device to produce movement in a compass needle by moving a bar magnet back and forth inside a cardboard tube with wires wrapped around it. This current generator was the first dynamo, using a coil and a magnet to produce electricity.

findings, and Volta wondered if dissimilar metals in a moist environment might generate electricity. Volta soldered together strips of copper and zinc, and using a series of bowls of salt water, dipped a copper end into one side of a bowl and a zinc end into the other side, and the copper end of that strip into the next bowl, etc. He discovered that indeed, he could produce a spark when he attempted to connect the first zinc end to the last copper end. He went on to use alternate discs of zinc and copper with intervening pieces of wet cardboard between them and thus produced the first *Voltaic pile,* the forerunner of our present-day battery. In honor of his friend, he called the process "galvanism." Today we say persons become "galvanized" when they experience a strong emotional shock. In 1800 Volta sent his findings to The Royal Society in London, initiating much experimentation. Now there was a ready and cheap source of electricity that anybody could construct.

In Denmark, Hans Christian Oersted (fig. 3) heard about the Voltaic pile and made one. While passing current through a wire he noticed that it disturbed the needle of a nearby compass, attracting one of its poles. He found that if he reversed the wire connections to the Voltaic pile, the opposite pole of the compass needle was attracted. He published his findings in a French journal in 1820, establishing the relationship between electricity and magnetism. Thus, we have electromagnetism which underlies the development of relays, motors, transformers, etc.

By publishing in a French journal, Oersted unintentionally alerted the French physicist André Marie Ampere. Within a few weeks, Ampere showed

that two parallel wires, each carrying current, interacted with one another. If the currents flowed in the same direction, there was attraction between the two wires and, if in opposite directions, there was repulsion. He next used coils of wire suspended on strings and found that they would rotate with respect to one another when current passed through them. He also made an instrument to measure variations in current by using the amount of deflection produced in a compass needle by passage of current through a wire held a fixed distance from the needle. This was the first *galvanometer* (fig. 4). Soon other galvanometers based on rotation of coils in magnetic fields came along, and we use them to this day.

It wasn't long before Georg Ohm, in the city of Cologne, in Germany, using Volta's piles and Oersted's galvanometer, began looking at lengths and cross-section areas of conductors. He studied the relationship between these and the amounts of current and the number of Voltaic piles in the circuit. He published his findings in 1827 in an article entitled "The Galvanic Circuit Investigated Mathematically." From this work came what we refer to as *Ohm's Law* and the concept of resistance to the flow of electric current.

At about this time, in London, a young lad named Michael Faraday (fig. 5) was an apprentice in a bookbindery. He avidly read any book that came into the shop if it concerned chemistry, electricity or magnetism. He was an admirer of the chemist Sir Humphrey Davy, inventor of the miners' safety lamp. In the evenings, Faraday attended Davy's popular lectures. When his seven years of apprenticeship were almost done, he submitted to Sir Humphrey a beautifully written and illustrated set of notes taken at those lectures and asked him for a job in his laboratory. Davy was skeptical, but because Faraday was so insistent, he hired him as a bottle washer and janitor. Faraday ended up staying there 45 years, first becoming Davy's assistant and later, when Davy died, becoming head of the laboratory.

While still an apprentice in the bindery, Faraday built a Voltaic pile and passed electric current through a solution of Epsom Salt (magnesium sulfate). He noted the accumulation of gas bubbles on the immersed wires and also the fact that the solution became cloudy. This early evidence of the phenomenon of electrolysis is recorded in a letter to one of his friends. In another experiment he wound several sets of insulated wire on an iron ring so that one set of wires had no direct contact with any other. He found that by passing a current through one wire, he could cause any of the other wires to affect a distant compass needle. In this way he demonstrated a form of induction different from the spark induction noted by Galvani. He also noted that the compass needle motion was related to the making and breaking of contact.

Faraday's next experiment was with a coil of wire wound on a paper tube (fig. 6). On inserting or withdrawing a bar magnet from the hollow of the tube, he was able to produce motion of a compass needle near wires that ran from the tube to a place distant from the bar magnet. Thus we see the first generation of electric current using a coil and a magnet—i.e., the first dynamo.

Joseph Henry was working in the USA at the same time as Faraday was conducting his experiments in England. Henry made several discoveries and beat Faraday in announcing the fact that a rising current in a conductor creates a magnetic field around the conductor that induces a current in opposition to the original direction of flow. Faraday announced the same finding very soon afterwards, and a Russian physicist named Heinrich Lenz stated that an induced potential difference in a

circuit always acts to oppose the change that induced it. This is known as Lenz's Law. Nevertheless, Henry is credited with the discovery of self-induction. He is also credited by some with one of the early descriptions of distant effects of sparks and the invention of the relay switch by means of which Samuel F. B. Morse was able to extend the range of his wire telegraph system. In addition to these achievements, Henry invented the first electric motor.

The creation of sparks, limited at first to discharging Leyden jars that were charged by friction generators, received a big boost after Faraday and Henry described induction and self-induction. Their discoveries inspired the French physicist Rhumkorff to develop the induction coil. With this device, a direct current from a Voltaic pile could be chopped by an interrupter and stepped up to high voltages, much as was later done in the spark coil of the Model T Ford. This device made it easy to charge Leyden jars.

Bringing It All Together

We have followed the path of development of knowledge concerning magnetism and electricity. We have seen how the work of each experimenter built on the findings of his predecessors, each adding his findings to what had gone before. However, it was the genius of a Scottish mathematician and physicist by the name of James Clerk Maxwell that brought the two together in a set of equations and gave us the concept of the electromagnetic spectrum. Maxwell applied math to Faraday's discoveries and developed a set of equations published in 1861 that allow calculation of the electromagnetic fields around charged conductors and magnetized bodies if one knows the currents that are flowing.

In turn, Maxwell's publications inspired Heinrich Hertz, a German mathematician who was fascinated by the work of James Maxwell. In 1880, he completed his dissertation on inductive effects of electrically charged spheres. He lived only to age 36, dying of blood poisoning, probably secondary to a sinus infection. However, in his short life he contributed immensely to the field of wireless communication. Others before him had noted some remote effects of spark discharges, but Hertz developed a spark-gap transmitter and a tuned receiver. To detect these remote effects, he used another smaller adjustable spark gap. With parabolic reflectors he was able to create standing waves of electromagnetic energy in his laboratory. Using his detector, and judg-

ing the intensity of the spark it produced as he walked it along the wave path, he was able to detect the crests and the nodes of the standing wave. From these measurements, which gave him the wavelength, and some crude estimates of the inductance and capacitance of his transmitter, he calculated frequency. He also noted that the kind of light striking the spark gap affected the signals and was thus the first to note photoelectric effects. He went on to refine these observations by using a prism to check light of different colors and found the strongest effect came from light near the violet end of the spectrum.

The publication by Hertz of his experimental results came to the attention of a professor of physics in Liverpool named Oliver Lodge. Lodge had been working on protecting buildings from lightning strikes. He had been impressed by the problems of self-inductance in the wires used for grounding lightning rods as the wires coursed around curves on their way to the ground. He understood Hertz's results and expanded on his efforts by developing tuned circuits with capacitors and inductors to sustain the signals produced by sparks. One of the major difficulties he faced was the lack of a suitable detector.

In 1879, David Hughes, an Anglo-American physicist and the inventor of the carbon microphone, discovered that a steel point that was loosely touching a block of carbon would not conduct electricity until an electromagnet was activated nearby. He was unable to convince his contemporaries of the significance of this discovery and declined to publish it. It was not until 20 years later that Oliver Lodge became aware of it.

In his quest for a good detector, Lodge received some assistance from Professor Edouard Branly of The Catholic University of Paris, who in 1880 published results of experiments concerning the effect of Hertzian waves on collections of iron filings contained in glass tubes. These tubes of filings would become conductive as the filings became aligned between metal plugs at either end of the tube when the plugs were connected in a receiving circuit and the circuit was acted on by a Hertzian wave generated by a distant spark. They would stay conductive until they were tapped to disrupt the alignment. The device was adapted by Lodge as a detector; he gave it the name "coherer." That device was "the detector" through the years of "spark radio."

Enter Marconi

Lodge was an academician and did not think of patenting or commercializing his inventions until an Italian by the name of Guglielmo Marconi started applying for British patents using some of Lodge's methods. There followed a few court battles between these two; eventually some financial settlements were reached, but the details were kept secret.

Marconi was the son of a wealthy Italian father and a British mother, Annie Jameson. By the age of 20 he had taught himself a great deal about what were then called "Hertzian Waves." His mother was very supportive and he was free to experiment on the family estate. Following up on the work of Hertz and Lodge, he experimented with tuned transmitters and various antennas. By age 22 he was in England with a letter of introduction to the Chief Engineer of the British Post Office, secured by his mother from a mutual friend. It should be noted that the British Post Office was also in charge of the government telegraph monopoly.

It wasn't long before Marconi was able to demonstrate his "wireless telegraph" to several government officials, and from there the story of the growth of wireless communication is well known and well documented. The Fleming diode, the DeForest triode, and the growth of continuous-wave radio communication occupied the early 1900s, followed rapidly by amplitude modulation and all its subsequent outgrowths. These later stories are part of current radio lore.

References

The earliest days of wireless communication are steeped in mystery, hidden away in little-known books and journals and seldom spoken of. This has been an attempt to open some of this area to the ham community.

I relied on many sources in writing this summary. Principal among them are the three listed below. The first two are highly recommended for their extensive documentation and pleasurable reading. The third details a number of Hertz's experiments.

1. *Syntony and Spark: The Origins of Radio,* by Hugh G. J. Aitken, Published by John Wiley & Sons, New York, NY 1976.

2. *The Great Physicists: From Gallileo to Einstein,* by George Gamow, Published by Dover Publications, Mineola, NY 1988.

3. "Heinrich Hertz and the Development of Physics," by Joseph F. Mulligan, in *Physics Today,* pages 50–57: 1989; Published by The American Institute of Physics, College Park, MD 20740.

Updated rules for:

The CQ WPX Awards Program

The CQ WPX Award recognizes the accomplishments of confirmed QSOs with the many prefixes used by amateurs throughout the world. Separate, distinctively marked certificates are available for SSB, CW, and Mixed (CW and SSB/Phone). Please note that *CQ* is no longer issuing VPX and WPNX awards.

1. Applications

A. All applications for WPX certificates (and endorsements) must be submitted on the official application form (CQ 1051). This form may be obtained by sending a self-addressed, stamped, business-size (4 × 9 inch) envelope to the WPX Award Manager, Norm Koch, WN5N, P.O. Box 593, Clovis, NM 88101. It is also available on *CQ*'s website at <www.cq-amateur-radio.com/awardapps.html>. Computer printouts with a minimum of 10-point size type are acceptable provided they conform somewhat to the CQ 1051 application form.

B. All call letters must be in strict alphabetical order and **only** the entire call letters are required and must be shown.

C. All QSOs must be made from the same country.

D. All entries must be clearly legible.

E. Certificates are issued for HF (160–10) for the following modes and number of prefixes. VHF contacts do not count for the WPX Awards program. WARC band contacts are not acceptable. Cross-mode QSOs are not valid for the CW or Two-way SSB certificates.

Mixed (CW and SSB/Phone only): 400 prefixes confirmed.

CW: 300 prefixes confirmed.

Two-way SSB: 300 prefixes confirmed.

A separate application is required for each mode.

F. Cards need not be sent, but they must be in the possession of the applicant. Any and all cards may be requested by the WPX Award Manager or by the CQ Awards Committee.

G. The application fee for each certificate is $6.00 for *CQ* subscribers (subscribers must include a recent *CQ* mailing label, or a photocopy of it) and $12.00 for non-subscribers, or the equivalent in IRCs at $.50 each.

H. All applications and endorsement requests should be sent to the WPX Award Manager.

2. Endorsements

A. Prefix endorsements are issued for each 50 additional prefixes submitted. Minimum submission at any one time is 50 prefixes.

B. Band endorsements are available for working the following numbers of prefixes on the various bands: 1.8 MHz – 50, 3.5 MHz – 175, 7 MHz – 250, 14 MHz – 300, 21 MHz – 300, 28 MHz – 300.

C. Continent endorsements are available for working the following numbers of prefixes in the respective continents: North America 160, South America 95, Europe 160, Africa 90, Asia 75, Oceania 60.

D. Endorsement applications may be submitted by computer printout or on *CQ* form 1051. Use a separate application for each mode of your endorsement application.

E. For prefix endorsements, list only additional call letters confirmed since the last endorsement application.

F. A self-addressed, stamped envelope or proper IRCs for surface or airmail return is required, and $1.00 or 2 IRCs for each endorsement sticker.

3. Prefixes

A. The letter/numeral combinations which form the first part of the amateur call will be considered the prefix. Examples: K6, N6, WD4, HG1, HG19, WB2, KC2, OE2, U3, ZS66, etc. Any difference in the numbering, lettering, or order of same shall constitute a separate prefix.

B. A prefix will be considered if licensed by the governing authority in the country of operation after November 15, 1945.

C. In cases of portable operation in another country or call area, the portable designator would then become the prefix. Example: WN5N/7 would count as W7, J6/WN5N would count as J6, KH6/WN5N would count as KH6, etc. Portable designators without numbers will be assigned a zero (Ø) at the end of the designator to form the prefix. Example: LX/WN5N would count as LXØ. When claiming a prefix which has been sent as KC5KKY/XV5, for example, if you are claiming the XV5 for credit, it is requested that the claimed prefix be listed in the proper alphabetical position, such as XV5/KC5KKY, if for XV5, or KC5KKY/XV5 if for KC5. The portable prefix must be an authorized prefix of the country/area of operation. Maritime mobile, mobile, /A, /E, /J, /P, or interim license class identifiers do not count as prefixes.

D. All calls without numbers will be assigned a zero (Ø) plus the first two letters to form a prefix. Examples: XEFTJW would count as XEØ, RAEM would count as RAØ, AIR as AIØ, etc.

WPX Honor Roll

The WPX Honor Roll recognizes the operators and stations that maintain a high standing in confirmed, current prefixes. The rules, therefore, reflect the belief that Honor Roll membership should be accessible to all active radio amateurs and not be unduly advantageous to the "old timers." With the exceptions listed below, all general rules for WPX apply toward Honor Roll credit.

A minimum of 600 prefixes is required to be eligible for the WPX Honor Roll. No certificates are issued, but a listing of members appears in *CQ* every other month.

Only current prefixes will be counted toward the WPX Honor Roll standings. A list of prefixes to be removed from the Honor Roll is available from the WPX Award Manager for an SASE. Prefixes will be deleted from the Honor Roll listing two years after they are no longer authorized for use by the governing authority or by the ITU.

B. Special-issue prefixes (i.e., OF, OS, 4A, etc.) will be considered current for as long as they are assigned to a particular country and deducted as credit for Honor Roll standings after cessation of their use or assignment.

C. Honor Roll applicants must submit their list of current prefixes (entire call required) separate from their regular WPX applications. Use regular form 1051 or a computer printout as long as it conforms closely to the 1051 form. Indicate Honor Roll and mode desired. Forms may be obtained by sending a business-size, self-addressed, stamped envelope or 1 IRC (foreign stations send extra postage or IRCs if airmail is desired) to the WPX Award Manager. A separate application must be made for each mode. Lifetime Honor Roll fee for each mode is $10.00.

A computer printout of your individual Honor Roll file may be obtained from the WPX Award Manager for $6.00 plus a self-addressed envelope and sufficient loose postage for return. Excess postage will be returned.

D. Endorsements for the Honor Roll may be made for 25 or more prefixes. A $1.00 endorsement fee plus an SASE or IRC is to be included. For prefixes by countries see the *Callbook* listings.

WPX Award of Excellence

This is the ultimate award for the prefix DXer. The requirements are 1000 prefixes in Mixed mode, 600 prefixes in SSB, 600 prefixes in CW, all 6 continental endorsements, and the 5 band endorsements 80–10 meters. A special 160 meter endorsement bar is also available.

The WPX Award of Excellence plaque fee is $60.00. The 160 meter bar is $5.25.

(effective August 1, 2000)

Amateur Satellites

BY PHILIP CHIEN, KC4YER

Ham Radio in Space

Phase 3-D Scheduled for Autumn Launch

As we go to press (early June), the success or failure of four launches will determine the future of amateur radio in space. The Ariane 507 vehicle is scheduled to launch the Phase 3-D satellite with a large commercial satellite (either PAS-1R or EuropeStar) in late September or early October.

The Ariane 5 has a mixed track record. The Ariane 501 ended in failure less than a minute after launch due to software errors. Ariane 502 achieved a much lower orbit than planned due to sloshing propellants confusing the low propellant indicator. Ariane 503, 504, and 505, however, have had great success putting their payloads into excellent orbits.

The Ariane 5 is a two-stage launch vehicle, plus two boosters. The main core stage burns liquid hydrogen and liquid oxygen. The boosters burn solid propellant. The upper stage uses liquid propellants—monomethyl hydrazine and nitrogen tetroxide, for those interested. These propellants are known as "hypergols," since they ignite on contact without requiring any ignition source. The same hypergol propellants are used by Phase 3-D's main engine. Ariane 5 launches from French Guiana in South America.

Phase 3-D will transmit on more bands than any other satellite ever built, including those built by NASA and the military. Other satellites certainly have more power and greater bandwidth, but not as many bands. Phase 3-D transmits on every amateur radio band with allocated frequencies for space communications from 2 meters through 24 GHz. Phase 3-D will also set the altitude record for anything with a GPS (Global Positioning System) receiver. Once in orbit, Phase 3-D will be assigned an OSCAR number—probably AO-40.

The other three launches are all critical for the ham radio setup on the International Space Station.

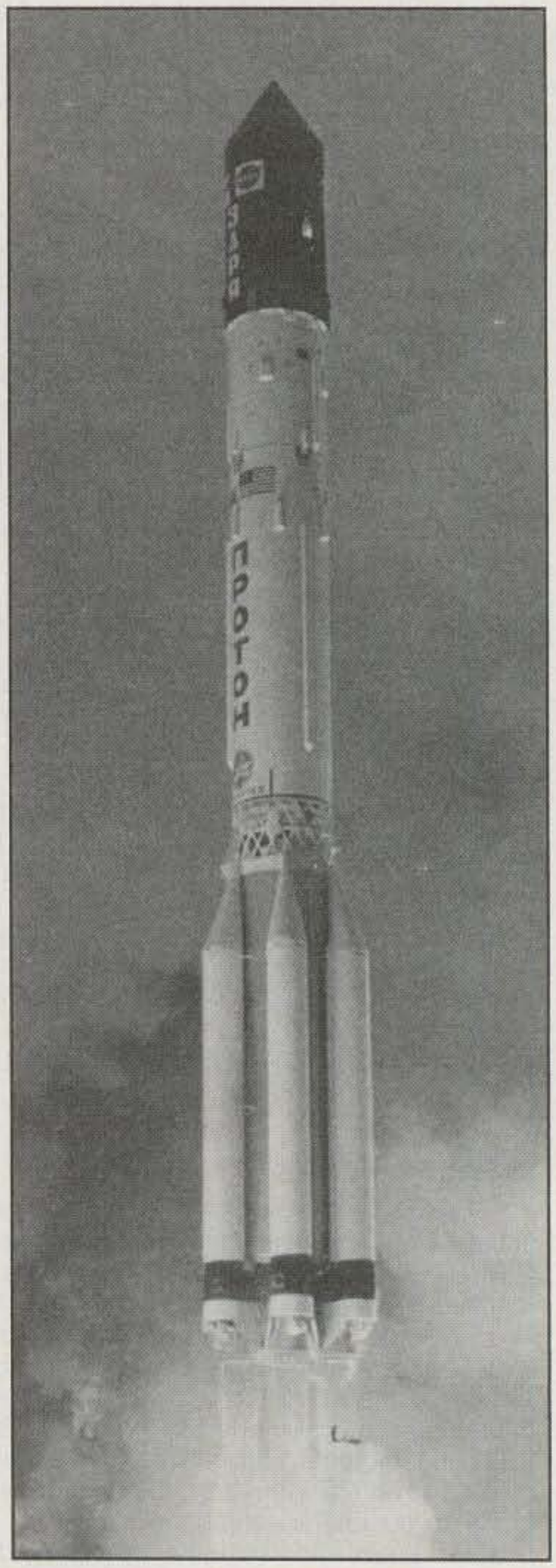
The first launch will be the Russian Service Module, currently scheduled in the July 8 to 14 timeframe. The long-delayed Service Module contains the living quarters for the three-person long-duration crews who will occupy the space station. The space station ham rig eventually will be located in the Service Module, with four external antennas mounted on handrails placed on the outer shell by space walkers.

The service module will be launched on a three-stage version of the Russian Proton launch vehicle. All three stages of the Proton burn monomethyl hydrazine and nitrogen tetroxide. The Proton was developed by the Chelomei design bureau as part of the Russian-manned lunar program. Protons have launched hundreds of spacecraft, including planetary and lunar probes, all of the Russian space stations from Salyut 1 through Mir, and even western communications satellites. A fourth stage is added for high-altitude and planetary missions but is not used for heavy low-altitude spacecraft such as space station modules. Two separate failures of Proton second-stage engines last year temporarily grounded the Proton and contributed to the many space station delays. Redesigned second-stage engines are being test flown on two Protons with relatively inexpensive communications satellites before Russia will risk the launch of the one-of-a-kind Service Module.

The Proton is an extremely reliable launch vehicle, but a lot is at stake with the Service Module's launch. If, for whatever reason, the Service Module is lost due to a launch failure or has problems in orbit, an extremely lengthy delay for the space station would result.

The Proton launches from Baikonur in Kazakhstan. Until 1990, Kazakhstan was one of the republics of the Soviet Union; it is now an independent country. Kazakhstan was never part of Russia, although Russia has had a major influence on its history. The Baikonur Cosmodrome is now leased to Russia by Kazakhstan.

Shortly after the existing space station components in orbit dock to the Service Module, a Russian Progress resupply cargo spacecraft will carry fuel and supplies. That launch isn't absolutely super critical, though. The propellant is needed to raise the space station's orbit, and the supplies are needed to complete many of the Service Module's important subsystems.



FGB launch on a Proton launch vehicle. FGB (Russian initials) is the Functional Cargo Block, a segment of the International Space Station. (NASA photo)

The STS-106 shuttle flight in mid-September will carry several thousand pounds of cargo, including the preliminary ham radio setup, to the International Space Station. The initial hardware consists of 2 meter and 70 cm

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The STS-106 crew logo. Scheduled for mid-September, this shuttle flight will carry several thousand pounds of supplies, including the initial ham equipment, to the International Space Station.

commercial handheld FM radios with their adapter cables, high noise isolation headsets, a packet module, an adapter module to connect everything together, and the various connecting cables (power, RF, computer, etc.).

The space shuttle's three main engines burn liquid hydrogen and oxygen. The two boosters are filled with solid propellant. The shuttle's OMS (Orbital Maneuvering System) uses the same hypergols as the Proton and Ariane upper stage. The shuttle, of course, is launched from the Kennedy Space Center in Florida.

Initially, the ham rig will be set up in the FGB (Functional Cargo Block; "FGB" is formed from the Russian initials). When the FGB was launched in November 1998, it used a pair of "Sirius" monopole antennas to transmit telemetry on 147 MHz. Those antennas are no longer needed, and the current plan is to hook up an adapter cable to the Sirius antennas. No suitable antennas are available for 70 cm operations, so initially the space station will be limited to 2 meters. At some point in the future the external antennas will be mounted on the Service Module by space-walking astronauts (or cosmonauts), and the ham hardware will be moved into the Service Module.

The FGB was funded by the United States, although it was built in Russia. Russia paid for the Proton launch vehicle which put the FGB into orbit. Technically, the FGB is considered part of the Russian segment aboard the space station. Legally, however, since it was funded by the United States, it could be argued that any transmissions from it would be from U.S. territory and therefore U.S. ham radio regulations would apply, in particular third-party rules.

Later, cargo flights to the space station will carry the adapter cable for slow- scan television, a digital voice recorder, and other enhancements as they're developed. Eventually all of the ham equipment aboard the space station may be replaced with improved units.

The shuttle has the best track record of any launch vehicle—only one failure out of 98 launches. However, and this is important, it's also the most complicated launch vehicle in the world. A single critical failure can result in an emergency

abort or possibly the loss of the shuttle and crew. The most critical and risky portion is the 8 1/2 minutes from launch to orbital insertion. NASA has been implementing a program to reduce the risks and increase reliability.

All of those launches mean nothing until the first crew is launched in late fall. The first space station crew has been in training for over four years, over three times that of a typical crew. The Soyuz spacecraft has been extremely reliable, carrying Russians and visiting space travelers from many other countries to and from orbit since 1967. The new Soyuz TMA version offers more space than previous versions. The three-person crew will consist of expedition commander William Shepherd, Soyuz commander Yuri Gidzenko, and flight engineer Sergei Krikalev, all experienced space travelers. Shepherd is the overall crew commander, but Gidzenko is in charge of the Soyuz spacecraft.

Sergei Krikalev is well known to hams around the world as U5MIR from his long stays aboard the Mir space station and his one- week shuttle mission on STS-60. In addition, Krikalev flew on the STS-88 shuttle flight which connected the first two space station components together in orbit.

If for some reason this crew can't fly, the backup crew consists of commander Ken Bowersox, Soyuz commander Vladimir Dezhurov, and flight engineer Mikhail Turin.

The launch vehicle is the venerable Soyuz A-2 built by the TsSKB Central Samara Design Bureau. The Soyuz traces its heritage back to the original Sputnik launch vehicle which put Sputnik 1, the first satellite, into orbit on October 4, 1957. Every single launch of a Russian-crewed spacecraft has been by one of the original launch vehicle's direct descendants. The same launch pad that was used for Sputnik 1 and Yuri Gagarin's Vostok 1 is still in use today. The Soyuz launch vehicle uses highly refined kerosene and liquid oxygen in each of its stages—not as powerful as liquid hydrogen, but perfectly adequate for the job. The Soyuz is considered to be an extremely reliable launch vehicle. Nonetheless, the crew has an escape system— a small rocket mounted on top of the Soyuz. If there's trouble with the launch vehicle on the pad or in the early stages of ascent, the escape rocket will pull its spacecraft away from the booster with a bone-rattling 10 Gs acceleration. The escape rocket was actually used by cosmonauts Vladimir Titov and Gennady Strekalov. Titov's wife jokes that that "launch" count as his making half a space flight!

The Soyuz is launched from Baikonur, not far from the Proton launch pads. The Soyuz can also be launched from a northern launch site within Russia at Plesetsk, near Archangel. All of the Russian-crewed spacecraft have been launched from Baikonur.

Each of these launches, on three different launch vehicles launching from two separate continents, is critical for the space station and its ham radio rig. The Proton will carry the space station's living quarters, the Service Module, into orbit. The shuttle will carry the initial ham radio station. The Soyuz will carry the first crew. Obviously, the failure of either the shuttle or Soyuz to accomplish its mission would result in major delays to the space station's assembly.

Four rockets—launching from three continents, designed by different companies, using a variety of different propellants—will be responsible for changing how hams operate in space. Whether you have a several-thousand-dollar OSCAR Mode B station or just a VHF handheld radio, there will be new ham radio opportunities in space in the next couple of months—*if* all of the launches remain on schedule and are successful. Whatever your interest in amateur satellites, the future of ham radio in space promises to be exciting!

73, Phil, KC4YER

Reader Survey
August 2000

We'd like to know more about you—about who you are, where you live, what kind(s) of work you do, and of course, what kinds of amateur radio activities you enjoy. Why? To help us serve you better.

Each time we run one of these surveys, we'll ask a few different questions and ask you to indicate your answers by circling numbers on the Reader Service Card and returning it to us (we've already paid the postage). As a bit of an incentive, we'll pick one respondent each month and give that person a complimentary one-year subscription (or subscription extension) to *CQ*.

This month we'd like to know how active you've been in introducing young people to ham radio. Let's arbitrarily define young people as anyone under age 21.

Please indicate...	**Circle Reader Service #**
1. ... Whether you think it's important to introduce young people to amateur radio	
Yes	138
No	139
No opinion	140
2. ... Whether you've ever demonstrated ham radio to young people	
Yes, family members only	141
Yes, family and non-family members	142
Yes, non-family only	143
No	144
3. ... How often (if ever) you have demonstrated ham radio to young people outside your immediate family	
Never	145
Once or twice	146
Every couple of years	147
About once a year	148
More than once a year	149
4. ... How often (if ever) you have demonstrated ham radio at a school or youth group	
Never	150
Once or twice	151
Every couple of years	152
About once a year	153
More than once a year	154
5. ... The general nature of the response you've gotten, if you have done a demonstration of ham radio for young people in the past five years	
Great interest	155
Some interest	156
Polite listening	157
Little interest	158
No interest	159
Don't remember	160
No demos in the past 5 years	161
6. ... Whether and how you have followed up on any interest generated	
Ran licensing course for those interested	162
Referred interested prospects to radio club licensing course	163
Referred interested prospects to ARRL	164
Follow-up was someone else's job	165
No follow-up done	166
Have not done ham radio demos	167

Thank you for your responses. We'll have more questions for you next month.

What You've Told Us...

We got ahead of ourselves last month and accidentally printed the results of the April survey before the March results. So, to get back on track, here are the March survey results, which asked about the FCC's restructuring decision and your own license upgrade plans.

We're going to start with the last question, in order to put the rest of the responses into perspective. Among the March respondents, 37% hold Extra Class licenses, 24% Advanced, 9% General, 16% Tech Plus, 11% Basic Tech, 0% Novice, and 2% aren't licensed. Of this group, only 15% feel the FCC's restructuring decision was a mistake, while 59% feel it's good for ham radio, and 26% aren't very happy but can live with it.

The majority of readers support the FCC move to reduce the maximum code test speed to 5 wpm, with 29% saying "It's what I've been waiting for," and 24% saying they agree with it even though it won't directly affect them. Another 28% disagree but understand the reasoning, while 10% feel it will kill ham radio and another 10% don't really care. Only 17% of the readers who responded to the survey filed comments with the FCC on restructuring, but even that number (over 200) means that *CQ* readers accounted for at least 10% of the total comments filed.

We next asked about personal plans to upgrade as a result of restructuring. After discounting those who can't upgrade (Extras and non-licensed readers), 77% said they planned to upgrade, 11% were undecided, and another 11% said no. Of those intent on upgrading, 48% said they planned to take the test before the April 15th effective date of the new rules; 26% were going to wait until afterward; 11% said part before and part after, and 15% said they'll take the test whenever they're ready.

This month's winner of a free *CQ* subscription is Wayne Ackerman of Columbus, NC. As always, thank you for participating.

Math's Notes

What's New And How To Use It

BY IRWIN MATH, WA2NDM

A Digital Primer—Part III, Conclusion

We have now looked at the entire analog-to-digital portion of a digital transmission scheme and are ready to process the serial bit stream that is being received. The discussion that follows does not necessarily explain exactly how the chips operate, but I have tried to reduce fairly complex circuitry to a form that can easily be understood by the non-digital engineers in our ranks. For the purists, please bear with me. The purpose here is to educate and simply to "get the point across."

The first step is to derive the clock. The circuit in fig. 1 is one method of doing this. The incoming data stream is applied to a differentiator, where the output is converted to a pulse every time a rise or fall time is applied. The diodes steer the proper polarity of the differentiated pulses to the output "stretcher," and the inverter inverts the negative pulse. The output stage produces the correct pulse width and level and consequently the actual clock.

Another more widely used method is to employ a phase-locked loop. This circuit, shown in fig. 2, is basically an oscillator that can be varied in frequency by means of the DC voltage. A mixer compares the frequency of the oscillator (initially set close to the frequency of the desired clock) with the incoming data and generates a DC voltage that is related to the frequency difference between the two. This DC voltage is then used to pull the oscillator to the same frequency as the data. When the oscillator is "locked" to the incoming data, its output is used as the clock signal. The benefit of the phase-locked loop is that the oscillator can be a square-wave generator with the proper width of the desired clock pulses. In addition, it does not have to be at the same frequency as the data, but can be at some convenient multiple.

Now that we have a clock and a data stream, the next step is to decode the data stream. Fig. 3 shows how this is done. The serial data signal is fed to a de-multiplexer, which is similar in performance to the multiplexer previously described, except the reverse. Each output is switched on one at a time by the shift register. First the shift register is reset by information derived from the header. Then the clock pulses turn on each output at the correct time to route the received bits to the proper parallel data line. Once this is done, the parallel data words (which exactly match the initial data words) are ready for decoding. This is done by a digital-to-analog converter (DAC).

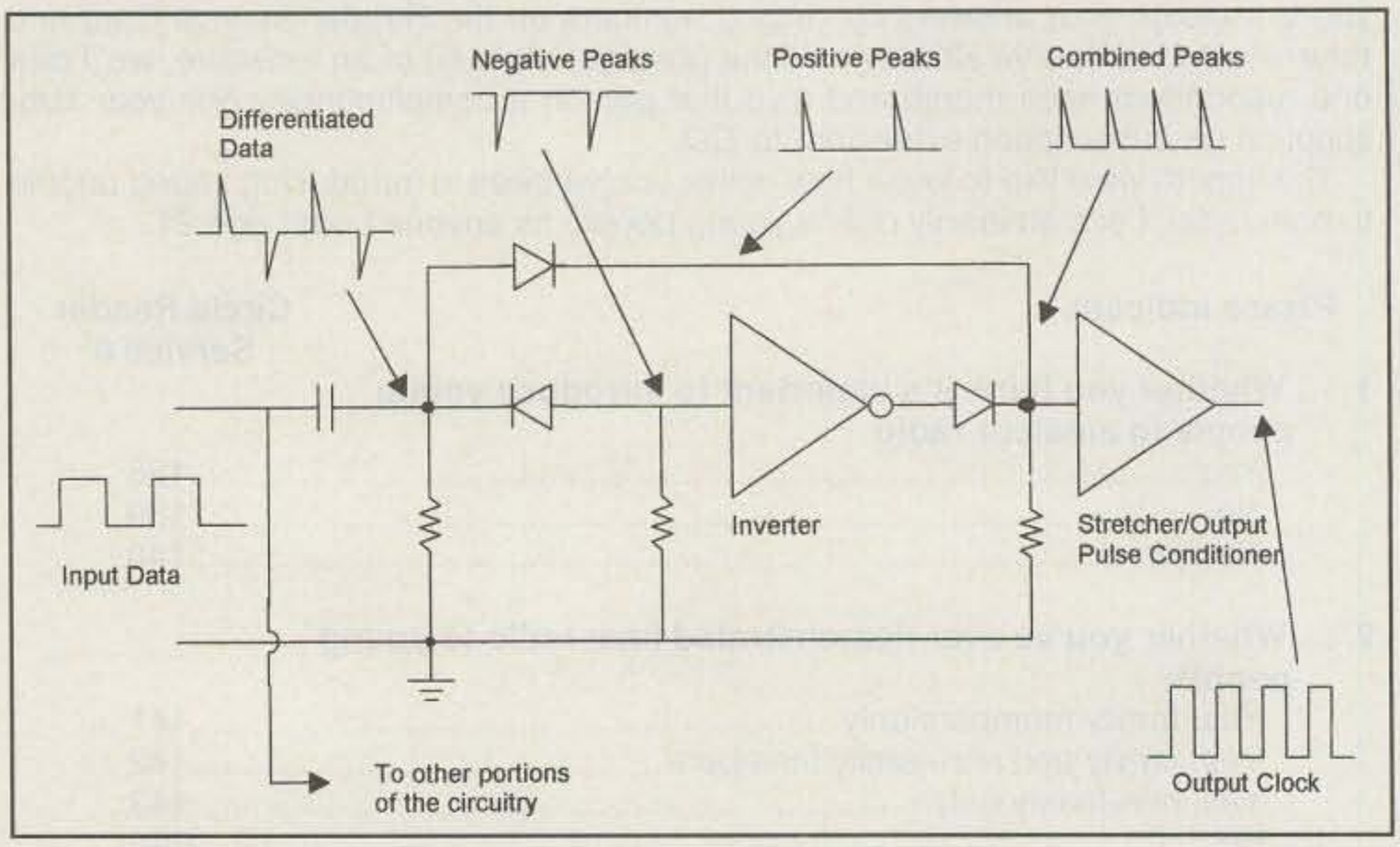

Fig. 1– Representative simplified clock recoverer.

The DAC consists of a precision voltage source and precision voltage divider, as shown in fig. 4. Each point on the voltage divider is controlled by one of the input bits. As you can see, each output is at a different level. As the switches are activated, the voltage present on the "holding" capacitor changes in step with the incoming bits. If everything is chosen carefully, the voltage across the holding capacitor will be a duplicate of the original analog signal. A buffer amplifier completes the circuit.

Rereading Parts I and II of this series, you can see that digital transmission of analog signals is a fairly complex process. The speeds of clocks and converters are in the hundreds of kilohertz up to a megahertz for audio, and more than a hundred megahertz for video. However, there are chips and chip sets that enable implementation of the process with a reasonable number of components. The advantage is transmission of signals through all sorts of noisy

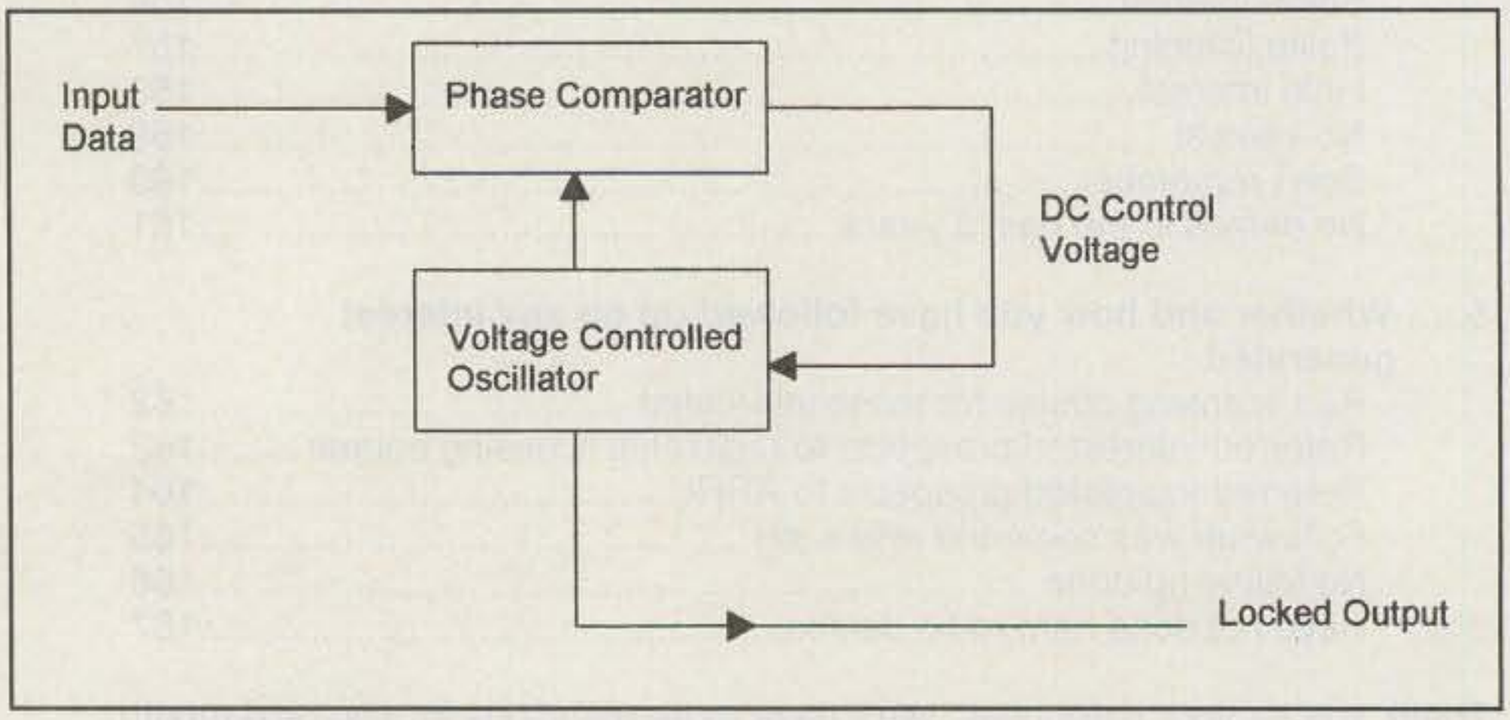

Fig. 2– Simplified block diagram of a phase-locked loop.

c/o CQ magazine

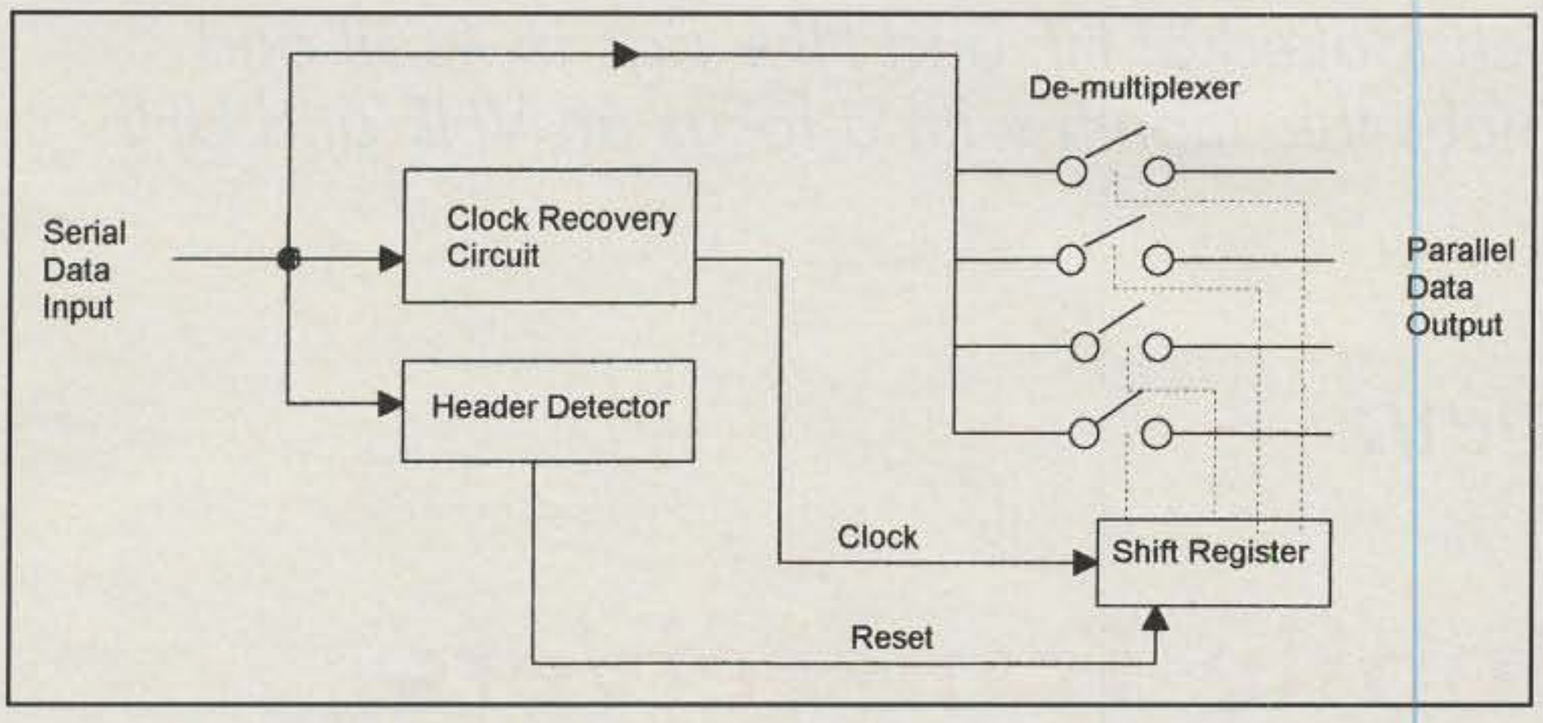

Fig. 3– Block diagram of a basic de-serializer circuit.

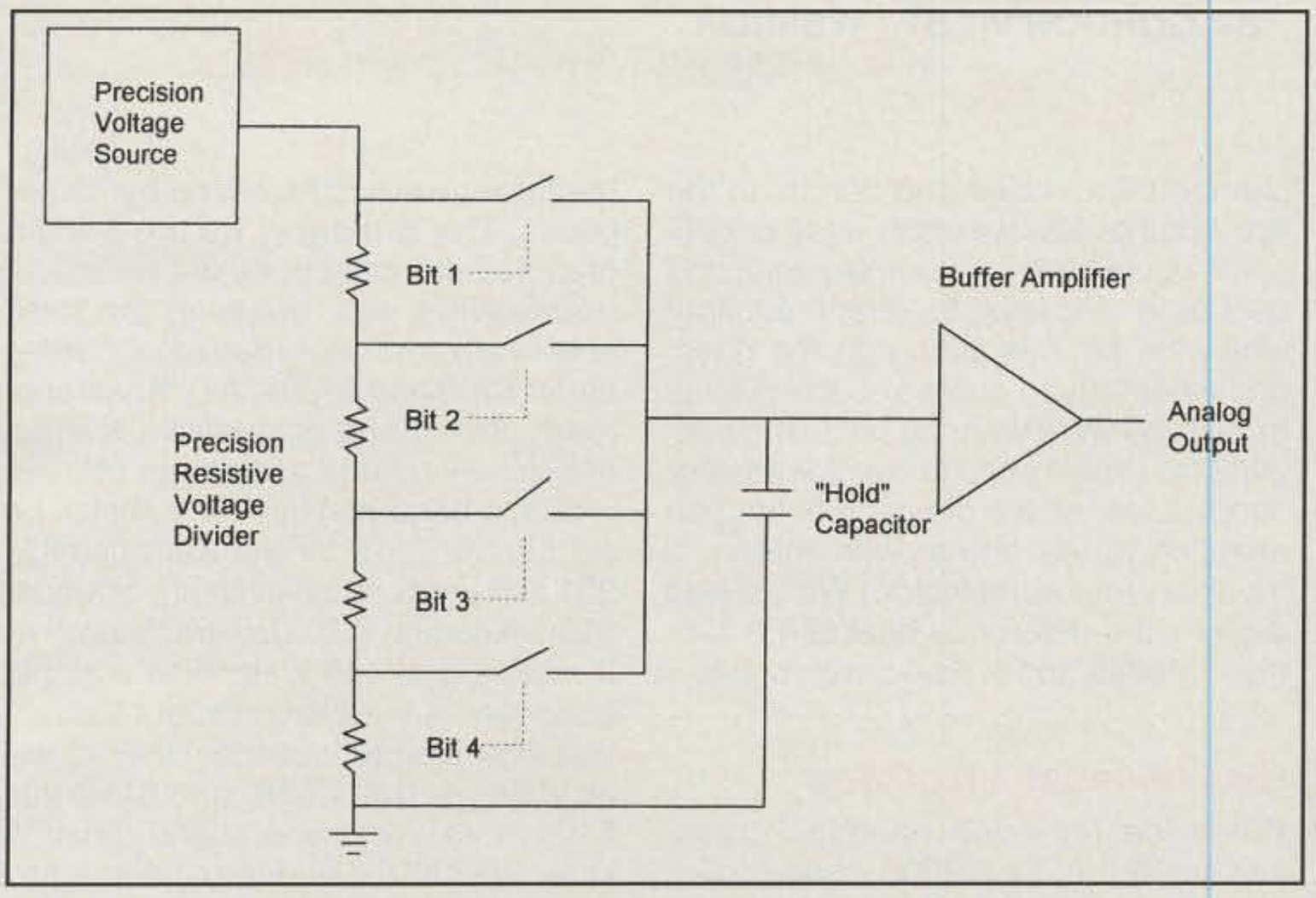

Fig. 4– Basic digital-to-analog converter.

environments with full specifications, if anything at all is received. Just as with CW (Morse Code), digitized signals can be received under the most trying of conditions; that is why the technique is so appealing.

Since the smallest increment of any signal, be it audio or video, reverts to a single digital word, manipulation of these words allows all sorts of special effects to be produced. The musician can correct a wrong note by modifying the words that correspond to that note without having to re-record an entire song. The video engineer can record a program and then make as many copies as he or she wishes with no degradation in image quality, and the spacecraft orbiting Jupiter can send back detailed information and pictures at whatever data rate is needed to extract the weak signal from the noise simply by slowing down the speed at which the bits making up the various words are transmitted. Furthermore, as the cost of this technology continues to shrink, the applications will increase to the point where most of the transmission of all sorts of signals will be by digital means.

For further information, again do not hesitate to visit the web sites of Analog Devices at <www.analog.com>, Maxim Integrated Circuits <www.maxim-ic.com>, and the Crystal Division of Cirrus Logic <www.crystal.com>, as well as those of most of the other major semiconductor manufacturers.

In conclusion, I hope you have enjoyed the series. This is a technology that should be understood, even if only on the surface, by the experimenter, as components related to digital transmission most certainly will be available on the surplus market. It also is just a lot of fun to experiment in this area.

73, Irwin, WA2NDM

CQ's market survey, which looked at HF and HF+ rigs in April and handhelds in June, continues this month with a focus on VHF and UHF FM mobile rigs.

CQ Market Survey:

FM Mobile Transceivers

BY GORDON WEST,* WB6NOA

Today's ham radio marketplace offers no less than 27 models of FM mobile transceivers featuring single-band as well as dual-band operation, plus two tri-band mobiles. This month's mobile VHF/UHF radio survey follows six months of field testing and wraps up in-use evaluations made by hams who range from brand-new operators to some very savvy OMs who plan to hook up their mobile rigs to both the computer and GPS (Global Positioning System) equipment for APRS (Automatic Position Reporting System) use.

We did a lot more than just read the spec sheets. One of our tests was judging how intuitive or awkward it was to change frequencies and bands on the fly. Another test was how easy or difficult it would be to see the new color and cool-blue displays in direct sunlight when the rig was sitting on the dash, and whether you could see the display at all if you were wearing polarized sunglasses. (You'll need to check with *your* sunglasses, as the direction of the polarization varies, and as with antennas, it's a very important factor.) We will also explore the difference between a two-band mobile and a dual-band mobile.

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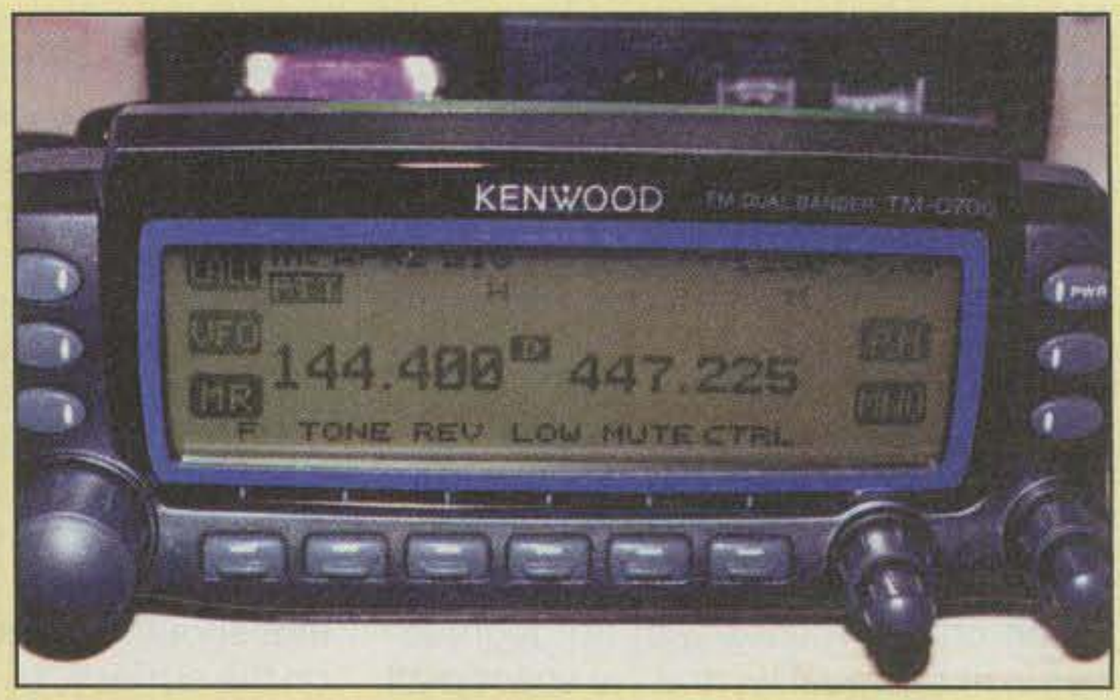
Classifications by Price

When we reviewed handheld transceivers in the June 2000 issue of *CQ*, our comparison tables listed them by function and size categories. When we reviewed HF transceivers back in April, the tables were categorized by "street" prices. This is the way we are going to organize the call-out tables for mobile transceivers, too, breaking the available radios into two broad categories — under $300 and $300+. As you will soon read, pricing and competitive features are closely related as both go up.

Single-band mobiles for 2 meter FM start out at $179 for the Kenwood TM-261 and pretty much even out at around $230. A combo VHF/UHF transceiver for 2 meters and 440 MHz, with a single-band readout, averages about $325. If you ever plan to consider UHF as well as VHF, you'd do well to spend less than $100 more now for the added capability later. We call these one-band-at-a-time 2 meter/440 MHz mobile transceivers "two-band radios" as opposed to dual-banders (our next category), because

ICOM's dual-band IC-2800 has a full-color, thin-film-transistor, remote head that can take a video input to display SSTV pictures, APRS mapping from your computer screen, or almost anything else that has an NTSC format.



The Kenwood D700 puts a TNC and APRS capabilities on the inside! Add a GPS receiver and you can roam the airwaves as you cruise the highways.

they don't give you simultaneous access to both bands.

You will be up in the $400s when you consider a dual-band transceiver that would show you *both* 2 meters and 440 MHz at the same time on side-by-side simultaneous running receivers. An exception might be the dual-band Alinco DR-605, seen selling for an incredibly low $339.

Up in the $500 range, ICOM's dual-band IC-2800 adds a full-color, thin-film-transistor, remote head that can even take a video input to display SSTV pictures, APRS mapping from your computer screen, or just about anything else that has an NTSC format (Too bad it won't directly receive and display these images. They need to be recorded and fed back in.).

For $629, the Kenwood D700 puts a TNC and APRS capabilities on the *inside!* Just add a GPS receiver and get set to roam the airwaves as you roam the highways. Also in the $600 category are Kenwood's simultaneous tri-band radios, the TM-642 and 742, which let you select exactly which bands you want to work, all at the same time!

If you look carefully at the comparison sheet, though, price alone does not necessarily mean you'll get less *for* less. The Yaesu FT-3000 single-band, 2 meter transceiver includes a full-blown UHF scanner capable of hearing all the action up to 999 MHz (minus cellular, of course). And for just a couple hundred bucks more, the Yaesu FT-8100 could take you all the way up to 1330 MHz.

High Power Without High Heat

Nearly all of the equipment we tested gave us plenty of power output on the 2 meter and 440 MHz bands. Fifty watts for 2 meters is plenty! All the rigs gave us at least 35 watts output on the Bird wattmeter, and the Yaesu 3000 wins top honors with over 73 watts out on 2 meters, as measured at 14.0 volts DC. We found we easily could squeeze 5 or 10 more watts out of almost every mobile transceiver by switching out the relatively lightweight red-and-black power cables with hefty red-and-black, 10-gauge wire feeds. If you *must* have the very highest amount of power output, switch over to bigger power cables, run the engine, and watch your through-line wattmeter go up.

On UHF, most power outputs were measured at between 35 and 40 watts. The little ADI AR-447 was seen close to 43 watts output at 14.5 volts DC input. I realize that 14.5 VDC input is a tad high, but if you measure your battery

Both the single-band 2 meter AR-147 and 440 MHz AR-447 transceivers from ADI provided plenty of power output and a nice hot receiver.

voltage with the car running, you might be surprised to see that it's probably approaching about 15 volts DC.

I was amazed to see how manufacturers have ingeniously developed the internal cooling of their equipment to maintain high-power output levels without the sound of a huge turbine fan keeping things cooled down. The inexpensive ICOM IC-2100 uses the entire chassis as a die-cast aluminum heat sink, and we could barely get it warm after a few minutes of key-down. Same thing with Yaesu's FT-2600M meeting many mil-spec standards. Most amazing, though, was the micro-small Yaesu FT-1500M, which dissipates heat throughout the entire transceiver chassis in its less than 5 inches square by 1 1/2 inch high design. I figured it would be hot as a firecracker after a few minutes of key-down, but it was running relatively cool. The Yaesu FT-3000 uses built-in twin fans to provide optimum cooling; air comes in from the top and bottom, and exits out the rear.

Bonus Receive

Most of the manufacturers have satisfied our appetites for out-of-band receive capabilities as well as ham band transceive. However, not all single-band, 2 meter transceivers offer AM aircraft receive capabilities. If you enjoy monitoring the planes, look in the receiver specifications to see if it shows AM reception from 118 to 136 MHz. If you don't see that specified, you may wish to ask your salesperson whether this transceiver can tune in aeronautical AM calls.

Nearly all of the transceivers we tested receive public service and public safety calls from 148–174 MHz. This gives you reception of the 24-hour VHF weather channels, the VHF marine radio band, business band, high-band ambulance and police, and—if you're in range—the 162 MHz seismic beacons found up and down the entire West Coast. When we hear that tone warbling at a very low repetition rate, it usually signals us ahead of time that we are about ready to *feel* an earthquake!

On dual-band equipment, nearly all of the UHF "bonus" receive capabilities went up to 470 MHz. If it only receives as high as 459.99, you are going to miss out on exciting police, fire, and paramedic calls, Family Radio Service, GMRS, and a host of other UHF activity above 460 MHz. The little ADI AR-447 only goes as high as 459 MHz, and we are told this is done on purpose in order to maximize receiver performance in the amateur 440–450 MHz

The heavy-duty Yaesu FT-2600M has a speaker that comes right out the front. Although it's a single-bander, it's built like the Yaesu land-mobile line and works well.

segment of the band. I must say, the AR-447 was indeed interference-free on the ham band.

Yaesu is the equipment to look for if you specifically want to monitor 800 and 900 MHz public safety communications (cellular is blocked out, as required by law). During our tests, the three Yaesu transceivers with "bonus" 800–999 MHz reception offered excellent sensitivity to tune into our local trunked fire and paramedic radio system. While the Yaesu ham equipment doesn't track the trunked calls, it nonetheless can easily receive up in this frequency range. If it's 800 MHz reception you're looking for, it appears that only Yaesu has it.

If your operating preferences extend to VHF/UHF ham bands other than 2 meters and 70 cm (440 MHz), your choices become very limited. For 6 meters Alinco offers the DR-M06, and Kenwood has a 6 meter band module that plugs into their TM-742 tri-band system. Folks who enjoy 222 MHz have four choices. There are two single-banders, ADI's AR-247 and the Kenwood TM-331, and the band is built into Kenwood's TM-642 and offered as an optional band unit for their TM-742.

Finally, when it comes to the 1270 MHz band, we could only find Kenwood addressing this market with a single-band TM-541 transceiver or the 1200 MHz module for their 742 series. There is nothing currently offered by ham manufacturers for 902 MHz or the microwave bands above 1300 MHz.

Bands and Displays

There is a lot to be said about single-band equipment; the attractive features would be price and simplicity of operation. You don't even need an instruction manual to figure out the 50 watt output, 2 meter Kenwood TM-261 seen selling for around $180. My real favorite, however, was the ICOM IC-2100, which is a relatively fresh design with a selectable green or amber display. I like the oversized tuning dial, which was easy to grab when jumping around in the dune buggy, and with plenty of audio output, I could hear over the roar.

I played with both the single-band ADI AR-147 2 meter transceiver and the AR-447 440 MHz rig, and while they gave me plenty of power output and a nice hot receiver, playing around with the buttons was anything but intuitive.

For just about $50 to $75 more, though, you can step up to a two-band transceiver such as the ICOM IC-207, Kenwood G-707, or Yaesu 90R. Remember, these rigs offer two bands, but you can operate just one at a time. Using just one band at a time minimizes accidentally turning down the wrong volume, or turning the wrong channel selector, or answering a call on VHF when it actually came over the UHF side of the radio. With just one band showing at a time, you know exactly what you're doing at just a glance when zipping down the highway. *Driving safety is one of your most important considerations when choosing a mobile transceiver!* Don't compromise safety by putting equipment in your vehicle that is so complicated to operate that you must constantly look down at the dial to see what's going on. It's not worth it.

Alinco's DR-135 is set up to let you add a TNC board inside the radio.

The 2 meter/440 MHz, one-band-at-a-time ICOM IC-207H has a big, bright display with large, bold characters and a simple programming sequence that lets you store memory channels fast.

If you are heavy into public safety communications, then maybe the single readout on a two-band radio won't satisfy your listening and communication requirements. There *are* times when you need receivers running simultaneously, and if this is what you need, step up to a dual-band transceiver with simultaneous running bands and dual frequency displays.

Speaking of displays, ham equipment manufacturers are slowly beginning to realize that we need a brighter background and darker characters to be seen easily in direct sunlight on the dash of our vehicles. Some rigs have hard-to-see super-thin black characters on a relatively dark background screen. An amber background with black numbers is adequate, but why not something really visible, such as a silver background with heavy black numbers and characters?

I'm sad to say that color LCD displays still cannot be seen in direct sunlight. This means you will need to come up with some sort of hood for my overall favorite dual-bander, the ICOM IC-2800, with its thin-film-transistor, color LCD screen. The same thing goes with the Kenwood "cool blue" V7 display; it is a total washout on the bright dashboard of any vehicle or out on the card table during Field Day. Outside of direct sunlight, I still think the 2800's color display is the coolest of the bunch. I also liked the Yaesu "omni-glow" displays, along with the ICOM IC-2100 display which may be switched selectively from either amber for bright light to green when traveling at night.

Maximizing Your Memory

Just as important as *seeing* what your display is reading out for frequency is *understanding* what memory channel you may have dialed up. Except for some very old-design equipment with only 20 memory channels, almost all equipment boasted a minimum of 50 memory channels per band, with newer equipment boasting 100 memory channels per band.

Carefully read the tables in this article, and you will see which rigs have the most memory, keeping in mind that dual-band equipment listed with 200 channels of memory really may only give you 100 channels per band. Here's another thing to consider, too: Some equipment may only allow a specific number of memory channels for VHF and others specifically for UHF. I would rather have a set that gives me the flexibility to program the memories as needed for where I am and what I want to have available. Manufacturers rarely list this in their spec sheets, so if this is important to you, you'll need to ask your salesperson which units offer this sort of flexibility in memory assignments.

Having the capability to name your memory with alphanumerics is an important feature if you have a lot of frequencies stored in your memory. Let's see now . . . Is 146.940 the Disneyland repeater, or is it the Magic Mountain repeater? If you're able to name the channels, all the better.

Do you know how long it's going to take you to punch in all of those letters?

The Kenwood TM-G707 offers two bands, but you can operate just one at a time.

If you do it by hand on your own equipment, plan to spend around 2 hours naming 100 channels. However, if your equipment can take a *clone* or PC program input of frequencies and names, you can do it in minutes, not hours. Most newer equipment is listed in the tables with cloning and/or computer upload/download capabilities, and there are plenty of programs that will allow you to customize the channels that go into your rig before you install it in your vehicle. Never try to program and drive at the same time! In fact, trying to program channels when the rig is in your vehicle is a task in itself! Program it *before* you install it.

If you need more than your own memory to come up with the frequencies you want to program, there are repeater frequency guides, maps, and software available from the ARRL (860-594-0200) or ArtSci Publishing (818-843-4080). Non-amateur listings are available from various sources. Probably the easiest to find is the *Police Call* guidebook series available at RadioShack.

Helpful Features

More and more repeaters throughout the country require subaudible CTCSS (Continuous Tone-Coded Squelch System) tone to activate. Every radio in this survey provides tone encode, but half of the equipment offered may still require an optional board for tone *decode*. Adding the board requires taking the top or bottom cover off the equipment and slipping in the optional CTCSS decoder. For those of us who regularly work on mobile and portable radio equipment, it's no big deal.For the beginner, however, having the decode capabilities already installed could certainly increase listening pleasure without hearing distant repeaters on a different tone coming through the squelch. *(Unless, of course, you are interested in doing a little bit of repeater DXing and want to hear those distant stations. Also, be aware that not all repeaters pass through the CTCSS tones on their outputs. If your repeater suddenly disappears when you turn on tone decode, shut it off.—ed.)*

If your local repeater operates with digital coded squelch (DCS), we are *finally* beginning to see manufacturers include this as a regular feature in some equipment. Ask around if you don't know what type of squelch system is used in your area.

Here's yet another "feature" that not all manufacturers include with their equipment—*automatic repeater shift*. Now I realize that our country is so full of repeaters on 2 meters that we have flip-flop inputs, splinter channels, and some oddball splits, but most of the regular big-city and small-city repeaters operate on a normal nationally-recognized split that falls within automatic repeater shift band pre-planning. This is a handy function!

Let's say you are driving to a new state and you put your set in the scan mode. After hours of traveling in the desert, it magically locks onto a relatively strong repeater. With automatic repeater shift, you are all set to give it a try. If the repeater still doesn't come up, take your mobile and let it scan for repeater tone on the input when someone else is using the repeater. On the 2 meter band, most repeaters are open; if you have not preprogrammed your radio, this is one way to get on the air with a local repeater without actually having the directory in front of you. However, I recommend you *never do this while driving*. If you must, take an exit off the expressway, search and lock into several repeaters, and then resume your travels. When we travel in our communications van, every night I preprogram from the repeater directory those repeaters that I plan to be within coverage for the next day.

The *band scope* is another neat feature. If you are in an area where you don't hear much of anything, let the radio do the searching for you and give you a spectral readout of where the activity is. Only a few of the radios we tested offered band scope capability, but it is a good feature. The only down side to band scope is that the receiver mutes during the search procedure. Again, it's not something you can use while driving.

When we were testing the equipment, some of the dealers indicated that manufacturers are now offering a step-up microphone with their equipment. We are beginning to see more microphones back-lit for nighttime use. This is excellent for safety. First of all, at night you can figure out where in the world the microphone is! Just look around for the glow, and then see what is behind all of those letters and numbers. If you have pre-loaded your local autopatch autodial numbers, these back-lit, full-function microphones often allow you to place an autopatch call without having to lean over and do anything with the radio control dials themselves.

Plenty of the single-band and dual-band transceivers offer capabilities for direct connection to 1200/9600 baud packet controllers. Some come with a DIN-plug, while others come with a DB-9 connector. With still others, you'll have to use the mic and speaker sockets. Alinco's DR-135 is set up to let you add a TNC board inside the radio, and the Kenwood TM-D700 offers full packet and APRS capability with everything built in.

If you think you are going to be heavily into packet and APRS, the Kenwood D700 at $629 seems to have the very best going for it, especially when hooked up to almost any type of small GPS set. At this time next year I expect to see ham manufacturers installing GPS boards directly inside their mobile rigs and offering a small magnetic patch antenna for GPS reception. If you're already into APRS, you may already own a GPS receiver that will tie in nicely with the D700.

Another feature that may be of inter-

est to your mobile operation is full cross-band repeat, offered in some of the dual-band transceivers. Let's say you park your vehicle at work and you don't want to miss the activity on your favorite 2 meter repeater 40 miles away. It's tough to hear the repeater on your hand-held inside work and impossible to access it, but your mobile unit in the parking lot can work the repeater loud and clear. Cross-band repeat would allow you to use a 440 MHz HT in your office on a carefully selected, unused frequency to communicate with your mobile rig, which then would automatically retransmit your signal out on the repeater input frequency and send the repeater output signal up to you on 440. Be sure to use the lowest possible power (Your rig is transmitting whenever the repeater is active, and you want your car to start when it's time to go home.) and use CTCSS on both sides of the 440 link to be sure the mobile radio won't accidentally key up on noise and begin to transmit.

I prefer *not* to cross-band because of some of the potential interference problems that could occur, as well as inadvertent equipment lock-up that sometimes occurs no matter how hard you try to avoid it. In addition, there are questions about whether this sort of cross-band repeating is in strict compliance with all FCC rules. I must agree with some of those concerns, especially the rules on control (you need a 3-minute timeout time or the ability to manually shut off your mobile rig within 3 minutes of losing remote-control capability) and station ID (the link from the car to your HT never identifies). Nonetheless, cross-banding is a "feature" that some folks may look for in operating at emergency scenes, and in an emergency, anything goes. If you choose to use this feature, be sure to *cross-band carefully* and avoid all interference.

Another nice feature in some dual-band mobiles is the capability of simultaneously receiving two different frequencies within the same band. I like this feature for monitoring something on the 2 meter band, plus the VHF marine band at the same time. Same thing on UHF—one side of the radio is for the local UHF Red Cross repeater, and the other side of the radio is receiving a 460 MHz public safety frequency.

Antenna Connections

Most dual-banders now seem to have their own built-in duplexer. This means you can use a dual-band antenna with a single coax cable going to a single 2 meter/440 output connector. An exception is the Kenwood tri-band TM-742 and 642 equipment, on which each module has its own antenna jack. If you're planning on working this through a triple-band antenna, then indeed you are going to need to purchase a *triplexer* for this job. Some hams prefer to run separate antennas for each piece of equipment, one antenna per band. This definitely gives your vehicle the porcupine look! If you buy a rig with a built-in duplexer and a single antenna jack and want to use separate antennas, you'll need to buy a *diplexer* to split the signals for the different antennas.

Now where are you going to mount your new radio? With newer vehicles coming in with the most bizarre front dashboard assemblies, transceivers with a detachable head make exceptional good sense. They certainly lead to safer driving if the head is mounted up high where you can see it easily without taking your eyes off the road. You are asking for a collision if you run your equipment down low by your right knee. Just one too many times you are going to be looking down at the dial and miss what is happening up ahead in front of you. Consider the remote head unless you have a vehicle with enough dashboard space to allow you to mount everything within plain view.

The most unique mounting of a remote head comes from a rather old-design Kenwood triple-band transceiver, the TM-742. Not only does the head come off the body, the display can be separated from the controls. The body goes under the seat, the controls where you can easily get to them, and the head is right up there where you can see it easily. It makes sense.

Some manufacturers are using remote head cables that look identical to multi-wire telephone extensions that you can buy at the local phone store. Manufacturers suggest that you only use *their* extension cables, yet I have successfully used hardware-style extension cables, and if the jack fits, everything works well. Many of the remote heads come with elaborate metal mounting brackets, but I have found that Velcro™ works wonders and gives me several different operating areas for the remote head on the dash or transferred back to the rear of our communications van.

See 'Em If You Can

As you get closer to making the big decision about which mobile transceiver to buy, I absolutely recommend actually seeing the rig to see how it looks, sounds, and feels before you buy it. Are the knobs large enough for your fingers? Can you easily see the display at an angle? Can you see the display with your polarized sunglasses on? Is the audio from the speaker loud enough? If you can't get to a radio store, try to find someone who owns the rig in which you're interested, and who is willing to let you "take it for a spin" or at least answer your questions.

Reviewing the Reviews

In looking over the notes of our equipment reviewers, we will highlight some of their findings, starting from the top down when it comes to pricing.

The Yaesu FT-90R two-band transceiver offers two bands, but only one at a time may be operated. With only one band showing at a time, you know exactly what you're doing at a glance when zipping down the highway.

The dual-band Alinco DR-605 was one of the least expensive top-performing true dual-banders that we tested.

First of all, we all feel that you must give serious consideration to the ICOM 706 MK IIG or Yaesu FT-100 if you plan to do HF as well as VHF/UHF in your vehicle. If those are outside your range of interest or your budget, though, there are plenty of great rigs among the VHF/UHF-only radios.

The Kenwood tri-band TM-742/642 mobile radios are solid performers, albeit an older design. If you really want three bands all running at the same time, there is nothing like the "42" triple-banders to satisfy your requirements. If you want the very latest in APRS, the Kenwood D700 at $629 is the only thing out there that does as much as it can for packet and APRS. If you're into data, this should be your only choice going mobile or at home on the base.

My favorite dual-bander is the ICOM IC-2800. Although it is rather expensive at about $520, it works great and has one of the most futuristic displays I have ever seen—that is, until you take it out in the sunlight where it instantly disappears. If only they had a way of changing the display contrast so it would be dark black on a pure silver background for full daylight in-sun viewing. Nonetheless, it is still my dual-band favorite.

The Kenwood single-band mobiles are good, solid performers. Their operation is uncomplicated, and while they haven't changed much over the years, you can count on their performance.

The dual-band Kenwood TM-V7 with its "cool blue" screen would go well in a dark mobile-home interior or as a base station. On the dashboard of a vehicle, however, you will be hard pressed to see the LCD readout, whether you make it positive or negative in appearance. We also found that programming of the V7 *absolutely* requires the instruction manual. This unit has so many features that you really must keep the instruction manual handy. It is a terrific transceiver, though.

Almost everyone liked the operation of the Alinco DR-610. We especially liked the band scope and how it reads out activity up and down the frequencies or memorized channels. It also has a 20 dB RF attenuator that worked well in the city to help cut intermod from a nearby 152 MHz paging transmitter. We would like to see a back-lit microphone offered as "standard equipment" with this great transceiver. If you don't need the detachable head, the very affordable Alinco DR-605 may be just the answer. The 605 was one of the least expensive top-performing true dual-banders that we tested.

Absolutely the smallest transceiver was the Yaesu FT-90R. All of our scanner enthusiasts liked its ability to receive all the way to 999 MHz. The little blue color display was quite visible in almost all lighting conditions, and the rig is so small it can go just about anywhere with the added capability of being able to remove the face plate from its micro body.

Audio was plenty loud enough, but for me, something this small would really need a very specialized application in our mobile communications unit. If it's ultra small you want, however, this one has all of them beat!

The regular-size Yaesu FT-8100 has a receiver that really cuts through the clutter of frequencies in a downtown area. We liked the smart search which allows the receiver to sweep either the entire band or a portion of the band and load in special memory the frequencies on which activity is found. The radio *looks* tough, and it works just as well as it looks.

The Kenwood G707, along with its detachable head, makes spotting a channel frequency easy with its oversize LCD display and big black num-

bers. This is a way we like to see all LCD panels, and we compliment Kenwood on keeping the head scaled *up.* It's the same thing with the single-band 2 meter FT-3000 transceiver. The way the knob is situated on the side of the unit, changing frequencies is relatively easy. Whoever worked on the layout of this rig gets an A+; when manipulating the FT-3000, everything is functionally where you would expect it to be.

The ADI mobile radios were rock-solid performers with plenty of power output and nice, sensitive receivers. However, they were far too complicated for most of us to figure out how to run, and we still can't figure out how to get the automatic dialer off transmit each time we push the microphone button. While these radios may have specific applications, they have too many features for me to try to come to grips with them.

Everyone *loved* the 2 meter/440 MHz, one-band-at-a-time ICOM IC-207H. It has a big, bright display with large, bold characters and a simple programming sequence that allows you to store memory channels quickly. The head detaches and goes just about anywhere, and the soft keys with LCD labels make for easy nighttime operation. We also appreciate that ICOM is including the full-featured microphone with this unit, as it is with the 2800.

For low-cost voice and data operating, check out the Alinco DR-135. Packet and APRS are supported with the optional internal digital communications board. With its internal TNC, the DR-135 can be used for keyboard communications or geo-locating in combination with an external GPS receiver, at 1200 or 9600 bps. We also liked the new styling of their microphone with the back-lit keys.

Another powerful workhorse is the Yaesu FT-1500, putting out a whopping 50+ watts from its tiny little body. If you're driving a Rambo-type vehicle and need just a single band, the tough little 1500 should suit you well.

Another heavy-duty rig from Yaesu, the FT-2600M has a speaker that comes right out the front. This is ideal for commercial vehicles that make a lot of noise, in which case you really need a loud ham radio set. Although it's just a single-bander, it's built like the Yaesu land-mobile line and works well.

The single-band Alinco DR-150 has a feature that only a couple of the other rigs share—an adjustable squelch delay. In our communications van we regularly run the DR-150 on a call channel; when we hear the long squelch tail, we always know which radio just sounded off. It also has a band scope, which lets us see where the activity is taking place.

Finally, our pick hit for the least expensive full-featured, 55 watt, single-band mobile is the ICOM IC-2100H. The whole radio is a heat sink, so you can run it for hours with a lot of transmitting without it even getting warm. It clones easily to other 2100's, and the design of the equipment is based on ICOM land mobile equipment of similar size and features. Seen selling for $179, it has the most features for the lowest price and very well could be the choice for an entry-level transceiver with full-level features.

Take a Test Drive

Above all, get your hands on the equipment and take it for a drive. Find someone local who has the set you are considering, see how they like it, and ask if you can spend a few minutes checking it out. Remember, look for the rig within your budget that meets the greatest number of *your* operating needs. All of the equipment we tested worked *great.* Good luck on making the final decision!

Another Option: Building Your Own

Want to build your own single-band VHF transceiver? Well, you can with Ten-Tec's kits for 6 meters, 2 meters, and 222 MHz FM. Each kit includes plenty of modern microprocessor features and "takes about 20 hours to assemble," according to Ten-Tec Sales Manager Scott Robbins, W4PA. Plus, he notes, "You will learn from building how to take care of it yourself."

The 2 meter unit, Model 1220, offers 15 memory channels and up to 30 watts out, with a bright 6-digit LED display, plus standard CTCSS encode and decode. The basic kit puts out 5 watts and sells for $195. The 30 watt amplifier module will run you an additional $84.

You can also explore 222 MHz operating with the 20 watt, 15-memory Model 1230 at $295; or work 6 meter DX with the 5 watt, 15-memory Model 1260, for $195.

Another option from the folks at Ten-Tec is *transverter* kits—in on one band, out on another. The Model 1209 connects to your 2 meter mobile rig to give you 8 watts out on 6 meters—for under $99! There's also the 20 to 6 meter transverter, Model 1208, and the 10 to 2 meter version, Model 1210. The transverters may also be ordered factory-assembled (at a slightly higher cost).

Ten-Tec sells direct, so call them for their catalog at 865-453-7172, or visit their website at <http://www.tentec.com>. Please note that because these are kits, we did not include them in the comparison charts, which don't have a category for "the pride and satisfaction of building it yourself"!

CQ Market Survey Handy Pull-Out Reference Guide

As a service to our readers, we are putting the tables for this month's Market Survey, along with the tables from the previous two installments of this series—on HF/HF+ transceivers (April issue) and on handhelds (June issue)—together in a handy pull-out section. Now, no matter what sort of rig you're looking for, you can take this section with you when you head out to the amateur radio store or hamfest, or start dialing 800-numbers. You'll be able to tell at a glance what major features are found in each radio on the market today, along with the typical (or lowest) "street price" at the time of first publication.

Remember, though, price isn't everything. You need to look at any "value-added" features or services that each dealer may provide, such as immediate availability, on-site warranty service, pre-charged batteries to let you get on the air immediately, or pre-programming or cloning of popular local frequencies. All of these are factors in the overall value you receive.

Finally, use these tables to select radios with features that best meet *your* needs, not what your friends like or what the guy you talked to on 20 meters likes. Recommendations from others are *very* helpful, of course (that's why we publish reviews), but they have to be balanced against the specific types of activities you have in mind for *you.* With all that in mind, and this handy pull-out section in hand, you're set to get started on your search for the best new rig for *you!* —*73, the Editors*

Under $300

	Kenwood TM-261	ICOM IC-2100	Radio Shack HTX252	ADI AR-147	Yaesu FT-1500	Alinco DR-150	Yaesu FT-2600	Alinco DR-430	Alinco DR-135	Alinco DR-140	ADI AR-447	Alinco DR-M06	ADI AR-247	ICOM IC-207
No. of Bands	Single	Single	Single	Single	Single	Single	Single	Single	Single	Single	Single	Single	Single	2 Band
Freq. Coverage														
6 m	—	—	—	—	—	n/a	—	—	—	—	—	TX/RX *	—	—
Air	RX	No	—	RX	No	RX	No	—	RX	RX	—	—	—	RX
2 m	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	—	TX/RX	TX/RX	—	—	—	TX/RX
148–174 MHz	RX	RX	RX	RX	RX	RX	RX	—	RX	RX	—	—	—	RX
220 MHz	—	—	—	—	—	n/a	—	—	—	—	—	—	TX/RX	—
440 MHz	—	—	—	—	—	RX	—	TX/RX	—	—	TX/RX	—	—	TX/RX
450–470 MHz	—	—	—	—	—	RX	—	RX	—	—	1/2	—	—	RX
800–900 MHz	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1270 MHz	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Power Out	50	55	25	60	50	50	60	35	50	50	35	20	30	50V/35U
Display Bands	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Memories	61	113	11	81	149	100	175	20	100	50	81	100	81	182
Alphanumeric	Yes	Yes	No	No	Yes	No	Yes	No	Yes	Yes	No	No	No	No
LCD Color	amber	both†	white & black	amber	blue	green	orange	amber	amber/red	amber	amber	amber	amber	amber
Remote Head	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes
Band Scope	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No
CTCSS														
encode	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
decode	opt	✓	✓	✓	✓	opt	✓	opt	✓	✓	✓	opt	✓	✓
DCS	No	No	No	Yes	No	No	Yes	No	Yes	No	Yes	No	Yes	No
Auto Repeater Shift	Yes	Yes	No	No	Yes	No	Yes	No	No	No	No	No	No	Yes
Attenuator	No	✓	No	No	No	No	No	No	No	No	No	No	No	Yes
DTMF Memories	15	14	—	9	8	5	8	—	10	—	9	—	9	14
Mic Direct Freq. Input	Yes	Yes	No	Yes	Yes	Yes	Yes	—	No	—	Yes	No	Yes	Yes
Backlit Mic Keypad	Yes	Yes	—	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes
Packet Compatible	No	No	1200	Yes	DB9, 1200/9600	1200/9600	1200/9600	No	DB-9, 1200/9600	1200	Yes	No	Yes	1200/9600
APRS Ready	No	No	No	No	No	No	No	No	opt	No	No	No	No	No
Software Programming	No	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Cloning	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Crossband Repeat	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No
Dual In-Band RX	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No
Built-in Duplexer	—	—	—	—	—	—	—	—	—	—	—	—	—	Yes
Size	small	small	small	small	vy small	small	medium	small	small	medium	small	medium	small	medium
Weight (lbs.)	2	2	2	2	1	2	3	2	2	2	2	2	2	3
Lowest "Street" $$ Seen	$179	$179	$179	$189	$199	$219	$229	$229	**	$179	$249	$249	$299	$299

** RX 47-60MHz*

† Amber & Green

*** Awaiting FCC type acceptance as of this writing.*

FM Mobile Transceivers

FM Mobile Transceivers

Over $300

	Alinco DR-605	Kenwood TM-G707	Yaesu FT-3000	Yaesu FT-90R	Yaesu FT-8100	Alinco DR-610	Kenwood TM-461	Kenwood TM-V7	Kenwood TM-541	Kenwood TM-331	Icom IC-2800	Kenwood TM-D700	Kenwood TM-742/642
No. of Bands	Dual	2	Single	2	Dual	Dual	Single	Dual	Single	Single	Dual	Dual	Tri
Freq. Coverage													
6 m	—	—	—	—	—	—	—	—	—	—	—	—	opt
Air	No	RX	RX	RX	RX	RX	—	RX	—	—	RX	RX	RX
2 m	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	—	TX/RX	—	—	TX/RX	TX/RX	TX/RX
148–174 MHz	RX	RX	RX	RX	RX	RX	—	RX	—	—	RX	RX	RX
220 MHz	—	—	RX	RX	RX	—	—	—	—	TX/RX	—	RX	opt
440 MHz	TX/RX	TX/RX	RX	TX/RX	TX/RX	TX/RX	TX/RX	TX/RX	—	—	TX/RX	TX/RX	TX/RX
450–470 MHz	RX	RX	RX	RX	RX	RX	RX	RX	—	—	RX	RX	RX
800–900 MHz	—	—	RX	—	RX+	—	—	—	—	—	—	RX	—
1270 cm	—	—	—	—	RX	—	—	—	TX/RX	—	—	RX	opt
Power Out	50V/35U	50V/35U	10W	50V/30U	50V/35U	50V/35U	35	50V/35U	10	25	50V35U	50V/35U	50V/35U
Display Bands	2	1	2	1	2	2	1	2	1	1	2	2	3
Memories	100	180	81	180	310	120	61	280	20	20	232	200	300
Alphanumeric	No	Yes	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	No
LCD Color	amber	amber	omni-glow	blue	omni-glow	amber	silver	blue	amber	amber	full colors	amber	amber
Remote Head	No	Yes	No	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes × 2
Band Scope	No	No	Yes	No	No	Yes	No	Yes	No	No	Yes	Yes	No
CTCSS													
encode	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
decode	opt	✓	opt	✓	opt	opt	opt	✓	opt	opt	✓	✓	opt
DCS	No	No	Yes	Yes	No	No	No	No	No	No	No	Yes	No
Auto Repeater Shift	No	—	Yes	Yes	Yes	No	Yes	Yes 2M	No	Yes	Yes	Yes	No
Attenuator	No	No	No	No	No	Yes	No	No	No	No	Yes	Yes	No
DTMF Memories	No	—	—	8	6	5/10*	15	15	—	—	14	10	—
Mic Direct Freq. Input	No	—	Yes	Yes	Yes	Yes	—	Yes	—	No	Yes	Yes	Yes
Backlit Mic Keypad	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	opt
Packet Compatible	1200/9600	Din, 1200/9600	1200/9600	1200/9600	1200/9600	1200/9600	No	1200/9600	No	No	Video Input†	1200/9600	No
APRS Ready	No	No	No	No	No	No	No	No	No	No	Video Input	Yes	—
Software Programming	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	No	Yes	Yes	—
Cloning	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	No	Yes	Yes	—
Crossband Repeat	Full	No	Yes	No	Full	Full	n/a	Full	n/a	n/a	Full	Full	Full × 3
Dual In-Band RX	No	No	Yes	No	All	All	n/a	All	n/a	n/a	No	All	No
Built-in Duplexer	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	—	—	Yes	Yes	No
Size	small	medium	Medium	micro	medium	medium	small	medium	small	small	medium	medium	medium
Weight (lbs.)	2	3	3	1	2	3	2	3	2	2	3	3	3
Lowest "Street" $$ Seen	$339	$340	$399	$399	$429	$439	$439	$449	$449	$469	$519	$629	$639

**with add-memory board*

†1200/9600

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- **New telescopic antenna included for better reception**
- **New keyboard layout for easier operation**
- **Attractive new black case**
- **Now includes 1100 mAh high capacity Ni-Cd batteries**
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- Download free control software from AOR web site!
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- True carrier reinsertion in USB and LSB modes.
- Includes 3 KHz SSB filter!
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- 8.33 KHz airband step is correctly supported
- Noise limiter and attenuator
- Band activity"scope" display with "save trace" capability
- Four-way side panel rocker switch allows one-hand operation
- Large display includes A and B VFO frequencies and signal strength meter
- Battery Save function with Low Battery indicator
- Operates on 12 VDC external power
- 4 AA Ni-Cd batteries supplied, also uses standard AA dry cells
- BNC antenna connector
- Wide choice of accessories
- Patented design (U.S. Pat. No. 6,002,924)

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CIRCLE 15 ON READER SERVICE CARD

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AOR engages in ongoing efforts to improve its products. As such, design and performance parameters may change without notice or obligation on the part of the manufacturer and/or distributor(s).

VHF & UHF Handhelds

"Cute" Handhelds

	Yaesu VX-1	Alinco DJ-V5	Alinco C5T	Alinco S11	Alinco S41	ICOM Q7A	Kenwood TH22
Ham Bands	2m/440	2m/440	2m/440	2m	440	2m/440	2m
Output Power	1/2W	5W	1/2W	1/2W	1/2W	1/2W	5W
RX Coverage (MHz) (cellular blocked)	76/999	76/999	108-174 420-479	Ham	Ham	30-1300 + wide FM	135-174
Air Receive	Yes	Yes	Yes	No	No	Yes	No
Memories	291	200	50	21	21	200	40
Alphanumerics	Yes	Yes	No	No	No	No	No
Dual RX	No	No	No	No	No	No	No
Dual Knobs	No	No	No	No	No	No	No
Auto Rptr Shift	Yes	Yes	No	No	No	Yes	Yes
Tone Scan	Yes	Yes	No	No	No	Yes	Yes
Backlit Keypad	Yes	Yes	Yes	No	No	No	Glows
Cloning	Yes	Yes	No	No	No	No	No
Computer Prog.	Yes	Yes	No	Yes	Yes	Yes	No
Ant. Connector	SMA	SMA	Fixed ant.	Fixed ant.	Fixed ant.	SMA	BNC
12 VDC Operation	Yes	Yes	No	No	No	No	Yes
CTCSS Encode	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CTCSS Decode	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DCS Tone	Yes	No	No	No	No	No	No
Power Levels	2	3	2	2	2	—	3
Audio Output	1/4W	1/2W	1/3W	1/4W	1/4W	1/2W	1/4W
Power Saver	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DTMF Slots	8	8	—	—	—	—	—
Seen Selling $$	$169	$239	$155	$88	$88	$134	$199

"Ultimate" Handhelds

	Kenwood D7A	ICOM T81A	Yaesu VX5R
Ham Bands	2m/440	2m, 6m, 440, 1270	2m, 6m, 440
Output Power	5W	5W	5W
RX Coverage (MHz) (cellular blocked)	118-136, 136-174 400-480	6m, 74-170 + wide FM, 400-470, 1.2 Ham	.5-16, 48-999 + wide FM
Air Receive	Yes	Yes	Yes
Memories	200	124	220
Alphanumerics	Yes	Yes	Yes
Dual RX	Yes	No	No
Dual Knobs	No	No	No
Auto Rptr Shift	Yes (2m)	Yes	Yes
Tone Scan	Yes	Yes	Yes
Backlit Keypad	No	No	Yes
Cloning	No	Yes	Yes
Computer Prog.	Yes	Yes	Yes
Ant. Connector	SMA	SMA	SMA
12 VDC Operation	Yes	Yes	Yes
CTCSS Encode	Yes	Yes	Yes
CTCSS Decode	Yes	Yes	Yes
DCS Tone	No	No	Yes
Power Levels	3	3	3
Audio Output	1/2W	1/2W	3/4W
Power Saver	Yes	Yes	Yes
DTMF Slots	10	9	9
Seen Selling $$	$399	$350	$350

"Totally Cool" Handhelds

	ADI 600	Alinco G5	ICOM G2XAT	ICOM W32	ICOM T22A	Kenwood TH79	RadioShack 200	RadioShack 400
Ham Bands	2m/440	2m/440	2m	2m	2m	2m/440	2m	440
Output Power	5W	5W	7W	5W	5W	5W	2W	1W
RX Coverage (MHz) (cellular blocked)	108-174, 330-500 800-985	108-173 420-480	Ham	118-174 400-470	118-174	118-174 300-470	136-174	420-470
Air Receive	Yes	Yes	No	Yes	Yes	Yes	No	No
Memories	200	200	40	200	80	82	30	30
Alphanumerics	Yes	No	No	Yes	Yes	Yes	No	No
Dual RX	Yes	Yes	No	Yes	No	Yes	—	—
Dual Knobs	Yes	No	No	Yes	No	Yes	—	—
Auto Rptr Shift	Yes	Yes	No	Yes	Yes	Yes	No	No
Tone Scan	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Backlit Keypad	Yes	Yes	No	Yes	No	No	No	No
Cloning	Yes	No	No	Yes	No	Yes	No	No
Computer Prog.	Yes	No	No	Yes	No	No	No	No
Ant. Connector	BNC	BNC	BNC	BNC	BNC	BNC	SMA	SMA
12 VDC Operation	Yes	Yes	Yes	Yes	Yes	Yes	9V	9V
CTCSS Encode	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CTCSS Decode	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DCS Tone	No	No	No	No	No	No	No	No
Power Levels	3	3	3	3	3	3	2	2
Audio Output	1/2W	3/4W	1/2W	1/2W	1/2W	3/4W	1/2W	1/2W
Power Saver	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DTMF Slots	10	20	5	5	5	10	1	1
Seen Selling $$	$199	$280	$200	$295	$225	$369	$179	$199

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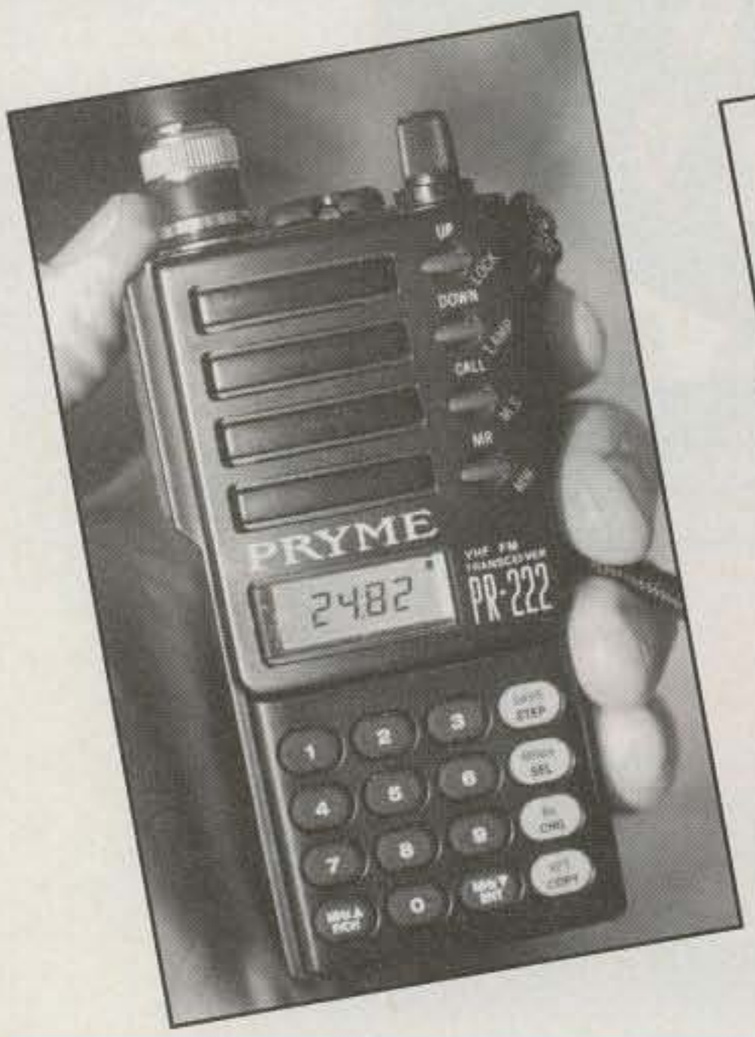
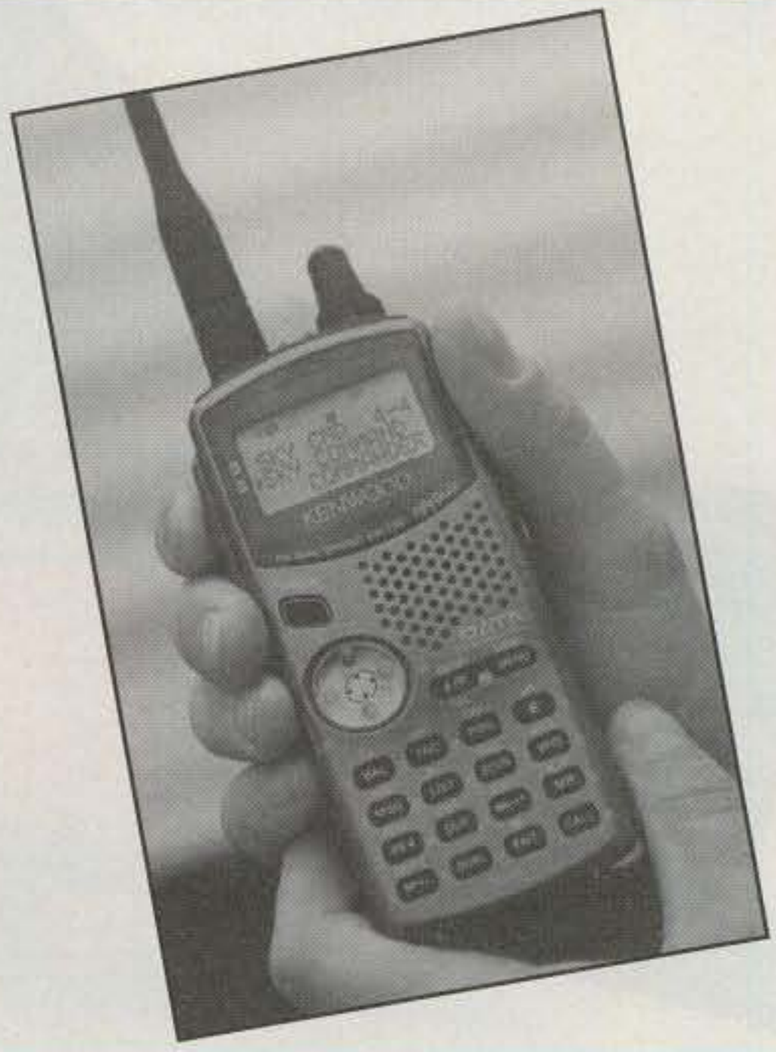
This radio has not yet been type accepted by the FCC. It may not be offered for sale or lease until the approval of the FCC has been obtained.

CIRCLE 119 ON READER SERVICE CARD

"Rambo" Handhelds

	Kenwood G71	ADI Pryme 222	ADI 52	ADI 400	ADI 201	Alinco 195	Alinco 191	Alinco 280	ICOM T2H	ICOM T7H
Ham Bands	2m/440	222	6m	440	2m	2m	2m	222	2m	2m/440
Output Power	6W	5W	5W	5W	5W	5W	5W	4W	6W	5W
RX Coverage (MHz) (cellular blocked)	118-174 400-480	216-229	40-54	400-480	130-179	Ham	135-173	210-240	136-174	118-174 400-470
Air Receive	Yes	No	No	No	No	No	No	No	No	Yes
Memories	200	41	41	40	40	40	40	10	40	70
Alphanumerics	Yes	No	No	No	No	Yes	No	No	Yes	No
Dual RX	No	No	No	No	No	No	No	No	No	No
Dual Knobs	No	No	No	No	No	No	No	No	No	No
Auto Rptr Shift	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Tone Scan	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Backlit Keypad	Yes	Partial	Partial	—	—	No	Yes	No	No	Yes
Cloning	No	Yes	Yes	—	Yes	Yes	Yes	No	Yes	Yes
Computer Prog.	No	Yes	Yes	—	No	—	No	No	Yes	Yes
Ant. Connector	SMA	BNC	BNC	BNC	BNC	BNC	BNC	BNC	BNC	BNC
12 VDC Operation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CTCSS Encode	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	Yes
CTCSS Decode	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—	Yes	Yes
DCS Tone	No	No	No	No	No	Yes	No	No	No	No
Power Levels	3	2	2	2	2	3	3	2	3	3
Audio Output	3/4W	3/4W	3/4W	1/3W	1/2W	1/2W	1/2W	1/2W	2/3W	1/2W
Power Saver	Yes	Yes	Yes	Yes	—	Yes	Yes	No	Yes	Yes
DTMF Slots	10	—	—	—	—	8	9	—	5	9
Seen Selling $$	$249	$299	$299	$199	$200	$175	$175	$275	$159	$229





"Rambo" Handhelds
(continued)

	Yaesu 50	Yaesu 51R	Yaesu 10R	Yaesu 40R	Yaesu 911	Yaesu 23R	Yaesu 33R	Yaesu 11R	Yaesu 41R	Cherokee AH-50
Ham Bands	2m/440	2m/440	—	440	1.2 GHz	2m	222	2m	440	6m
Output Power	5W	5W	5W	4W	2W	5W	5W	5W	5W	5W
RX Coverage (MHz) (cellular blocked)	76-200 300-999	76-999	140-174	420-470	Ham	Ham	Ham	100-180	420-470	Ham
Air Receive	Yes	Yes	Yes	No	No	No	No	Yes	No	No
Memories	112	200+	100	99	49	10	10	150	150	5
Alphanumerics	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No
Dual RX	No	Yes	No	No	No	No	No	No	No	No
Dual Knobs	No	No	No	No	No	No	No	No	No	No
Auto Rptr Shift	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No
Tone Scan	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No
Backlit Keypad	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
Cloning	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No
Computer Prog.	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No
Ant. Connector	SMA	BNC	SMA	SMA	BNC	BNC	BNC	—	—	BNC
12 VDC Operation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CTCSS Encode	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
CTCSS Decode	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
DCS Tone	Yes	Yes	Yes	Yes	No	No	No	—	—	No
Power Levels	3	5	3	3	2	2	2	3	3	2
Audio Output	1/2W	3/4W	3/4W	3/4W	1/2W	1/2W	1/2W	1/2W	1/2W	1/2W
Power Saver	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DTMF Slots	—	—	—	—	10	No	No	—	—	—
Seen Selling $$	$430	$350	$250	$275	$550	$300	$350	$189	$189	$150

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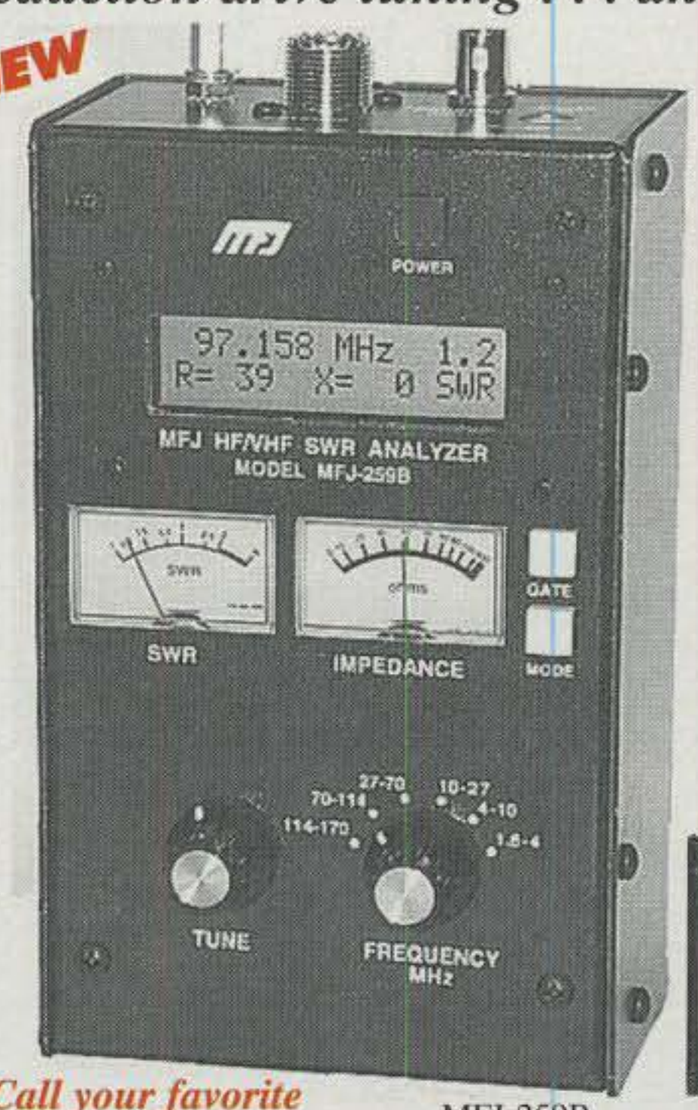

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MFJ-219B, $99.95. UHF *SWR Analyzer*™ covers 420-450 MHz. Jack for external frequency counter. 7½x2½ x2¼ inches. Use two 9 volt batteries or 110 VAC with MFJ-1312B, $12.95. *Free* "N" to SO-239 adapter.

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Under $800

Make/Model	DC or AC?	RX coverage	TX bands	Power Output (*tested)	RX circuitry	Mem. Chs.	Remote Head	DSP?	Built-in Keyer?	Built-in Tuner?	"Street Price"
Alinco DX-70	DC	.15-30 MHz + 50 MHz	All HF + 6m	110*	Dual Conv.	100	Yes	No	No	No	$750
Alinco DX-77T	DC	.15-30 MHz	All HF	120*	Dual	100	No	No	No	No	$699
Elecraft K2 Kit	DC or built-in battery	1.8-30 MHz	All HF	10*	Dual	10	No	No	Yes	Option	$600
ICOM IC-707	DC	.5-30 MHz	All HF	105*	Dual	32	No	No	No	No	$650
ICOM IC-718	DC	30 kHz-30 MHz	All HF	100	n/a	101	No	Option	No	No	$799
Kenwood TS-50	DC	.15-30 MHz	All HF	110*	Dual	100	No	No	No	No	$750
MFJ 9xxx series	DC	Ham band	Single banders for 10, 20, 40, 80m	14*	Dual	VFO	No	No	No	No	$250 each
Patcomm PC-9000	DC	Ham band	All HF + 6m	40 (HF), 20 (6m)	Single	1 per band	No	No	Yes	No	$799
RadioShack HTX-10	DC	28-29.7 MHz	10m.	31*	Dual	5	No	No	No	No	$150
Ramsey QRP-RX	DC	Single banders for 20, 30, 40, 80m	(Rcvr only)	n/a	n/a	—	No	No	No	No	$30/kit/band; $15 case+knobs
Ramsey QRP-TX	DC	(Xmtr only)	Single banders for 20, 30, 40, 80m.	1 CW only	n/a	—	No	No	No	No	$30/kit/band, $15/case+knobs, $10 power supply
Ramsey SX-20	DC	20m.	20m.	10	n/a	n/a	No	No	No	No	$300 kit, $370 wired/tested
Ranger RCI-2950DX	DC	24.8-24.9, 28-30 MHz	12 & 10 m.	25*	Dual	10	No	No	No	No	$400
Ranger RCI-2970	DC	28-30 MHz	10m.	100*	Dual	10*	No	No	No	No	$550
RF Limited 357DX	DC	28-29.7 MHz	10m.	150*	Dual	5	Yes	No	No	No	$400
SGC 2020	DC or battery pack	1.8-30 MHz	All HF	21*	Triple	20	No	No	No	No	$675
Sierra Kit	DC	1.8-30 MHz	All HF	3*	Dual	—	No	No	No	No	$369
Ten-Tec Scout	DC	Ham modules	Ham modules	49*	Dual	—	No	No	No	No	$549
Yaesu FT-600	DC	.5-30 MHz	All HF	140*	Triple	100 w/ alphanumerics	No	No	No	No	$900
Yaesu FT-840	DC	.1-30 MHz	All HF	125*	Dual	100	No	No	No	No	$749

$1000–$1500 Range

Make/Model	DC or AC?	RX coverage	TX bands	Power Output (*tested)	RX circuitry	Mem. Chs.	Remote Head	DSP?	Built-in Keyer?	Built-in Tuner?	"Street Price"
ICOM IC-706 MkII	DC	.2-179 MHz	All HF + 6/2m.	120*	Triple conv.	100	Yes	Yes	Yes	No	$1075
ICOM IC-706 MkII-G	DC	.2-470 MHz	All HF + 6/2m + 70cm.	125*	Triple	100	Yes	Yes	Yes	No	$1400
Kenwood TS-570D(G)	DC	.1-30 MHz	All HF	120*	Dual	100	No	Yes	Yes	Yes	$1050
Kenwood TS-570S(G)	DC	.1-54 MHz	All HF + 6m	120*	Dual	100	No	Yes	Yes	Yes	$1349
Patcomm PC-16000	DC	.1-30 MHz + data readout	All HF	110*	Dual	100	No	No	Yes+reader	No	$1000
Ten-Tec Pegasus	AC+DC	.5-30 MHz	All HF	104*	Dual	Comp. control	Yes/Comp.	Yes	Yes	No	$900
Yaesu FT-100	DC	.1-1000 MHz (cellular blocked)	All HF + 6/2m +70cm	128*	Dual	200	Yes	Yes	Yes	No	$1300
Yaesu FT-920	DC	.1-30 / 48-56 MHz	All HF + 6m	145*	Dual	110	No	Yes	Yes+memory	Yes	$1400

$1500–$2585 Range

Make/Model	DC or AC?	RX coverage	TX bands	Power Output (*tested)	RX circuitry	Mem. Chs.	Remote Head	DSP?	Built-in Keyer?	Built-in Tuner?	"Street Price"
ICOM IC-746	DC	.3-60 / 108-174 MHz	All HF + 6/2m.	121*	Quad conv.	100	No	Yes	Yes	Yes	$1600
ICOM IC-756	DC	.3-60 MHz	All HF + 6m.	130*	Quad	100	No	Yes	Yes	Yes	$2000
JRC JST-245	DC	1.8-30 / 50-54 MHz	All HF+6m	180*	Triple	200	No	No	Yes	Yes	$2500
Kachina 505 DSP	AC+Comp. DC	1.1-30 MHz	All HF	110*	Dual	Comp. memories	Yes/Comp.	Yes	Yes	No	$2000
Kenwood TS-870	DC	.1-30 MHz	All HF	135*	Quad	100	No	Yes	Yes	Yes	$2300
SGC-2000 w/ADSP	DC	1.8-30 MHz	All HF + marine	170*	Dual	100	Yes	Yes	No	No	$1850
Yaesu FT-847	DC	.1-30/ 50-54/ 144-148/ 430-450 MHz	All HF + 6/2m + 70cm	119*	Dual	100	No	Yes	Yes	No	$1600

Top of the Line ($2500+)

Make/Model	DC or AC?	RX coverage	TX bands	Power Output (*tested)	RX circuitry	Mem. Chs.	Remote Head	DSP?	Built-in Keyer?	Built-in Tuner?	"Street Price"
ICOM IC-756 Pro	DC	.1-60 MHz	All HF+6m	170*	Triple conv.	100	No	Yes	Yes	Yes	$3500
ICOM IC-775	AC	.1-30 MHz	All HF	175*	Quad	100	No	Yes	Yes	Yes	$3500
ICOM IC-781	AC	.1-30 MHz	All HF	195*	Quad	100	No	No	Yes	Yes	$7000
Kenwood TS-950SDX	AC	.5-30 MHz	All HF	110*	Quad	100	No	Yes	Yes	Yes	$4000
Ten-Tec Omni VI	DC	Ham bands	All HF	105*	Triple	100	No	Yes	Yes	No	$2500
Yaesu FT-1000	AC	.1-30 MHz	All HF	200*	Double	100	No	Yes	Yes	Yes	$3400
Yaesu FT-1000D	AC	.1-30 MHz	All HF	200*	Quad	100	No	Yes	Yes	Yes	$4100
Yaesu FT-1000MP	DC	.1-30 MHz	All HF	200*	Double	100	No	Yes	Yes	Yes	$2600

"Which Radio Should I Buy?"

This is one of the most common questions asked by people in the market for a new radio, especially among people making their first purchase of a particular type of radio, and who aren't yet confident in knowing which features are most important. It's really impossible to recommend a specific radio to someone else, for several reasons:

1) Virtually all of today's radios are high-quality, designed well, built well, and operate well. *But,* each radio has its strengths and weaknesses, so a radio that's ideal for one person may not do the job at all for another. Why is that?

2) Each ham has different operating needs and preferences. For example, if you enjoy CW, then a built-in keyer may be important to you (but useless to someone who operates voice only). If you're a contester, then narrow filters to help you pull out callsigns on crowded bands are vitally important (but not so vital to someone whose primary passion is ragchewing on 17 meters). The list goes on and on.

3) Many people develop extreme loyalty to a specific brand of radio and wouldn't consider buying—or recommending that you buy—a radio made by anyone else. However, it may be that another company's radio will better fit *your* needs, and you might find yourself disappointed if you've followed advice that limited you to considering only one brand.

So How Do I Choose?

The first question you should ask yourself before asking "Which radio should I buy?"—and the first question that any good sales person will ask you—is "What do I plan to *do* with this radio?"

If your plans are for something that's new to you, take the time to find some people who are already doing whatever it is you're interested in (if there aren't any near you, look around on the internet). Ask them what *features* in a radio are most important to them in pursuing that activity. Try to talk to at least three or four people. Once you've gotten their lists, compare to see which features show up the most often. These are probably the most critical features for whatever it is you'd like to do with your radio. Next, sit down with your financial manager (in most cases, that translates to "spouse") and figure out how much money you have available for investing in a new radio.

Now, using the tables in our Reference Guide, see which radios offer the greatest number of features that you want, and which of those fall into your budget range. If there's more than one, compare the other features that each offers, ask your friends who told you which features are most important what they know about each of the radios you're considering, look for reviews, read the ads, and talk to your dealer.

Remember, a good dealer is going to do his/her best to match you up with the radio that will make you happy. A satisfied customer is a repeat customer. The dealers' sales people know their products, and the more specific you can be in telling them what you're looking for and what you're willing to pay, the better they can help you.

Good luck in making the choice that's best for *you,* and *have fun on the air!*

—The Editors

What sets apart one DSP modem from another? One big factor, says RTTY veteran W6IWO, is how accurately and easily you can tune in a signal. He says the HAL DXP38 makes accurate tuning a piece of cake.

CQ Reviews:

The HAL Communications DXP38 Modem

BY DALE SINNER,* W6IWO

The DXP38 from HAL Communications is a multimode digital modem that uses digital signal processing (DSP) to let you communicate via radioteletype (RTTY) and other HF digital modes.

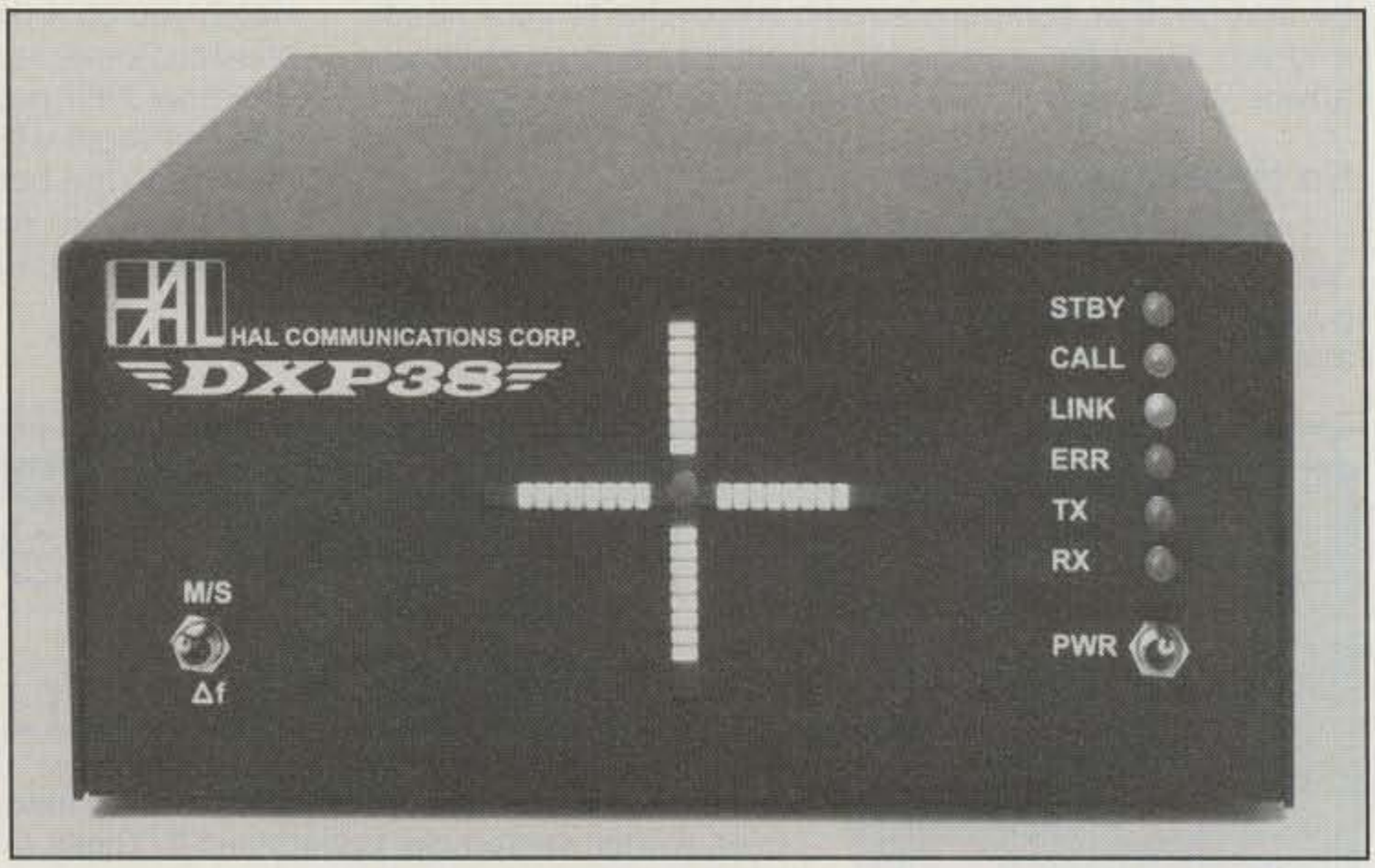
What qualifies me to review this fine piece of gear? My first exposure to RTTY was in 1952 in the Army, but I was unable to obtain a machine until 1965. I had been bitten by the bug, and I could hardly wait for the day when I could print my first QSO.

I had to build the demodulator and I modified the transmitter for FSK. The circuit I used for the demodulator was taken from an article in *CQ* entitled "Teletype Without Tears,"[1] which incorporated several tubes. It served me well and worked flawlessly for many years.

RTTY consumed my life. I very seldom used CW anymore, and I never operated phone. To this day, my mic and bug sit on the shelf collecting dust.

After years of using the tube unit, a friend and I began experimenting with solid-state devices for demodulation. This led to the 741 op amp. We ultimately settled on a final circuit that again served me well for a few years.

Over the years I've used a lot of different modulator/demodulators (what the word "modem" really means)—i.e., the ST5, CP100, ST6, ST6000, PCI2000, PCI3000, PCI4000, P38, DSP4100, and now the DXP38. With all this experience in using various modems, I feel qualified to do this review.



The DXP38 HF DSP modem from HAL Communications gives you high-quality RTTY (and other HF digital modes) at a reasonable price. Just connect it between your computer and your radio and you're ready to go! Software is included. (Photo courtesy HAL Communications)

For my own shack I have chosen HAL modems, not because of the name, but because of the quality of the units. I expect them to do exactly what they are advertised to do. Thus, each unit I have tried has been put through many tests, from copying weak signals, fades, multipath signals, flutter, to noise.

The DXP38 is by far one of the best modems available, and at $395 it is priced right for today's amateur market. I have not tried the ST-8000 (it doesn't fit my budget), but it is said to outcopy the DXP38. That may be so, but for the average guy who is raising a family or on a low budget, the DXP38 is priced right and performs to HAL standards.

What Will It Do Better?

A modem really is a receiver. It receives sounds (tones) and transforms them into intelligent information. How well the receiver hears is important to the user.

When you are considering buying a new radio, one of the first things you think of is the receiver's dynamic range. You will note that reviews usually include the dynamic range at various frequencies and at various audio levels. Why

**1904 Carrolton Ln., Fallbrook, CA 92028*
e-mail: <dsinner@tfb.com>
[1]CQ magazine, December 1958, p. 36

wouldn't you also consider this same criterion when buying a new modem?

Take a look at fig. 1 and compare the dynamic range of various modems. Here you find analog and digital modems and can see how they compare. Note the DXP38 range; you find it way up there in hearing ability. I believe it hears better than any other modem I have tested. Taking into consideration that this modem is a DSP device and uses the same A/D converter as other HAL modems, you might ask why they all are not the same. All things considered again, it is probably because of the excellent tuning indicator incorporated in the unit. With this tuning indicator you can get a better picture of where you should be with a signal. The zero-centering LED, which can be switched in and out, will also aid in getting you right on any signal. Because you can tune in the signal better, this modem will outperform most of the other HAL modems (more about tuning in a bit). I think of this modem as one designed for hams, giving us maximum performance at a reasonable price.

You may not hear me on the air very much, but I'm listening. To test a modem I listen a lot. I tune the bands looking for a weak signal and then watch the copy. Signals sometimes do not register on the S-meter, but I'm still copying enough to understand the text.

If you are a DXer, all of the above features are of vital importance. However, there is more. Many DX signals are down there in the mud and are very difficult to copy. Often I copy W1AW RTTY bulletins, but not the strongest signal. Instead I go to the weakest band, copy there, and watch the modem perform. It's an interesting test. Try it sometime.

Speaking of DXing, this unit is the choice of DXpeditioners, because it combines the tuning device and modem in one small box. It is also easy to install without the need for special cabling or soldering. The back panel has RCA jacks, which are common throughout the world—also a plus.

If you are a contester, you want a modem to be selective, so it must have tight filtering. I have found the DXP38 to be outstanding in this area. Along with the filtering in your radio, you can really separate the signal you want from the one next to it. I use a 250 Hz filter in my radio for contesting and never worry about being too close to someone else or, for that matter, a signal near me. However, I must confess I also use an oscilloscope for tuning, even though the DXP38 has its own tuning indicator. I've been using an oscilloscope for so many

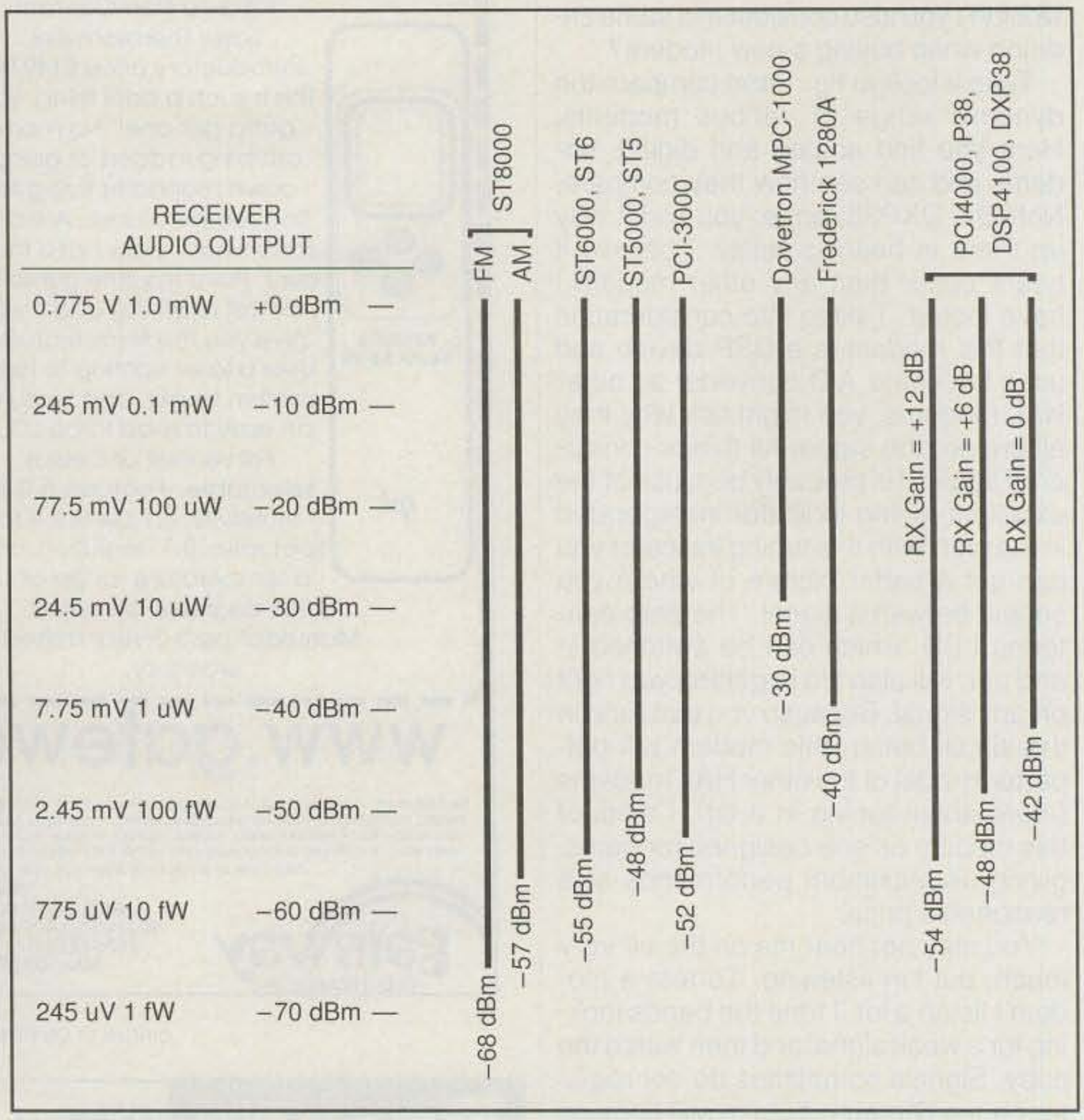


Fig. 1– A comparison of the dynamic range of various HF digital modems, including the DXP38. Dynamic range is a critical factor in determining how well any receiver "hears." Note: fW is femto watts, or 10^{-9} watts. (Artwork courtesy HAL Communications)

years it's hard for me to change. The scope in the DXP38 works just fine, though, and with its zero centering feature you can get right on each time. I have been using the unit in the zero centering position along with the scope, and I always know where I am with regard to the filtering of the DXP38. Therefore, from this operator's viewpoint, the modem will outperform anything I have ever tried in the past.

I'm not an avid DXer, but I do participate in some contests. I must confess, though, that my operating time is dictated by other events, and more often than not there is something happening around here which forces me to leave a contest without participating for the entire time allotted. However, when I look at the results, I'm happy with my performance. You don't know the disadvantage a West Coast ham has until you live here or experience a contest from here. It's tough to break through the East Coast wall to Europe, especially when signals are weak. With the DXP38 I hold my own pretty well.

How does the DXP38 handle signal variations due to changes in propagation? Propagation variations are a phenomenon which eludes us on more occasions than we would like. We plot propagation daily and still it fools us. It's on a par with the local weather forecaster who tries to predict the weather in advance and often has egg on his face. Sometimes propagation is good, and sometimes it's not so good—even when it's supposed be good.

Most contesters check the propagation numbers frequently before and during a contest. Sometimes signals have so much noise on them that tones can't be demodulated, the signal strength flutters, there is multipath distortion or deep fading of one or both tones, or all of the above. These are the worst conditions for copying signals, and here is where you want a modem that really performs.

In most cases you should use slow AGC (automatic gain control) for copying during such circumstances. However, my friends, no matter what modem you use, they all will have trouble with these conditions. A modem can't make the tones; it has to hear them before it can do its job.

From where I live to the former Soviet countries is 6000 to 8000 miles, and most signals arrive here with strong multipath. The signals are difficult to demodulate, especially during a contest when there are adjacent signals. The DXP38 does an outstanding job, and I can copy most on the first try even though in contesting short exchanges are the norm. However, when you exchange serial numbers and signal reports, the demodulator can become confused. Up-shift on space can be a real problem even in the best of circumstances, but include multipath signals and you will experience real difficulties. Here again the DXP38 does a more than adequate job.

Other Features

The DXP38 copies ASCII, AMTOR, PACTOR, and CLOVER modes in addition to Baudot RTTY. My experience with AMTOR is limited, but with the lack of this mode's use on the air, it's not likely I'll get any experience in the near future. It is slower than PACTOR and therefore now has taken a back seat. PACTOR has moved ahead as one of the new conversation modes and a traffic-handling mode.

WinLink software has brought about a great change in the moving of messages from the internet to HF and then to packet. The ASCII mode is seldom used in HF communications, and would not be an improvement over AMTOR or PACTOR because of the error-correction feature of these two modes.

Then there is the CLOVER mode. This four-tone mode is a fascinating method of communication. Imagine four tones in a 500 Hz bandwidth. It not only has error correction, it does this in a very small piece of spectrum. CLOVER is a duplex mode in that both sides of a QSO can type at the same time without ever saying "over." In fact, you can even send data or a picture while holding a conversation.

The DXP38 has the original version of CLOVER II, which can quickly move a lot of information and data. The commercial versions have more sophisticated versions of CLOVER and can handle more data, making them the choice of many foreign countries as well the United States military and commercial interests.

What About Software?

The DXP38 comes with free terminal software for both DOS and Windows 95/98/NT. At present there are numerous software programs available for this product. Above I mentioned WinLink, by Hans Kessler, N8PGR <www.winlink.org>, but there are others, such as "RCKRtty for Windows" by Walter Dallmeier, DL4RCK <dl4rck@t-line.de>; "RTTY" by Ray Ortgensen, WF1B <wf1b-sales@wf1b.com>; "Writelog" by Wayne Wright, W5XD, and Ron Stailey, K5DJ <www.writelog.com>; "XPWare" <xpware@home.com>; and "Easy Term" <eztorders@mvhenley.com>. The RTTY and Writelog programs are primarily contesting programs, but Writelog can also be used for ragchewing. In addition, Writelog has the new PSK31 mode built in for those who wish to make use of the sound board in their computer.

The Tuning Indicator

You will find the DXP38's tuning indicator a valuable tool when separating one signal from another. Back when the P-38 came on the scene, I asked about a CRT tuning indicator. Bill Henry, K9GWT, President of HAL, told me then that most companies did not even make a small CRT tube, and any tubes that were available would be so expensive it would be prohibitive to build such an indicator. However, it wasn't long thereafter that the RTTY-1 tuning indicator was introduced. HAL pays attention to the needs of hams!

The RTTY-1 sold like hotcakes, I'm told. Thus, when the DXP-38 was introduced, once again we found the tuning indicator, only this time it is much more sophisticated than the earlier version. The center LED is now what I refer to as a zero centering guide. Tune in a signal and flip the switch, and check to see how close you really are. I use it in this position all the time, since I use the oscilloscope for tuning.

There is another neat little trick this indicator will do for CLOVER fans. When tuning a CLOVER signal, simply watch each segment of the four-segment LEDs as they drop into place. When each segment does drop into place, the CLOVER signal is tuned properly and you will be right on frequency with the other station.

When I make suggestions to HAL, they listen. I know others have done the same. I think I know hams pretty well. If you could buy a fancy car for the price of a "Tin Lizzie," why wouldn't you? With the DXP38 you are getting a fine modem at the "Tin Lizzie" price without sacrificing quality. Therefore, if you are a DXer, a contester, or just someone who likes to ragchew, this modem is the one for you. It will do all the things I mentioned above and leave you with the satisfaction of money well spent.

Resources

For more information, or to order, contact HAL Communications Corp., 1201 W. Kenyon Rd., P.O. Box 365, Urbana, IL 61801-0365 (phone 217-367-7373; fax: 217-367-1701; e-mail: <halcomm@halcomm.com>; web: <http://www.halcomm.com>). ■

Public Service

BY BOB JOSUWEIT, WA3PZO

Public Service and Emergency Communications

Hams Come to Towns' Aid—Here and Abroad

In May much of New Mexico was on fire. One fire that got out of control was the result of a "controlled burn" set by National Park Service firefighters attempting to clear brush at Bandelier National Monument, south of Los Alamos. Here's that story.

"You have less than 30 minutes to load a vehicle. What would you take with you?" This question was asked of residents of fire-prone areas.

New Mexico has five climate seasons—the usual four, and a fire season which crosses late spring and early summer. It is a period that is usually quite dry, and of course as summer approaches, the rising temperatures dry out things even more. The state has had a drought for the last two years.

The "controlled burn" had been set by the National Park Service firefighters. It was hoped they had the blaze contained, but the next day stiff winds pushed the fire across Los Alamos Canyon and it threatened the city and the Los Alamos National Lab.

When the Cerro Grande fire escaped control, hams from the Los Alamos area immediately began to provide emergency back-up communications for public safety and in support of the first Red Cross shelters. Approximately 11,000 residents completed an orderly, and very well-conducted evacuation in less than six hours. Residents had known they would have to move.

According to Jay Miller, WA5WHN, on the day prior to the evacuation, there was a continuous low-frequency rumble as low-flying, fire-retardant slurry bomber after slurry bomber flew north toward Los Alamos from Kirtland AFB in Albuquerque, approximately 75 miles away. The next day the slurry bombers could not fly due to the wind shear near the mountains. Most of the residents of Los Alamos were aware of an imminent wall of fire. Miller commented, "If there ever was a curse on the State of New Mexico, it's the wind."

A satellite view of the plume of smoke from the Los Alamos fire. (Photo courtesy NOAA)

Hams Called into Action

As the fire continued to approach Los Alamos, the local Emergency Operations Center (EOC) was activated. Additional sites were set up at the New Mexico EOC in Santa Fe, the hospital in Los Alamos, and in several other spots. All traffic was handled on two repeaters (145.19 and 146.82 MHz), as well as on simplex. Health and Welfare traffic was out of the question during the first 48 hours. A internet web site was set up to list information on evacuees who had registered at a Red Cross shelter. Since there were no fatalities, that traffic was given the lowest priority.

The situation was very fluid, as aircraft had been grounded and the extent of the fire and the rate of fire progression were not fully known. The New Mexico Search and Rescue Support (NMSARS) team was put on 1-hour standby shortly after the evacuation was ordered. Bob Rieden, WD5IDL, reported that some teams were dispatched to determine the extent of the fire on the northeast perimeter. These teams were equipped with Automated Position Reporting System (APRS) equipment, so their exact locations were known in base camp at all times. When bearings to the fire were radioed in to base camp, the location of the fire was plotted on computer mapping programs. This information was then relayed to other emergency entities involved in evacuations and fighting the fire. The observation tasks and communication operations continued for two days. It then became possible to use firefighting aircraft. Other emergency operations were becoming more stabilized, too.

Even hams who were being evacuated pitched in. Virginia Turner's husband Robert was helping with communications. Meanwhile, she waited for her husband at a shelter, hoping they would have a house to go back to.

Normal Communications Overloaded

Natural gas lines to Los Alamos had been shut off. Power poles were burning. In the first 8 hours of the evacuation, telephone lines were overloaded, and cell-phone sites were marginal. Everyone was trying to call everyone else. Miller says the evacuation of White Rock was really eerie.

"It was dark, and all you could see up the hill was a line of headlights heading west on SR 502 from White Rock to Pojoaque. When I had heard the call on 145.19 to evacuate White Rock, I knew the City of Los Alamos was not going to survive the wall of fire. The smoke was so thick you could not see the city. Soot was dropping out of the air like sand pebbles. When you could see the fire, it was white or had a slight brownish color to it. You knew when it hit the houses because the flames brightened and you could see dark, black smoke." Los Alamos was surrounded by tall ponderosa pines, junipers, and spruces. The city no longer exists. Over 20,000 acres burned, destroying over 400 homes.

Relief on the Way Via Ground Zero

Over 40 operators were manning stations within 4 hours of the onset of the emergency in the Los Alamos area. More

c/o CQ magazine
e-mail: <wa3pzo@cq-amateur-radio.com>

than 100 operators from New Mexico and beyond assisted with communications. Many spent 72 hours or more providing vital links. Relief operators headed north from Albuquerque three or four at a time. They checked in on the 145.19 MHz repeater and received their assignments. Not only was the KB5RX repeater providing a valuable communications link, it was taking the heat as well. As communications were taking place, the fire overran the facility housing the repeater. The repeater stayed on the air! ARRL New Mexico Section Manager Joe Knight explained that the repeater is underground and solar-powered.

"It's in a 32 gallon drum in the ground below several feet of dirt," says Knight. A piece of heliax feedline connects the repeater to a fiberglass antenna.

"The thing we were worried about was the fiberglass antenna, which is on top of the tower. The flames were licking up at the tower, but it is still operational," Knight said. "We are still using it for communication, and it has been going 24 hours a day."

The underground installation was done a number of years ago to keep the repeater on the air despite snow, bitter cold temperatures, and fire.

A Red Cross Viewpoint

Jim Morrison, KM5BS, a Red Cross volunteer, provided us with this information: "A major shelter was established in White Rock, New Mexico, a community located several miles southeast of Los Alamos. Hams assisted in coordination of the shelter needs and conducted communications between the various EOCs and the shelter. Public safety was extremely busy with evacuation and providing security and fire protection to the the city of Los Alamos.

"At about 0130 UTC Thursday morning fire and smoke forced the evacuation of White Rock. That shelter was moved to the Santa Fe High School, about 40 miles south of Los Alamos. Other shelters were also established in the town of Pojacque.

"When I arrived about mid-day on Thursday, hams were busy coordinating the various shelters. Communications involved locating separated family members, safety information, and other support required by multiple shelter operations.

"I was fortunate to be able to monitor these communications while approaching the location. I am retired from a career in law enforcement that included managing a communications center. I can say without hesitation that the

These destroyed buildings are across the street from the Caritas headquarters in Prizren. "There are no words to describe this," said Marcos, IK5BHN. (Photos of Kosovo by IK5BHN)

communications I monitored were exemplary. The hams conducted operations that would have made me proud if it had been my communicators in the public safety center.

"During the first couple of days of the National Red Cross response we had no solid communications with the shelters other than via ham radio. There were limited phone lines available, and the hams were essential in keeping up with what was happening. These guys and gals have been providing 24/7 communications for over a week now and are still going strong. We have an ARES/RACES station in the State EOC. I have not passed a shift without using them several times to find out information that could not be obtained by other means. The bottom line is: These amateur operators did a heck of a job. It makes me proud to be a ham."

Four Major Fires at Once

While Los Alamos received most of the national press coverage, there were four major forest fires in New Mexico. Various communities were evacuated. All had hams involved. All of the operators packed their own gear, because they didn't know where they would be assigned and what would be needed. One operator asked, "Is there anything more we can do for you?" The response was "Yes. Send an ocean and we could use some sleep."

Miller commented, "We used to watch the people in North Carolina and Florida after a hurricane and wonder how they could survive walls of water, or the people in Quebec who suffered for months through an ice storm with no power. Now we know."

Radio Reinforcements in Kosovo

Over the past year *CQ VHF* and *CQ* have covered ham radio activity in the Balkans. Last month we reported on ham radio being the only means of communications from many towns in Kosovo. This month we take a look at hams helping in the region.

"What I saw stabbed me to the core," said Marcos Barberi, IK5BHN, of his first trip to Kosovo last fall. "Place names, all in Albanian, meant burned out houses, killed relatives, and tragedies and mourning of the most heart-wrenching kind for returning refugees."

There are destroyed buildings everywhere. Asphalt roadways are filled with potholes from heavy military equipment. Gardens and courtyards are heaped with rubble at every turn. Window curtains are trampled in the mud everywhere, the discards of hastily fleeing humanity. Today the countryside is still ribboned with yellow plastic tape imprinted with red skull and cross bones to warn of mine-field dangers.

Over 100,000 homes were destroyed in this conflict, according to USAID, and

Team members Marcos, IK5BHN, and Carlo, IK6DPW, on the old bridge in Prizren during the second trip to Kosovo, December 1999.

Marcos, YU/IK5BHN (no official license), entering Pec ("Peje" in Albanian) with mobile HF and VHF stations installed in his vehicle. Note the conditions of the road and the trash in the once prosperous neighborhood.

Ham team member Carlo, IK6DPW, going through an identity check with KFOR German troops. Note the street is paved with stone and the buildings in the background are destroyed.

over half of the 2 million people were displaced from this mountainous region, which is about twice the size of Delaware. Rebuilding will be slow. The police are the UN, the army is NATO, and there is practically no justice being administered. Most municipal government buildings were burned down, as were the post offices. The public communication infrastructure is gone.

Equipment Shortages

Because the European ham community has similarly equipped Bosnia in the recent past (1993–95), Italian hams have fewer surplus radios to donate. Vacationing Americans Mike and Flo Adams (K5CDA and KC5PPL, respectively) became aware of the need for radios when a friend invited them to tour the Florence, Italy, Emergency Operations Center. There they met Barberi and heard his story.

Adams returned to the US, and in his spare time he set up a web site to communicate the area's ham equipment needs. It become a US collection center for radio donations for Kosovo.

Where to Begin?

To transmit in a foreign country, licensing and antenna permits are needed. On his initial survey trip last October, Barberi approached authorities at UNMIK (United Nations Interim Administration Mission in Kosovo), which administers the country. After being shuttled from office to office, a high-ranking official clearly explained (with expletives) that he had more important matters to handle and gave Barberi the firm directive to do whatever was needed without interfering with the soldiers.

Relying on his nearly identical experiences in Bosnia (1993–95), Barberi decided to adhere to International Amateur Radio Union (IARU) norms to stay out of trouble. He assigned himself the callsign YU/IK5BHN, since Kosovo previously belonged to Yugoslavia. "I warmly hoped that Belgrade agreed with my callsign," he said.

Propagation to Italy on 40 meters was good, alive with traffic. But Barberi was heart-sick at the destruction. "My eyes, heart, and brain were all there on the road. I could not bring myself to transmit," he said.

After a few days the sight of the torn-up roads, the soldiers, and the armored vehicles all become "normal", and Barberi began to operate his mobile HF rig, contacting many Italian stations.

In the evenings, when Barberi had more time and better propagation, he found that 40 meters had a lot of interference, jamming, and Russian splat-

ter. He put a split around two VFOs, transmitting as usual on SSB on one and programming the other to listen 800 Hz lower to CW. "Expediency usually works," he said.

A Survey of Needs

The electric service in Kosovo is unstable and frequently interrupted, making operation of radios, computers, faxes, and other office equipment unreliable. In October Barberi's voltage meter showed the line currently had 175 volts, not the expected 220. Stop-gap solutions included the installation of large-capacity batteries (often with no way to recharge them) until other solutions could become available.

A needs survey took the team to eight field stations of the Catholic relief agency Caritas. Some had intermittent radio contact with their headquarters in Prizren. All had reasonable-quality VHF radios, many working despite badly located or damaged antennas and coax cables. The team welded, soldered, and made many temporary repairs, bringing all stations back to life. Lists of needed equipment were compiled, and they included requests for some of the best chargers made.

The VHF traffic was mostly lists of urgently needed supplies for refugees: medicines for severe illness or trauma patients, building and repair equipment. The necessities of life were so scarce that everything was an urgent request.

Transmission problems abounded with some of the mountains over 8000 feet high. Repeaters would have solved the difficulties with ease. "We could have installed repeaters anywhere without permission," said Barberi, "but the land mines and lack of electricity, along with the mud and local advice, were discouraging." They had to give up investigating repeater sites.

Roadblocks

Travel between sites is extremely difficult. People must stay off the roads until the nighttime curfew ends and the armored transports of paratroopers finish their patrols. In Kosovo distances are measured in hours, not miles, because the roads are so badly damaged and choked with civilian and military traffic. The roadblocks are a waste of time, as every zone is administered by a different country. The trip from Prizren to Skopje (about 125 miles), for example, took 13 hours, including 8 hours going through customs.

In Skopje the team met with Elvira Simoncini, Z38/IV3FSG, the amateur radio liaison with Caritas. She is unsalaried and lives in the muddy, primitive conditions in Kosovo, spearheading the radio communications project.

"It was a meeting of OM and long time friends," recalled Barberi. "There was a shared bond of difficult work, shared cold and stress and risks, ... a sincere human warmth between people emotionally exhausted from giving to the huge needs around us."

Since that meeting Italian amateurs have returned to Kosovo about every two months to upgrade and expand the radio net for humanitarian communications. There is still much left to be done as equipment becomes available.

For more information on how you can help go to <www.radiopage.com> or contact Mike Adams, K5CDA.

With Thanks

This month we would like to thank Jay Miller, WA5WHN; Bob Rieden, WD5IDL; Jim Morrison, KM5BS; Joe Knight, W5PDY; Martha Underwood, NU5R; and many others for supplying information. Keep those reports coming in! Until next time ...

73, Bob, WA3PZO

Washington Readout

Regulatory News In The World Of Amateur Radio

BY FREDERICK O. MAIA, W5YI

Topics Covered by FCC at Dayton Hamvention 2000

The 49th Dayton Hamvention, held May 19–21 this year, attracted approximately 30,000 attendees. The Hamvention was also the ARRL National Convention for the first time.

The FCC Forum was hosted by William Cross, W3TN. Bill is an FCC official who writes regulations in the Commission's Policy and Rules Branch at their Washington, DC headquarters, and was the principal author of the FCC's recent restructuring of the Amateur Radio Service.

The Hamvention FCC Forum

At the forum Bill explained that the FCC's Public Safety and Private Wireless Division of the Wireless Telecommunications Bureau is responsible for most of the rulemaking activities that affect the Amateur Radio Service. It also handles the day-to-day administration of the Amateur Service.

Bill started off by asking, "How many of you have taken a test within the last few months or plan on taking one as a result of the license class restructuring?" Dozens of hands were raised. "And how many of you have upgraded and received additional HF frequency privileges as a result of license restructuring?" Again many hands were raised! He congratulated them and also the many VEs who were in attendance.

"From what I've heard, you VEs have been as busy as one-armed paperhangers for the past few months," he said. "Exam volume is up significantly. Exam sessions with up to ten times the normal number of examinees were common; CSCEs were being issued right and left. From what the VECs told me, you all issued CSCEs for about 20,000 people to be eligible for upgrades on April 15th. And apparently they all showed up April 15th for that next CSCE. You all have been busy."

(The following text, through the end of this month's column, is a direct quote from Bill's speech at the Hamvention forum, unless otherwise noted.—ed.)

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (telephone 817-461-6443)
e-mail: <w5yi@cq-amateur-radio.com>

Amateur Spread-Spectrum Rulemaking

The first Amateur Service Commission action that came out after last year's Hamvention was the Report and Order in WT Docket No. 97-12. This proceeding looked to authorize amateur stations to make greater use of spread-spectrum emission technologies. In this proceeding, the Commission removed the restriction in the rules that limited SS emission types amateur stations could transmit. It also removed now unnecessary recordkeeping and station identification requirements that applied only to stations transmitting SS emissions.

These changes will allow Amateur Service licensees to experiment with additional SS emission types, allow amateur radio operators to develop innovations and improvements to communications products and develop new communications technologies. Amateur stations can now transmit and experiment with SS technologies currently used in consumer and commercial products.

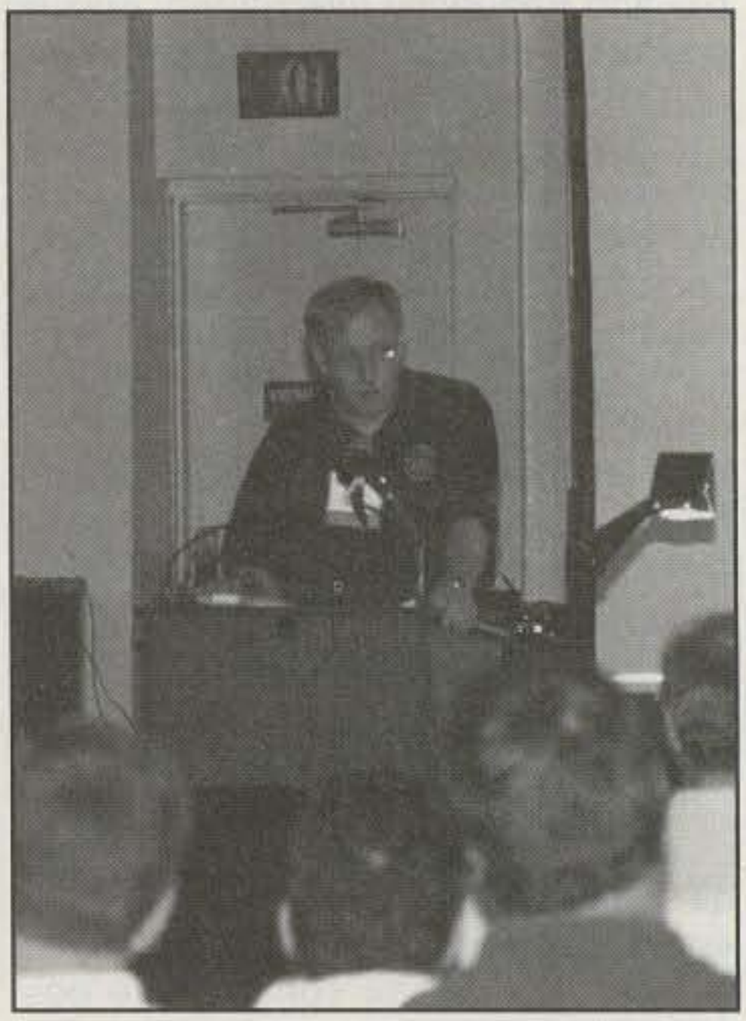
SS emissions are still restricted to amateur service bands above 420 MHz, and for the first time an amateur station is required to incorporate automatic power control if it transmits more than 1 watt. This automatic power control requirement applies only to stations transmitting SS emission types, however. These rule changes became effective November 1, 1999.

Five Amateur Petitions Dismissed

(The second Report and Order that directly affected the Amateur Service was an Order that dismissed five unrelated petitions for rulemaking that we had received.—ed.)

The petitions were dismissed because we found that the petitioners had not presented sufficient evidence to justify altering the current operator privileges or they requested changes that are inconsistent with the international Radio Regulations.

Two of the five petitions caught your attention. In RM-9259, the ARRL requested that the Commission declare that the phrase "good amateur practice" requires that control operators of amateur radio stations comply with voluntary band plans. The ARRL also requested we declare that any amateur radio station control operator who selects a transmitting frequency not in harmony with those voluntary band plans is not operating in accordance with good amateur practice. This would be a violation of Section 97.101(a).



The FCC Forum at this year's Dayton Hamvention was hosted by Bill Cross, W3TN, of the FCC. (Photo by Doug Stracener, KA5YSY)

The ARRL believed that this was necessary to prevent interference by "rogue operators." It also noted, however, that rigid enforcement of band plans is neither warranted or feasible, and it did not want to fix the current band plans as they are, or to incorporate voluntary band plans into the Rules.

We received over 70 comments and reply comments on this idea. In a nut shell, not many of you thought much of it. Numerous comments objected to the scope of the request, and to any attempt to establish mandatory band plans.

We found that what the ARRL was asking for would have the effect of transforming voluntary band plans into *de facto* required mandates. We also noted that Section 97.101(d) already provides that no amateur operator shall willfully or maliciously interfere with or cause interference to any radio communication or signal and we dismissed the request as unnecessary.

RM-9673 was received from the Central States VHF Society. It requested that we amend the rules to protect weak-signal operation in which its members and others engage. It wanted to eliminate wide-band emissions that are increasingly popular on the VHF bands, such as FM voice and/or packet emissions, in certain frequency segments.

Again, when a request was received that would have the effect of limiting your flexi-

Bill, W3TN, spoke at a well-attended FCC Forum at the 2000 Dayton Hamvention. (Photo by Doug Stracener, KA5YSY)

bility to use your frequencies, you were vocal. Sixty-eight comments and reply comments were received.

Some of you expressed the view that weak-signal operation is a minority operating interest within the VHF Amateur Service community. Others said we should not set aside frequency bands on the basis of personal operating interests, or you disputed the need for protecting weak-signal operations. The ARRL said that the requested rule amendment is not necessary and that user education can solve the problem that the CSVHFS believes exists.

We agreed that the proposed revisions to the rules were not necessary. We also pointed out that subdividing Amateur Service bands on the basis of operating interests would result in a loss of flexibility to accommodate changes in operating trends and new technologies.

Our policy regarding interference between Amateur Service stations engaging in different operating activities was stated in the Spread Spectrum decision I mentioned earlier. Here it is:

We believe that excluding specific emission types from additional frequency segments based on the specific operating interests of individual licensees or groups of licensees is inconsistent with the principle that each station licensee and each control operator must cooperate in selecting transmitting channels and in making the most effective use of the frequencies allocated to the Amateur Radio Service.

A hallmark of the Amateur Radio Service has been that all frequencies are shared. The expectation of any station that it can operate in a totally interference-free environment, therefore, is unreasonable. We also believe that subdividing amateur service frequency bands would undercut the voluntary band planning that the amateur service community does and would result in a loss of flexibility to reallocate spectrum as licensees' operating interests change, new technologies are incorporated, and frequency bands in the radio spectrum are reallocated.

Restructuring of Amateur Service License Classes

This proceeding started in August 1998 as one of the first groups of biennial review proceedings. In these proceedings the Commission undertook a review of all its regulations relating to administering wireless services to determine which regulations can be streamlined or eliminated. The Report and Order was released December 30, 1999.

We received over 2250 comments in this proceeding. They showed that you generally supported streamlining and simplification of your license structure.

The Commission simplified the Amateur Service license structure by grandfathering the Novice and Advanced Class operator licenses and by combining the Technician and Technician Plus classes of amateur radio operator licenses. Six classes of amateur service licenses are still in the database and will be until all the Technician Plus Class licenses are renewed. Then there will be five. Novice and Advanced Class licensees can renew or modify their licenses indefinitely.

You told us that a three-class license structure will provide an incentive for licensees to continue the educational opportunities offered by amateur radio as the ARRL requested, and will continue to provide an incentive for amateur radio operators to advance their communication and technical skills. Additionally, a three-class license structure provides a sufficient number of license classes so that the fundamental purposes underlying the Amateur Service rules will not be compromised. Those classes are the Technician Class, the General Class, and the Amateur Extra Class operator licenses.

Some of the other features of the revised license structure that you asked for and that we were able to accommodate were the

ARRL's overall request that no change in the license structure be made that would reduce the privileges of any existing licensee, and other commenters' requests that licensees not receive additional privileges without passing the required examinations.

Ultimately, the number of Novice and Advanced Class licensees will decline because they will either upgrade to the General or Amateur Extra Class or fail to renew and drop out of ham radio. It appears Advanced Class licensees are upgrading in significant numbers. So are the Tech Plus Class licensees. The number of Novices has been declining for the past few years, especially since the Technician Class became the no-code class of license.

During April and May more than 10,000 amateurs upgraded to the General Class and more than 7,000 to the Extra Class. That's over 17,000 people who have been in the exam rooms and have completed the licensing process in the last two months alone.

Let's stop here for a minute and see what we have. We have a simplified licensing structure—Technician, General, and Amateur Extra Class licenses. We have new exam elements. We have Technician Class licensees walking into exam sessions and walking out with General Class privileges without taking an exam. We have Novice Class licensees rediscovering ham radio, maybe getting a General Class license by passing only written exams. We have a lot of people who have had no contact with the HF end of ham radio for years (which is what this proceeding was all about) qualifying for HF privileges on the basis of exams passed long ago.

Morse Code Exam Standards

The Notice of Proposed Rulemaking sought comment on all aspects of the Morse Code standards used in our telegraphy examinations, including whether we should continue to have a standard that requires three different telegraphy examinations or whether this standard should be reduced to one or two telegraphy examinations, and if so, what the required speeds should be.

The international Radio Regulations contain certain requirements that an applicant for an amateur radio license must satisfy. With regard to telegraphy specifically, the Radio Regulations require that persons seeking a license to operate an amateur radio station must prove that they have the ability to send correctly by hand and to receive correctly by ear texts in Morse Code telegraphy signals.

The Radio Regulations do not contain any specified minimum speed, but they also provide that this requirement may be waived *only* for an operator of a station transmitting exclusively on frequencies above 30 MHz.

In order to comply with the Radio Regulations, our rules require that every class of amateur radio operator license that authorizes privileges below 30 MHz has, as one of the examination elements, that an applicant is required to pass, or otherwise receive credit for, a telegraphy examination element.

Some comments stated that the current licensing structure overemphasizes the importance of manual telegraphy. The ARRL said that the current examination structure places a strong emphasis on demonstrating Morse Code proficiency, while not requiring demonstrated proficiency in more technically advanced communications techniques. It also said that telegraphy should not be overemphasized to the exclusion of other operating modes.

The Commission concluded that the public interest will best be served by reducing the telegraphy examination requirement to the minimum requirement that we have found meets the Radio Regulations. We streamlined Section 97.503(b) to reduce the number of telegraphy examination elements from three to one—specifically, a 5 wpm telegraphy examination.

We believe that an individual's ability to demonstrate increased Morse Code proficiency is not necessarily indicative of that individual's ability to contribute to the advancement of the radio art. As a result, we found that such a license qualification rule is not in furtherance of the purpose of the Amateur Service and we do not believe that it continues to serve a regulatory purpose.

Updating the Written Examination Elements

The purpose of the written examination is to allow the applicant to demonstrate that he or she is qualified to be an Amateur Service licensee.

Your comments strongly agreed that the written examination elements were in need of updating or changing. You convinced us that the current written examination elements are not adequate. Almost all of the comments suggest that some type of change to the current system is needed.

The National Conference of VECs, for example, said that the topics currently specified in the rules fail to take into account changes in operating habits, technology, and transmitting equipment that have occurred over the past 15 years. It also said that this rule section results in VEs administering examinations that contain questions on topics that are not appropriate to the class of license being tested for.

We agreed that the rules specifying the written examination elements were in need of updating and should be streamlined. so we revised Section 97.503(b) to reduce the number of written examination elements from five to three and we aligned these elements with the classes of amateur radio operator licenses.

There are now three written examination elements, one for each class of operator license, and the make-up of the exam is no longer hamstrung (no pun intended) by the pre-1983 components that our old Field Operations Bureau used when they made up the exams. Now the Technician Class written exam is Element 2, a 35-question exam; the General Class written exam is Element 3, also a 35-question exam; and the Amateur Extra Class written exam is Element 4, a 50-question exam.

The Commission agreed that the Question Pool Committee, or QPC, of the NCVECs is capable of both specifying topics and organizing questions by topic, if this function is necessary, as part of its maintenance of the question pools. Allowing the Question Pool Committee of the NCVECs this flexibility will allow material included on amateur radio operator examinations to reflect technological advances in a much more timely fashion than can be accomplished by the rulemaking process.

Repeater Coordination

Repeater stations are one of the multitude of type of stations your license authorizes. Our rules provide that any station licensed to the holder of a Technician or higher class operator license may be a repeater. The decision as to whether to put up a repeater is the station licensee's decision.

Frequency coordination in the Amateur Service is voluntary. Always has been. In 1987, in PR Docket No. 85-22, Report and Order and Memorandum Opinion and Order, the Commission decided to continue relying on voluntary coordination of Amateur Service repeater stations. There is no Commission rule requiring approval of a frequency coordinator before a repeater goes on the air.

Frequency coordinators are entities that are recognized in a local or regional area by amateur radio operators whose stations are eligible to be auxiliary or repeater stations. Frequency coordinators may be individuals, clubs, or informal groups. They don't have to be hams, but they usually are.

Frequency coordinators derive their recognition from the voluntary participation of the local or regional Amateur Service community. We do not tell you who your frequency coordinator is. The frequency coordinator is responsible to you, not to the FCC.

In a system where you voluntarily choose to put up a repeater and voluntarily recognize the coordinator, a coordinator not considering the concerns of all users of spectrum affected by repeater operation can be replaced by a local amateur choosing another frequency coordination entity. Changing coordinators is the mechanism that we anticipated you would use to replace a frequency coordinator who was not representative of all or otherwise meeting your needs.

This process does not involve the FCC. The FCC does not recognize or regulate local or regional frequency coordinators, *per se*. The list of coordinators in the *ARRL Repeater Directory* is there for whatever editorial or informational purpose the ARRL decided this list would serve. Complaining to us about them isn't going to do you much good.

The function of an Amateur Service frequency coordinator is to recommend transmit/receive channels and associated operating and technical parameters in order to avoid or minimize potential interference. The action word is *recommend*. You may go to your local frequency coordinator and ask about getting coordinated. The coordinator can tell you that its database shows no available channels or that it cannot recommend

transmit/receive channels or associated operating and technical parameters for your station. There are a multitude of reasons why they may not be able to.

As long as you do not cause harmful interference to another station, however, you can put your repeater on the air. Section 97.205 provides the authority. The licensee of the repeater station is responsible for that station. It may be that the standards the coordinator is using do not fit your area or that there are facts about local conditions that are not known to the coordinator, or that the database is out of date.

A frequency coordinator does not have the authority to tell any licensee that he or she may not put a repeater on the air. Telling you that would in essence restrict what your license authorizes. Only the Commission can do that. The coordinator's decision is to coordinate your station or not to coordinate your station.

There are no Commission rules governing the selection of a coordinator or the procedures for coordination. The technical standards a coordinator uses—such as distance separation, propagation models, channel spacing, etc.—are not FCC standards and are not in the rules. If the standards a coordinator is using are "wrong" in some sense, tell the coordinator.

I assure you that different coordinators around the country use different standards. Amateur radio operators and coordinators have the flexibility to make and change these standards at the local and regional level. If the coordinator doesn't listen, find someone to better perform this function. Coordination is an option to serve your needs.

Voluntary coordination and the flexibility that goes with it have allowed you to respond to local situations in a manner that meets your needs.... The process need not involve us, does not involve us, and should not involve us. I have the greatest confidence that you can do a better job collectively solving your local or regional problem than the FCC ever could.

Frequency coordination is taken without the involvement of the FCC. This approach keeps coordination at the local level, where people who more readily have knowledge of the facts can respond to the situations expeditiously and where the coordinator is directly answerable to the local amateur community. If you want, you can have multiple coordinators in a state or on a band, part of a state coordinated (like the urban parts) and other parts not, some bands coordinated (the congested ones I suppose) and some bands not coordinated. If one of these models fits your needs, then use it. There are a lot of other models, too.

The Commission receives relatively few complaints about the decisions of frequency coordinators in the amateur service. Southern California is the exception. In part, this disparity appears to be due to the fact that licensees have chosen to place their repeater stations at very high elevations. High antennas cover large land areas with a single station's signal.

The effect of putting these things way up high is to limit the number of repeaters that may transmit on a repeater channel without interfering with one another. High antennas and big coverage areas have a trade-off: Fewer repeaters can co-exist on the channel. Now you—not the FCC—have to decide who gets to be the repeater. Is it this club or that club? This person or that person? Who gets to keep the channel at the end of a civil war in the club? How do you decide? Don't come to me; I don't have a clue what the local conditions or politics are. And I have no basis for saying ye" to one and no to another. This isn't a Federal issue. Rather, it's as local as you can get.

The Commission has never selected or approved any entity as a local or regional Amateur Service frequency coordinator, or reviewed the coordination decisions of a particular Amateur Service frequency coordinator. In the few geographical areas where the local or regional Amateur Service community has decided to have multiple frequency coordinators, we expect that the coordinators will cooperate with one another. If they don't, you, the users, will not be able to use your channels. The requirement that licensees may make the most effective use of amateur service frequencies is still there. and the fact that multiple coordinators may be involved does not absolve licensees of this responsibility.

73, Fred, W5YI

A question-and-answer session followed Bill's formal remarks. One of the great benefits of attending the Dayton Hamvention (amd any other hamfest with an FCC forum) is the ability to learn what the FCC is doing, and why, directly from the people responsible for making and enforcing the Amateur Service rules. It's an excellent exercise in citizenship, too, as letting FCC officials know what's on our minds is an important part of the process of government. Even informal discussions such as these can have a significant impact on the future of our hobby.

BY CARL SMITH, N4AA

News Of Communication Around The World

Honors Presented at Dayton 2000

The Bhutan 2000 DXpedition Team did an outstanding job on the air and then continued that outstanding effort by passing out some 2500 QSL cards at Dayton. Shown here at the DX Publishing booth at the Hamvention are (seated left to right) are Dave, W2CC; A52A Team Leader Glenn Johnson, A52GJ; Glenn's son, 14-year-old Mark, A52MJ; and (standing) Carl, N4AA. (Photo courtesy Vic, AE5DX)

Most of the *major* DXpeditions of the year have come to an end by now, but we still have a few to look forward before year's end. The FR/-T, Tromelin DXpedition should be in full swing about the time you receive this issue. ZD9, Tristan da Cunha is scheduled for September, and the 3B6, Agalega operation is slated for October. There is also the major operation from Palmyra/Kingman Reef coming up in October, after a number of short operations over the past several months by team members as they traveled in and out of those two locations.

A5 – Bhutan

Most of you know that there were two operations from Bhutan back in May—one by Jim Smith as A52JS and the other by the Bhutan 2000 DXpedition Team as A52A. The A52A Team set a new DXpedition QSO record with over 82,000 contacts in their logs. Jim Smith reported that he had a bit over 20,000 QSOs in his logs. It's amazing that we went from *zero* to over 100,000 Bhutan QSOs in barely one month.

The A52A Team arrived at the Dayton Hamvention in mid-May with logs and QSL cards. They handed out around 2500 cards over that weekend, making a lot of DXers very happy. The requests that had already been sent to Glenn, WØGJ, were being handled by team members (and Glenn's family) at the rate of several hundred per day. Over 11,000 requests had been answered by the end of May.

Speaking of WØGJ, Glenn will be back in Bhutan at the end of the year for about a month. He is a doctor and will be working in the country. If all goes well, he may return to Bhutan from time to time and expects to be active on those trips. His personal call is A52GJ.

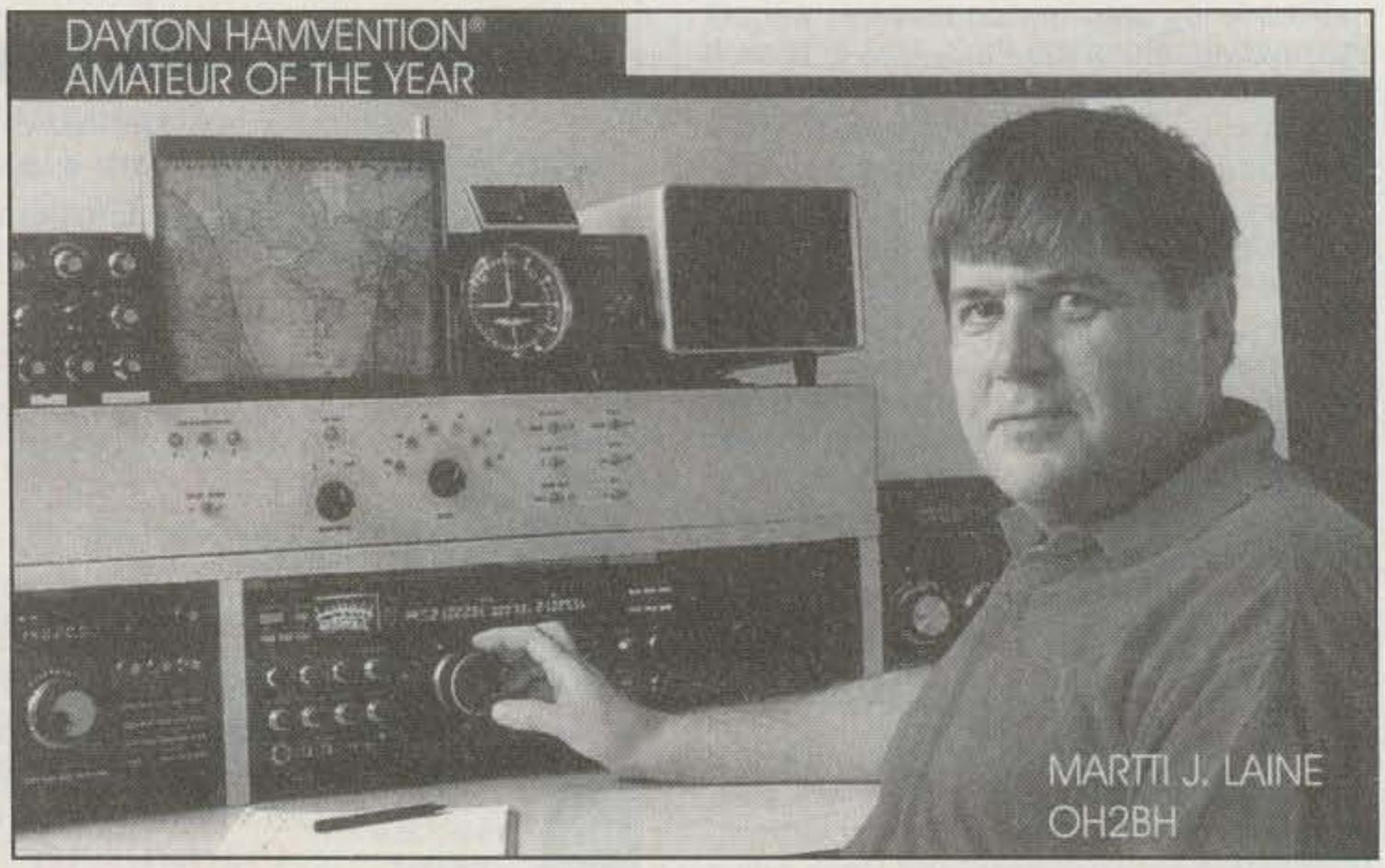
Jim Smith was visiting his family in the UK, but should be back on Norfolk handling his QSLing chores by the time you read this.

Yonten, A51TY, the only known Bhutan resident to be licensed under the new laws, has been on the air, and you can expect to hear him from time to time.

Martti Laine, OH2BH Radio Amateur of the Year

This year's Dayton Hamvention Radio Amateur of the Year is Martti Laine, OH2BH. In recent years Martti has been acknowledged as "Amateur Radio's Ambassador to the World."

Originally licensed in 1961 at the age of 15, Martti's interest in amateur radio turned to the thrill of chasing DX, and more important, to bringing this thrill to



Martti Laine, OH2BH, was named the Radio Amateur of the Year at the Dayton Hamvention this year.

P.O. Box DX, Leicester, NC 28748-0249
e-mail: <n4aa@cq-amateur-radio.com>

The WPX Program

CW

3039.....E4/G3WQU

Mixed

1858.....UA9SG

CW: 350 E4/G3WQU. 400 E4/G3WQU. 700 AI9L. 850 K6UXO. 900 JK1AJX. 1150 AA1KS. 1700 I2EAY. 2300 JA9CWJ. 2350 JA9CWJ. 2400 JA9CWJ. 2800 W2ME.

SSB: 1100 EA1IF, I2EAY. 1150 EA1IF. 1200 EA1IF. 1250 EA1IF, W4LTF. 1300 EA1IF. 1350 EA1IF. 2600 KS3F.

MIXED: 450 UA9SG. 500 UA9SG, EA3CYM. 550 EA3CYM. 600 EA3CYM. 650 EA3CYM. 850 K6UXO. 1000 AK7O. 1300 W4LTF. 1750 AA1KS. 1850 I1-21171. 1900 I1-21171. 2050 I2EAY. 3400 WB2YQH. 4700 W2FXA.

10 meters: AI9L

Award of Excellence Holders: K6JG, N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, ABØP, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH,, K2POF, DJ4XA, IT9TQH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KB0G, NB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1PO, K9LNJ, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IV4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBP, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, KZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, I7PXV, S57J, EA8BM, DL1EY, KØDEQ, KUØA, DJ1YH, OE6CLD, VR2UW, 9A9R, UAØFZ, DJ3JSW, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL.

Award of Excellence with 160 meter Endorsement: K6JG, N4MM, W4CR2, N5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF N4NX, SMØDJZ, DK3AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WBØDD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDE1, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU, EA7TV.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101 USA.

others. Over the past 30 years Martti has visited more than100 DXCC countries, including the initial operations from ten new DXCC countries. He has helped introduce amateur radio into previously *closed* countries such as Albania, Myanmar, and Palestine.

Outside the realm of DXing, Martti is a director for Nokia Mobile Phones, most recently serving in Beijing, China. Marti has now "retired" to his native Finland, but continues to travel to "new ones," such as the recent DXpedition to Chesterfield Reefs, TXØDX, where he added yet another brand-new country to his personal totals.

The only member of both the CQ DX Hall of Fame and the CQ Contest Hall of Fame, Martti can now add one more honor to his amateur radio resume. According to the Dayton Amateur Radio Association, "Laine has been responsible for activating a variety of new DXCC countries, often while traveling under difficult and even dangerous conditions, and he is considered amateur radio's number one Ambassador of International Goodwill." Congratulations, Martti.

DX Honorees Announced At 2000 Dayton Hamvention

A number of others were honored by the Southwest Ohio DX Association at Dayton 2000 for their service to DXing and amateur radio.

1999 DXpeditioner of the Year: Jukka Heikinheimo, OH2BR, for his three month operation as VP6BR from Pitcairn Island.

1999 DXpedition of the Year: FOØAAA, Clipperton Island

1999 Outstanding Service: Tedd Mirgliotta, KB8NW (*OPDX* News Editor)

CQ DX Hall of Fame Inductees

John Kanode, N4MM. Congratulations to John C. Kanode, N4MM, of Boyce, Virginia, one of the two inductees to the CQ DX Hall of Fame this year. John has been involved in DXing for over 45 years and was one of the original 13 to achieve top of the Honor Roll on Phone, CW, and Mixed all at the same time. He is the DX editor of *Auto Call Magazine* and has written articles on DX operating that have appeared in *QST, The ARRL Operating Manual,* and *DX Power.* He has served on the CQ DX Awards Committee, the CQ Contest Committee, and the ARRL DX and Contest Advisory Committees in several positions. John has been on the ARRL Board of Directors for over 11 years and is now serving as an ARRL vice president.

Over the past 19 years John has worked to enhance and broaden the DXCC Program. He worked hard to get 10, 18, and 24 MHz—and 6 and 2 meters and other UHF bands—included in the DXCC Program. John says the accomplishment of which he is most proud is getting the ARRL Board to adopt 6 meter DXCC. Many members believed no one would ever achieve it. As of the

Jukka, OH2BR (right), receives the Southwest Ohio DX Association's DXpeditioner of the Year award from Bob, W9UI.

Steve, N8BJQ (left), presents the CQ DX Hall of Fame award to John, N4MM, at the DX Dinner at Dayton.

end of May 2000 there are eleven 2 meter DXCCs and 264 6 meter DXCCs. There are no 70 cm DXCCs, but there is a provision in the program in case anyone gets one. In fact, there is a DXCC offered for any UHF band.

In 1976 John created the idea of the WPX Award of Excellence and presented it to *CQ* to include in their WPX program. He has over 200 operating awards from various national amateur radio societies.

John has been on several contest DXpeditions to Curacao and Martinique, where world and North American records were set for multi operation. In 1969, when John was in the Canal Zone, he gave many DXers their first KZ5 contact on 80 and 40 meters.

John has been an amateur since 1952; he became an Extra in 1958. He

The WAZ Program

Single Band WAZ

10 Meter SSB

499.....W6PGK 500.....N4CH

15 Meter SSB

532.....DL1NAI

15 Meter RTTY

6.....RK6CWA

17 Meter CW

28.....KØDEQ

20 Meter CW

506.....JA6BCI

40 Meter CW

207.....DF1RQ

160 Meters

150...UA4HBW (40 zones) 152.....9A2AJ (31 zones)
151.....K9YY (32 zones)
76.....I4EAT (40 zones, endorsement)

All Band WAZ

RTTY

120.....UA9FAR

All CW

165.....IZ5BAM 168.....DS4CNB
166.....DL7VZF 169.....JR4DAH
167.....9A2TN 170.....UA9CES

SSB

4550.....CT3DZ 4553.....JA1EUI
4551.....KD2OV 4554.....I8TWB
4552.....IZ5BAM 4555.....IV3BKH

Mixed

7935.....K6GSL 7940.....DL6ATI
7936.....HJ3PXA 7941.....N3AO
7937.....GØWMW 7942.....DS4CNB
7938.....IZ5BAM 7943.....JAØADY
7939.....DJ5KM

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to the CQ WAZ Award. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached at e-mail: <k5rt@cq-amateur-radio.com>.

is now retired from IBM and lives in Boyce, Virginia on 2 acres with five towers. He is a member of the National Capitol DX Association, Potomac Valley Radio Club, North Shenendoah DX Association, and Shenandoah Valley Amateur Radio Club. He is a life member of the ARRL, QCWA, INDEXA, and AMSAT.

Chod Harris, VP2ML/WB2CHO (SK). Chod is remembered for a number of activities related to DXing. He published "The DX Bulletin" for over ten years, was the creator of *The DX Magazine* in 1989, and edited this column for over ten years. Along the way Chod worked at the ARRL, where he was instrumental in the creation of the famous *Tune in the World With Ham Radio* package

THE WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with the CQ Master Prefix list. Scores are based on the current prefix total, regardless of an operator's all-time count. Honor Roll must be updated annually by addition to, or confirmation of, present total. If no up-date, files will be made inactive.

MIXED

4846 9A2AA	3629 VE1XN	3101 WA8YTM	2835 W2WC	2381 S58MU	2256 KS4S	1706 AA1KS	1389 VE6BF	1006 VE9FX
4201 W2FXA	3501 N4MM	3043 K9BG	2814 JH8BOE	2342 K2XF	2242 YU7JDE	1687 KC6X	1380 N1KC	1003 EA2BNU
3901 EA2IA	3472 SM3EVR	3042 YU7SF	2799 I2EOW	2301 W9IL	2155 W4UW	1656 I1-21171	1295 W2EZ	995 F5RRS
3884 W1CU	3448 9A2NA	3033 YU7BCD	2753 HA0IT	2289 9A4W	1921 DJ1YH	1618 YU1ZD	1264 VE6FR	983 KX1A
3866 F2YT	3426 I2PJA	2974 I2MQP	2709 KØDEQ	2280 W6OUL	1919 N3XX	1611 Z35M	1263 VE6BMX	869 K6UXO
3863 K6JG	3374 YU1AB	2947 WB2YQH	2640 IK2ILH	2272 N6JM	1882 OZ1ACB	1589 W7CB	1251 KW5USA	741 KU6J
3772 UA3FT	3333 N5JR	2903 KF2O	2636 S53EO	2268 W8UMR	1872 JN3SAC	1441 AI6Z	1195 W2CF	601 JH2IEE
3677 N6JV	3269 IT9QDS	2894 W9HA	2597 HA5NK	2267 WA1JMP	1852 I2EAY	1430 WT3W	1146 JR3TOE	
3673 N4NO	3101 PAØSNG	2852 4N7ZZ	2477 YU7GMN	2259 K5UR	1847 PY2DBU	1396 NH6T	1089 OK1DWC	

SSB

4235 IØZV	2992 EA8AKN	2473 UA3FT	2162 K5RPC	1668 KS4S	1522 I3ZSX	1314 KC6X	1015 DL8AAV	790 N3DRO
3778 ZL3NS	2909 I4CSP	2464 LU8ESU	2056 IN3QCI	1634 HA5NK	1518 W2ME	1185 KI7AO	1001 EA7CD	734 VE6BMX
3598 K6JG	2838 N4NO	2440 KF2O	2048 HAØIT	1609 W6OUL	1495 IK2AEQ	1175 LU3HBO	982 EA3EQT	719 F5RRS
3513 F6DZU	2784 N5JR	2422 WA8YTM	1954 W4UW	1606 DK5WQ	1440 W9IL	1155 K4CN	972 AI6Z	716 KX1A
3416 I2PJA	2755 I2MQP	2401 PY4OY	1923 K5UR	1599 K3IXD	1432 N3XX	1121 WT3W	937 LU4DA	683 OK1DWC
3149 CT1NH	2708 PAØSNG	2391 I8KCI	1813 N6FX	1592 IT9SVJ	1419 DF7HX	1104 EA5DCL	896 JR3TOE	642 BD4DW
3077 N4MM	2696 9A2NA	2358 KF7RU	1774 K2XF	1572 CT1BWW	1411 T30JH	1073 I2EAY	892 AG4W	641 F5LIW
3027 OZ5EV	2600 I2EOW	2278 CX6BZ	1752 YU7SF	1549 K8MDU	1386 I3UBL	1066 NH6T	878 JN3SAC	635 F5UTE
3019 F2VX	2579 CT1AHU	2230 EA1JG	1712 I8LEL	1538 IKØEIM	1369 SV3AQR	1046 N1KC	862 VE9FX	608 KE4SCY
3017 EA2IA	2504 4X6DK	2183 YU7BCD	1704 EA7TV	1536 LU5DV	1357 W2FKF			

CW

3895 WA2HZR	2593 VE7DP	2302 W2WC	1982 N6FX	1678 IK3GER	1553 EA7AAW	1265 EA2CIN	1055 W4UW	844 JK1AJX
3670 N6JV	2535 W2ME	2243 JA9CWJ	1926 OZ5UR	1670 N3XX	1509 EA5YU	1245 I2MQP	995 YU1TR	799 WT3W
3300 VE7CNE	2527 LZ1XL	2173 HAØIT	1905 G4SSH	1668 9A2HF	1487 9A3SM	1240 AC5K	994 K2LUQ	706 WA2VQV
3249 N4NO	2490 N5JR	2147 HA5NK	1853 I7PXV	1658 DJ1YH	1482 IK5TSS	1174 KC6X	967 WA2BNU	'691 N1KC
3133 K6JG	2470 N4MM	2135 KA7T	1823 K2XF	1639 KS4S	1348 LU3DSI	1161 I2EOW	965 NH6T	623 KX1A
2998 K9QVB	2450 YU7BCD	2102 EA7AZA	1822 K5UR	1625 JN3SAC	1335 VE6BF	1159 AI6Z	930 PY4WS	614 F5RRS
2961 EA2IA	2445 G4UOL	2083 S58MU	1806 LU2YA	1577 EA6BD	1312 W9IL	1155 LU7EAR	888 VE6BMX	610 EA5DCL
2960 YU7LS	2410 9A2NA	2057 KF2O	1782 IT9VDQ	1564 JA1GTF	1270 4X6DK	1058 9A3UF	850 K6UXO	
2734 YU7SF	2399 WA8YTM	2026 G3VQO	1744 W6OUL	1558 I2EAY				

that so many have used in beginning their ham radio adventure.

Chod and his wife Jean lived on the island of Montserrat for a year or so before finally settling down in Santa Rosa, California. He served as an IARU conference delegate from Montserrat, most recently in 1995. He even managed to find time to go on a few DXpeditions, mostly in the Caribbean area.

Chod suffered a heart attack on October 27, 1999 and died six weeks later on December 8, 1999. He was 50 years old. Chod's long-time friend Jim Cain, K1TN, presented a tribute to him in the March/April 2000 issue of *The DX Magazine*.

During the "Celebration of Chod's

QSL INFORMATION

7O1YGF to DK9KX
8P9V to OH6RX
8Q7LA to OM3LA
8S7IPA to OZ5AAH
9G5MD to G3OCA
9M6XXT to JA1CMD
9N7EK to JR8FEK
9N7IP to JG5CIP
9N7RN to IK4ZGY
9N7SZ to JA9LSZ
9N7VJ to JA9VJ
9N7WU to JA8MWU
9N7YT to JJ2NYT
D2BB to W3HNK
D2XX to N4FN
D73A to HL1IE
DP1ICE to DL5EBE
DP1KGI to DL5EBE
DU1/N2NL to W2YC
E29DX to HSØGBI
EK7DX to F5LGQ
EM5ØØE to UR4EN
EX5T to F5OJO
EX7ML to DL4YFF
EX8ML to W3HNK
L21H to LU7HVN
L2F to LU9FDG
L47EC to LU7EC
L47EE to LU7EE
L59DAH to LW9DAH
LU/UX1KA to DL5EBE
N3WW/KHØ to JF2WXS
OD5NA to W4AO
OHØEA to OH2KMG
OK8EBE to DL5EBE
OL5TEN to OK1JN
OZ5HCA to OZ3FYN
PR2G to PT2ADM
PY5ØØA to PT2ADM
WH7P/KHØ to JP1IOF
XE1GKG to N8SHZ
XE1HEY to N8SHZ
XE1IGR to N8SHZ
XRØZY to OM2SA
XV5JY to JA1KJW
XV5TK to JA3MCA
XV5VE to JA8VE
YB9BON to W7TSQ
YJ8AB to N4FN
YJ8NAC to N4FN
YO7LXT to YO7VS
YR2ØØØ to YO3KAA
ZD8Z to VE3HO
ZK2XO to DL8NBE
ZS8D to ZS6EZ
ZX3D to PY3BZA
ZX5J to VE3HO
3W2LC to VK6LC-M K Johnson9 Abinger Rd, Lynwood WA 6155, Australia
3W7CW to SP5AUC, Tomasz Rogowski, Mochnackiego 4/77, 02-042 Warszawa, Poland
3W7TK to OK1HWB-Michal Plásil, P.O. Box 29, 395 01 Pacov, Czech Republic
3XY2D to VE2DPS, Denis Perron, 1398 Rang 7, Bellecombe QC J0Z 1K0, Canada
3Z60W to SP2BNJ-Aleksander Kwiatkowski, ul Pomorska 86-B m 6, 80-345 Gdansk, Poland
4B1AC to XE1BEF-Hector Miguel Espinoza Flores, Martires de Chicago, 981 Infonavi, Colima Col, Mexico
4S7UB to KJ6UB-Nalin A Nanayakkara, 4151 Jameson Dr, Corona, CA 91719 USA
4S7YSG to JA2BDR-Kazuo Yoshikawa, 4249-4, Shimoebi, Yokkaichi, Mie, 512-1203, Japan
4W/JA1BK to JA1BK-Kan Mizoguchi, Central PO Box 231, Tokyo 100-91, Japan
5B4/T93Y to T93Y-Boris Knezovic, P.O. Box 59, Sarajevo BA-71000, Bosnia and Herzegovina
5C8A to EA5XX-Julio Volpe O'Neil, Apartado 4062, 03080 Alicante, Spain
5R8DS to PA3BXC, Elandweide 112, 3437CV Nieuwegein,The Netherlands
5V7MD to K7PT, Chuck Degard, 919 W. Vaughn, Tempe, AZ 85283, USA
5X1Z to SM6CAS, Nils-Goeran Persson, Box 2050, SE-436 02 Hovas, Sweden
6Y5MM to W4YCZ, Jack R. Main, 172 W. Ocean Ave., Norfolk, VA 23503, USA. Bureau requests accepted
6Y8A to WA4WTG, R. Robert Kaplan, 718 SE 3rd Ln, Dania Beach, FL 33004 USA
7S2A to SM2LWU, Erik Willfoer, Gummarksnoret 141, SE-931 95, Skelleftea, Sweden
7S2E to SM2DMU, Rainer Martinsson, Sikea 7238, S-91500 Robertsfors, Sweden
8M2000 to JARL QSL Bureau Shobara Post Office, Shimane 699-0588, Japan
8P9JL to OH6RX, Jussi Pekka Sampola, Tolby angsvag 238, FIN-65460 Tolby, Finland
8S7A to W3HNK; Contests only via SM7CRW
8S7IPA to OZ5AAH, Ben Jakobsen, 9 Knoldager, 2670 Greve, Denmark. No Bureau requests.

(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," P.O. Box 3071, Paris, TN 38242; phone 901-641-0109; e-mail: <golist@wk.net>.)

5 Band WAZ

As of May 30, 2000, 523 stations have attained the 200 zone level and 1135 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zZones confirmed:
K2SY AA7A DJ4XA

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
W4LI (AA4KY), 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
K1ST, 199 (26)
ABØP, 199 (23)
KL7Y, 199 (34)
NN7X, 199 (34)
OE6MKG, 199 (31)
IK1AOD, 199 (1)
DF3CB, 199 (1)
F6CPO, 199 (1)
W6SR, 199 (37)
W3UR, 199 (23)
KC7V, 199 (34)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W3NO, 199 (26)
K4UTE, 199 (18)
K4PI, 199 (23)
HB9DDZ, 199 (31)
N3UN, 199 (18)
NØTN, 199 (6 on 40)
K4IQJ, 199 (23)
K3NW, 199 (23)
UA3AGW, 198 (1,12)
EA5BCK, 198 (27,39)
G3KDB, 198 (1,12)
KG9N, 198 (18,22)
KØSR, 198 (22,23)
UA4PO, 198 (1,2)
JA1DM, 198 (2,40)
9A5I, 198 (1,16)
K4ZW, 198 (18,23)
RAØFA, 198 (2 on 10,15)
LA7FD, 198 (3,4)
K5PC, 198 (18,23)
NT5C, 198 (18)
VE3XO, 198 (23,23 on40)
K4CN, 198 (23,26)
KF2O, 198 (24,26)
OH2VZ, 198 (31,18 on10)
K9YY, 198 (18, 18on 10)
W6BCQ, 198 (37,34on40)
G3KMQ, 198 (1, 27)

The following have qualified for the basic 5 Band WAZ Award:

****Please note: Cost of the 5 Band WAZ Plaque is $80**

Endorsements:
W6BCQ (198 zones)
K3NW (199 zones)
N4XR (197 zones)
G3KMQ (198 zones)

($100 if airmail shipping is requested).

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to the CQ WAZ Award. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached at e-mail: <k5rt@cq-amateur-radio.com>.

The Lyapin Island DXpedition team, August 21–24, 1999. This was the team's third operation from the island, which is located in the Sea of Azov. Over 2000 QSOs were made during the operation. Left to right: UR8IDX, RV1CC, US5IGX, UY5EI, IT5XD, UT8IO, son of UT8IO, US8IWC, US8ISC, US8IOD, and US8IB. (Photo courtesy Vlad, RV1CC)

(Since reading Jean's story, I know of at least one more person who will remember Chod when they see a poinsettia—me!)

CQ Contest Hall of Fame 2000

Larry (Tree) Tyree, N6TR, and Walter Skudlarek, DJ6QT, were announced as the newest members of the CQ Contest Hall of Fame at the annual Contest Dinner at Dayton this year. Tree was featured on the cover of the June issue of *CQ*. For details on both N6TR and DJ6QT, see the July/August issue of *CQ Contest* magazine.

DXpeditioning—Behind the Scenes

I mentioned this book last month. They have now announced a distributor in the U.S. The book will be available from the Island Radio Expedition Foundation (IREF), 118 Oak Ridge Drive, New Braunfels, TX 78132. The price from this source will be $28.00 plus $3.00 postage. It will continue to be available from Nevada Communications in the U.K. at £16.95 plus shipping.

Wrap-Up

That's it for this time. Congratulations to all of those we mentioned this month for their outstanding accomplishments in their respective ham radio fields and activities.

I continue to look for comments and/or items of interest to the DX community. Good DXing and . . . 73, Carl, N4AA

Life," held for family and friends on December 10, 1999 in Santa Rosa, his wife told this story:

"Several years ago at Christmas time I asked Chod if he would pick up a poinsettia to have in the house. When I got home from work that evening, he presented me with a poinsettia in about a 2 inch pot—not quite what I had in mind. I didn't want to criticize, so I thanked him, but added, 'Don't you think we should get another bigger one?' Chod's response was, 'Oh no, just water it and it will grow.' For the next several days, each day Chod substituted a slightly larger flower for the original one until we finally had a huge poinsettia plant. It took me until the third day to figure out what was going on."

Jean added, "Since I told that story at the celebration, now there are about 100 people who will think of Chod every time they see a poinsettia."

CQ DX Awards Program

SSB

2308 .....JR4NUN 2309 .....N2PVS

CW

1009 .....WØIKD

SSB Endorsements

320.....PT2TF/331 320 .....EA1JG/320

CW Endorsements

150.....WØIKD/152 28 MHz .....WØIKD

RTTY Endorsements

310.....K3UA/312

The basic award fee for subscribers to *CQ* is $4. For nonsubscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 331 active countries. Please make all checks payable to the award manager.

Magic In The Sky

BY JEFF REINHARDT, AA6JR

New Views of Amateur Radio

Dayton Magic

There was plenty of magic in the air at the Dayton Hamvention this year! I had the pleasure of seeing several familiar faces, while meeting many new and interesting people. I saw a few new products and actually bought a few goodies for the shack. Even more important, I sensed a renewed energy, a "vibrancy in the vitality" of ham radio.

Unsung Heroes

One of the great hallmarks of amateur radio is the willingness of people to give and share their resources with others, from the teacher (I really don't like the term "Elmer") to the repeater owner/operator, to the developers (such as the TAPR and APRS folks), through the Skywarn, ARES/RACES, Red Cross and CAP (Civil Air Patrol) groups that lay it all on the line for others. Let's not forget the VEs who make it possible for us to become licensed, and the technically gifted who think nothing of repairing a broken piece of equipment for a friend or club member. All of them contribute toward putting "Magic in the Sky," and we should never take them for granted.

There is another group, however, that never seems to get a headline or even a kind word. I call them "the people who are always there." These are the folks who add a lot to amateur radio by their mere presence. They are the people and clubs that provide a reassuring "anchor" to our operations. They are experienced net control operators such as Jim, KZ2P, and many others, who log countless hours for the Mobile Emergency and County Hunters Net on 14.336.

It's clubs such as RAWNY and LARC in western New York that provide a host of services and quality meetings for their members. Then there's my favorite, the person who answers my CQ call with a friendly reply! Let's not forget the family members and spouses who, licensed or not, support (sometimes tolerate) our hobby. They often help us more than we know, deflecting phone calls during a QSO, putting together a Field Day "feed," and stretching the family budget for a techno-toy as a birthday/holiday/Father's Day gift. All of these folks do a lot to add to the magic. Do your part and let your favorite "unsung heroes" know that they are appreciated. If you'd like, drop me a note and we may share a salute in a future column of "Magic in the Sky."

5904 Lake Lindero Drive, Agoura Hills, CA 91301-1418
e-mail: <aa6jr@cq-amateur-radio.com>

David Greer, N4KZ, and Alan Kaul, W6RCL, share public-relations tips at the ARRL PR "Sprint" in Dayton. David is a newspaper publisher in Kentucky, and Alan is a producer for "NBC Nightly News with Tom Brokaw."

Spreading the Word

Bill Pasternak, WA6ITF, certainly does a lot for ham radio. He's the driving force behind *Newsline,* but he also does a great deal behind the scenes to advance the hobby. Due to a sudden illness, he could not attend the forum he annually arranges at Dayton, but in show business tradition, we carried on. Several months ago, Bill asked that I, along with others (including *CQ* Editor Rich Moseson, W2VU) participate in the "Ham Radio Town Hall Meeting." I was asked to speak about the post-restructuring environment, specifically on "Spreading the Word."

No matter how often I engage in public speaking, I still get the "heebie-jeebies" about speaking before a group. The longer the advance notice, the worse it gets. I kept musing on the theme "Spreading the Word," but one question continued to bother me: What *is* "the word"? In a blinding flash of inspiration (or a poorly grounded rig), I found one: "Welcome."

Welcome, newcomers! Welcome to my shack. Through this magic we call radio, you are a guest in my home, my car, with me and my HT. I welcome your sharing this time. I don't care when you became licensed or how it came about. All that matters is that you're licensed and part of this wonderful thing we call ham radio.

I was once a newcomer, and the most wonderful words to hear were "congratulations" and "welcome." It's a pleasure to share those words with you. Welcome to the world's biggest talk show! Enjoy ham radio. Explore its many facets. Acquire operating skills and techniques. Listen. Learn from others. In practically no time, you'll be the person saying "welcome" to a newcomer.

Public Relations

I take a lot of good-natured (I think!) ribbing about my professional work in advertising, marketing, and public relations. Being a PR practitioner *sounds* easy, conjuring up images of catered receptions; calling press conferences where eager reporters and photographers show up with cameras, microphones, and notebooks at the ready; free cocktails; and more. Would that were the case! Unfortunately, PR tends to *sound* easy. Trust me, it's not! Anyone who ever sent out a news release about a club's Field Day activities and had it ignored knows what I am speaking about. Nothing is automatic.

Using amateur radio as a "client," what would *you* do to inform others about this great hobby and the good that we do?

Some of this subject was explored at the ARRL PR "Sprint" held at Dayton, where a panel of communications professionals answered questions about getting more publicity for ham radio. A good crowd turned out for the session hosted by MC (and ARRL PR Committee Chairman) Dave Bell, W6AQ. The rapid-fire questions and answers provided some good techniques for club newsletter editors, Public Information Coordinators, and anyone charged with generating good stories about what we hams do.

What do you do when a ham in your city applies to erect a tower and all his neighbors are stirred up against it? How do we generate stories that are interesting enough to get coverage from

Dick Stein, K2ZR, takes a question for the PR Sprint panel at the Dayton Hamvention.

Just some of the crowd making its way through exhibits at Hara Arena.

newspapers and TV stations? What do you do when a local reporter equates hams with CB operators? These were some of the issues explored at the session. How will you handle it when the TV crew shows up an hour before Field Day ends and none of your operators have shaved, bathed, or changed clothing in the past 27 hours? Still think PR is easy?

The challenge for your club's PR volunteers is to transform the magic we put into the sky into magic in the media. See what your club can do to generate some good publicity.

A Standing Ovation

At another Dayton event I saw something I'd never seen before. It was at Dayton where Arnie Sposato, N2IQO, announced to the industry that he was leaving his position as Advertising Manager for *CQ* after 17 years of fine service to *CQ* and the ham industry. "Big deal," you might say. Read on. I came to know Arnie a few years ago, and he quickly broke through the image of your "typical" salesman. Now don't get me wrong on sales people. There are good ones, there are great ones, and then there's Arnie. He's a true gentleman, and it's an honor to know him.

Selling advertising space is one of the more difficult (and thankless) jobs in the world. (Anyone who has tried to sell ads for a hamfest program can relate!) You're asking for money, big money, all the time. You're competing against other publications, other media, and you're always competing against time. But because of the ads you see in *CQ* and other publications, you get to read quality magazines with colorful pictures and informative articles. Advertising money is what pays the freight in publishing. Yes, you must subscribe, or pay the newsstand price at a store, but what you pay is only a small fraction of what it takes to publish and distribute a monthly magazine. More ads mean a thicker, more substantive magazine for you. Those ads also tell you about exciting new products.

It was fitting that at the annual *CQ* gathering at Dayton, an advertiser unexpectedly took to the podium and in an eloquent, impromptu speech, summed up what the ham industry thought of Arnie and his professionalism. You could have heard a pin drop. When the speaker was done, the room erupted in a spontaneous standing ovation that lasted several minutes. All I can add is that it was well deserved. So just as we started this column with a salute to unsung heroes, we'll close on the same note. Good luck, Arnie!

Until we chat again, do your best to put some "Magic In The Sky."

73, Jeff, AA6JR

World Of Ideas

BY DAVE INGRAM, K4TWJ

A Look At The World Around Us

Crystal Sets Revisited

Your response to our double feature on crystal sets in the October and November 1999 columns was far more than favorable. It was phenomenal! These little critters are unbelievably popular. Such enthusiasm for "free playing radios" truly warrants further study. Thanks to a couple of very special guests, more notes and views of crystal sets are in the limelight this month.

Building simple crystal sets is the perfect way to introduce that special youngster in your life to electronics, amateur radio, and emergency preparedness. Say you thought crystal sets could only tune in AM band stations? Indeed not. They are also capable of shortwave reception, and they can even be used to copy ham band CW and SSB signals if you apply some creative experimenting. We will include "how to do it" details as we progress. Meanwhile, let's kick off this show-and- tell feature with a few recently received notes from readers.

Readers' Comments

First I wish to thank everyone for the kind words and encouragement to feature more crystal sets in this column. We are proud to honor that request, and we also point out that includes folks like you sharing your views and notes to make it successful. Judging by your comments, that should be no problem. Check out, for example, the following:

"Just like QRP'n and kit building, dinking with crystal sets puts the fun of homebrewing back in radio. In many cases they [crystal sets] may well prove to be a youngster's first exposure to science and radio communications. Keep the articles on them coming."—*Bruce, WB4WZ*

"I built several types of crystal sets during my teen years, and your articles on them brought back many fond memories. Please give us more."—*Duane, W9MNE/KR6O*

"Your past two articles on crystal sets kindled warm memories. I built several sets as a youngster and listened to them continuously—not for general entertainment, but just for the thrill of hearing a radio I built myself work. It also proved to be my first stepping stone into amateur radio. Keep up the crystal set articles."—*Ernie, W5NH/K6UVI*

"As a crystal set junkie for many years, I thoroughly enjoyed your October and November '99 columns on crystal sets. Please continue the series. Here are my tips for success with them. Always use 2000 ohm earphones, as 8 or 16 ohm types load down the circuit and will not work."—*David, W3WBE*

"Your columns were a real shot in the arm for crystal sets. Thanks and congratulations."—*Rebecca Anderson Hewes and Mike Peebles of the Crystal Set Society*

"Great articles on crystal sets. Let's see more. Do you have more info on those little loopstick-based Rocket Radios of the 1950s? I had one when I was young and I loved it."—*Craig, K7UKW*

Yes, Craig, Rocket Radios have become highly cherished classics from eras past, and you can get a brand new replica of it right now! Read on.—K4TWJ

The Rocket Radio Returns!

I am sure many of you remember those neat little Rocket Radios of the '50s. They were pocket-size gems with an earphone wire and antenna clip lead extending from one end and a sliding "space probe" for tuning extending from the other end (photo A). Rocket Radios were basic glass-diode and loopstick-

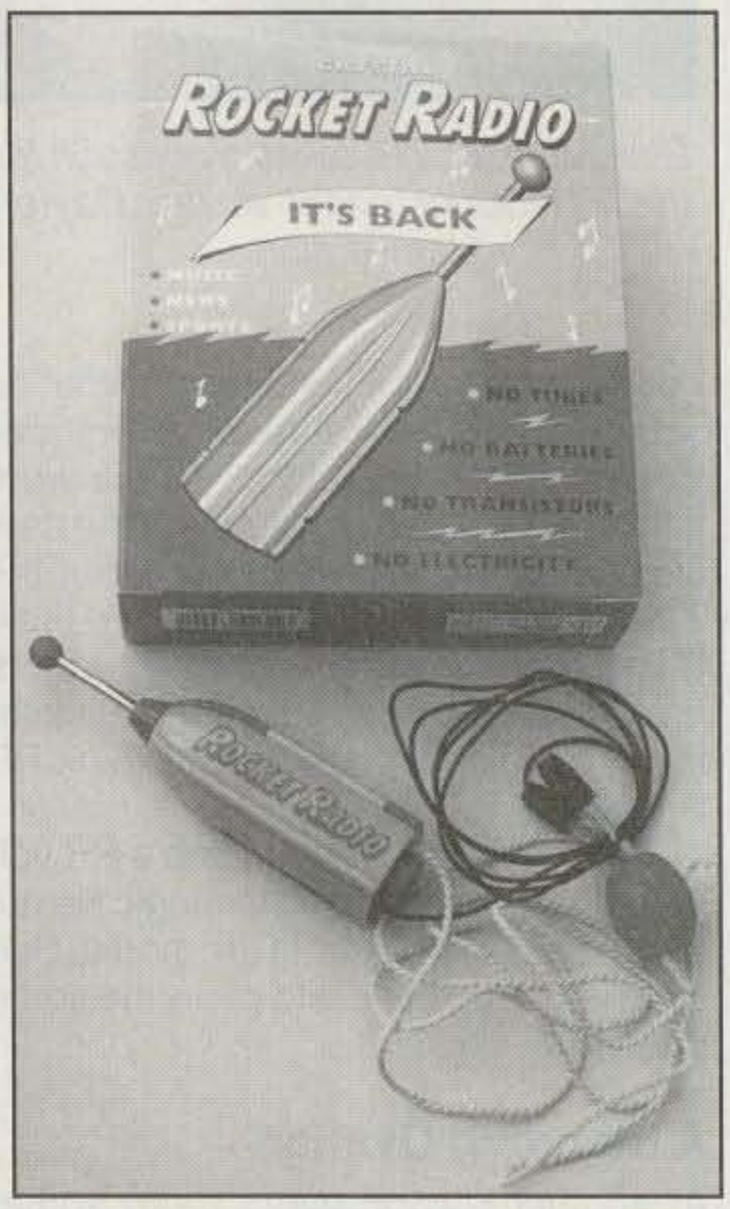


Photo A– One of the most popular crystal sets of all times is the famous Rocket Radio of the 1950s. This pocket-size wonder worked great with almost any makeshift antenna and no ground. The sliding "Space Probe" on nose cone was used for tuning. Exact reproductions of the Rocket Radio are available from Restoration Hardware stores.

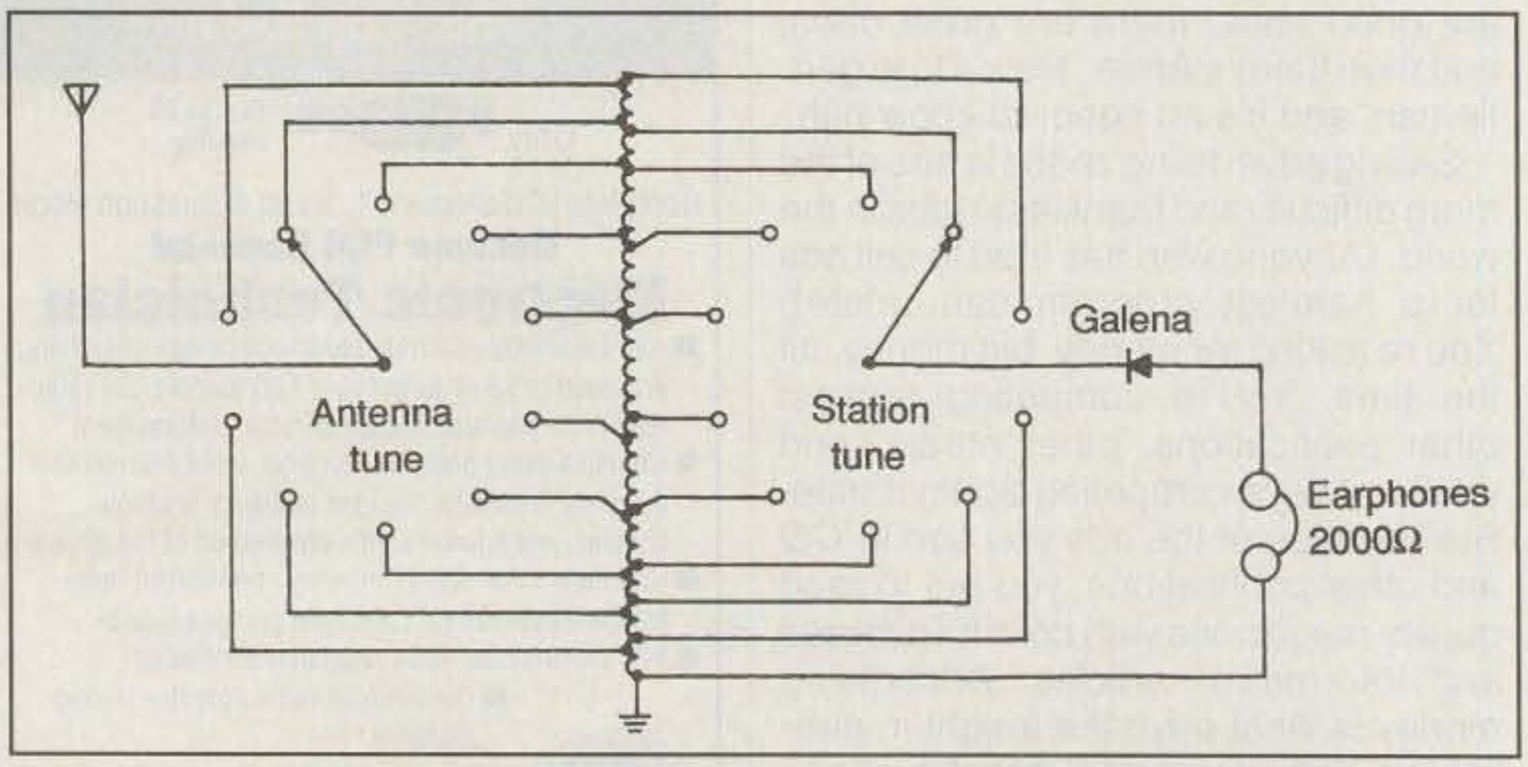


Fig. 1– Circuit diagram of the Beaver Baby Grand and Lemco crystal sets shown in photos A and B. Notice both sets are completely inductance tuned and do not use capacitors.

4941 Scenic View Drive, Birmingham, AL 35210

type crystal sets, but they could really pull in local-area AM stations. Almost anything worked fine as an antenna for them—a hank of doorbell wire (Remember when wire was sold by hanks rather than feet?), a window screen, or a chain-link fence. You could even pick up two or three local-area stations with their antenna lead clipped to the metal fingerstop on a rotary-dial telephone (I'll bet you've forgotten that trick, haven't you?). Evidently one of the (unshielded) wires in a telephone cable connects to the fingerstop and thus serves as an antenna.

Original Rocket Radios have become quite scarce, but exact reproductions presently are available from Restoration Hardware and its affiliated stores nationwide. The price of this heartthrob is only $10. The radio is supplied complete with earphone, information booklet, and a roll (hank?) of antenna wire. I find the replica still plays great with just its antenna lead clipped to the fingerstop on our bedside "Princess" telephone. In fact, it still picks up Patsy Kline and Elvis Presley music from the 1950s. What a treat!

Restoration Hardware stores are scattered around the country, or you can contact them at 104 Challenger Drive, Portland, TN 37148 (telephone 1-800-762-1005) or on the web: <www.RestorationHardware.com>. I suggest you move quickly before Rocket Radios are sold out.

Catwhiskers and Galenas

One of the first chaps to compliment our 1999 double feature on crystal sets and offer views of his own sets for "next time" was Bob Shrader, W6BNB. You have heard me say there is a noteworthy tale behind every golden oldie rig, key, or crystal set, and Bob's treasures really prove that point. In this particular case the tale is about Bob.

As you may recall, W6BNB is the fellow who wrote about nano tubes in the March 2000 issue of *CQ*. He also wrote the famous *Electronic Communications* book that was published in six editions between 1959 and 1991. If you ever studied for a commercial FCC First Class or General Radiotelephone License (and passed!), you probably studied material from Shrader's *Electronic Communications.* He is a living legend, and so is his book! It covers all the theory on which the FCC's exam questions are based. It's awesome!

Two of Bob's most unique crystal sets are shown in photos B and C. The Beaver Baby Grand represents Bob's very first piece of radio equipment. It measures 1" × 2" × 4" and was made by the B M & T Co. of California in 1921. On the top are binding posts for earphones, antenna, and ground wires, plus rotary switches for matching the antenna and tuning. This little treat was made long before glass diodes came on the scene; thus an open-air galena-and-catwhisker detector is mounted atop the case.

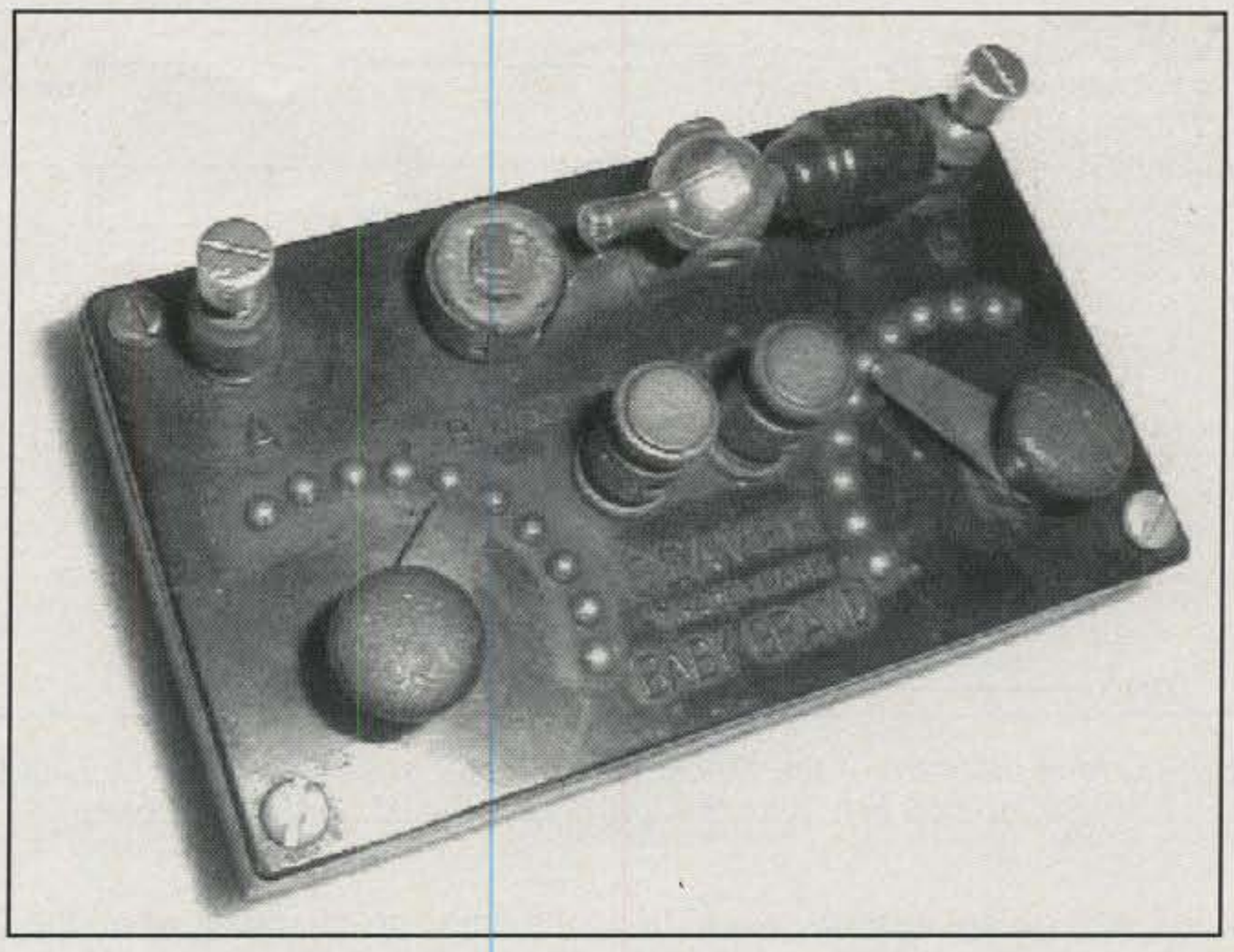


Photo B– Roaring back from the 1920s is this original Beaver Baby Grand crystal set made by the B M & T Co. of California. It sports a multi-tap coil for tuning and matching various antennas and a galena-and-catwhisker detector. This particular set has seen extensive use over the years but still works. (Photo courtesy owner W6BNB)

The Lemco Number 340 in photo C was produced by Lee Electric and Manufacturing Co. of San Francisco, also during the early 1920s. Its circuit is essentially the same as that of the Baby Grand (fig. 1), and it too has an adjustable catwhisker detector (cartridge-type detectors came next; then glass diodes came into existence). Bob also has an old-time Dicto Grand high- impedance speaker (actually a large earphone in design) that works with the sets—when used in a quiet room. We will continue with more notes from W6BNB later. In the meantime, let's meet K4IPY and check out several more crystal sets.

Sea-Going Sets

Another crystal-set enthusiast with some very interesting, historically significant sets is Henry Johnson, K4IPY. Most "tale worthy" is his WW II emergency/backup receiver such as the type required aboard all large ships and merchant vessels of eras past (shown after Henry's excellent restoration in photo D). This particular set was made by the Marine Division of Mackay Radio and Telegraph Co. of New York in 1936. It was designed for wall mounting in a ship's radio room and tunes the International Distress Frequency range of 350 to 550 kHz (right below the AM broadcast band).

Initiated after the *Titanic* sank in 1912 and continuing until just a few years

Photo C– This Lemco Radio Telephone Crystal Set No. 340 is also 1920s vintage and belongs to W6BNB. Its coils, circuitry, and galena-and-catwhisker detector are almost identical that of the Baby Grand in photo B. (Photo courtesy W6BNB)

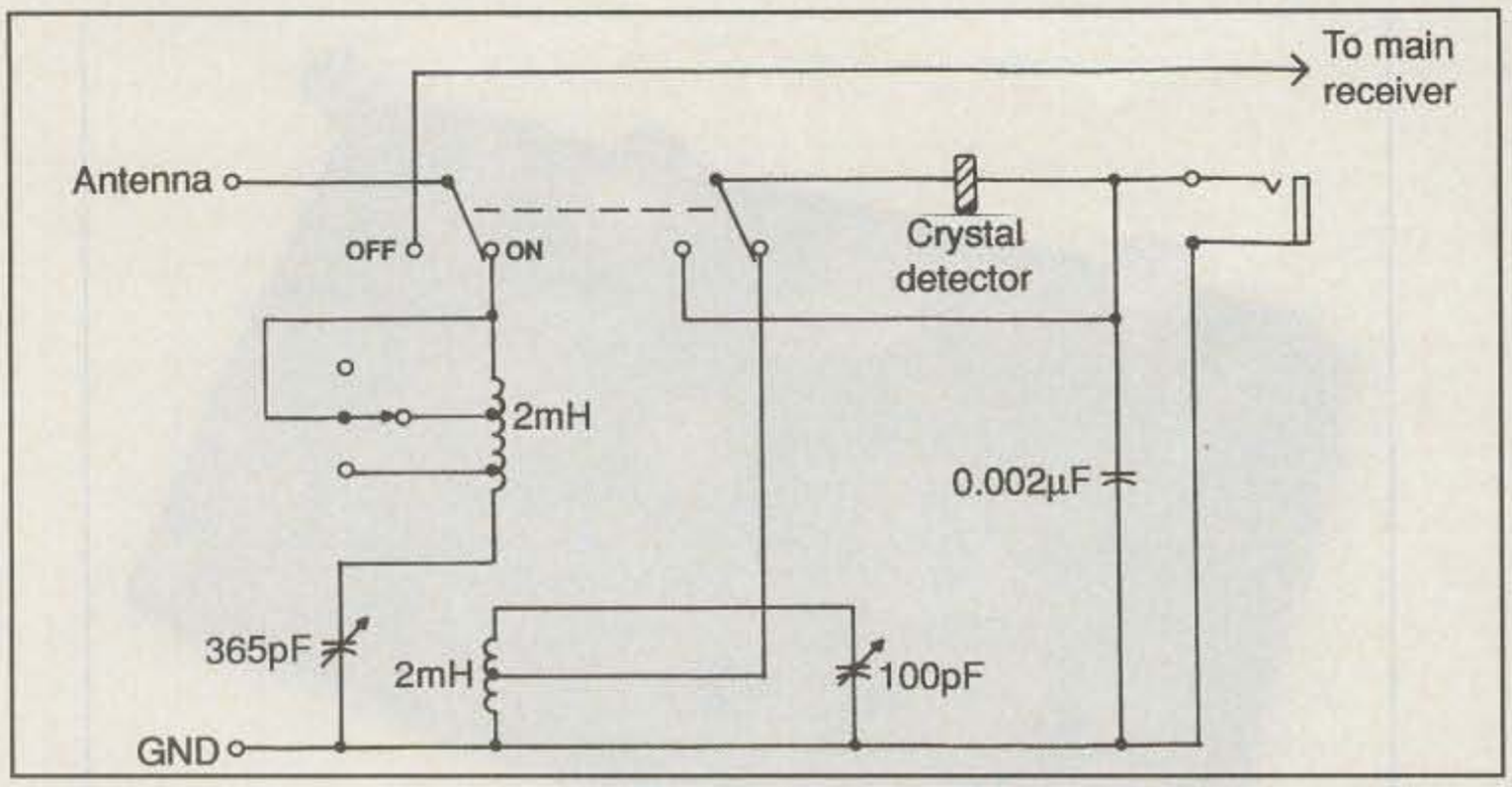


Fig. 2– Circuit diagram of the Mackay crystal set shown in photo D. Unit tunes 350 to 550 kHz plus the low end of the AM broadcast band.

ago, all sea-going vessels were required to continuously monitor 500 kHz with an auto alarm system. They were also required to maintain a backup receiver for copying distress calls from other vessels. This practice "sank with the ship," so-to-speak, when the Coast Guard discontinued use of Morse code and ceased monitoring the time-established 500 kHz distress frequency. I guess everyone now has GPS receivers and cell phones so they can determine their own location and make their own call to the Crisis Center (and be put on "hold") as they sink. Oh, well . . . at least we still have some sea-going crystal sets such as the Mackay to remind us of yesteryear's proud CW era.

Photo D– This Mackay Radio and Telegraph Co. model 123 crystal set was designed for emergency shipboard use during eras past and tunes the international distress frequency range of 350 to 550 kHz. Proud owner Henry Johnson, K4IP, restored it to like-new condition and mounted it on his ham shack wall, where it captures every visitor's attention. (Photo courtesy K4IPY)

How could a simple crystal set receive CW signals, you ask? It couldn't, *per se,* but it could respond to modulated CW (MCW) such as a mechanical buzzer-modulated signal or a spark- gap-generated signal. Even a small gasoline-driven engine or an outboard motor on a lifeboat with a wire touched to its spark plug could fill that bill. Combined, the impromptu transmitter and crystal receiver produced a crude yet functional emergency communications system. Anyone copying such a setup surely would respond to a distress call just to stop all the static and interference!

Looking at the Mackay radio's circuit diagram (fig. 2), we see it is a somewhat conventional crystal set with a tapped coil and catwhisker-type detector similar to Shrader's Lemco and Baby Grand. The main difference is the 350 to 550 kHz Mackay set uses a much larger coil than the 550 to 1550 kHz Lemco set. The Mackay also sports a double-pole double-throw switch to bypass the set and short out its sensitive galena crystal to prevent burnout from the ship's transmitter. Look carefully at photo D and you can see the glass-enclosed galena crystal is adjustable by a small slider on its right side. Binding posts for the antenna and ground are on the enclosure's top.

Henry says MCW signals now are quite rare, so he demonstrates the set to visitors by connecting it to one of his wire antennas and tuning in "low end" AM band stations. Terrific! Henry also has a "Type C" emergency/distress crystal set made by the Radiomarine Corp. of America during the 1940s, and we plan to feature it in a future "crystal set" column.

Dinkin' Delights

Experimenting with various ideas and circuits for custom crystal sets can prove to be a quite enjoyable pursuit. With a bit of creative tinkering, you can even copy ham band CW and SSB activities on a crystal radio. I'm serious! In fact, W6BNB suggests going a step further and making it a two-crystal superhet unit. Now that's big-time radio indeed! Where does one begin with such an open-ended dink project? W6BNB, K4IPY, and I will start the ball rolling with some ideas to consider. Then you can continue the pursuit in your own way as desired. Fair enough?

An easy to reproduce crystal set circuit suitable for AM band or general HF/shortwave reception is shown in fig. 3. The key to its frequency coverage is obviously its coil and tuning capacitor. Rather than using a large Quaker Oats box-size coil in its tuned circuit, I suggest starting with an old-style copper tank coil and mating variable condenser as utilized in Hartley transmitters of the 1930s. As an alternative, a plug-in coil such as that used in ham receivers of the 1940s should work well. Details on coil sizes, turns count, and mating tuning capacitors are abundant in old radio handbooks. Curl up with a bunch of them and plan your pursuit. If you prefer a more modern approach, try using a T-50-2 toroid core-type coil and mica-capacitor tank circuit such as those found in QRP gear. A 1N34 diode and 2K ohm earphone will round out the circuit. You will know you are on the right track when you start hearing foreign broadcast stations on your crystal set.

Once shortwave reception is achieved, the next step is adding a makeshift BFO for copying CW and SSB signals. The "easy route" here is connecting the output signal from a tunable antenna analyzer, grid dip oscillator, or external VFO in parallel with the crystal set's input. If the VFO's level is too high for good diode mixer action, just wrap a few turns of its (unshielded but insulated) output lead around the antenna lead "gimmick capacitor style." The crystal set's tuned circuit will be very

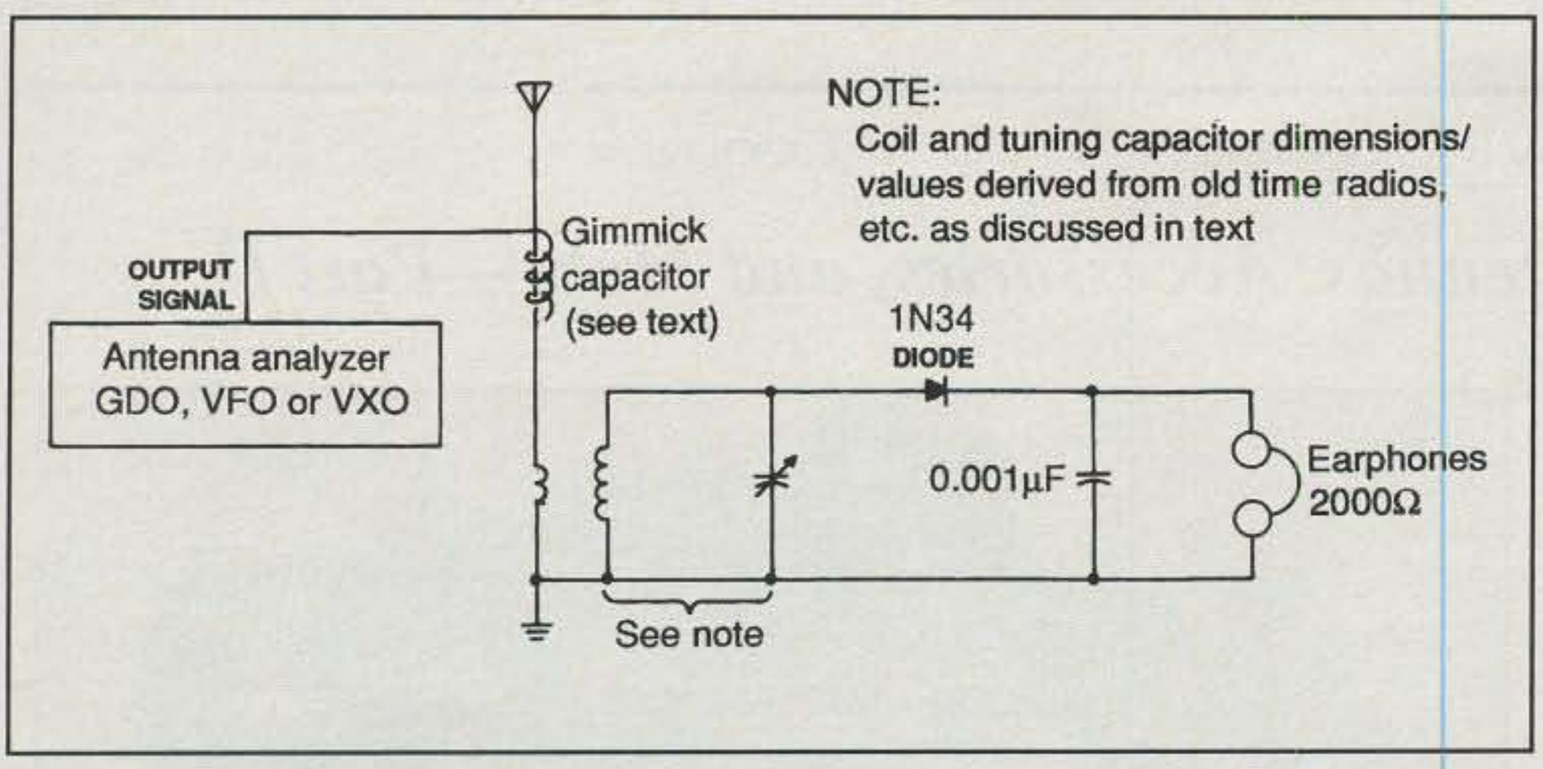


Fig. 3– Circuit diagram of an experimental homebrew crystal set for AM, CW, SSB, and shortwave reception. If the VFO signal is low, substitute a direct electrical connection for the gimmick capacitor.

broad, so receiving ham band signals will only require tuning the VFO across your desired frequency range. How's that for simple elegance!

The previously mentioned VFO or antenna analyzer probably will drift and require frequent readjustment for good copy, so the next step is replacing it with a simple VXO circuit. This type of tunable crystal oscillator has a limited frequency range, but it is stable, accurate, and easy to set. The VXO idea also spins off additional ideas, such as integrating the shortwave crystal set circuit with basic oscillator-and-amplifier QRP transmitters to produce a transceiver on the same PC board. It also kindles ideas for using a separate VXO operating 455 kHz above the incoming frequency to produce an IF of 455 kHz, then mixing 455.1 kHz from another oscillator in a second diode stage. Resultant audio can then be amplified with an LM386 and . . . The ideas could continue indefinitely. There are no limits to what you can do with a crystal set and some creative imagination!

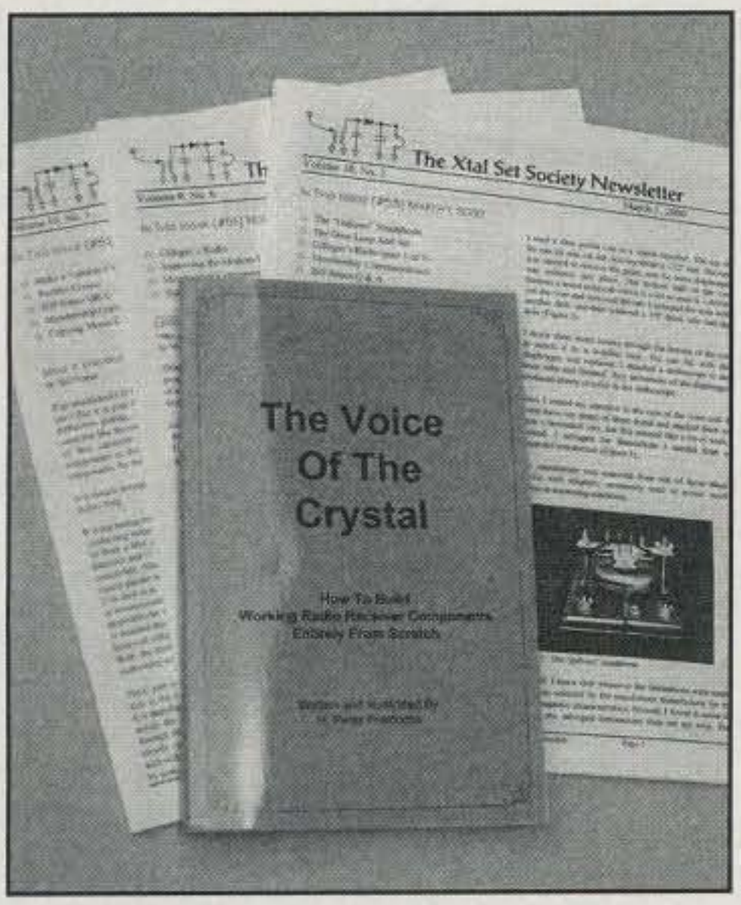


Photo E– More new books and captivating newsletters continue to emerge from the Crystal Set Society. The Voice of the Crystal is a good example. It describes how to assemble components and build working crystal sets from regular household items.

Wrap Up

Closing time once again approaches, but the good news continues rolling in and demands quick recognition.

Remember the Crystal Set Society and its fascinating array of crystal-set-related information and goodies highlighted last year in this column? Well, the society continues to grow, its newsletters are still terrific, and it also started to handle a new book by Peter Friedrichs entitled *The Voice of the Crystal* (photo E). The book is unique, as it explains how to use household and commonly available items to make parts and build radios from scratch—diodes, capacitors, earphones, speakers, and more. The book is an excellent source of information for both crystal radios and survival communications. Copies are $14.95 plus s&h ($2.00 regular mail; $4.00 priority mail) from The Crystal Set Society, P.O. Box 3026, St. Louis, MO 63130; on the web: <www.midnightscience. com> or via 1-800-927-1771.

Finally, I extend a sincere invitation for you to send views and details of your own favorite crystal set(s) for inclusion next time. Overall, the recognition helps bring everyone together, helps collectors, and rescues sets destined for the trash bins! 73, Dave, K4TWJ

What's New

BY KARL T. THURBER, JR., W8FX

A New Column for A New Century

Summer HTs, Antennas, Accessories, and More—Part II

This month in your "What's New" column we'll again focus on new and interesting software and computer treats, books for your burgeoning bookshelf, radio gear, plus antennas and antenna accessories for the hamshack. We'll also catch up on reader correspondence. Once more, welcome to your new column!

Recently, ICOM introduced the IC-706MKIIG, which boasts the same features as its predecessors in the series, plus some great enhancements that enable what ICOM refers to as "base station performance and features in a mobile-rig-size package." The versatile rig covers 160 meters through 70 cm. (Photo courtesy ICOM America, Inc.)

Software and Computers

Creative Services Software Combo. Rick Ruhl, president of Creative Services Software (CSS), updated us on his latest activities. CSS has assembled its popular TNC, WeFax, and LogWindows logging programs into a single package, the Digital Trio, especially for the support of popular AEA/Timewave TNCs. At $129.95 the new package includes the current versions of the CSS software on CD-ROM. The disc contains full documentation in Word or PDF format, plus demos of all CSS software and other supported programs. Rick also announced updates to the firm's popular Pkterm '99 software.

For more details, contact Creative Services Software, Inc., 503 West State St., Suite 4, Muscle Shoals, AL 35661; (phone 256-767-3739; e-mail: <sales@cssincorp.com>; on the web: <http://www.cssincorp.com>).

Note: For information on Timewave TNCs and multimode data controllers, contact Timewave Technology, Inc., 58 E. Plato Blvd., St. Paul, MN 55107-1827 (phone 651-222-4858; e-mail: <sales@timewave.com>; on the web: <http://www.timewave.com>).

Pathfinder Software from AA6YQ. Dave Bernstein, AA6YQ, offers the free program Pathfinder, which makes it easy to find QSL information from web-accessible sources. The program searches address and manager databases, as well as country-specific callbooks. You can modify these searches, or you can replace them with new ones. Pathfinder works under Windows® 95, 98, or NT, and it requires Microsoft Internet Explorer, version 4 or 5. The program's search library has been updated and expanded to contain search files for an impressive 90 online QSL sources. Dave adds that he now supports browsers other than Internet Explorer, as well as the Linux and Mac operating systems. This special support is offered online by the Pathfinder Web Client. It's completely self-contained within its own web page; this means that you don't even have to download any software to use the Pathfinder Web Client. Check out the web site at <http://www.qsl.net/pathfinder>. Web Client is at <http://www.qsl.net/pathfinder/WebClient>.

Cat Control Special Edition. In December 1998 we discussed the attractiveness of sitting in front of your PC and "smartly" controlling your radio directly from it. We also mentioned some early implementations of Neil I. Sternstein, K2RCH's' CAT CONTROL, specifically the basic or "Lite" versions.

Neil tells us that he now offers fully implemented CAT CONTROL software for the Yaesu FT-1000MP, which he calls the PC1000MP Special Edition. The new version presents a user-friendly graphical interface (GUI) to control and augment the functionality of this popular amateur transceiver. To make the program user friendly, an artist's rendition of the FT-1000MP front panel is presented with as much true-to-life functionality as possible. You merely use the mouse in place of your finger to operate your transceiver remotely from your PC. The CAT CONTROL software is $99.95 plus $5 s/h.

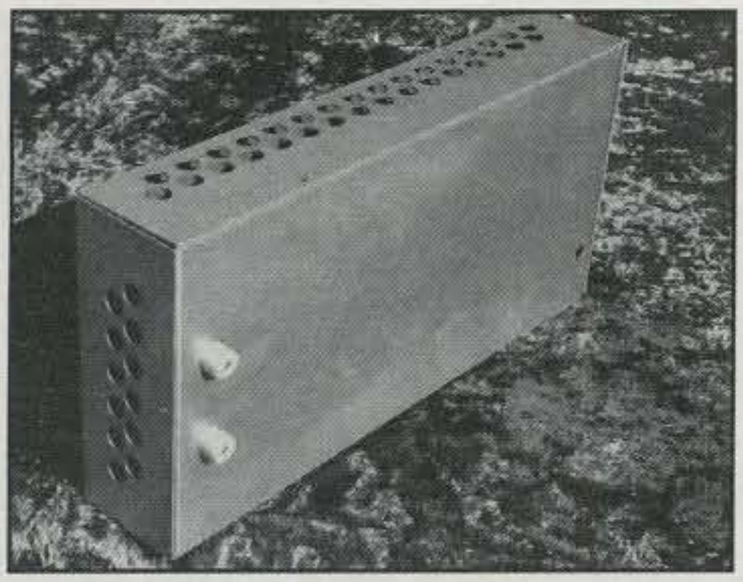
For more information, contact Neil at CAT CONTROL, 5 Aberdeen Place, Woodbury, NJ 08096 (856-848-6214; e-mail: <catcontrol@yahoo.com>).

From the Bookshelf

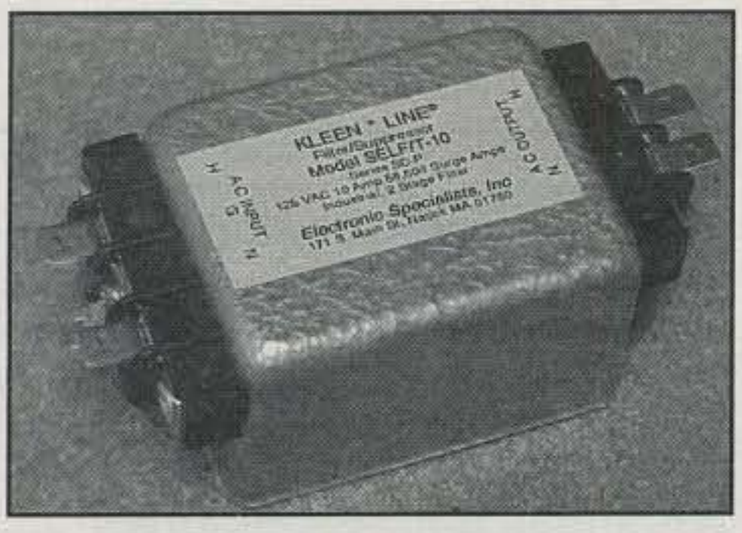
Silver River Books and Photos. Silver River, Inc. is a publisher of award-winning, richly illustrated books on travel and the natural sciences. The company also makes high-quality photos available to the public.

An intriguing book of great interest to radio amateurs is *Shorty and the Radio Men,* a young writer's lighthearted encounter with World War II. Written by Myron Sutton, the 356-page, perfect-bound book ($16.95) offers an intimate chronicle of radio men in combat. From infantry and radio training in Alabama, to advanced radio at Fort Benning, then across the Atlantic in winter to combat

*289 Poplar Drive, Millbrook, AL 35054-1674
e-mail: <w8fx@cq-amateur-radio.com>



The six-amateur-band (160, 80, 40, 20, 15, and 10 meter) WXØB BPF-1 filter is the first in a series of "new generation" bandpass filters housed in a single enclosure. The BPF-1 can be automatically switched from band to band to enable the use of multiple radios either by one operator or by multiple operators in the same facility. The filter is characterized by low band-to-band hash and high harmonic rejection. (Photo image downloaded from Array Solutions web site)



Electronic Specialists recently upgraded their line of RFI Filter-Suppressors. These units now provide RFI attenuation from 10 kHz to 250 MHz. Surge, spike, and transient suppression is rated at more than 50,000 surge amps, with a suppressor response time of 1 picosecond. The Kleen Line® Model SELF/T-10, an industrial-grade, two-stage wire-in filter/suppressor, is shown in this photo; it's $52. (Photo image downloaded from Electronics Specialists web site)

in Europe, *Shorty* is told in words as fresh and youthful as yesterday as it chronicles one hilarious misadventure after another. Particularly noteworthy is that the author reportedly wrote the book in 1946 and laid it aside, unpublished, for 55 years while he wrote some 30 other books.

For ordering information, contact Silver River, Inc., 1619 Meadowview Drive, Medford, OR 97504 (1-800-440-1802; e-mail: <silverriv@aol.com>;. web: <http://www.silverriver.com>).

Guide to VHF/UHF Amateur Radio. The books published by the Radio Society of Great Britain (RSGB) are well known for their scope and quality. Ian Poole, G3YWX, is the author of a number of radio-related technical books. Among them is his new *Guide to VHF/UHF Amateur Radio.* The 112-page book covers many of the aspects of operating an amateur radio station on these bands, showing how much variety there is and how to make the most of the hobby using these frequencies. The eight chapters include ones introducing the VHF and UHF frequencies, plus chapters on propagation, bands and bandplans, receivers and transmitters, antennas, mobile and repeater operation, DXing, and data communication.

The book is published by the RSGB at £8.99 (Sterling), or roughly US $14.32. Ian's book is available from the Radio Society of Great Britain Lambda House, Cranborne Road, Potters Bar, Herts, EN6 3JE, England (tel: +44 1707 660888; e-mail: <sales@rsgb.org.uk>;. web: <http://www.rsgb.org>). You also can contact Ian via e-mail at <ian_poole @ lineone.net); his personal web site is <http://website.lineone.net/~ian_poole>.

Note: Ian tells me that although the ARRL stocks many RSGB books, he doubts they will stock this one, since they already offer other RSGB VHF books and also have some of their own. However, Ian is working on getting online booksellers Amazon.com and Amazon.com.uk to stock more of his books.

OSCAR Satellite Report. Gene Harlan, WB9MMM, and Sharon Harlan, KB9SH, of Harlan Technologies, publish and edit a variety of SSTV, spectrum and audio analyzer, and other ham software, as well as *Amateur Television Quarterly*. Perhaps lesser-known is their "OSCAR Satellite Report" newsletter, which is issued for the purpose of enhancing user communications about the OSCAR Satellite Program.

"OSCAR Satellite Report" is an excellent resource for keeping abreast of what others are doing in the satellite community; finding out what DX is being heard; locating articles suitable for the satellite newcomer; learning what satellite software is available; discovering new web sites to visit; receiving Keplerian Element updates; finding out about new products; seeing what satellites are off, on, or being launched; and receiving other satellite information you might need.

Contact Harlan Technologies, 5931 Alma Dr., Rockford, IL 61108-2409

(phone 1-800-557-9469; e-mail: <OSR @hampubs.com>; web: <http://www.hampubs.com>).

Pasternack Enterprises Catalog #2000. In several previous columns we noted the Pasternack Enterprises catalog, which detailed the company's extensive lines of coaxial-related products. Recently we received a copy of PE's most recent opus, Catalog #2000, which at 162 pages is the largest Pasternack catalog ever. It includes several thousand different coaxial-related products, along with associated technical data. The 8" × 11" format catalog shows a very wide variety of adapters, attenuators, breakouts, coax and coax assemblies, connectors, switches, patch cords, power dividers, switches, terminations, tools, twinax, directional couplers, DC blocks, and many other coaxial products and related items. It's easy to use the catalog to find components: It has a comprehensive table of contents as well as an index arranged by model number.

For a catalog, contact Pasternack Enterprises, P.O. Box 16759, Irvine, CA 92623-6759 (949-261-1920; e-mail: <sales@pasternack.com>; web: <http://pasternack.com>.

CRB Research Books Goes Hi-Tech with its Catalog. As I've mentioned before, from the correspondence I receive, I'm surprised by the number of radio amateurs who also are shortwave listeners (SWLs), scanner enthusiasts, CBers, computer security specialists, home electronics buffs, and the like.

CRB Research Books, around since 1967, includes among its titles books catering to this rather eclectic audience, perhaps more so than most other radio hobbyist booksellers. While most of the books it distributes are about conventional radio and electronics topics, many are offbeat, serving more than just electronics hobbyists. The CRB catalog is interesting in and of itself. It's now online at <http://www.crbbooks. com>. In fact, following an industry trend, CRB Research Books no longer issues a printed catalog. My CRB 2000 catalog sported a large red sticker that proclaimed "Last Catalog." CRB has significantly upgraded its web site to depict more items in an online catalog than would be possible in a printed catalog. The online catalog is organized into book categories so you can go directly to the types of books you prefer. Also, you can receive free e-mailed catalog updates, and you can print out sections of the catalog from the web site. If you don't have internet access, you can have custom printouts mailed to you.

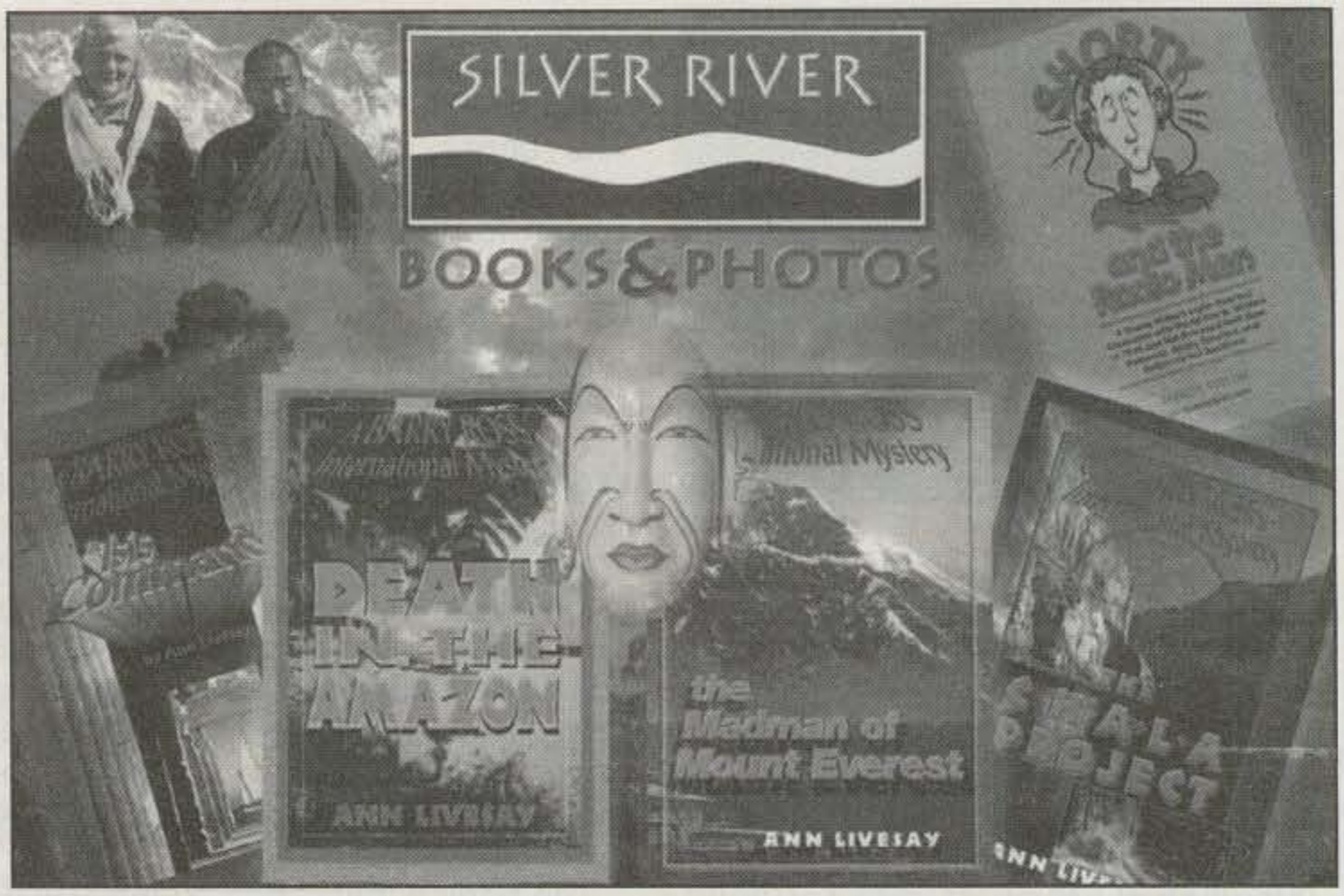


Fig. 1– Silver River, Inc. is a publisher of award-winning illustrated books on travel and the natural sciences, and it also makes high-quality photos available to the public. In this month's column, we discuss one of their more intriguing books, Shorty, *a chronicle of America's radio men in combat in World War II. (Postcard collage courtesy Silver River, Inc.)*

Contact CRB Research Books, Inc., P.O. Box 56, Commack, NY 11725 (phone 631-543-9169; e-mail: <sales@crbbooks.com>; on the web: <http://www.crbbooks.com>).

Radio Gear

ICOM IC-706MKIIG. Increasingly, state-of-the-art transceivers are losing their conventional labels as separate HF, VHF, or UHF rigs. While not quite approaching "DC to light" capabilities, the ICOM IC-706 series does cover the proverbial waterfront, spectrum-wise. Recently ICOM introduced the new IC-706MKIIG, which boasts the same features as its predecessors in the series, plus great enhancements that enable "base station performance and features in a mobile-rig-size package." The new combo rig covers 160 meters through 70 cm.

The "706 legacy" began in 1995 when the first IC-706 was introduced, one which covered HF as well as 6 and 2 meters. Later, in 1997, ICOM developed the IC-706MKII with more features and power. Today the latest incarnation offers all-mode (SSB, CW, RTTY, AM, and FM) operation on 160 meters through 70 cm; up to 100 watts power, depending on band; an automatic repeater function; CTCSS encode/decode; DSP capabilities; and a remote-control faceplate sized right for easy use and portability.

For a free brochure, contact ICOM America, Inc., 2380 116th Avenue NE, Bellevue, WA 98004 (425-450-6088; web: <http://www.icomamerica.com>). *Note:* You can sign up to receive regular e-mail announcements and news from ICOM at the web site.

Antennas and Accessories

New Bandpass Filters from Array Solutions. In 1998 we profiled the popular WXØB StackMatch used to stack, match, and power-split to two or three HF beam antennas, mounted on a single tower. We also described the SixPak, a six-antenna, two-radio configurable antenna-to-radio switch. Now proprietor Jay Terleski, WXØB, offers a new concept in bandpass filters.

The six-amateur-band (160, 80, 40, 20, 15, and 10 meter) WXØB BPF-1 filter is the first in a series of "new generation" bandpass filters housed in a single enclosure. The BPF-1 filter can be automatically switched from band to band to enable the use of multiple radios either by one operator or by multiple operators in the same facility.

The three-resonator filter is $475. It's characterized by low band-to-band hash and high harmonic rejection. The filter is based on Ed Wetherhold, W3NQN's classic design popularized in *QST*. The filter handles 200 watts CW, RTTY, or SSB, and it can be modified for specific amateur bands or for other

radio services. For more information, contact Array Solutions, 350 Gloria Rd., Sunnyvale, TX 75182 (972-203-2008; e-mail: <wx0b@arraysolutions.com>; web: <http://www.arraysolutions.com>).

Upgraded RFI Filter-Suppressors. Since 1971 Electronic Specialists has marketed protectors and interference control products for a wide variety of "high tech" electronic equipment, according to the firm's Frank Stitfer. Much of the emphasis has been on protecting heavy-duty industrial and business-oriented equipment, but they also offer high-quality, affordable products suitable for in-shack amateur radio and home computer use.

Recently, Electronic Specialists upgraded its popular line of RFI Filter-Suppressors. These units now provide RFI attenuation from 10 kHz to 250 MHz. Surge, spike, and transient suppression is rated at more than 50,000 Surge Amps, with a suppressor response time of 1 picosecond. The units are available in several grades, reflecting different filter attenuation levels to accommodate interference severity. Load current capability includes models handling 3, 10, 15, 20, or 30 amperes. Solder lug, push-on tab, screw terminal, and wire lead options are available. List prices start under $50.

Contact Electronic Specialists, Inc., 32 North Main St., Natick, MA 01760 (phone 1-800-225-4876; e-mail: <esp@elect-spec.com>; web: <http://www.elect-spec.com>).

We Get Letters

Once again we're just about out of space. Before wrapping up things this month, we'd like to acknowledge some of the good folks who corresponded with us. A tip of the W8FX hat goes to Dave Bernstein, AA6YQ; Ian Poole, G3YWX; Jay Terleski, WXØB; Chris Eppich, KC8LAT; Dr. Jack Nilsson, N8NDL; Bob Newton, W5RN; Neil Sternstein, K2RCH; Tony Benbenek, Sr.; Frank Stitfer; and Terry Schieler, WØFM. Thanks, folks!

Correspondents Dr. Jack Nilsson, N8NDL, and Chris Eppich, KC8LAT, reported there have been major changes at Nil-Jon Antennas, which we profiled in the February "Digital Dipole" column. Jack continues as president, while Paul Branszet, KI8HO, is Sales Director. The contact information for the firm is NilJon Antennas, Inc., P.O. Box 764, Amherst, OH 44001 (440-9892295; e-mail: <paul@nil-jonantennas.com>; web: <www.niljonantennas.net>).

Also, correspondent Bob Newton, W5RN, told us he had trouble contacting Harold Wood, K6MLO, online. We profiled Harold's Coil Designer program in the March "Digital Dipole" column. Bob reports that Harold has changed Internet Service Providers (ISPs), so he now has a new e-mail address: <hwk6mlo@earthlink.net>. So far, his web site is down. The current price for the Coil Designer program diskette is $15, or $13.50 via e-mail delivery.

Keep the cards and letters coming, and let us know what "new stuff" you'd like to see in your column. We'll try our best to accommodate your 'druthers.

Wrap-Up

That's all for this time, gang. Next time, more "What's New." See you then.

Overheard: I realized a long time ago that if you can't be kind and manage to say nice things to people over the air, at least you can keep quiet.

73, Karl, W8FX

Radio Classics

BY JOE VERAS, N4QB

Vintage Gear and Its History

Hallicrafters—The Early Years

On the evening of December 31, 1932, Bill Halligan sat at his table in the Empire Room of Chicago's Palmer House with more on his mind than the commencement of the New Year. Neither his wife, Katie, nor any of the friends sitting around his table—perhaps not even Bill himself—could have envisioned just how successful the plans he announced that night would be. As the clock approached midnight and the orchestra struck up the opening notes of *Auld Lang Syne*, Halligan may have briefly reprised his past before meeting the future and 1933.

William Joseph Halligan was born in the Charlestown section of Boston, Massachusetts on December 8, 1898. His father owned and operated a bakery, a business begun by his Irish immigrant father before him. Bill developed an interest in wireless as a young teen and learned to copy code listening to the spark signal of nearby Navy station NAD. He passed the test for the amateur license at age 14, receiving the call-sign 1AEH. By the time he reached 16, Bill had graduated from high school and was enrolled at the Eastern Radio Institute, where he acquired his commercial license. The commercial ticket led to a job with the Marconi Company, pounding brass aboard the *SS Dorothy Braford*, an excursion boat running between Boston and Provincetown on the tip of Cape Cod. He also saw duty aboard ships sailing between Boston and Portland, Maine or Savannah, Georgia.

By the time of Bill's 18th birthday, the U.S. had entered World War I. Halligan enlisted in the Navy and initially was stationed at NAE, a ship-to-shore station on Cape Cod. There he made practical use of his ability to copy both American and Continental Morse. Traffic arrived at the station via landline (American Morse) and was retransmitted to ships using the radio code (Continental). He also served aboard ship in the North Sea and Atlantic Ocean, often splitting his duties. One watch would find him manning the radio equipment in the vessel's shack, while another might find him shoveling coal in its boiler room. At the war's end, he held the rank of Chief Petty Officer.

The Hallicrafters SX-9 receiver pictured here is a prototype. It differs slightly in appearance from those made in both early and late production runs. (Photos by Joe Veras, N4QB)

Halligan's postwar experience included a year at Tufts College and two more years as a cadet at West Point. In 1923, he left school for good to marry Katherine Fletcher, a union that would endure until her death nearly 60 years later.

After a brief stint as a newspaper columnist, Bill went to work for the Tobe Deutschmann Company. Deutschmann's main business had been selling parts to radio manufacturers, but after Halligan came aboard, the decision was made to open a retail outlet at 46 Brattle Street in downtown Boston. Drawing upon his wartime experience, Bill chose the name *Radio Shack* for his new store. The rest, as the saying goes, is history.

In 1928, Halligan headed west to Chicago to join in a partnership with Larry Chambers. Chambers-Halligan sold radio components to the manufacturing industry. Through the early years of the Great Depression, the partnership was a moderately successful one. Eventually, however, orders were hard to come by, and collecting payment for them was even tougher.

By the latter half of 1932, Bill had developed a desire to take his business affairs in a different direction. Bleak as the outlook was at the time, he began making plans to join the ranks of the radio manufacturers to whom he sold parts. As the year came to a close, he accumulated a small office, a few people to staff it, a company name, and a motto. The company he announced to his dinner guests that New Year's Eve was *The Hallicrafters, Incorporated,* a name derived from combining a portion of Bill's surname and the company motto, "Handcraft Makes Perfect."

Among the things Halligan still lacked to enter the radio business were two big essentials: a manufacturing facility and the necessary license. In pursuit of the latter, he ran headlong into that familiar, old nemesis, The Radio Corporation of America.

RCA had been granted unusual and expansive rights by the U.S. government some years earlier. Federal authorities were reluctant to allow a foreign-owned company such as British Marconi, Halligan's old employer, monopolistic control over so vital an interest as maritime communications. In 1919, the government, through the Department of the Navy, encouraged the formation of a cartel involving General

P.O. Box 1041, Birmingham, AL 35201
e-mail: <n4qb@cq-amateur-radio.com>

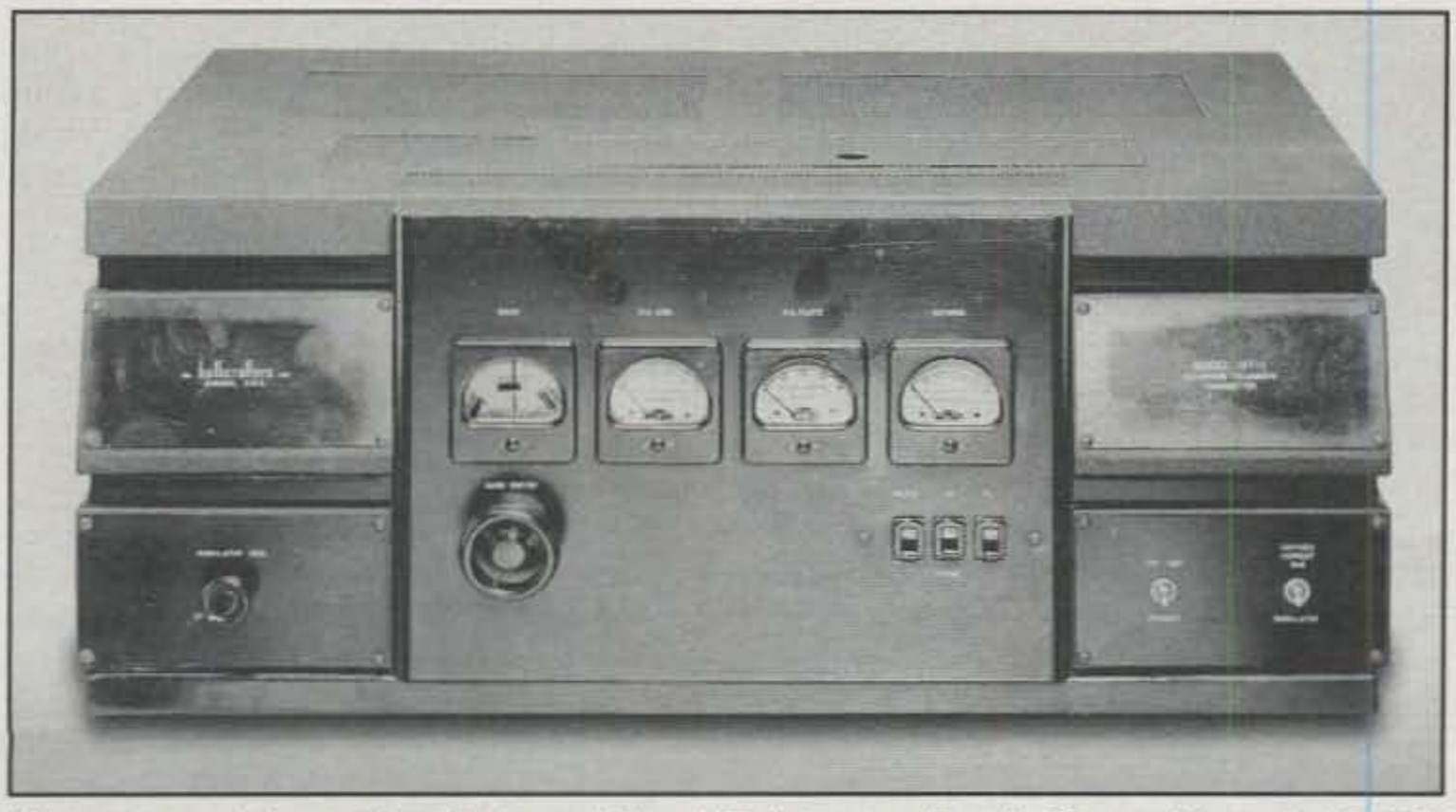
The S-1 was the first in a long line of receivers aimed at the amateur and short-wave enthusiast market.

Electric, AT&T, Westinghouse, and The United Fruit Company. This cartel operated under the umbrella name of The Radio Corporation of America.

During the years following its inception, RCA spent large sums of money buying up patents having anything to do with the emerging radio technology. By the time players such as Bill Halligan and Art Collins came on the scene, RCA had sewed up the rights to most facets of radio construction, including specific circuits and the tubes that went in them. The May 2000 "Radio Classics" column details how Collins solved the tube problem; what Halligan lacked was the manufacturing license.

Bill's initial approach was pragmatic. He would first design a radio circuit and draw up a schematic. Then he would pre-sell 50 to 100 units to radio shops or furniture stores; the sets at this time were aimed at the consumer market. Finally, he would contract with a company already possessing an RCA license for the actual manufacture of the radios. The Howard Radio Company and Silver-Marshall Incorporated were two he used for this purpose. This same concept of pre-selling one's initial production would help launch R.L. Drake into the communications receiver business several decades later.

Halligan also learned to turn the shifting sands of Depression-era business strategy to his advantage, while others foundered upon its rocks. Silver-Marshall, Inc. was in bankruptcy by late



Not apparent from this picture of the HT-1 transmitter is the unit's weight, 195 pounds, which brings its original selling price to exactly a dollar a pound.

1933. The most valuable asset it possessed was its RCA license. Bill took over operation of the company, renaming it Silver-Marshall Manufacturing. At last he had his own plant and the coveted license to manufacture his radios.

The early Hallicrafters ham receivers were essentially constructed one at a time, and total production numbers were relatively low. True to the company motto, the sets looked, euphemistically speaking, *handcrafted*. The S-1 in the accompanying photograph was the first in a long line of receivers aimed at the amateur and shortwave enthusiast market. It is a five-tube regenerative set, covering 1.5 to 22 MHz in four band-switched ranges. It has a built-in speaker, but no bandspread control. The familiar Hallicrafters *Skyrider* nomenclature also began with this receiver and would continue to appear on their top-of-the-line products all the way through the SX-32. The S-1 appeared in the fall of 1933, selling for $39.95.

The S-2 and S-3 followed later that same year and the next, augmenting the original design with bandspread tuning and additional frequency coverage. Hallicrafters introduced its first superheterodyne, the S-4, in 1934. When equipped with the optional crystal filter, the model designation changed to SX-4, a practice that would last as long as Hallicrafters was in the radio business.

The problems Halligan inherited from Silver-Marshall Incorporated were persistent enough to doom the new company a year later. However, he came upon a way to move out from under them and into another facility. The Ecophone Radio Company was also in financial distress, but possessed a 50,000 square foot plant, along with the RCA license. Halligan merged the two firms, with Hallicrafters retaining controlling interest, while Ray Durst, Ecophone's credit manager, became vice-president.

In a role-reversal demonstrating the agility necessary for business survival at that time, Hallicrafters put its new facility to work producing radios for other companies. Numbered among these were not only other radio manufacturers, but mail-order catalog houses, including Sears & Roebuck and Montgomery Ward. The infusion of cash provided by these outside projects enabled Halligan to begin producing his own radios in earnest.

The S-9/SX-9, the first Hallicrafters model to be produced in significant numbers, distinguished itself in other ways, too. The nine tubes were of the new all-metal variety, and the use of iron, rather than air core, transformers in the IF was a first for amateur receivers. The engraved, German-silver main tuning dial replaced the airplane-type dial employed on earlier receivers. The crystal-filter version carried a price tag of $89.50 when the first units became available in 1936. The SX-9 pictured here is a prototype and differs slightly in appearance from those made in both early and late production runs.

Through the spring, summer, and fall of 1936, the Hallicrafters product line continued to grow, with the debut of five new receivers. In addition to another *Super Skyrider* (the SX-11), new arrivals included a model for the 5 and 10 meter bands and an entry-level set. Taking a cue from the auto industry, Halligan began announcing "next year's models" in the fall of the preceding year. He also discovered the value of advertising, displaying his company's wares in multi-page sections of ham and radio hobbyist magazines. Even though advertising dollars may have been hard to come by, he had a firm enough grasp of marketplace economics to realize such a commitment was necessary.

In 1938, it became possible to have an "all Hallicrafters" station with the introduction of the HT-1 transmitter. Four 6L6s in a parallel/push-pull arrangement modulate the RK47 final for 50 watts of output on AM, whereas key down on CW is good for 100 watts. Not apparent from the picture is the unit's weight, 195 pounds, which brings its original selling price to exactly a dollar a pound. The crystal-controlled HT-1 came equipped to cover 40, 20, and 10 meters, but could be set up to switch among any *three* bands from 160–10 meters.

Late that same year, the HT-4 joined the company's fledgling transmitter line. The 450 watt CW, 325 watt AM phone rig would enter the military as the BC-610 and serve proudly during World War II. The Hallicrafters production line cranked out more than 18,000 of the BC-610 version by the war's end. Receiver production at the plant was similarly prolific, with tens of thousand of units being supplied to the country's armed services.

Hallicrafters revived the Ecophone name during the war years, and used it on a number of inexpensive shortwave sets and "morale radios" intended for casual use by military personnel. Production at 14 facilities also included instruments and other non-radio items. By the time a truce was declared, the company had completed more than $150,000,000 worth of government contracts.

Hallicrafters celebrated its tenth birthday in the midst of World War II. From Bill Halligan's perspective, it must have seemed like much more than a decade since his New Year's Eve announcement. Many crises had been encountered and numerous heights scaled during those years. The roller-coaster ride continued into the post-war period, and business was filled with anything *but* dull moments.

In 1956, the company began a series of ownership changes that would eventually result in its extinction. Bill Halligan sold the company to the Penn-Texas Corporation, only to buy it back again the following year. In 1966, Hallicrafters became a division of Wilcox Electric, a subsidiary of Northrop, the prominent defense contractor. After the Breaker Corporation purchased Hallicrafters from Wilcox in 1975, the company disappeared from ham radio and, soon thereafter, all other markets as well.

Halligan remained interested in ham radio all his life. In his retirement, he was active as W9AC in Chicago, or as W4AK from his winter home on Collins Avenue in Bal Harbor, Florida. His key fell silent on the 14th of July, 1992. In addition to his two sons and ten grandchildren, Bill's survivors included the numerous hams who used his equipment and the military operators whose own lives depended on it.

A future "Radio Classics" column will cover Hallicrafters' later history and equipment in more detail, but if the sound being pumped out by the push-pull 6V6's of the SX-28 here beside me is any indication, the good old days will be hard to beat.

73, Joe, N4QB

Thanks to Bob Enemark, W1EC, for making another radio from his collection available for photography. Bob graciously hosted a photo session at his Duxbury, Massachusetts QTH, and provided lunch as well! He owns the SX-9 prototype in the color illustration.

Chuck Dachis, WD5EOG, not only has written the definitive book on Hallicrafters, he also assembled the ultimate collection of its products. The S-1 and HT-1 photos in the column were taken during my visit with Chuck a couple of years ago. For more information on Hallicrafters, his book *Radios by Hallicrafters* is available from <www.amazon.com> on the web. It may also be obtained from *Electric Radio*, 970-564-9185, as well as numerous other vendors of radio and electronics books. You will also enjoy visiting his own website, <www.hallicraftercollector.com>.

Contesting

BY JOHN DORR, K1AR

News/Views Of On-The-Air Competition

Why Are There So Many Contests?

August's Contest Tip of the Month

Care to guess how many times you say "CQ Contest" in a 48-hour DX contest? I haven't done the math, to be honest, but if you only called CQ once every 2 minutes, you would say the words over 3000 times (assuming you call CQ twice per cycle). My guess is that the number is actually significantly higher. This month's tip is simple: An investment in a voice keyer is critical for the serious contest operator. Even if you're a casual operator, voice assistance dramatically reduces operator fatigue, resulting in improved scores. If you doubt the claim, take a few hours by yourself and call CQ over 3000 times! By around 100, you'll be getting the idea!

Calendar of Events

July 29-30	IOTA Contest
July 29-30	Russian RTTY WW Contest
Aug. 5-6	ARRL UHF Contest
Aug. 5-6	10-10 Summer QSO Party
Aug. 5-6	N. American CW QSO Party
Aug. 6	YO DX Contest
Aug. 12-13	Worked All Europe CW Contest
Aug. 12-13	Maryland QSO Party
Aug. 19-20	N. American SSB QSO Party
Aug. 19-20	Oregon QSO Party
Aug. 19-20	Keyman's Club of Japan CW Contest
Aug. 19-20	SEANET SSB Contest
Aug. 19-20	SARTG WW RTTY Contest
Aug. 19-21	New Jersey QSO Party
Aug. 26-27	Ohio QSO Party
Aug. 27	Colorado QRP Club Summer QSO Party
Sept. 2-3	All Asian SSB Contest
Sept. 3	North American CW Sprint
Sept. 9-10	Worked All Europe SSB Contest
Sept. 9-11	ARRL Sept. VHF QSO Party
Sept. 10	North American SSB Sprint
Sept. 17-18	Tennessee QSO Party
Sept. 23	Panama Radio Club Contest
Sept. 23-24	**CQ/RJ WW RTTY Contest**
Oct. 28-29	**CQ WW DX SSB Contest**
Nov. 4-6	ARRL CW Sweepstakes
Nov. 18-20	ARRL SSB Sweepstakes
Nov. 25-26	**CQ WW DX CW Contest**

Larry "Tree" Tyree, N6TR, receives his CQ Contest Hall of Fame award at the Dayton Hamvention 2000 Contest Banquet. (Photo courtesy K8CX)

Rarely a month goes by when I don't receive an e-mail or letter from someone asking me to promote the idea of fewer contests within contest circles. Each and every time I receive such a request, I have to say it does make me think about the subject. When you look at the contest calendar in this column (or even better, the list in the *CQ Almanac*), it's easy to understand that point of view. There are over 14 events in this month of August alone, not including several I simply didn't have room for! In fact, there are some weekends, during busy months, where four or five simultaneous operating events are underway at various times.

Yet when you ask fellow contesters what they consider to be their favorite contest, you get an incredibly wide range of responses. In part, I think it's because we operate contests for so many reasons. However, this is also what's driving the breadth of contest choices that exist today.

When it comes right down to it, most of us have one or two favorite contests that stand out above all the others. It could be based on our station's limitation or strengths, or simply just the first one we ever operated, offering some level of nostalgic value.

Without a doubt, and having nothing to do with where you're reading this, my favorite event is the CQ World-Wide DX CW Contest. In fact, I suppose that I have to concede that DX contests in general are where my primary interest lies (although I have a bent towards the NA Sprints, too!). This is, for the most part, a very widely held feeling on the East Coast of the U.S. and in other parts of the world. As with any geographical area, the contests that afford the best results are usually the most popular in that location. If you pose the same question to someone in Texas or Colorado, he or she would probably tell you about the benefits that come from operating domestic contests such as the ARRL Sweepstakes.

As I mentioned earlier, there is a nostalgic part of this equation, too. Like many of you, my first "contest" was the once popular ARRL Novice Roundup. When I look back at the 20+ hours of operating I did to make 230 QSOs in the 1969 NR, it's amazing that I ever operated another contest. However, to tell you the truth, it was one of the best times I ever had in an operating event! Then for many others there is ARRL Field Day. This popular event provided my initial exposure to ham radio. For that reason Field Day has always had a special spot in my contesting interest curve, so much so that I've never missed operating one (albeit from home many times) in my 31+ years of hamming. I'm sure I'm not alone on that front.

From an international perspective, DX contests are immensely popular—and not just the CQ WW and ARRL DX. There are literally dozens of national contests, some permitting international participation and others limited to domestic QSOs. For example, there's the YODX, SP-DX, Helvetia, CQ-M, and Canada Day Contests, among others. Maybe some of you can recall an experience such as listening to a buzz saw of weak European stations on 80 meters working each other at high QSO rates, wondering what it would be like to work them yourself.

What's the Answer?

It is hoped that most contest sponsors have some goal in mind when promoting their event to the ham radio public. Some are trying to stir up activity from rare states. Others are attempting to increase activity on certain modes or bands. Still others are trying to encourage newcomers or those with small stations to join in on the fun. My question for the contest community to consider is this: If there's not a significant goal you're trying to achieve by sponsoring a contest, or the organizational support for the event is minimal at best, then why conduct the contest in the first place? The concept is something like a local Internet Service Provider. The world

2 Mitchell Pond Road, Windham, NH 03087
e-mail: <K1AR@contesting.com>

simply does not need another ISP with a great monthly rate and a local telephone number.

We've all heard the arguments, however. So many of these contests have little or no activity, so what's the big deal?! Well, my view is that this is precisely the point. If a contest has little or no activity, then why sponsor the contest at all? It seems like common sense to me.

The contest and non-contest community will never completely see eye-to-eye on the virtues of contest operating. It's no different than the conflicts SSTVers and non-SSTVers experience on 20 meter SSB, or net operators versus non-net operators and 2 meter packet operators versus non-packet operators, for that matter. The list just goes on and on. Fortunately for the hobby, our self-policing approach works very well for the most part. What do you think?

Final Comments

Congratulations to the two new members of CQ's Contest Hall of Fame: Larry "Tree" Tyree, N6TR, and Walter Skudlarek, DJ6QT (see the July/August issue of *CQ Contest* for details).

The 2000 *CQ* Contest Survey results are pouring in. In total I've received over 300 responses from around the world thanks to the assistance provided by K8CX and W4AN on their respective web sites at <http://hamgallery.com/survey.htm> and <www.contesting.com>. I'll be reporting the final results in a few months. If you haven't already taken the time, please submit your response today!

That's it for this month. As always, please remember the deadline for the November issue is September 1st.

73, John, K1AR

YO DX Contest
0000Z to 2000Z Sun., Aug. 6

This is the annual running of the YO DX Contest sponsored by the Romanian Amateur Radio Federation and the Romanian DX Club. This is a worldwide contest with everyone working each other on SSB and CW.

Classes: Single Operator All Band/Single Band; Multi-Operator/Single Transmitter.

Frequencies: Operation is limited to 80–10 meters, no WARC bands using the usual sub-band allocations.

Exchange: RS(T) plus ITU Zone. YO stations will substitute their two-letter country abbreviation for their zone.

Scoring: Credit 8 points for YO QSOs, 4 points for QSOs outside your continent, and 2 points for QSOs within your continent. QSOs within your own country are valid for multiplier credit only. Final score is computed by multiplying total QSO points times the sum of YO counties and ITU zones worked on each band. Stations may be worked only once per band regardless of mode.

Deadline for logs is 30 days after the contest. Mail them to: RARF, P.O. Box 22-50, R-71100 Bucuresti, Romania or via e-mail in ASCII format only to <yodx_contest@hotmail.com>.

ARRL UHF Contest
1800Z Sat. to 1800Z Sun., Aug. 5–6

Activity on this one starts at 220 MHz and goes all the way up to 2.3 GHz and higher.

Classes: Single Operator, Multi-Operator, and Rover.

Exchange: Grid square locator.

Points: Take three points for 220 or 432 MHz contacts, six for 902 or 1296 MHz. Credit 12 points for 2.3 GHz or higher.

Multiplier: Total number of different grid squares worked on each band. Final score is the total QSO points from all bands times the sum of the grid-square multiplier from each band.

An award pin program is available for this contest for making 5 QSOs. Details, including the full rules, are published at <www.arrl.org/ontests/announcements/99/rules-uhf.html>. It is suggested you send a large SASE to the ARRL for official log and summary sheets.

Send logs to: ARRL UHF Contest, 225 Main Street, Newington, CT 06111 or via the standard ARRL e-mail methods.

North American QSO Party
CW: 1800Z Sat., Aug. 5 to
0600Z Sun., Aug. 6
SSB: 1800Z Sat., Aug. 19 to
0600Z Sun., Aug. 20

This is a short but fun QSO party that can have some fast rates. Any licensed radio amateur may enter, with the object being to work as many North American stations (and/or other stations if you are in North America) as possible during the contest period.

Classes: Single operator and multi-operator, two transmitter. Multi-operator stations must keep a separate log for each transmitter. Multi-operator stations must have at least 10 minutes between band changes. Single operator entrants may only have one transmitted signal at a time. Output power must be limited to 150 watts for eligible entries. Single operator stations may operate 10 out of 12 hours (multis may use the full 12-hour period). Off times must be at least 30 minutes in length and must be clearly marked in the log.

Mode: CW only in CW parties. Phone only in Phone parties.

Bands: 160, 80, 40, 20, 15, and 10 meters only. You may work a station once per band. Suggested frequencies are 1815, 3535, 7035, 14035, 21035, and 28035 kHz (35 kHz up from band edge for Novice) on CW, and 1865, 3850, 7225, 14250, 21300, and 28600 kHz (28450 for Novices) on phone. Try 10 meters at 1900Z and 2000Z, 15 meters

1930Z and 2030Z, and 160 meters at 0430Z and 0530Z.

Exchange: Operator name and station location (state, province, or country).

Scoring: Multiply total valid contacts by the sum of the number of multipliers worked on each band. Multipliers are states (including KH6 and KL7), Canadian provinces/territories and other North American countries (do not count USA, Canada, KH6, or KL7 as countries). Non-North American countries do not count as multipliers, but may be worked for QSO credit.

Team Competition: Team competition is limited to a maximum of five single operator stations as a single entry unit. Groups having more than five members may submit more than one team entry. To qualify as a team entry, the name, callsign of each operator, and callsign of the station operated should the operator be a guest at a station other than his own (e.g., K6ZZ op by K6RO) must be registered with K6ZZ on CW and WA7BNM on SSB. The team registration information must be in written or telegraphic form and must be received before the start of the NAQP. There are neither distance nor meeting requirements for a team entry.

Awards: A total of five plaques will be awarded for the high score for the Single Operator CW, Single Operator Phone, Multi-Operator CW, Multi-Operator Phone, and Single Operator Combined score categories. Certificates of merit will be awarded to the highest scoring entrant with at least 200 QSOs from each state, province, and North American country.

Send CW contest logs to Bob Selbrede, K6ZZ, 6200 Natoma Avenue, Mojave, CA 93501. SSB logs go to: Bruce Horn, WA7BNM, 4225 Farmdale Avenue, Studio City, CA 91604. Entries must be postmarked not later than 30 days after the party to be eligible for trophies and awards. Logs can be submitted via e-mail, too. E-mail log submissions must be in ASCII text format; include your summary sheet and complete log. Name your files with your callsign (e.g., yourcall.SUM and yourcall.LOG). Please do not send any binary format logs (i.e., yourcall.BIN or yourcall.QDF). NAQP CW logs go to <k6zz@ccis.com> and NAQP SSB logs go to <bhorn@hornucopia.com>.

European DX Contest

CW: Aug. 12–13 SSB: Sept. 9–10
0000Z Saturday to 2359Z Sunday

This is the 46th annual contest sponsored by the DARC. The activity will be between European countries and the rest of the world on all five bands, 3.5–28 MHz. (IARU Region I regulation of frequencies for contest operation.) A reminder that the WAEDC has returned to a 36-hour limit for single operator entries. The minimum time of operation on a band is 10 minutes. However, a quick band change in order to work a new multiplier is allowed.

Classes: (a) Single Operator, All Band. (b) Multi-Operator, Single Transmitter; only one signal on any band at the same time. (c) SWL. Note: DX spotting is allowed for all classes.

Exchange: RS(T) plus a progressive QSO number starting with 001.

Points: One point per QSO and 1 point for each QTC reported.

Multiplier: The multiplier for non-Europeans is determined by the number of European countries worked in each band (see WAE country list). Europeans use the ARRL DXCC list of non-European countries.

Bonus Multiplier: Multiply your multiplier on 80 meters by 4, on 40 by 3, and on 10/15/20 by 2.

Final Score: Total QSO points plus QTC points times the sum total multiplier from all bands.

SWL: Only the Single Operator, All Band class may be used. The same callsign, European or non-European, may only be logged once per band. The log must contain both callsigns and at least one of the control numbers. Each QSO logged counts 1 point; each complete QTC 1 point (maximum of 10 per station). Multiplier is determined by the DXCC and WAE country lists.

QTC Traffic: Additional point credit may be earned by making use of the QTC traffic feature. A QTC is a report of a confirmed QSO that took place earlier in the contest and was later sent back to a European station. It can only be sent by a non-European station back to a European. The general idea is that after a number of Europeans have been worked, a list of these stations can be reported back during a QSO with another station. An additional one point credit can be claimed for each station reported.

A QTC contains the time, call, and QSO number of the station being reported (e.g., 1300/DL2DN/134, which means at 1300Z you worked DL2DN and received #134).

A QSO can be reported only once and not back to the originating station. A maximum of 10 QTCs to a station are allowed. The same station may be worked several times to complete this quota. Only the original contact, however, has QSO value.

Keep a uniform list of QTCs sent; 3/7 indicates that this is the third series of QTCs sent and that seven are being reported.

If more than 100 QTCs are claimed, a check list must show that the maximum quota of 10 per station is not exceeded.

Club Competition: This rule requires the club to be a local group and not a national organization. Eligible club members must operate within a 500 km diameter. To be listed, a minimum of three logs must be received from a club. Entries must clearly indicate their club name on the summary sheet. A special trophy will be awarded by the DARC to the winning clubs from Europe and non-Europe.

Awards: Certificates will be awarded to the top scorers in each class in each country. Each participant with at least half the score of the continental leader will also receive a certificate. Plaques will go to continental winners in the single- and multi-operator classes and the winning EU and non-EU clubs.

Logs: It is suggested that you use the offi-

cial DARC or equivalent log form. Use 40 contacts to the page and a separate sheet for each band. Submit a dupe sheet for each band with 200 or more contacts. A summary sheet showing the score and a signed declaration are also required (sample log forms are available with an SASE and/or IRCs). You may also send your logs via e-mail. Check out the DARC homepage at <www.darc.de/referate/dx/> for the details. All stations claiming more than 100,000 points must submit a computer readable log for QSOs and QTCs.

WAE Country List: C31, CT1, CU, EA, EA6, EI, F, G, GD, GI, GJ, GM, GM Shetland, GU, GW, HA, HB, HBØ, HV, I, IS,IT, JW Bear, JW Spitsbergen, JX, LA, LX, LZ, OE, OH, OHØ, OJØ, OK, OM, ON, OY, OZ, PA, S5, SM, SP, SV, SV5 Rhodes, SV9 Crete, SY Athos, T7, T9, TA1, TF, TK, UA1346, other EU-CIS republics, YU1267, ZA, ZB2, 1AØ, 3A, 4J1M-V, 4U1 Vienna, 9A, and 9H1.

The mailing deadline for logs is September 15th for CW entries and October 15th for SSB to WAEDC Contest Committee, Durerring 7, P.O. Box 1126, D-74370 Sersheim, Germany.

Maryland DC QSO Party

1600Z Sat. to 0400Z Sun. Aug. 12–13
1600Z to 2359Z Sun. Aug. 13

The Maryland/DC QSO Party is sponsored by the Antietam Radio Association. Non-Maryland stations work Maryland/DC operators. Maryland/DC stations may work anyone. Stations may be worked once per band/mode, and mobiles/portables that change counties may be worked again for QSO credit. You may only operate single operator outside of Maryland. Inside Maryland, entrants may operate single operator, portable, or mobile.

Exchange: QTH (county for MD stations, state/province/DXCC country for others) and operating category (Club, QRP, Mobile, Novice/Technician, and Standard).

Frequencies: SSB: 3920, 7230, 14260, 21370, 28380, 50150, and 146550 kHz. CW: 3643, 3701, 7035, 7126, 14040, 21115, and 28040, and 28115 kHz.

Scoring: Each Maryland county, Baltimore city, and D.C. are multipliers (25 maximum). Multipliers may be claimed once; they do not repeat on each band. Score 10 points for club station QSOs, 5 points for mobiles, 4 points for QRP/Novice and Technician QSOs, 3 points for a CW contact, and 1 point for any other valid contact. QSO points are cumulative (i.e., mobile MD stations count 5 points). Note that each Canadian province is no longer a separate multiplier. Final score is total QSO points times multiplier.

Awards: Plaques are available to the high-scoring MD-DC, non-MD-DC, and MD-DC club. Certificates will be awarded to the high scorer from each state and Canadian province. In addition, there will be certificates awarded to the high score from a MD mobile, top 10 MD logs, Novice, Technician, DX station, QRP per state, high score per non-MD entry, and MD YL.

Logs are to be postmarked by September 1st and sent to: Antietam Radio Association, P.O. Box 52, Hagerstown, MD 21740-0052. Be sure to indicate your operating class on the summary sheet. If you want the final results, include an SASE with your entry.

New Jersey QSO Party

2000Z Sat. to 0700Z Sun., Aug. 19–20
1300Z Sun. to 0200Z Mon., Aug. 20–21

This is the 41st annual party sponsored by the Englewood ARA. Phone and CW are part of the same contest. The same station may be worked on each band and mode, and NJ stations may contact in-state stations for QSO and multiplier credit.

Exchange: QSO number, RS(T), and QTH; county for NJ, state/province or country for others.

Scoring: All stations credit 3 points for each contact. Multiply total QSO points by multiplier to compute final score. Out-of-state stations multiply total NJ QSOs by number of NJ counties worked (maximum 21).

Frequencies: 1810, 3535, 3950, 7035, 7135, 7235, 14035, 14285, 21100, 21355, 28100, 28400 kHz and 50–50.5, and 144–146 MHz. Suggest phone on even hours, 15/10 meters on odd hours, 160 at 0500Z.

Awards: Certificates to the top scorers in each NJ county, ARRL section, and DX country. Second-place awards if four or more logs are received from that section. Also, there are Novice/Tech. and mobile awards. Four plaques have been donated by the NNJ/SNJ section managers for the winning stations in those sections.

Use UTC time and indicate the multiplier only the first time it is worked. Be sure to include a QSO check sheet, and a summary sheet showing scoring, etc. Send a large SASE if you wish a copy of the results.

Stations planning activity in NJ are requested to advise the EARA by August 1st so that coverage in all counties may be planned.

Logs must be received no later than Sept. 12th and go to: Englewood ARA, P.O. Box 528, Englewood, NJ 07631-0528.

Ohio QSO Party

1600Z Sat. to 0400Z Sun., Aug. 26–27

This one is sponsored by the Mad River Radio Club.

Classes: Single-Operator, Multi-Operator, and Mobile Rover.

Exchange: Ohio stations exchange serial number and county. Stations outside of Ohio exchange serial number, and state/province. **Frequencies:** CW 3.545, 7.045, 14.045, 21.045, 28.045; SSB 3.850, 7.225, 14.250, 21.300, and 28.450.

Scoring: Work stations once per band and mode. Score 2 points per CW QSO and 1 point per phone QSO. For Ohio stations, multipliers are 49 US states, 13 VE provinces,and 88 Ohio counties. For stations outside of Ohio, multipliers are 88 Ohio counties. Multipliers are counted only once per mode. The final score can be calculated by multiplying QSO points by total multipliers.

For complete rules and free logging software check out <http://www.qsl.net/mrrc/oqp.html>. Send your logs to Jeff Clarke, KU8E, 2896 Minerva Ave., Columbus, OH 43231, or via e-mail: <ku8e1@yahoo.com>.

QRP

BY DAVE INGRAM, K4TWJ

The Art of Low-Power Hamming

QRP Conferences and Forums are Hot!

There's no doubt about it, gang: Interest in QRP is expanding on almost a daily basis. That fact is apparent in the growing number of on-the-air activities and low-power rigs being introduced every month and in the number of big-time symposiums, conferences, and forums devoted entirely to QRP. Emerging as leading events of the day are QRP's well-known "Four Days in May" held in conjunction with the Dayton Hamvention, Pacificon in California during the fall, and the new Atlanticon in Pennsylvania in the spring. A similar meeting of movers and shakers in the QRP world was held recently in Arkansas, and another event called Celticon is slated to be held in Ireland in September. The overall concept of these weekend conferences is upbeat, educational, and quite inspiring, with an extensive amount of information shared in a short period of time. If you have an opportunity to attend one of these events during the months ahead, go for it. They all are genuine "hands on" affairs with noticeable influence on future trends in QRP.

I had planned to attend Atlanticon last March, but an airline strike got in the way. (The strike was settled after Atlanticon began. What luck!) Through reports from George Heron, N2APB, and a booklet of proceedings, though, I was able to attend by proxy, so-to-speak. This was only the second Atlanticon, but the New Jersey QRP Club (its sponsor) went all out to ensure its success. The general format was similar to the other previously mentioned conferences. Equipment manufacturers displayed and sold kits and goodies Friday evening, and then forums by some well-known QRPers filled the day Saturday. A hospitality bash, tech workshop, plus two show-and-tell homebrew contests rounded out the event.

There were approximately 145 attendees for Atlanticon 2000, and everyone emerged with a healthy collection of new ideas and information, plus special treats to make QRP life even more exciting. Following is a nutshell synopsis.

Skip Arey, N2EI, Chuck Adams, K7QO, and Jim Kortge, K8IQY, discussed "Manhattan-style" homebrewing techniques plus a simple Manhattan-style project and a 2N2222-based 6 meter transverter project. Joe Everhart, N2CX, and Gary Diana, N2GJU, discussed Joe's new "SOP" receiver kit plus a microcomputer controller to make it a "smart" monitor receiver for CW or SSB. Dave Benson, NN1G, discussed mating PSK-31 with QRP, and Mike Gipe, K1MG, shared insight on operating QRP successfully. Ed Hare, W1RFI, of the ARRL discussed the League's position on QRP and the amazing saga of Doug DeMaw's "original W1FB Tuna Tin 2 Transmitter." Finally, Doug Hendricks, KI6DS, announced plans for NorCal to produce an all-surface-mount QRPp transreceiver kit, while the New Jersey QRP Club will produce enclosure kits for the rig.

Equipment dealers represented at Atlanticon included Emtech, Morse Express, Small Wonder Labs, Kanga U.S., Embedded Research, and the American QRP Key Mfg. Co. Also displaying products were Elecraft, FAR Circuits, and Red Hot Radio (hmmm—that new name sure sounds famil-

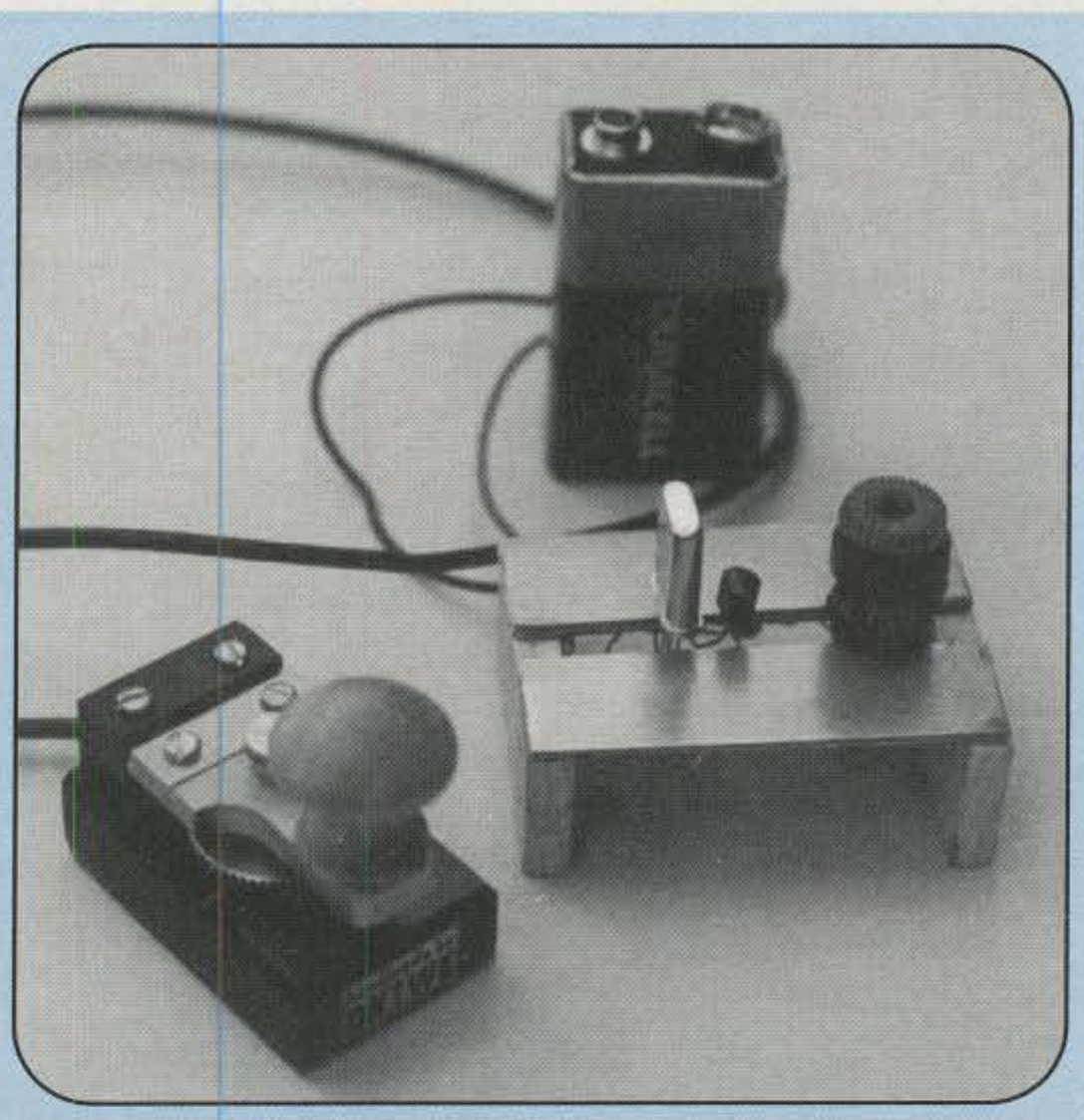
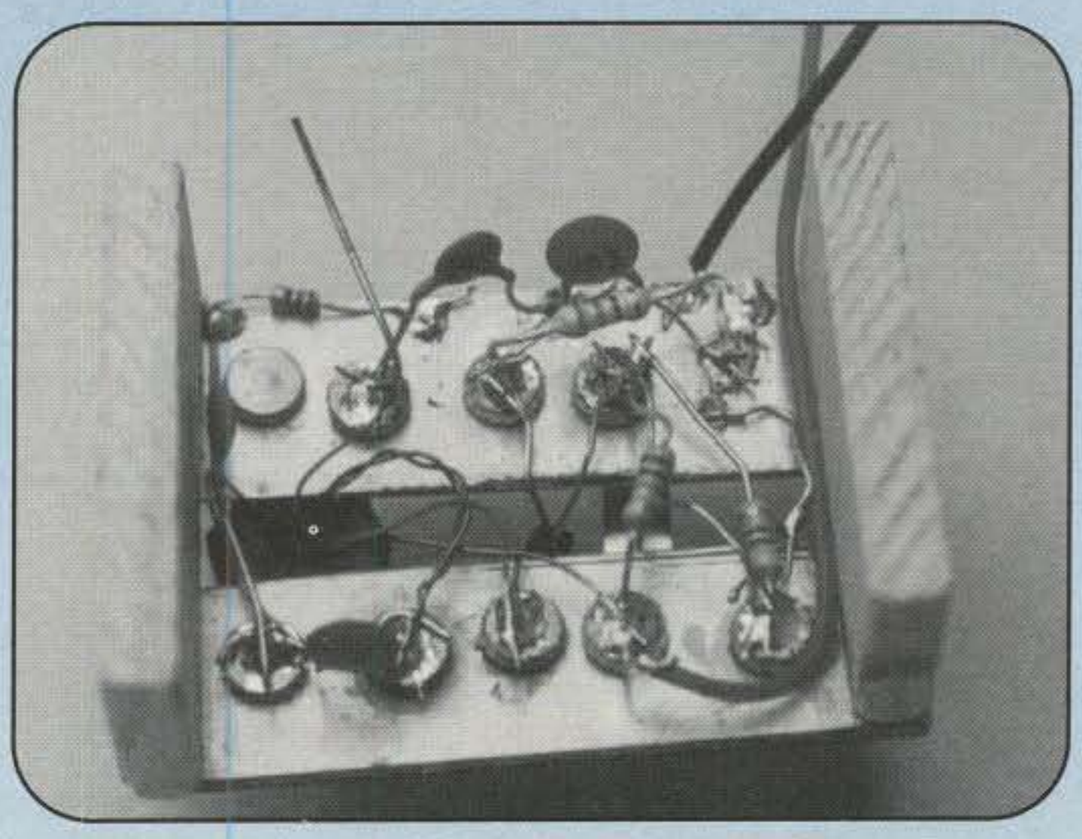


Photo A– Each preregistered Atlanticon attendee received a small QRPp transmitter kit called "SNAP" to assemble "Manhattan style" and enter in a homebrew contest. After looking at the kit, I decided to chop my board in half and build a miniature "retro" version of a famous 1950 wood-framed 6L6 transmitter. I teamed it with a miniature "Micke" from DK1WE, then both SNAP and I missed Atlanticon. Drat!

Photo B– An underside view of my miniature "retro" transmitter assembled Manhattan style. Circuit wiring is between eight tinned pads plus ground. Don't look too close here, or you may say my work is not just ugly construction, it's awful!



4941 Scenic View Drive, Birmingham, AL 35210

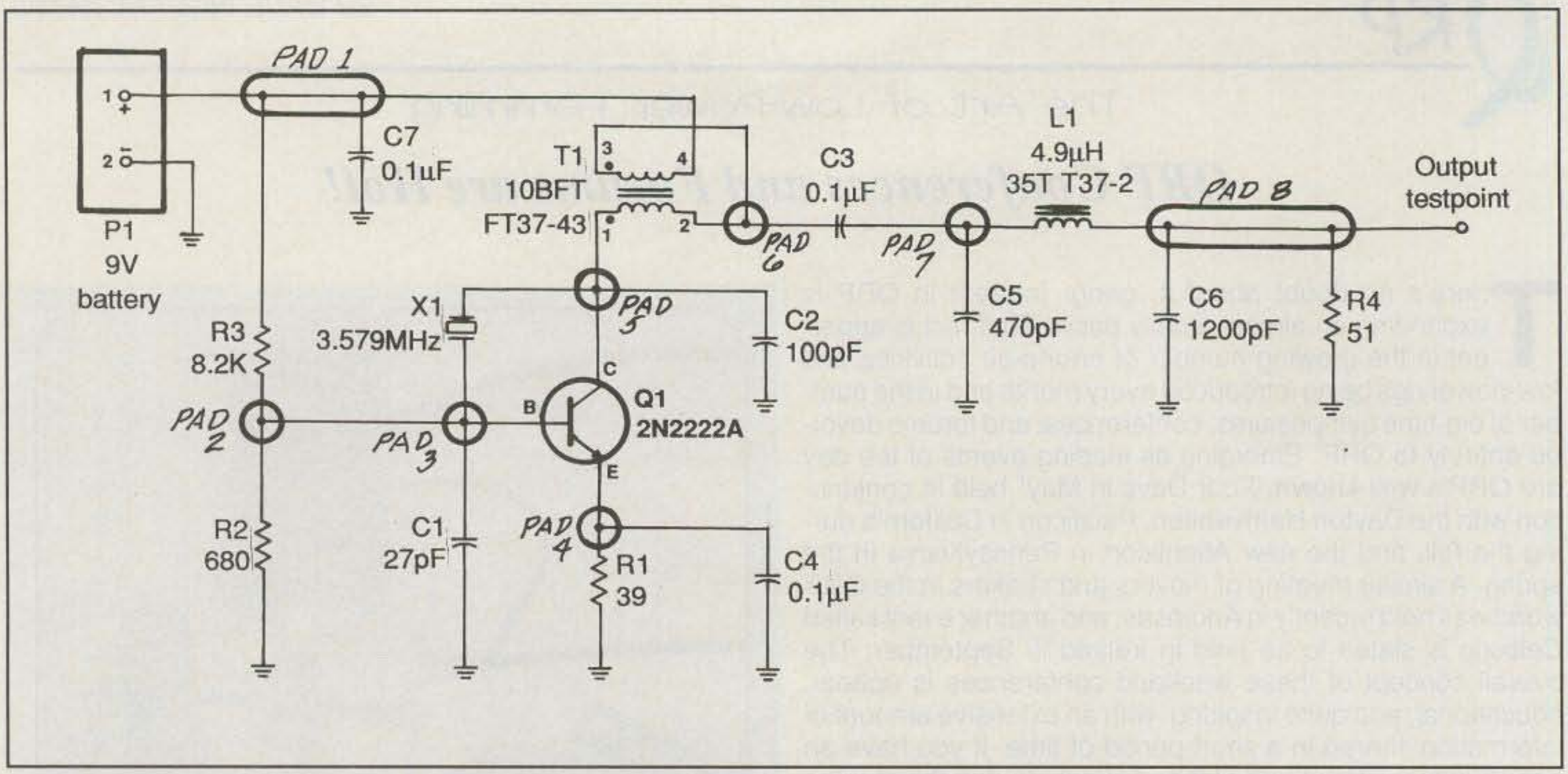


Fig. 1– This outline shows how a circuit might be assembled Manhattan style. Eight pads (represented here by 8 circles) are glued down to a "foundation" board of double sided and unetched pc board material. Components are then installed between pads and ground to make the full circuit. (Discussion in text.)

iar). Adding to the festivities was a special-event station using Doug DeMaw's special reassigned call, W1FB/3. Overall, I would say it was like an exclusive QRP hamfest!

I sense your questions on the forums and rigs, so let's shift into the "closer look" category.

Adventures in Manhattan

So what is Manhattan-style construction and what are its attributes? I could say it is similar to surface-mount assembly except different, but that might seem like humorous confusion (everyone needs a good smile!). With Manhattan, an unetched piece of double-sided PC-board material serves as a foundation, and small land, or "pads" of similar double-sided PC-board material are used for component lead connection terminals. The small lands or pads are cut with a hacksaw or snipped from a strip of PC-board material with shears or a cutter. They are then super-glued in position on the main slab of PC-board material. Once you "get the knack" of accurately positioning pads (usually in a pattern roughly

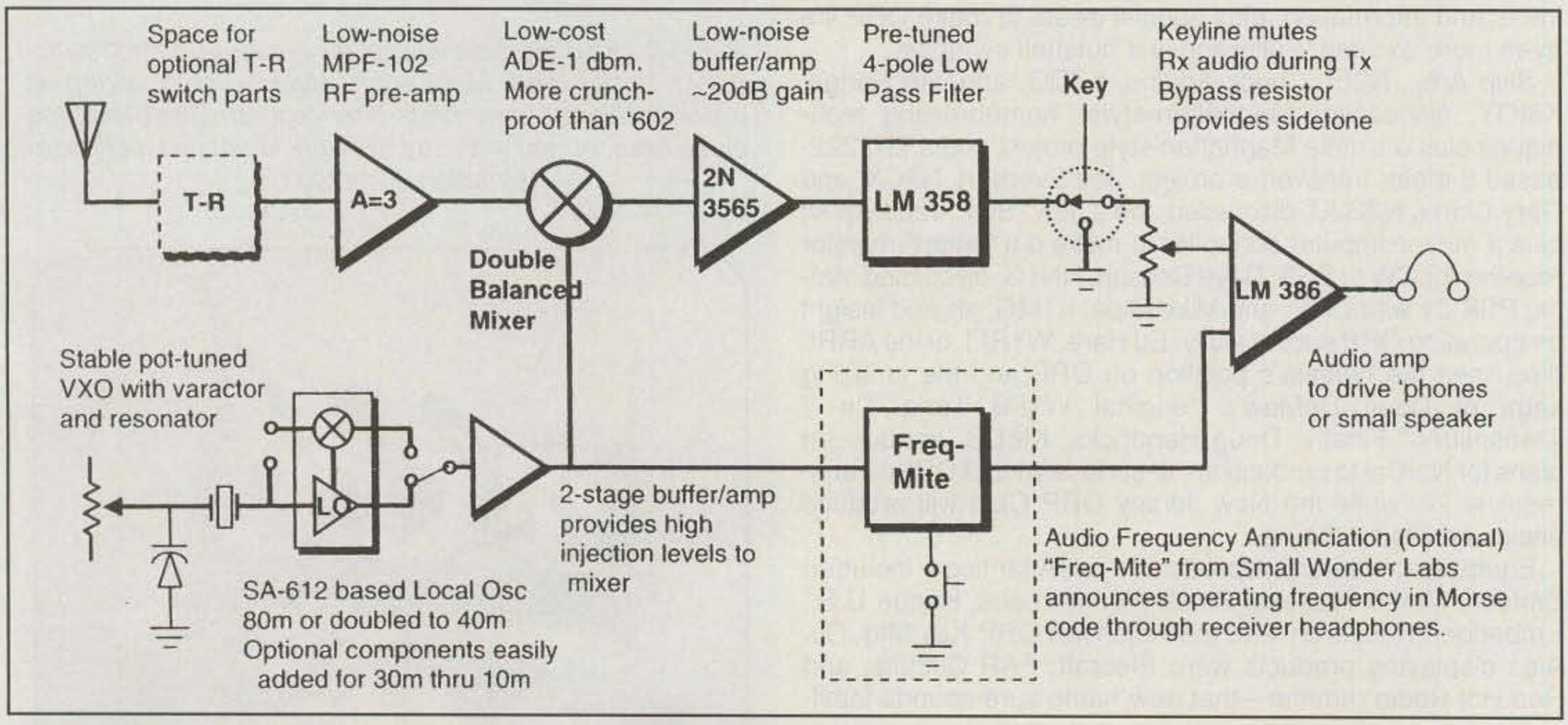


Fig. 2– Functional block diagram of the new SOP receiver kit presently being offered by the New Jersey QRP Club. N2CX and N2JGU are also working on an expanded version with PIC microprocessor control. (Discussion in text.)

Photo C– It's back! This "25 years later" version of the legendary W1FB Tuna Tin 2 Transmitter is updated with toroid coils, supplied with a 7040 kHz crystal, and pumps out a healthy 400 milliwatt signal. It mounts on a tuna-can chassis (not supplied) and is available as a quick-brew kit from the New Jersey QRP Club for $12.

following a circuit's diagram), pretinning the pads, and stabilizing wires on pads when soldering, assembly goes fairly smoothly. There may be a few "getting started" entanglements of pads becoming unglued, wires popping loose from pads, or remembering to view transistor pinouts from their top rather than bottom, but that's just part of the, err . . . fun!

Looking at a fair-size circuit or project after assembly, some components sit horizontally while some stand upright. The overall picture resembles a metropolitan area with small buildings and tall skyscrapers as seen from an airplane, and thus acquired the name "Manhattan-style construction." In the "favorable aspects" department, I would say Manhattan assembly reduces stray capacitance and is thus most beneficial for VHF, UHF, and lower microwave circuits and applications. In that respect, it also beats using a knife or Dremel tool to gouge out pads or "islands" on an unetched board. Building HF products Manhattan style, however, is still a fun, interesting endeavor everyone should try at least once. In fact, all preregistered Atlanticon attendees acquired a hands-on exposure to Manhattan assembly by receiving a small transmitter kit called "Snap" to build and enter in one of the two homebrew contests.

After thinking about this new concept (technology), I decided to model my Snap transmitter after a little wood- framed 6L6 Novice transmitter of 1950s popularity. The arrangement is now 50 years old, but it is still a heartthrob, even in "Snap" form (see photos A and B and fig. 1). Doesn't it kindle your interest in trying Manhattan assembly? Go for it!

Some Interesting Projects

As mentioned earlier, Joe Everhart, N2CX, recently devised an expandable direct-conversion receiver which the New Jersey QRP Club nicknamed "SOP" and now offers in kit form. The receiver is contained on an approximately 1.3 by 2.5 inch PC board and operates from a 9 or 12 volt battery. Its block diagram is shown in fig. 2, and a quick technical description follows.

Incoming signals are first boosted by an MPF 102 preamp stage, then applied to an ADE-1 mixer IC. Meanwhile, a more familiar NE602/SA612 IC is used as a variactor-tuned and crystal-stabilized oscillator to produce a heterodyne/conversion signal for the ADE-1. The difference between the ADE-1's two input signals results in an audio signal which is then output to a 2N3565 buffer, passed through an LM358 low-pass filter, amplified by an LM386, and applied to earphones. Provisions are included on the PC board for adding a T/R switch, muting the receiver, and integrating an "invisible dial" that reads out tuned frequencies in Morse code. That "Frequency Mite" option is available from Dave Benson, NN1G, of Small Wonder Labs. The receiver's "front end" and local oscillator can be configured to tune any band from 80 to 10 meters. (It is supplied with parts for 80 or 40 meter operation.) Nice!

Joe, N2CX, and Gary, N2JGU, (the chap behind those neat Tick keyers from Embedded Research) are now working on adding microcomputer frequency control plus "intelligent signal detection" to the SOP. Ultimately, this should result in an easy-brew receiver that can scan an owner's specified range and output signals to a small speaker only when activity is detected in the scanned range. How is that accomplished? It involves using a PIC chip rather than a tuning pot to vary voltage on a varicap. The varicap, in turn, changes capacitance and thus shifts the local oscillator's frequency. A PIC could also do more—such as evaluate signals in a DSP or algorithm manner and produce an output when a preprogrammed pattern is detected. Intriguing thoughts, eh?

Further details on this project should be available at <www.njqrp.org>. SOP receiver kits (the NJ QRP kit, not the PIC-controlled kit under development) are $28 postpaid in the U.S. and $30 DX, and the Frequency Mite option is $10. A homebrew enclosure kit consisting of PC-board material you solder together is also available for $5. Orders for SOPs and its options should go to NJQRP's George Heron, N2APB, 2419 Feather Mae Ct., Forest Hill, MD 21050.

When ordering an SOP kit, consider also ordering one of the new, updated versions of Doug DeMaw's legendary Tuna Tin 2 Transmitter kits (photo C). The kit goes together in a flash, runs up to 400 milliwatts, and truly belongs in every devoted QRPer's shack or car. Indeed, it is as much a classic among QRPers as Ten-Tec's Argonauts, and it is far less expensive—only $12 in the U.S. Cut the bottom off a clear-plastic soda bottle, and you even have a neat dust cover for the little rig. Who could ask for more?

New Surface-Mount Kit

Is the QRP community ready to pursue building an all-surface-mount transceiver kit? The best way to answer that question is by just pumping out an "introductory kit" and studying how well it is accepted. That is precisely what will be on tap in the days ahead. In fact, this is a joint NorCal and NJ QRP Club project, and it is especially designed to get folks started homebrewing surface-mount gear. Why? Because regular "leaded" components are becoming more expensive and difficult to find. Everything seems to be going the surface-mount route, and radio amateurs must change with the times.

The little rig is called the SMK-1, and it is actually a separate transmitter and receiver on one PC board. It works 7040

kHz with an approximate tuning range of 2 kHz, has full break-in operation with CW sidetone, and delivers a 400 milliwatt output signal. The rig has separate transmit and receive frequency controls, and its PC board (which holds approximately 85 components when assembled) measures only 2.5 by 2.25 inches. That might sound intimidating, but larger-size surface-mount components are used, so assembly is easier than working with tiny "fly speck" components.

Circuit-wise, the SMK-1's receiver is similar to K8IDN's "MRX" receiver (NE612 and LM386 ICs) with T/R protection diodes and an FET added for full QSK. The transmitter uses 2N2222s in a circuit quite similar to W1FB's Tuna Tin 2, with variactor tuning of the crystal frequency plus an oscillator-stabilizing regulator and a couple more 2N2222s for keying.

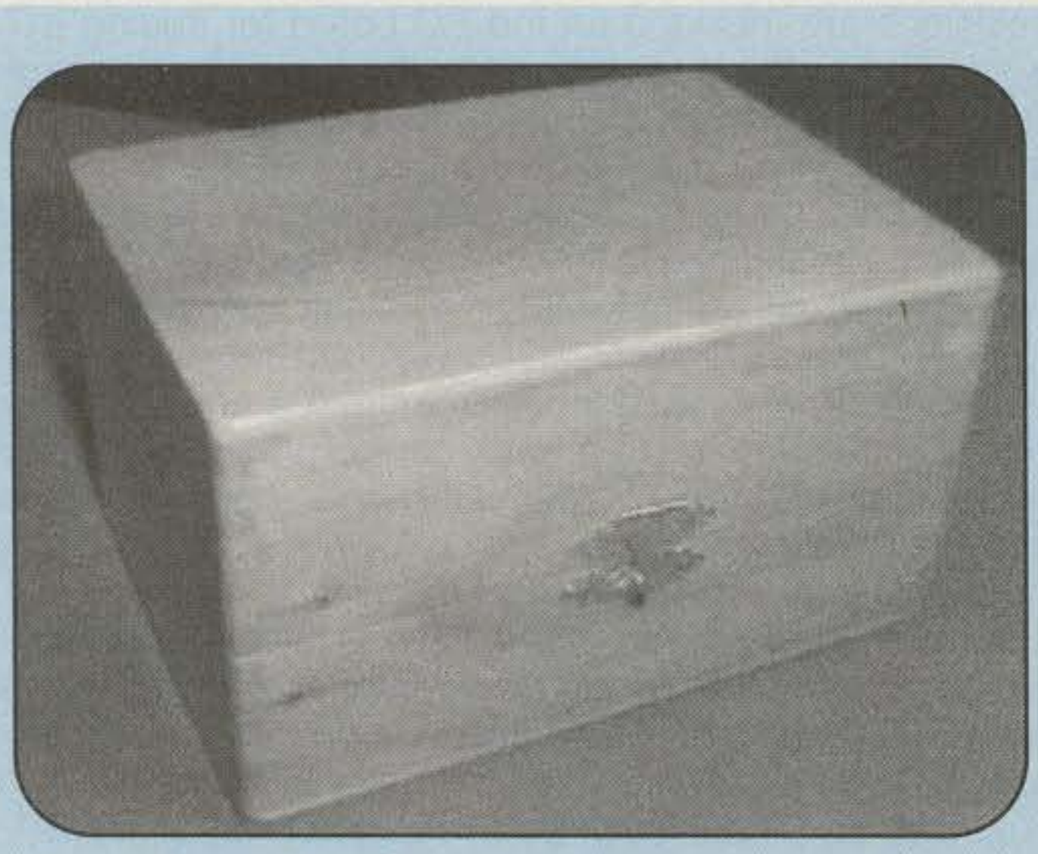


Photo D– Jim, N5IB, built this smart-looking wood box as an enclosure for his Small Wonder Labs GM30 kit transceiver. He lined the interior with copper foil, polished the exterior, and produced a masterpiece. (Photo courtesy N5IB)

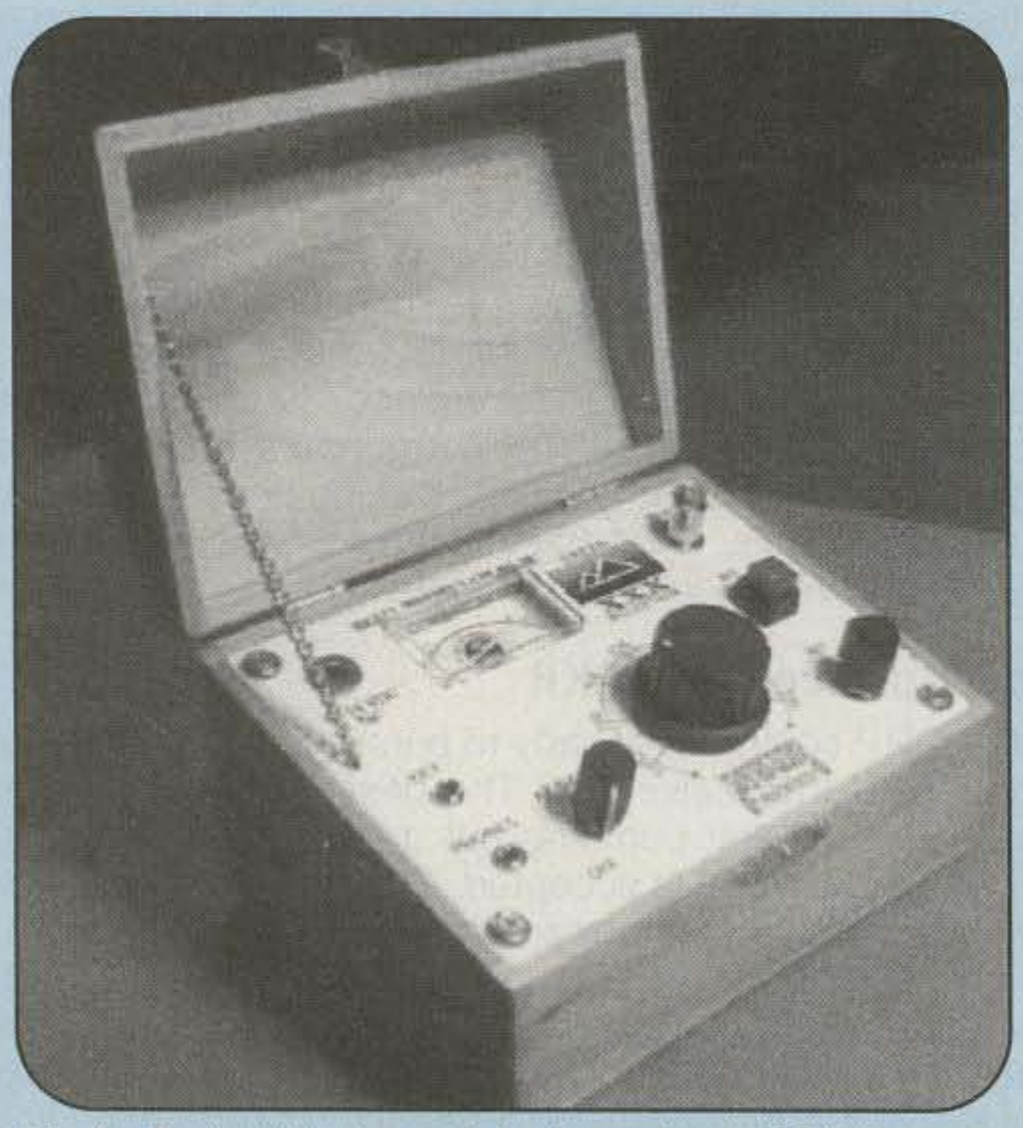


Photo E– Inside view of the homebrew GM30 transceiver and custom enclosure built by Jim, N5IB. All controls and connectors are accessed from the top, and logs can be stored in the lid. (Photo by N5IB)

Photo F– Close-up view of the front panel leads one to believe this is anything but a home-built rig. Panel is white and the Green Mountain logo on the top right is green.

The kit's "innards" (PC board and components) are available for $30 plus $4 s&h in the U.S. from Jim Cates, WA6GER, 3241 Eastwood Rd., Sacramento, CA 95821. Mating enclosure kits complete with hardware and knobs are available for $10 postpaid from George Heron, N2APB (address previously listed). I'm not sure how long kits will be available; check with WA6GER or N2APB for latest news. We hope to have more details on this gem in a future column. Stay tuned!

Outstanding Homebrew

I'm not sure who won the second (non-Manhattan-style) homebrew contest at Atlanticon, but Jim Giamanco, N5IB, definitely gets my vote as a top contender. Check out his beautifully enclosed Small Wonder Labs GM30 transceiver shown in photos D, E, and F. First, Jim installed a homebrewed transceiver in a fancy little wooden recipe box from a craft store. It worked out great. He then built this flip-top enclosure from scratch, and it looks even better. Both boxes are lined internally with copper foil, so they are electrically equivalent to metal enclosures. Notice the lid closes to protect the rig during non-use, the front panel is angled for comfortable operation, and all connections are accessed from the top. There is also room in the lid for storing log sheets and a miniature key. Now this is the perfect way to finish a homebrew rig so you can enjoy it for many years!

Sign-Off Time

We are down to the closing wire, but more QRP goodies and companies are due their time in the limelight. Collecting, verifying, writing, and rewriting information takes time, however, so more late-breaking news and views will be included in future QRP columns. Continue sending your own QRP picture, stay tuned, keep on QRP'n, and may the force of good signals always be with you!

73, Dave, K4TWJ

Beginner's Corner

BY PETER O'DELL, WB2D

For the Newcomer to Ham Radio

Yagis and Quads—An Overview

Yagis and quads are the directional antennas of choice for most hams. Debate rages on in ham circles regarding which is better. The winner is ...

For several decades now hams have experimented with Yagis and quads on HF. Often the debates are more at an emotional level than a scientific one. When properly constructed, both perform quite well—and both have tradeoffs and shortcomings. Over the years I have used both and been quite satisfied with each. So rather than attempting to convince you of the superiority of one over the other, I am just going to give you an overview.

By the way, this is not a "construction" article. If you decide that you want to start building and experimenting with these antennas, I will make two suggestions. First, get all the books that you can find on the subject. Three titles published by CQ Communications (and available from the CQ Bookstore) are *Lew McCoy on Antennas*, by Lew McCoy, W1ICP; *The W6SAI HF Antenna Handbook*, by Bill Orr, W6SAI; and *The Quad Antenna*, by Bob Haviland, W4MB. In addition, the ARRL publishes a number of books on antennas, including *The ARRL Antenna Book*, which has a lot of reference material in it as well as construction plans. Some of it is very readable and some of it is the equivalent of two or three valiums. There's also the very readable *Practical Antenna Handbook*, by Joe Carr, K4IPV (Tab Books).

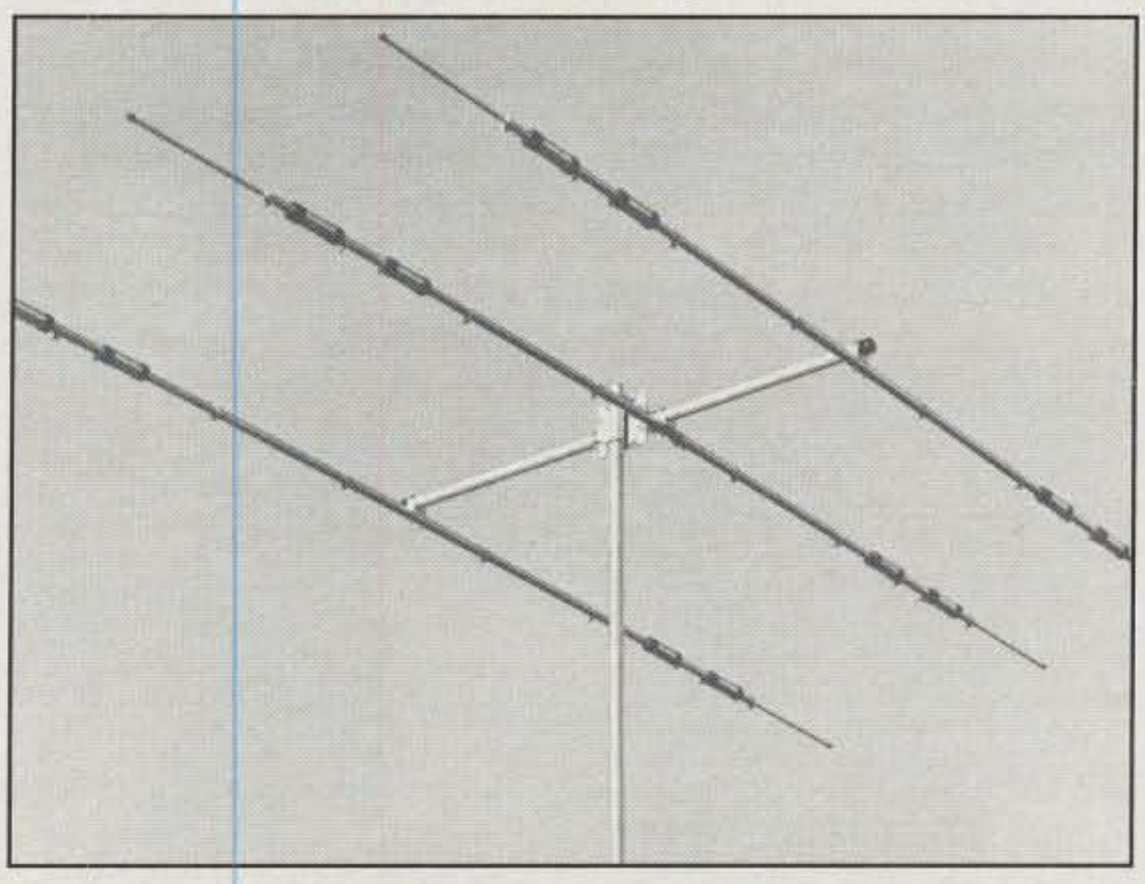
Second, there are a number of computer programs that model antennas and do a good job of predicting gain and patterns. Such programs are beyond my level of interest, so it would be foolish of me to make specific recommendations. I would suggest that you find other hams who have used these various programs and then ask a lot of questions. Learning to use a good modeling program can save you hours and hours of wasted time climbing up and down towers to make adjustments and tweaks. You will find them advertised in *CQ* and other ham publications.

Antennas always have seemed to me to be the equivalent of black magic in many respects: You are never sure *if* they really work, and no one really has a clue as to *why* they work. Then too there is the mystery of where they came from. Some say that the octagonal transderivational sentoid antenna was developed by a U-boat radioman stranded on a desert island off the coast of Africa during WW II. However, others know for sure that the secret design was passed on to the grandfather of a friend of a friend from occupants of a UFO. Sure.

With both the Yagi and the quad, though, we know who developed them and when. We also pretty much know why they work as well as how they work. Believe me, this is a rare thing in the history of antennas.

The Yagi

A Yagi antenna consists of a driven element (essentially a resonant dipole) and one or more parasitic elements. (See last month's column for a brief discussion of driven vs. parasitic elements.) Since the time of Marconi, radio engineers



The A3 World Ranger is Cushcraft's top-selling triband Yagi for 10, 15, and 20 meters. (Photo courtesy Cushcraft)

have known that parasitic elements affect the radiation pattern of a resonant antenna. In 1926, however, two researchers at the University of Tokyo—Drs. Yagi and Uda—systematically designed, built, and tested variations of beam antennas by adding parasitic elements to a dipole antenna. When the parasitic element is longer than the driven element, it is called a *reflector*. Think of the reflector as being like a mirror that shoots the signal back toward the front. With proper spacing, the reflected signal adds to that of the driven element; hence you get the gain pattern going out in the opposite direction from the reflector.

When the parasitic element is shorter than the driven element, it is called a *director*. The signal of the director adds to that of the reflector, giving approximately the same pattern as that of the director/driven-element combination—except the signal goes forward out from the director.

Yagi and Uda found that you could further increase gain by putting both a reflector and a director on the same boom

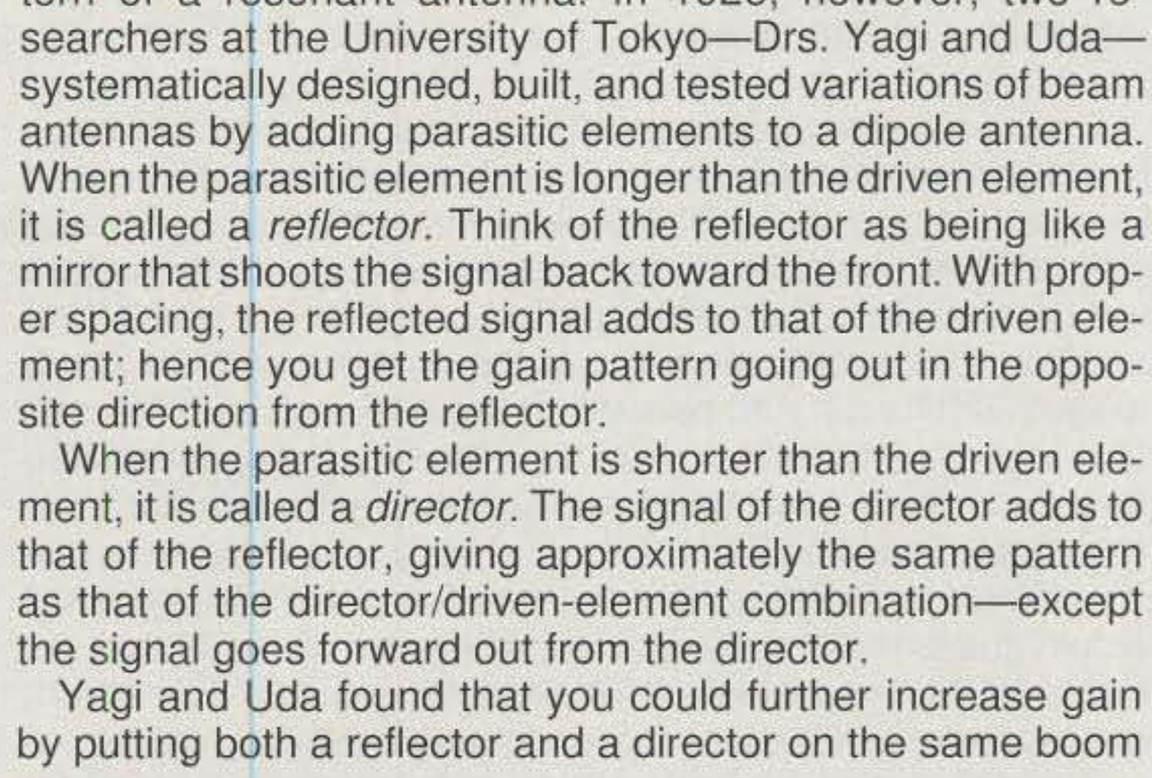


Fig. 1– A simple three-element monoband Yagi antenna.

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e-mail: <wb2d@cq-amateur-radio.com>

with the driven dipole element. In the case of both the reflector and director, the difference in length compared to the driven element is only a few percentage points of the overall length of the driven element.

By 1928, commercial interests, both point-to-point and broadcasters, were experimenting with Yagi designs (Poor Uda—being second banana often means that popular culture forgets you and only historians remember you!). In 1935 *QST* published an article by the late M. P. Mimms (then W5BDB) detailing a broad-spaced two-element Yagi for 20 meters. He called it the "signal squirter," and it caught the fancy of hams across the country. Aluminum tubing was hard to come by in those days. To minimize costs, the tubing was used only for the two elements. The supporting frame for the antenna was made out of wood—pretty cumbersome by today's standards. It worked, however, and it was rotatable. The days of the rhombic antenna as king certainly were numbered.

The two-element design is still available commercially today, primarily for 40 meters. Further experimentation showed that narrowing the spacing between the driven element and the reflector actually improved gain. Aluminum tubing has become a commodity item, so nobody would consider using a wooden frame to support the elements. I did, however, once see an 80 meter Yagi that used Rohn 25 tower sections for the boom. That was at a high-powered contest station, though, and as such can exist as little more than mere fantasy for the average ham and his postage-stamp city lot.

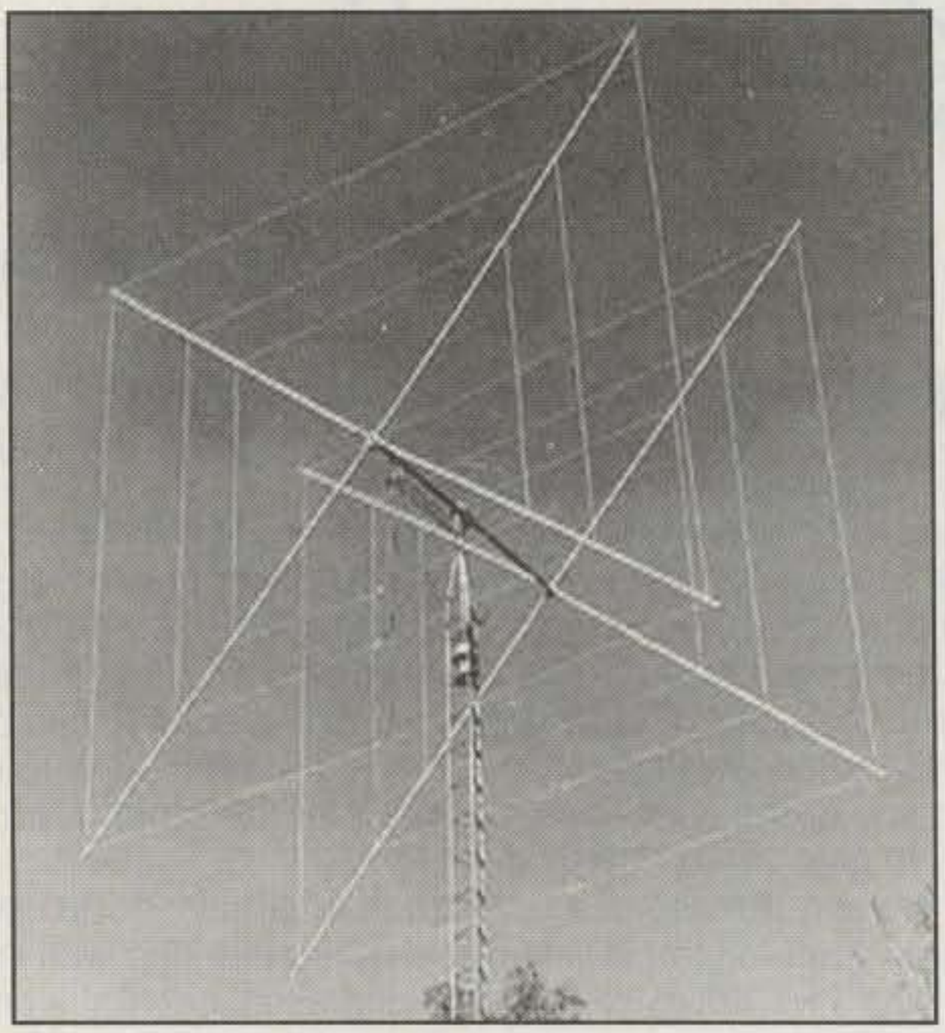
After WW I, interest in HF beam antennas soared. The excess technology of the war became surplus and a driving force in the spread of ham radio around the world. Surplus "prop pitch" motors could easily be turned into rotators. Yagi antennas were built primarily for 10, 15, and 20 meters. It wasn't long before "everyone" was experimenting with multiband Yagis.

One of the most common approaches was/is to add traps to all the elements. Of course, there are certain compromises involved. Ideal spacing of the elements is a function of wavelength. Thus, the spacing that yields ideal gain on 20 meters will produce less than ideal performance on 15 and 10. In addition, other characteristics of the antenna such as front-to-back (F/B) ratio and bandwidth are affected, too. You can also add more elements. Typically, those wanting more than three elements on a band add more directors rather than reflectors. The late 1950s, '60s, and early '70s were an explosive time for commercially designed and built antennas. I would guess that the "typical" ham beam antenna of that era had to be the three-element tribander (10, 15, and 20 meters), but tribanders with six or more elements were available.

Contest- and DX-oriented stations have always opted for monoband antennas. Ideally, each band has its own tower and monobander. Where space for towers is limited, the "Christmas tree" approach of extending the mast several feet above the top of the tower and mounting monoband antennas one above the other is popular. For structural reasons, the largest antenna gets mounted closest to the tower and so on, up to the smallest at the top—hence the "Christmas tree" name tag.

Sometimes hams refer to this as stacking antennas, but that is not technically accurate. Stacked antennas are antennas for the same band that are separated a specific distance from each other physically and electrically. The two antennas are pointed in the same direction, and the gain is increased in that direction.

At HF it is often not practical to have a rotating mast tall enough to stack antennas. Thus, one of the setups you will find in contest stations is to have a beam mounted to the side



The Cubex MKII two-element, three-band quad. (Photo courtesy Cubex Quad Antenna)

of the tower at the appropriate level. This beam is pointed in a direction where lots of contacts can be made.

For instance, an east coast US station might have such a setup with the fixed antenna pointed to Europe. When the band is open to Europe, the rotating Yagi is pointed to Europe, and a remote switch connects the fixed antenna to the rotating antenna through the appropriate length of transmission line. Now the contest station has an even stronger signal into Europe than it would with either antenna by itself. The operator(s) then "run Europeans," collecting a large number of contacts quickly. When the band fades to Europe, the fixed antenna is disconnected and the rotating antenna is used to make contacts in those parts of the world where the band is open. *(Another option for those whose budgets will allow it is a rotating tower, as described in the article "Turn the Tower, Hold the Antennas" on p. 52 in last month's* CQ.*—ed.)*

What is the "typical" Yagi today? I'm not sure that such a thing exists. Prior to the "WARC band" expansion of the 1980s, when hams first gained access to the 30, 17, and 12 meter bands, it most likely was the three-element tribander mentioned above. The tribander probably was tuned for either the phone or CW segment of each band.

When three new HF bands became available to hams in the 1980s, antenna manufacturers had to go back to the drawing board. The number of bands ideally to be included in the design had doubled. There also was renewed interest in making the antennas more *broadbanded* in order to cover both CW and phone segments.

Computer-aided design enabled a new generation of engineers to bring to market working antennas that their fathers would have sworn were impossible to build. Different designers employed different techniques. Some moved away from traps and experimented with things such as linear loading. Others found that the bandwidth could be increased by using two driven elements fed in a log-periodic fashion. And the work goes on.

If you are thinking of buying a multi-element multi-band HF antenna, you may want to look closely at the fine print. Determine how many elements are "active" on each band.

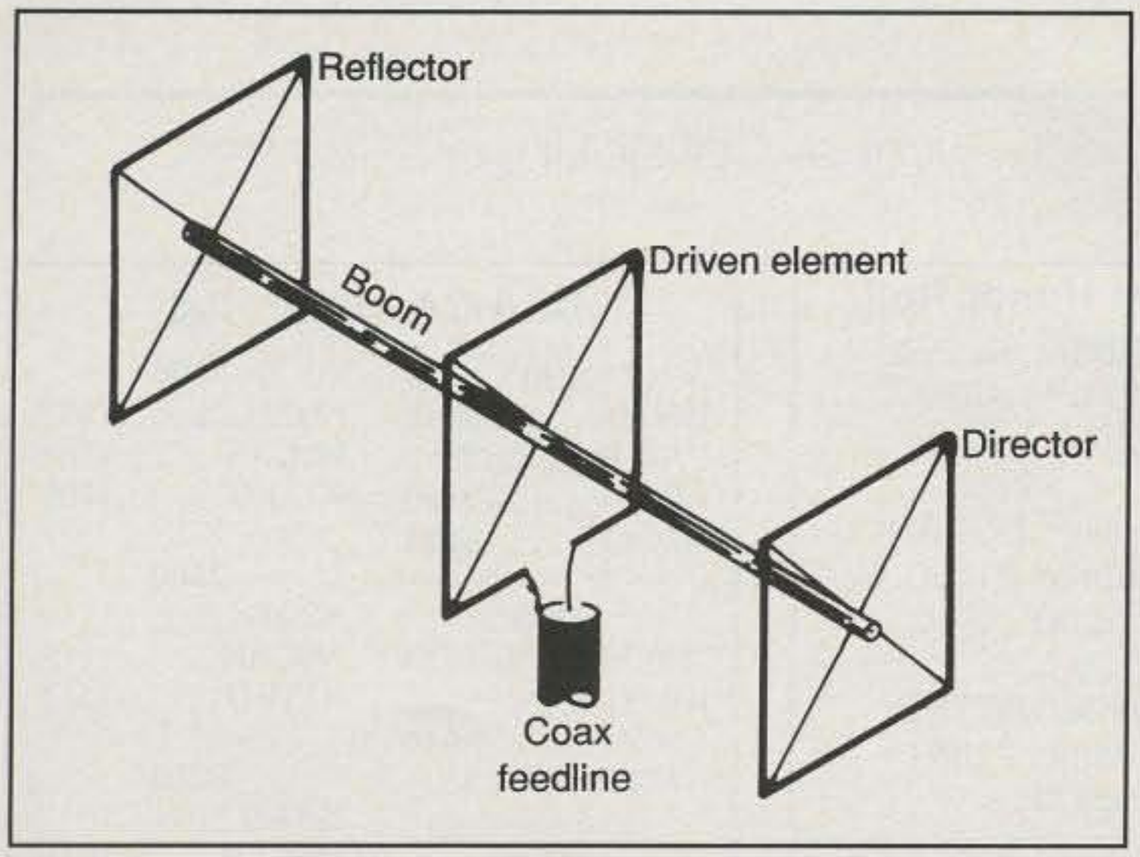


Fig. 2 – A simple three-element cubical quad antenna.

The design may have 15 elements total, but only three or four of them are active on any given band. Again, it is the gain figures for each band that count most.

The Quad

The story of the quad is one of ham ingenuity and perhaps divine inspiration. In 1939 a group of engineers went to Quito, Ecuador to set up the missionary radio station HCJB in the 25 meter shortwave band. Not only is Quito in the tropics, it is also at about 10,000 feet altitude. A four-element Yagi-like parasitic array had been designed and built for the station. Unfortunately, the combination of high power, jungle moisture, and high altitude produced something unexpected—corona discharge. And there was a lot of it—enough to melt the ends of the aluminum elements of the array. One of the engineers, Clarence Moore, W9LZX, devised a temporary fix by attaching aluminum "float balls" from toilet tanks to the ends of the elements. This reduced the corona somewhat, but it was obvious a new design was needed.

In 1942 Moore went away on vacation with a lot of engineering books for company. In the solitude he began to consider the folded dipole. What would happen if the folded element were pulled open into a rectangle? He returned to Quito and quickly constructed a loop antenna with parasitic elements. The cubical quad thus was born. Onlookers were amazed that the corona that had plagued the Yagi from the first moment was totally absent.

Moore built a second quad for his ham station, HC1JB, for the 20 meter band. His impressive signal caused other hams to ask for his design. Soon quads were springing up around the globe. Moore later returned to the US and was granted a patent for the cubical quad.

Quads provide gain and F/B ratios equal to or better than a Yagi of similar size and elements. To create a multi-band quad, you simply add an element for the higher band inside the existing element (or outside for a lower band). There are no traps to worry about. However, the same spacing compromises exist for quads that exist for Yagis. Some quad designers have tackled this problem by tilting the spreader (insulating poles that support the wire elements) out along the boom. With the proper angle, better compromises on spacing can be made.

One of the major downsides of quads is that they are more susceptible to weather damage than Yagis, particularly in areas that get a lot of ice and snow. Stacking them is pretty much out of the question, too. Also, each band requires a separate feedline or remote switching. On another note, neighbors may regard them as *less beautiful* than a Yagi. On the up side, a quad is probably easier to build than a Yagi, particularly a multi-band unit. There are also some commercially available units out there at reasonable prices. If there are certain bands that you do not wish to operate, just leave them out.

From an operating standpoint, you would be hard pressed to notice a difference between a quad and a Yagi of comparable size. But then there are some antennas that just seem to have a magic all their own, and even a mystical quality.

Back in the 1980s, a friend of mine had a triband quad built from the *ARRL Handbook* of that era. It had five elements on 10 meters. We worked stations on 10 when everyone else swore the band was dead. Come to think of it, the next time I go to a hamfest, I am going to look for a late 1970s *Handbook*. I think there was a song popular then entitled "Do You Believe in Magic?"

73, Pete, WB2D

Call for Photos and Stories

We'd like to hear from you about your experiences as a newcomer. If you have questions, we'll try to incorporate them into future columns. If you have photos (color prints or slides okay) of your station or antennas, please send them along and we'll publish the best ones. If you have a solution to a common problem that new hams experience, we'd like to hear about it so we can pass it along. You can contact me at <wb2d@cq-amateur-radio.com> or Peter O'Dell, WB2D, Beginner's Corner, 123 NW 13th St., Suite 313, Boca Raton, FL 33432.

Awards

BY TED MELINOSKY, K1BV

News Of Certificate And Award Collecting

Last month we began our discussion of developing a successful awards program. We spoke about choosing a theme, and design and printing issues were covered. Let's finish up this month with a discussion of pricing and publicity.

Pricing. The first rule is to keep the fee for the award reasonable. Expect to recover the cost of printing and postage. Don't try to finance your club's DXpedition from award receipts. If your award will be of great interest to DX stations, check postal rates carefully. You can have a single standard price for all applicants or a two-tiered price with a lower price for domestic applicants and a higher one for others. The two-tiered approach is very common.

You'll want to send the certificate flat in a large envelope with a cardboard insert for protection. Mailing tubes are handy, but several times more expensive than envelopes. Make up a sample and weigh it to avoid cost shock later.

Don't be greedy. Certificate hunters are a very small portion of the ham population and you'll never get rich from certificates. If you ask over $5 for a certificate, there will be little interest. Look at the prices for the certificates in this month's column. I consider them all to be quite reasonable.

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e-mail: <k1bv@cq-amateur-radio.com>

Publicity. Getting the word out and getting it heard is the key to a successful program. Brainstorm with club members to generate ideas. Some obvious choices: send samples to ham magazines (including this one), send samples to DX newsletters, use rubber stamps or printed labels/stickers for members' QSL cards, use your club's internet site, have members talk it up on the air, print "Good for XYZ Award" information on member QSL cards, and of course, use the bulletin-board facility of packet messages to get the word out. All of these methods will raise awareness of your awards program. Without awareness, there won't be any applicants.

Follow through. Assign a reliable person as the award custodian. Make sure this person replies to applicants within a short period. Require regular reports at club meetings.

Do all of the things we mentioned this month and last month, and your club's awards program will stand out from the rest. Good luck!

USA-CA Special Honor Roll

Thomas (Toby) Spratt, KB2ZL
USA-CA All Counties #999
May 6, 2000

Jimmy Dale Vandiver, N9CAR
USA-CA All Counties #1000
May 19, 2000

William E. Carpenter, K7TED
USA-CA All Counties #1001
May 22, 2000

USA-CA Honor Roll

500

WY4D	3118
EA4LH	3119
KB2ZL	3120
N9CAR	3121

1000

JH8BOE	1544
KB2ZL	1545
N9CAR	1546
K7TED	1547

1500

KB2ZL	1287
N9CAR	1288
K7TED	1289

2000

KB2ZL	1187
N9CAR	1188
K7TED	1189

2500

KB2ZL	1112
N9CAR	1113
K7TED	1114

3000

KB2ZL	1017
N9CAR	1018
K7TED	1019

The total number of counties for credit for the United States of America Counties Award is 3076. The basic award fee for subscribers is $4.00. For nonsubscribers it is $10.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated March 1, 1997. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 65 Glebe Road, Spofford, NH 03462-4411 USA. DX stations must include extra postage for airmail reply.

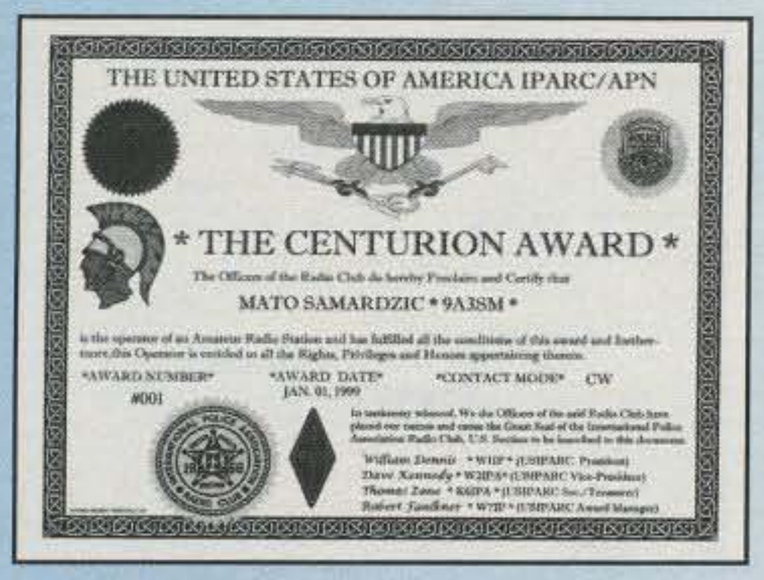
Pat, K7VAY, USA-CA #998.

USA-CA News

The speculation is over, and USA-CA now recognizes over 1000 stations that have worked all US counties. A sincere congratulations to Jim, N9CAR, whose place in county hunter history has been assured as the #1000th station to go all the way. In recent weeks (this is written in late May), I've noticed many new calls on 14336 kHz signing /AG. These are stations who have upgraded recently and who probably have been listening in on the fun on the top of 20 meters. This is our future, and from these ranks likely will come USA-CA top achievers in the years to come. Welcome aboard!

From Pat Pugh, K7VAY USA-CA All Counties #998 . . .

The first county I ever worked was Fulton, Georgia, my home county, back in early 1959. That was my first contact



The Centurian Award is available for contacts with 10 IPARC designated "club" stations plus 20 regular IPARC member stations.

The object of the Certificate of Proficiency (COP) award series is to work an IPA/RC member in each of the 50 states. It is offered in six levels.

The Golden Badge Award is one in the series of awards offered by the International Police Assn. Radio Club.

as Novice (KN4FXT), just after my 14th birthday. What county K4UJP was in didn't matter, since nobody tallied counties then and I was so nervous that I was fortunate just to complete the QSO. Forty-one years later I worked Eldon, N8STF, for county number 3076. He was in Alpena, Michigan. I was just as nervous working Eldon as I was during my first-ever contact as a new ham.

A year later, in 1960, our family relocated to Istanbul, Turkey, where I became not-so-legal TA2CA. There was no way to keep me off the air, so low power, CW, and infrequent QSOs became the rule. Amateur radio was frowned upon in Turkey at that time.

My career in the Air Force began in 1966 with a move to Hawaii after training. It was here in 1968 at KH6GOV that I came across the ICHN net on 20 meters SSB. I worked a few mobiles as a fixed station, but the bug had not bitten yet so I went along my way. Working 500 counties, not to mention them all, seemed to me to be an unreachable goal. In addition, my travels in Southeast Asia and throughout the Pacific didn't give me enough on-the-air time to even start county hunting.

In 1973, while returning from a fishing trip to Mariposa, California, I happened across the ICHN 40 meter SSB net. The net controller asked me if I would like to run that county. I worked a few stations, not fully understanding the procedures, and disappeared deep into the CW bands once again.

Graduation from California State University, a year in Thailand as HS2AKP, and the next nine years in several locations in Germany as DA2AA kept me busy. Mini-DXpeditions to C31, HBØ, and SV5 rounded out an enjoyable long stay in Europe. It was in Germany that I was certified as an intelligence Collection Officer by the National Security Agency. I was an electronic intelligence signals analyst, and retired from the Air Force in 1988 while I was in Texas.

A few years later my friend and neighbor in Ohio, Bill Smith, W4HMV, was getting close to achieving USA-CA All Counties. He convinced me to pursue working all the counties. He took me as co-pilot on one of this trips through Ohio and Kentucky; he worked SSB and I worked CW. That was it! I was hooked and even ran some rare Ohio counties later on my own. The late Ed Saunders, WA6VJP, taught me how to do it right on CW.

In early 1994 we moved to Hawaii, and my county hunting nearly came to a halt because of the time difference between Hawaii and the mainland and my work schedule. I did spend a weekend on the peninsula at Kalawao County in a dedicated effort, though, as the only counties I was logging in Hawaii were through normal QSOs and a little contesting. It wasn't until 1998 with our move to Arizona that I was able to join the race again, this time mostly on SSB.

My special thanks to Bill, W4HMV, for providing the spark, and to KA3MMM, N8STF, KF8CW, AF9T, and WB4FFV for giving me the last several counties. When the dust settles a bit more, I'll join the chase again and run some counties myself.

My other interests are stamp collecting and model railroading, and I have a fair collection of Vibroplex bugs. My XYL Sara is also retired from the Air Force, but she is not a licensed ham. I presently work at the Air Force golf course in Tucson, Arizona. County hunting and golf in sunny Tucson . . . What a life!—73/88 de Pat, K7VAY

International Police Assn. Radio Club Series

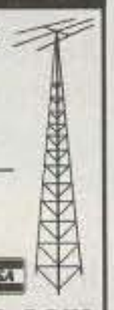
Police and other law enforcement officials have their own organization—the International Police Association Radio Club. There are branches in quite a few countries. W6RF is the award manager for the USA branch, and Bob has provided the rules and samples as follows. Listen for special event stations with "IPA" as their suffix. These invariably will be good for one or more of the following awards.

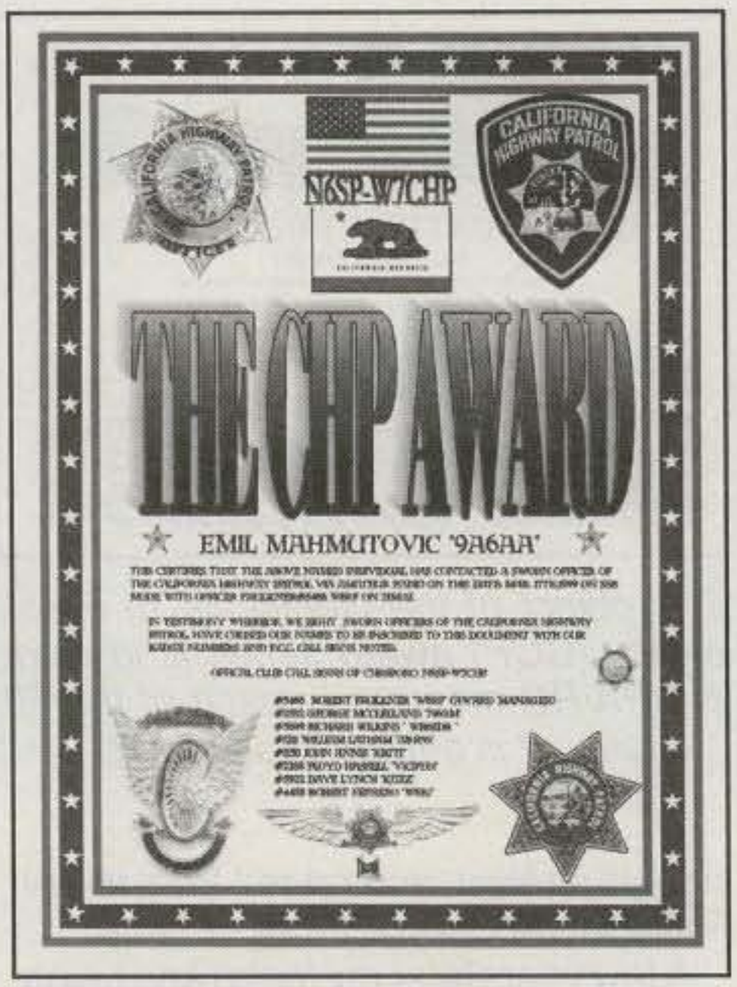
General Requirements. The IPA is an organization of amateurs who also serve their communities in the law enforcement field. A list of members is available from IPA, Box 463, Sanbornville, NH 03872 (SASE/US or 2 IRCs). Awards are available for all CW, SSB, or Mixed modes. A good place to look for member contacts is on their net on 21410 kHz at 1700Z on Wednesdays and Sundays. Contacts after 1 November 1985 are valid. No band or mode restrictions. GCR list is acceptable. Fee per award is $US3 for US and $US5 for DX. SWL okay. Apply to: IPA/RC Award Manager, Robert Faulkner, W6RF, 15733 Rancho Ramon Drive, Tracy, CA. 95376.

The J. Edgar Hoover (10 Most Wanted) Award. Contact an IPA/RC member in each of the 10 call areas of the US. QTH at time worked will determine the district; if N6EIK is worked portable or mobile in Nevada, this would count for the 7th call area. Alaskan KL7's count as a 7 and Hawaii KH6's count as a 6.

Centurion Award. Available to any amateur or SWL who contacts/logs 10 IPARC designated "club" stations plus an additional 20 regular IPARC member stations. Contacts on or after 1 April 1997 are valid. All bands and modes.

Certificate of Proficiency (COP) and the Golden Badge Award. The object of this series is to eventually work an IPA/RC member in each of the 50 states of the US. It is available in six levels as follows:

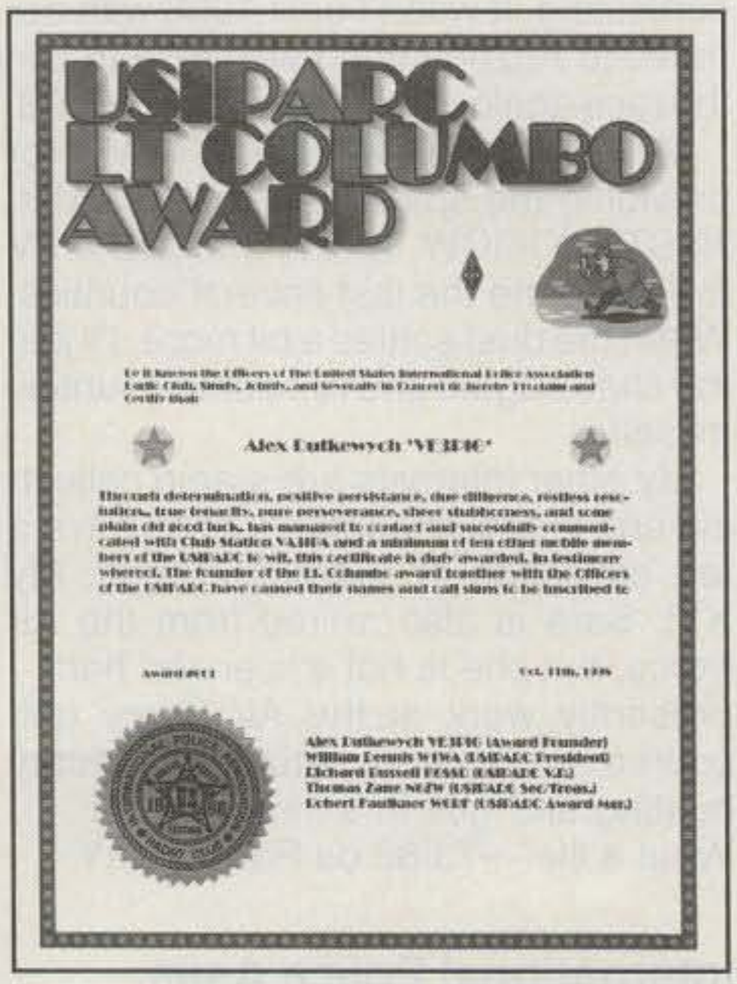




The CHP Award is offered to any ham/SWL who contacts a sworn officer of the California Highway Patrol and logs his/her badge number.

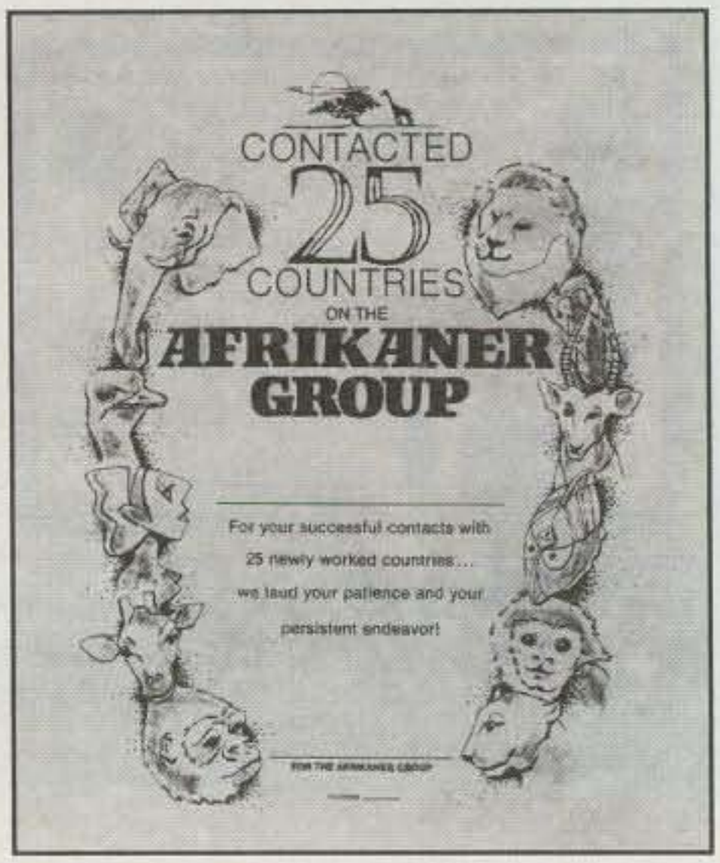
1. COP 5, Basic Award: Work an IPA/RC member in 5 different US states.
2. COP 15: As above, but 15 states.
3. COP 25: As above, but 25 states.
4. COP 35: As above, but 35 states.
5. COP 45: As above, but 45 states.
6. Golden Badge Award: As above, all 50 states.

CHP Award. Awarded to any amateur or SWL who works/hears a sworn officer of the California Highway Patrol (active or retired) and logs his/her ID/badge number. (There are over 50 officers who hold FCC callsigns and life-time badge numbers.) All bands and modes. US send officer's badge number plus log date and fee of $US3; DX same but with fee of $US5.



The Lt. Columbo Award is another in the series of awards offered by the International Police Assn. Radio Club.

Lt. Columbo Award. Available to any amateur or SWL who works/hears club station VA3IPA along with 10 other IPARC members who are operating mobile at the time of the QSO. (TV fans will remember the car connection with actor Peter Falk's *Columbo* series.) US GCR list and fee of $US5; DX same with fee of $US7. Applications are available from the sponsor for an SASE.



Work 25 different DXCC countries on the Afrikaner DX Net to earn the Afrikanergroup certificate.

Afrikanergroup Certificate

Now that we're enjoying the top of the sunspot cycle, listen up on 21355 kHz for the Afrikanergroup Net. Ron, KZ5RO, provided the rules for their certificate, which has been issued for 25 years now. For more information on the group, check out their website at: <http://www.afrikanergroup.com>.

Work 25 different DXCC countries on the Afrikaner DX Net, which is active every day of the week on 21355 kHz. When you've made the necessary contacts, just send a list of the QSO data plus $US1 to: Ronald M. Guilliams, KZ5RO, Rt. 3, Box 279 Aa, Farmville, VA 23901-9356.

Internet URL of the Month

The official awards program of the Radio Club of Costa Rica may be found at: <http://www.qsl.net/ti0rc/diploma.htm>. A quick check of my QSL collection shows that I've got seven TI call areas confirmed; that's good for their handsome TTI Award. How about you?

73, Ted, K1BV

News *(from page 4)*

California—that in cases of interference between a coordinated and an uncoordinated repeater, the rules require the owner of the uncoordinated machine to take whatever action is necessary to resolve the problem, up to and including shutting down the repeater. In all three cases, the Commission says interference problems have been brought to the licensee's attention, but that nothing has been done to resolve it. In the California case, it is noted that the repeater in question was *turned down* for coordination because of the potential for interference with communications in Mexico, and that a previous request for action and information on the case has been ignored.

FCC Tries to "Shoot Down" Unlicensed Glider Pilots

Glider pilots operating out of a "gliderport" in La Jolla, California, are apparently continuing to use amateur frequencies without getting licenses, and at least one ham is reportedly talking with these unlicensed operators. In a warning letter to the operators of the Torrey Pines Gliderport, FCC Special Counsel Riley Hollingsworth, K4ZDH, notes that the gliderport had already been warned once about unlicensed operations, and says that if the violations continue, the FCC "will seek criminal prosecution in cooperation with the United States Attorney in your jurisdiction." Plus, Hollingsworth has written to Erwin McDavid, N6AUE, warning him not to communicate with unlicensed pilots on amateur frequencies. Hollingsworth warned McDavid that "such communications, if willful, will jeopardize your amateur radio license."

Is Ham Radio Healthy?

A researcher from the National Cancer Institute is conducting what he terms an "inexpensive kind of quick study," comparing causes of death among radio amateurs in California to causes of death of all Californians over a certain time period. According to the ARRL's Audio News Service, researcher Kenneth Cantor wants to see if the causes of death among hams differs significantly from that of the general population. He is using an initial "cohort" of more than 100,000 people, comparing FCC licensing data with California state death records. The ARRL is cooperating with the study, although RF Safety Committee Chairman Greg Lapin, N9GL, a researcher himself, warned that this type of study has the potential for misleading results and that no absolute conclusions should be drawn from it.

For more news and updated information, see the news page on the CQ website at <http://www.cq-amateur-radio.com>.

Announcements *(from page 10)*

Aug. 20, **Warren ARA Hamfest**, Trumbull Campus, Kent State University, Warren, Ohio. Contact Renee McCaman, KB8SVF, 330-755-2433; e-mail: <mccaman@cboss.com>. Talk-in 146.970, 443.000.

Aug. 26, **CMRA Hamfest/Missouri ARRL State Convention**, National Guard Armory, Prathersville, Missouri. Contact Dewey Bennett, WMØH, 573-445-7030; e-mail: <dbenne01@coin.org>. Talk-in 146.76–. (Exams)

Aug. 26–27, **Duke City Hamfest**, Rio Rancho National Guard Armory, Duke City, New Mexico. Contact Marcus Lieberman, KM5EH, 505-836-1724; e-mail: <km5eh@arrl.net>; on the web: <www.qsl.net/dchf>. Talk-in 145.33–, 444.00+. (Exams)

Aug. 27, **Skyview Radio Society Hamfest /Swap&Shop**, Skyview Clubhouse, New Kensington, Pennsylvania. Contact Bob, N3WAV, 724-339-9607 eves. Talk-in 146.64–, PL 131.8.

Aug. 27, **La Porte ARC Summer Hamfest**, La Porte County Fairgrounds, west of La Porte, Indiana. Contact Neil Straub, WZ9N, 219-324-7525, e-mail: <nstraub@niia.net>; <www.geocities.com/siliconvalley/byte/1653>. Talk-in 146.52, 146.61–, PL 131.8.

Aug. 27, **Woodstock Hamfest 2000**, McHenry County Fairgrounds, Woodstock, Illinois. Contact Bob, N9KXG, 708-944-0500; <http://www.superhamfest.com>. Talk-in 146.52.

Aug. 27, **Lapeer Ham Swap & Computer Show**, Hadley, Michigan. Contact Lapeer Co. ARA, P.O. Box 12, Hadley, MI 48440; e-mail: <w8lap@arrl.net>; <http://www.lapeer.com/lcara>. (Exams)

On the Cover:

This month may well be the peak of sunspot Cycle 23, and since sunspots are so important to ham radio propagation, we thought it would be a good idea to include "Ol' Sol" on this month's cover as well as a ham! The ham in this case is Ed Krome, K9EK, of Columbus, Indiana, who specializes in designing and building his own gea, including antennas. Ed's main areas of operating interest are the VHF/UHF bands and amateur satellites.

Ed's "experimenter's antenna farm" includes a 12×12-element cross Yagi for 2 meters, a stacked pair of 19-element Yagis on 432 MHz, a short J-match Yagi on 903 MHz, and a 55-element loop Yagi for 1296 MHz. And that's not all. The dish mounted between the 432 Yagis is set up for easily swapping out feeds for different bands. Depending on which feed Ed has in place, the dish will put him on the air on 2.3, 3.4, 5.6, or 10 GHz.

All of the antennas are fed using a "dual-line system," in which he uses separate feedlines for transmit and receive on each band. Feedlines are 3/4-inch 75-ohm cable TV hardline for transmit, and RG-213 coax for receive. This arrangement can come in handy especially for satellite operating, in which different bands are used for uplink (transmit) and downlink (receive).

Back to the sunspots, we celebrate the cycle's likely peak in this issue with Part I of a primer by W8FX on just how sunspots cause changes in Earth's ionosphere, how gases from the Sun travel through interplanetary space via the "solar wind," and what happens when they blast into Earth's magnetic field. If you want a better understanding of the whole Sun-Earth interaction, you'll want to read this article.

(Cover photo by Larry Mulvehill, WB2ZPI)

VHF Plus

BY JOE LYNCH, N6CL

All About The World Above HF

Frequent 2 meter European Sporadic-E Openings

During the months of May and June Europeans enjoyed several days of sporadic-*E* propagation on 2 meters. Most of the following reports are from Wolfgang, DL5MAE, who is a big 2 meter EME enthusiast:

18 May: There was some nice *Es* opening tonight in southern Europe. In my QTH (JN58VF) I only heard two stations from EA5/EA7 (no QSOs). I was just out of the area of *Es* activity, but stations from Italy, Croatia, and Slovenia worked to Spain, Portugal, and EA9! Malta (9H) had an opening to France.

19 May: Another *Es* opening but not in my QTH (unfortunately!). However, northern Italy, Croatia, Slovenia, and Yugoslavia were lucky tonight (abt 1500–1600 UTC) to catch another *Es* opening on 2 meters to Israel (4X). So it seems the *E*-cloud from yesterday was moving to the east but still a bit too south for central Europe.

27 May: At least there were some short *Es* openings here in Europe on 144 MHz almost across the whole continent. Stations from DL worked to 9H1 (Malta), Spain, and Greece. There were also contacts between England and Bulgaria and England-Algeria (7X) reported. Also QSOs from IT9 (Sicily) and south Italy took place to the north (Denmark/north DL, Netherlands/Belgium).

28 May: As supposed, we got another *Es* opening on 2 meters this evening! From my QTH it was a big opening— Lybia! The 2 meter band was full of Arabic telephone activity from 5A! No amateur stations from 5A were worked because there is no activity from this country. Almost each 20 kHz there was telephone activity to hear in FM and also some dial signals. Besides this I worked three stations from Malta (one was mobile—9H1BN/m!) and one station from Sicily, IT9. Stations from U.K. were more lucky. They worked some rare ones like T9 and ZA! IT9VDQ reported 136 QSOs this evening on 2 meters!

We just had another short Es opening this evening. I worked Sv3KH from my QTH. Others were more lucky and worked much more DX and rare countries such as SV5, SV9, and 5B4.

31 May: Today we got some more *Es* on 2 meters. I worked EA7GBG from IM67QI as single station. South Europeans (9A, I, HA) worked towards 4X, SV5, EI , EA.

8 June: There is an aurora opening in northern Europe now (about 1500 UTC). I am a little bit to south for this event but stations about 400 km north already made good contacts to Scandinavia, UK, and the east.

9 June: Big *Es* opening here in JN58VF (near Munich) this afternoon! From about 1430–1730 UTC 144 MHz was full open and I did work about 45 stations from EA, EA9, CT, and CN! No new countries but three new grids!

11 June: Today at about 1100 UTC there was another *Es* on 2 meters! Unfortunately the *Es* cloud was over my head (JN58VF) and no QSOs were possible. 9A station worked to France, EA5s to Poland, and UK-stations/PAØ -stns/north DLs to Italy. Also Maltese stations worked to DL and PAØ.

Dave, G4ASV, wrote: After the good aurora in April comes the first sporadic-*E* opening on the 144 MHz band in the UK. My grid locator is IO81MX, 3 km E of GW at 233M asl. My equipment is FT221GTi, Henry 2K, 400W, 18-el DL6WU. The 144 MHz sporadic-*E* openings on Saturday 27 May 2000, LZ3CQ KN12PQ, LZ5UV, KN12PR, LZ1QB KN12RO, YT1VV, JN94US, OE3FVU heard, OM3CDR, JN88NE, HAØHO KN07SU, HA8TK, JN96UW, OK2IGG JN89IE, HAØHO, KN07SU, OM5KM JN98AH, YO5BEU, KN27GT, HA8EU KN06DQ, YO2IS, KN05PS, HG4GHJ JN96LX, YO5OBR, KN07XA, YO5PLA KN06, HA2SU, YO2LFP, KN06MD, 4N7AX KN05PC, HG8AD, KN06PP, YO2HS, HA5ARR, KN06QV, OM1AVK JN88OD, HAØDG/P, KN07VM, YU7MS, HA2PP JN87VE, YO5CFI, KN16WJ, HG8QG, KN06MT, HA5CBA, JN97OM, HA2RD, JN87WB, YO2LTP, KN06MD, HA7MB, KN07BM, YO2LFP, HA7UL, JN97KK, YO2LEA, KN06WK, YO7IV/P, KN34BL, YO3JW, KN34CK, YO3ACX, KN34BL, YO7VS, KN14VH, YO5QAQ, KN16UG, YO3APJ, KN34AL, HA8CE, KN06EN, HA8MV, KN06GU, YO5QAQ, KN16UG, and the highlight, ZA/OK1JR, JN91VH.

John Moore, W5HUQ, e-mailed me the following: "We had a nice opening on 9 June. I worked IW5BZQ and G3LTF. Heard IK1MTZ 539 for about 20 minutes calling CQ, but he could not hear anyone. Oh well."

VHF Plus Calendar

Aug. 6	First quarter Moon. Moderate EME conditions.
Aug. 10	Moon Apogee.
Aug. 11	Lowest Moon declination.
Aug. 12	*Perseids* predicted peak. (See text for details.)
Aug. 13	Poor EME conditions.
Aug. 15	Full Moon.
Aug. 20	Moderate EME conditions.
Aug. 27	Excellent EME conditions.
Aug. 22	Last quarter Moon.
Aug. 25	Highest Moon declination.
Aug. 26	Moon Perigee.
Aug. 26-27	Eastern VHF-UHF Conference (See text for details.)
Aug. 29	New Moon.

• *EME conditions courtesy W5LUU.*

Tentative Phase 3D Launch Date Reset

According to the ARRL, the Phase 3D amateur radio satellite will not launch until next month at the earliest. Under the latest tentative Arianespace launch schedule, P3D now could go up on the Ariane Flight 507 as early as the middle of next month. However, the launch could be as late as the end of October.

According to the League's bulletin: "Arianespace recently announced a resumption of Ariane flights. Flight 507 had been on the schedule to go into space in July, but concerns over potentially defective thrusters had caused some major customers to delay flight preparations. AMSAT-NA President Keith Baker, KB1SF, called the Arianespace announcement "very good news" for the Phase 3D program.

"The Phase 3D satellite is at the European Spaceport in Kourou, French Guiana, awaiting the start of its launch campaign.

"Arianespace representatives met recently with Phase 3D representatives at AMSAT-DL headquarters in Marburg, Germany, to discuss preparations for the P3D launch campaign. The exact date of the Phase 3D mission's launch depends on the Ariane 506 launch, set for July, and the availability of the other satellites flying with P3D.

"A launch contract, accepting Phase 3D as a payload for the first suitable Ariane 5 launch vehicle, was signed last October." *(Courtesy the ARRL bulletin service)*

Al Katz, K2UYH Named IEEE Fellow

Among the 248 new Fellows of the IEEE is Al Katz, K2UYH. Al was named a Fellow for his contributions to Microwave Linearization Technology. For those of you who own a copy of my book *The VHF "How to" Book* (now out of print), Al was featured on the front cover making adjustments to his dish. Al was one of two hams honored as a Fellow this year. He keeps the 432 MHz and above EMEers informed by his monthly "432 and Above EME Newsletter," posted on the web at <http://www.

P.O. Box 73, Oklahoma City, OK 73101
(phone 918-627-6625; fax 918-835-9785)
e-mail: <n6cl@cq-amateur-radio.com>

nitehawk.com/rasmit/em70cm.html>. Al is also one of my predecessors as *CQ*'s VHF column editor.

Current Meteor Showers

The big meteor shower for this month is the *Perseids.* As mentioned last month, activity for this shower starts appearing around mid-July. The most intense period is the four days leading up to the predicted peak. There should be several stations operating from rare grids during the peak days.

Our astronomy friends will be particularly interested in our reports this year because of the problem of visual observation due to the increasing full Moon, which occurs on August 15.

The peak is expected between 0500 and 1000 UTC on August 12. If there is the tertiary peak (that was observed so far only in 1997), that should occur around 1900 UTC on August 12. For skeds, check 3818 and 3843 kHz and the VHF reflector on the internet.

Current Conferences

The 26th Eastern VHF-UHF Conference will be August 26–27 (Friday, the 25th is in the hospitality room only). The conference chairman is Bruce Wood, N2LIV, 3 Maple Glen Ln., Nesconset, N.Y. 11767-1711 (516-225-9400 work, 516-265-1015 home, e-mail: <bdwood @erols.com>). For current information, check out <http://uhavax.hartford.edu/newsvhf>.

Sharing Our Stories

One way to increase interest in operating weak signal is to share our stories. I know that what intrigued me about getting back on the VHF+ ham bands was reading the stories of hams who were on the bands. In particular, I really enjoyed reading about how people got interested in weak-signal activities. As part of a regular feature in my column, I want to share some of those beginning stories. We start this month with Ken Pritchard, VE3OQC.

Having been in the communications field for most of my life (radar, telemetry, etc.), I wanted to become an amateur radio operator. It wasn't until several years ago though that the bug really bit. I met a local ham, Rick VE3VFT, who loaned me the study guide, and with my electronic background and Morse Code, in 30 days I passed the basic and 12 wpm.

With an FT-290 and 30 watt brick (bought from Rick) I built a small loop, and so started my venture into weak-signal 2 meter activity. Even though I was not quite sure of terms such as *grid squares* and *locators,* within several weeks I was on my way. It was amazing to work several states and dozens of grids with such simple gear, but I wanted more.

Subsequently, I found a used TR-751A and a 150 watt brick and added a 14-element Yagi. Wow! Big-time "tropo" and more grids, and more radios—TS-70OA-700 SP, IC-275, 271A, . . .

To work auroral stations on 2 meters SSB—now that was a challenge (I wanted more!). As I started having more fun, Bob Chandler, VE3SRE, began explaining more to me about 6 meter propagation. I read about *F2,* sporadic-*E*, double hop, meteor scatter. Now things were starting to cook!

The search started for a used rig, and in a month I had a DX70T. After all, I had to watch out for "TVI" on 6 meters! A week later I dragged home a Fairchild Military log-periodic that covered 20–230 MHz, 20 elements on a 21 foot boom. Now with money well invested, I was on 6 meters SSB and working meteor scatter during the *ETA Aquarids* meteor shower. What fun. This was great, but what's this? Sporadic-*E*—ooh!

Did it get better? Yes! I started building antennas—small, big, goofy (or so the neighbors thought). Picture this: a 6 meter egg beater! But it worked great and last year it got better again. I found a TS-690S. Now 50 watts on 6, 3 elements (the log) . . . I was having a blast and—I wanted more!

Oh, by the way, before the 690 I had the 706 MKII, but I wanted the larger rig feel—my own preference. Two months ago I bought a new 746. Wow!

One of the reasons I shied away from 2 meter SSB was intermod everywhere in Toronto. Not so with the 746. Now I can really enjoy 2 meters.

With a home-built 4-element Yagi on 6 and the 746, I'm ecstatic, although, it was good before, having worked XE1J. More recent DX includes LU2EG, GF05, CX8BE, GF 15, and a dozen others on May 2, 2000.

Is this fun? Absolutely! Can conversations last almost an hour on the weak-signal bands? Yes. Charles, N4KJP, and I talked for about 45 minutes along with Andy, KE4CJS. This, my friends, is what ham radio—experimenting, rag chewing—is all about.

I still like HF—mostly 10 and 15 with a A5B below 6 meters, but 6 meters is the biggest blast. Would I encourage others to venture into weak signal? Absolutely!

Each time I talk to potential or new hams, I tell them that there is no limit to what can be done. I try to explain that if they only want to operate with a handheld 2 m/440 cm , why not! Maybe that's all they want. Don't discourage them from operating. The sky's *is* the unlimited source. Have fun.

Kudos to Ken Neubeck, WB2AMU, whose book *A Guide to the Magic Band* is well read and worn out. It's the enrichment and knowledge of writers such as this that makes it all worthwhile.

Call me if you like at 416-690-6293 or e-mail <VE3OQC@yahoo.com>. 73 for now and hear you from FN03, *Ken Pritchard, VE3OQC.*

A Short Story

I received the following e-mail from Mark Gustoff, WO7T: "I'm new to 6

meters and have only had occasion to experience a few sporadic-*E* openings. I wanted to share with you and your *CQ* readers my excitement at what must have been my first *F2*-layer contact. On the evening of May 6, around 0300 UTC the band opened for a two-way to RH42 (YJ8UU) here into Chandler, Arizona. A true thrill with 100 watts and a vertical up 15 ft. When is the next *F2* opening?"

And Finally . . .

In a response to an inquiry about the ARRL June VHF QSO Party rules, Dan Henderson, N1ND, ARRL Contest Branch Manager, made the following statements to the VHF reflector:

The ARRL VHF/UHF contests are domestic in nature and designed to promote VHF/UHF/Microwave activity within the US and Canada. I have been told that DX to DX contacts for contest point credit have never been permissible, but perhaps in the past may not have been closely monitored. If a great band opening occurred, certainly stations should work as many stations as possible, even if they do not count for contest score credit.

I have reviewed the rules for this event back to 1988. This point was not specifically included in the rules until the re-write in 1997–98. I do not know why it was specifically included in that year's rules, as it happened before my taking over the Contest Branch and discussions with parties involved at that time haven't given me an indication as to why it was finally formally included in the rules announcement.

It was February 1994. I was on a Volunteers in Mission trip to Cuba for my church. I was inspired to go to that country after I had hosted the Central States VHF Society conference in Oklahoma City the previous July. At that conference we were able to have as our special guest Arnie Coro, CO2KK. It was the very first time that a Cuban ham radio operator was a guest of a major amateur radio organization in the U.S. Considering the chilled diplomatic relationships our two countries continue to maintain, it was a coup of sorts to have Arnie here.

As a goodwill ambassador for amateur radio, Arnie spent a month in this country traveling throughout the state of Oklahoma. He even appeared on my brother-in-law's sports talk show on a Tulsa radio station. Leaving Oklahoma, Arnie traveled to New England, where he was the guest of the North East Weak Signal group and their regional Eastern VHF-UHF Conference. Our hobby benefited greatly thanks to what originated in Oklahoma City and was carried off wonderfully by a good friend of U.S. amateur radio, Arnie.

After learning that there would be teams sent by my denomination to work on churches in Cuba, I volunteered to be on one of those teams. During the course of my first visit to Cuba, I met with officials of the Cuban national amateur radio organization and received an invitation to bring a team of hams back to the country for us to participate in what would become the first joint Cuba-U.S. amateur radio operation.

With all of our diplomatic ducks in a row, four of us (Lauren Libby, KXØO, now WØLD; Chip Margelli, K7JA; Janet Margelli, WA7WMB, now KL7MF;and I) traveled to Cuba for the June VHF QSO Party. As a result of our operations the COØFRC station received the DX plaque and CO2OJ/Rover made history as the first international rover operation. The following February I presented the plaque to the president of the Cuban national amateur radio organization in front of Cuban national television (which was taped and aired on their evening news).

With the understanding that the June VHF QSO Party was not a domestic contest, we who organized the operations of the joint Cuba-US efforts (both Cuban and US amateurs) proceeded to participate successfully in the contest. In an effort to encourage participation in the contest and to support the contest stations' activities, a national contest that piggybacked the June VHF QSO Party was organized. Participants in that contest provided contacts for the contest stations in the same manner as stateside stations support contest stations in their area.

Prior to the rules change in 1997 there was no prohibition of DX to DX contacts. Thanks to that, the DX to DX contacts supported the scores of all of the Cuban contest stations. From such activities several firsts occurred. Among them were these: the first domestic 1296 MHz contact in the history of Cuba and the first Cuba to US 1296 MHz contact .

Now that the rules changes have been pointed out, our Cuban friends feel a strong lack of incentive to participate in the June VHF QSO Party. This past June Arnie wrote the following:

CO2KK will be listening on 6 meters. There is really no incentive now in participating in the June VHF QSO Party after the rules changes. Just will be around looking for new grids and enjoying whatever DX becomes available as a result of the contest.

In response to Arnie, I wrote:

While I am about as disappointed as you are concerning the rules change, I for one would like to see countries such as Cuba and others that have a highly active ham population promote tag-along contests that will parallel the ARRL contest. Such contests would promote VHF+ activity. Naturally, the intra-country competition would detract from the contacts being made between that country and the U.S. and Canada, but it would still promote our interest of weak signal. Therefore, I would urge you, my friend, to foster within your country interest in such activity such as a tag-along contest would generate.

Arnie responded to me:

I sincerely agree with you about the ARRL June VHF QSO Party. There is absolutely no reason to just wash away all the DX station's possibilities with the rules changes. My point of view is that what must be done is to encourage more use of the VHF spectrum, not make people angry and turn them away from 50 MHz and higher frequencies.

One thing we did here was to promote a local tag-along contest—and I think we did it creatively—as there are but a handful of SSB rigs for 6 and 2 meters here in the island (something you know first hand, of course) and 2 meter FM has become extremely popular. Then we thought, "Hey, why not an FM DX Contest?"

And we were right, Mr. Lynch! People started building Yagis and Quads; they learned how to forget about the squelch button on their radios and run them open. A few enterprising guys built pre-amps copied from the circuits of the few existing brick amplifiers in the island. Yes, FM is mode 16F3 or

16G3, whichever way you want to look at it, frequency or phase modulation, but the 16 means your bandwidth is 16 kilohertz. Yes, we all know about the FM detector capture effect, but those are the rigs we have, and you know something? The contest picked up and right now at 7:30 PM here in Havana I am talking with a bunch of guys atop Loma de Jacan, the highest elevation in Matanzas province (sort of mountaintopping, except that elevation is just about 300 meters high more or less, nevertheless the highest in the whole province).

Now, you see, when our good friends Joe Lynch, Lauren Libby, and Chip and Janet Margelli visited us in 1994, we started promoting interest in these contests. COØFRC and COØVHF have won the DX station limited category a number of times, but more important, lots of Cuban radio amateurs started to realize that VHF operation was possible, even with low power and limited size antennas. So we have had contest QSOs with US stations on 2 meters FM, providing many with the new grid, and the new country, which of course meant new multipliers!

Feel free to quote from this e-mail in your *CQ* column, as I think that the ARRL must be made to understand that by changing the rules of the June QSO Party they are doing little service to amateur radio!

In a posting to the VHF reflector, Oscar Morales, CO2OJ, stated:

In my humble opinion, with the change, the June QSO Party loses much of its old importance in the area to become another "only for NA stations" contest. It's something like telling everyone outside North America, "Work only me or do not participate" or "In this contest I may contact anyone, anywhere but you can only contact me." I can't feel that kind of contest as mine any longer.

Yes, I know what many people may think, "Well Oscar, you may participate or not; it's your choice." Yes, it's really my choice and I'll use my choice in one way or another (at the end we will probably enter a contest just for fun), but I feel that the ham radio spirit may have lost something in this side of the world.

The bottom line is that with the new rules in place (albeit they are now three years old and nobody noticed or enforced them), our Cuban friends have been put on notice that their efforts do not matter.

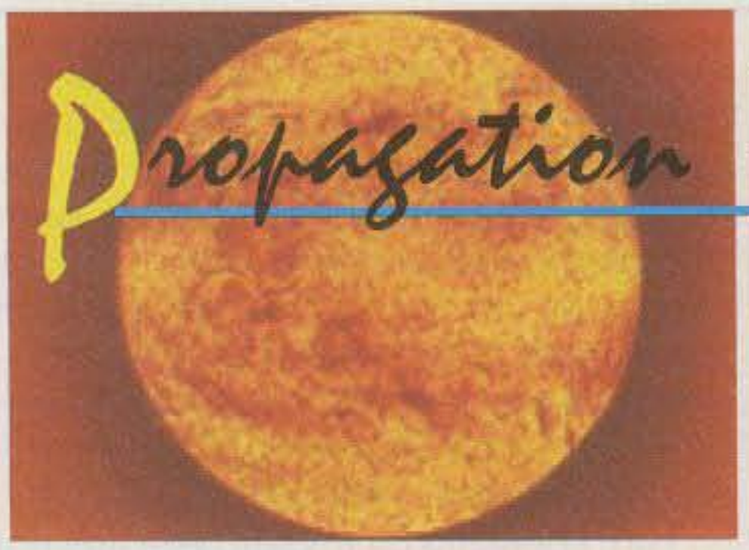
As Arnie testified above, it was as a direct result of the June VHF QSO Party participation by all of us amateurs who wanted to make it happen that VHF weak-signal activity received a boost. I would venture to say that there is no other single event that jump-started the weak-signal work in Cuba as their participation in the '94 June VHF QSO Party.

It is as a direct result of the June VHF QSO Party participation that people-to-people goodwill has been fostered and remains high between the hams of the two countries. Both Arnie and Oscar are always welcome participants in the openings that occur. And if there were the resources available, other stations would be on from Cuba as well—on even more of the weak-signal bands—thanks again to the interest in weak-signal operations fostered by Cuban participation in that 1994 VHF QSO Party.

I am speaking for myself here and not for *CQ* or anyone individually (except for Arnie, as he gave me permission to quote him). I urge the League to change the rules of the contest in such a manner as to permit DX to DX contacts. In so doing, they would continue to provide one more incentive for Cuban domestic development in the weak-signal arena.

That is all of the editorializing for this month. If you would like to tell your story about your beginnings in the weak-signal VHF arena, please e-mail it or send it to me at the addresses at the beginning of this column. I would like to publish one a month for as long as they come in.

If you have news to be included in this, your column, please let me hear from you. Also please note the new voice phone number: 918-835-9794. Until next month . . . 73, Joe, N6CL



Propagation

BY GEORGE JACOBS, W3ASK

The Science Of Predicting Radio Conditions

Sunspot Cycle 23 Peaks This Month?

According to the latest predictions from scientists at the Solar-Terrestrial Physics Division, which is part of NOAA's National Geophysical Data Center in Boulder, Colorado, there is a very strong likelihood that sunspot Cycle 23 will peak during this month with a predicted value of 116.

Bear in mind that the sunspot cycle is based upon *smoothed sunspot numbers*. These are 12-month averages of monthly mean values, centered on the middle month, in this case August. This means that we will not be able to confirm August 2000 as Cycle 23's peak for another six months.

Progress of Sunspot Cycle 23

The Royal Observatory of Belgium reports a mean sunspot number of 125 for April 2000. This is based on the weighted average of daily telescopic observations made at a worldwide network of more than three dozen cooperating observatories.

The daily sunspot count reached a high of 193 on April 2nd, the third highest daily count observed during Cycle 23 to date. A low of 94 was recorded on April 7th and 18th. The mean value for April results in a 12-month running smoothed sunspot number of 108 centered on October 1999. This is an increase of six from last month's smoothed number. A peak smoothed sunspot count of 116 is forecast for August 2000.

A corresponding increase in the 10.7 cm solar flux level was reported. Canada's Dominion Radio Astrophysical Observatory in Penticton, B.C., reports a monthly mean of 185 for April 2000. This results in a smoothed value of 170 centered on October 1999. A smoothed level on the order of 172 is expected during August 2000.

Where in the World Will W3ASK Be?

It's time again for W3ASK's annual "salting the ionosphere" trek. While there is no scientific explanation for why this ritual has resulted in good DX propagation conditions during the CQ WW DX Contest weekends over the past dozen years, it seems to have merit.

We generally try to carry our bags of salt to a location which has some relationship to the history or science of radio, or where other mythical rituals may have influenced Mother Nature successfully. Last year we followed the historic trail of Marconi and Galileo through Italy. We mythically salted the ionosphere above the University of Padua in northern Italy, where Galileo's original drawings of sunspots and the solar surface made telescopically over 350 years ago are on display. Mother Nature apparently appreciated this tribute, as DX conditions during the 1999 WW DX Contest periods were at their best of the '90s.

We will be carrying our bags of salt somewhere probably during August or September, but a final itinerary has not yet been finalized. We hope that this year's mythical tribute will again influence Mother Nature to cast her brilliance for a strong ionosphere during the 2000 CQ WW DX Contests.

August Propagation

August and early September are usually a transition period between summer and fall propagation conditions on the HF bands. On many days propagation conditions should seem much as they were during June and July. On other days, particularly during late August and early September, they will sound more typically fall-like, with somewhat higher daytime and lower nighttime usable frequencies. Since this is a period of transition, this month's DX Propagation Charts cover only the *one*-month period from August 15th through September 15th, rather than the usual two-month period. Short-Skip Charts for use during this period appeared in last month's column.

During the daylight hours good DX conditions should be possible on five bands: 10, 12, 15, 17, and 20 meters. Of the five, conditions should be best on 15 meters, with peak conditions expected to most areas of the world during the afternoon hours. While the 17 and 20 meter bands should be open for DX throughout the daylight hours, peak signals are expected during an approximate two-hour window immediately following sunrise and again during the late afternoon. Some fairly good DX openings should also be possible on 10 and 12 meters during the hours of daylight, particularly along an arc extending across central Africa, Latin America, and into the far Pacific area. Peak conditions should occur during the afternoon hours, but an increasing number of earlier openings should be possible by early September.

Between sundown and sunrise 20 meters is expected to be the best DX band. Openings should be possible to almost all areas of the world, often with exceptionally strong signal levels. Until

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for August 2000

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 9, 24, 27	A	A	B	C
High Normal: 7-8, 10-11, 15, 20, 23, 26	A	B	C	C-D
Low Normal: 2-5, 16-19, 21-22 25, 29-31	B	C-B	C-D	D-E
Below Normal: 6, 12, 14, 28	C	C-D	D-E	E
Disturbed: 1, 13	C-D	D	E	E

Where expected signal quality is:

A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9+, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S6, with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing on the following pages.

2. With the *propagation index,* use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be poor (D) on Aug. 1st, fair-to-good (C-B) on the 2nd through 5th, fair-to-poor (C-D) on the 6th, good (B) on the 7th, etc.

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midnight good DX conditions should also be found on 15 and 17 meters for openings toward Latin America, the far Pacific, and into Asia. Fairly good nighttime DX conditions are also expected on 30, 40, and 80 meters despite high static levels at times. Openings should be possible before midnight along an arc extending from northern Europe, through Africa, and into Latin America, the far Pacific, and Asia after midnight.

By late August it should be possible to work some DX on 160 meters during the hours of darkness. Conditions on this band, as well as on 40 and 80 meters, will tend to peak just as the sun begins to *rise* on the *light,* or easternmost, terminal of a path.

For short-skip openings during August and early September, try 80 meters during the day for distances less than 250 miles, with 40 meters also usable. During the hours of darkness both 80 and 160 meters should provide excellent communications over this distance. For openings between 250 and 750 miles use 30 and 40 meters during the day for distances up to 500 miles, and 20 and 17 meters between 500 and 750 miles. At night 40 and 30 meters should be the best bands for this distance until midnight, with 80 meters optimum from midnight to sunrise. Twenty and 17 should provide optimum propagation during the hours of daylight for openings between 750 and 1300 miles. Optimum conditions should continue on these bands for this distance range after sundown and until midnight. Between midnight and sunrise the best band should be 40 meters. For openings between 1300 miles and the one-hop short-skip limit of approximately 2300 miles, try 20 and 17 meters during the day, with 15 meters also usable. After sundown try 30 and 40 meters, with 80 meters also providing good propagation conditions for this distance range.

Frequent short-skip openings between approximately 400 and 1300 miles should also be possible on 10 and 12 meters, particularly during the daylight hours. Longer skip, up to 2300 miles, often should be possible during the late afternoon and early evening hours.

VHF Ionospheric Openings On 6 Meters

Increasing daytime usable frequencies, particularly during late August and September, along with peak levels of sunspot count should make possible some *F2*-layer DX openings on 6 meters.

The best times for such openings are when 10 meter openings are shown in the DX Propagation Charts with a rating of (4). Openings favor paths from North America to South America, southern Africa and the South Pacific, Australia and New Zealand. Don't expect 6 meters to open every day, but chances are improving form some openings to these areas during the daylight hours when conditions are expected to be High Normal or better.

The summertime peak in sporadic-*E* ionization is expected to wane during late August and September, but should occur often enough to produce some short-skip openings on 6 meters, between approximately 1000 and 1300 miles. If very occasional intense and widespread sporadic-*E* ionization should occur, a short-skip opening on 2 meters may also be possible. While sporadic-*E* propagation can occur at any time (as its name implies), there is a tendency for it to peak between 8 AM and noon, and again between 6 and 9 PM local time.

Seasonal conditions should begin to improve by late August for some 6 meter trans-equatorial (TE) openings. These openings won't occur every day, and at best they will be weak , noisy, and often affected with severe flutter fading. Openings favor paths between the southern tier states and deep South America. The best time to check for TE openings is during the early evening hours, shortly before and just after sundown, although they may occur at later times as well.

Meteors

A good amount of minor meteor shower activity is expected during August. Perhaps the best chance for a VHF meteor opening is during the *Perseids* shower, which began during late July but is expected to peak on August 12th. Check between 05 and 10 UT and again at 19 UT, when the rate of meteors entering the Earth's atmosphere may be high enough to sustain ionization for VHF openings.

Other minor showers and their dates of expected peak meteor rates are:

South Delta Aquarids—Aug. 4
North Delta Aquarids—Aug. 8
North Iota Aquarids—Aug. 12 and 19
Kappa Cygnids—Aug. 17

Aurora

The possibility of aurora activity increases as the Equinox approaches. Some may take place as early as late August and early September. VHF signals can be propagated for distances of up to 1200 miles or so by reflection from ionized patches produced by aurora activity. Aurora displays are most likely to occur during August and early September when conditions are Below Normal or Disturbed on the HF bands. Check the Last-Minute Forecast at the beginning of this column for those days during the month that are expected to be in these categories.

Web Site of the Month

A web site full of useful data of interest to both HF and VHF propagation can be found at: <http://www.spaceweather.com>. This site contains an "Aurora Watch and Alert," a "Solar Flare Watch and Alert," Boulder daily sunspot numbers, NOAA forecasts of geomagnetic storminess, daily telescopic and satellite pictures of the sun's surface, and much more. The site also contains a large number of web links to other sites with additional in-depth information.

73, George, W3ASK

HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *daylight* time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

August 15 to September 15, 2000
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-15 (1)	08-10 (1) 10-15 (2) 15-18 (3) 18-19 (2) 19-20 (1)	09-15 (1) 15-16 (2) 16-18 (3) 18-23 (4) 23-03 (3) 03-05 (2) 05-07 (3) 07-09 (2)	19-20 (1) 20-21 (2) 21-22 (3) 22-01 (4) 01-02 (3) 02-03 (2) 03-04 (1) 20-21 (1)* 21-22 (2)* 22-00 (3)* 00-01 (2)* 01-03 (1)*
Northern Europe European CIS	12-15	08-10 (1) 10-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	09-14 (1) 14-16 (2) 16-19 (3) 19-20 (2) 20-22 (1) 22-01 (2) 01-06 (1) 06-09 (2)	20-21 (1) 21-22 (2) 22-00 (3) 00-01 (2) 01-03 (1) 21-02 (1)*
Eastern Mediter-ranean & Middle East	12-16 (1)	08-10 (1) 10-13 (2) 13-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	07-09 (2) 09-16 (1) 16-17 (2) 17-20 (3) 20-23 (4) 23-00 (3) 00-02 (2) 02-07 (1)	19-21 (1) 21-00 (2) 00-01 (1) 22-00 (1)*
Western Africa	12-17 (1) 17-19 (2) 19-20 (1)	08-10 (1) 10-15 (2) 15-17 (3) 17-21 (4) 21-23 (3) 23-01 (2) 01-03 (1)	13-16 (1) 16-17 (2) 17-19 (3) 19-02 (4) 02-04 (3) 04-06 (2) 06-09 (1)	19-21 (1) 21-02 (2) 02-03 (1) 22-01 (1)*
Eastern & Central Africa	16-17 (1) 17-19 (2) 19-20 (1)	09-12 (1) 12-15 (2) 15-17 (3)	13-16 (1) 16-18 (2) 18-19 (3)	21-01 (1)
Central & South Asia	10-12 (1) 20-22 (1)	09-10 (1) 10-12 (1) 12-13 (1) 18-20 (1) 20-22 (2) 22-23 (1)	07-08 (1) 08-10 (2) 10-12 (1) 18-20 (1) 20-22 (2) 22-02 (1)	06-08 (1) 20-22 (1)
Southern Africa	09-11 (1) 11-15 (2) 15-17 (1)	08-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-08 (2) 08-15 (1) 15-18 (2) 18-21 (3) 21-22 (2) 22-00 (1) 00-03 (3) 03-04 (2) 04-06 (1)	21-22 (1) 22-00 (2) 00-02 (1) 23-01 (1)*
Southeast Asia	18-21 (1)	09-12 (1) 12-16 (2) 16-19 (1) 19-21 (2) 21-22 (1)	06-07 (1) 07-09 (2) 09-12 (1) 19-21 (1) 21-23 (2) 23-02 (1)	06-08 (1)
Far East	18-20 (1)	09-11 (2) 16-18 (1) 18-20 (2) 20-22 (1)	17-20 (1) 20-22 (3) 22-00 (2) 00-05 (1) 05-06 (2) 06-08 (3) 08-10 (2) 10-12 (1)	05-08 (1)
South Pacific & New Zealand	09-14 (1) 14-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	09-10 (1) 10-12 (2) 12-16 (1) 16-18 (2) 18-19 (3) 19-21 (4) 21-22 (3) 22-23 (2) 23-01 (1)	14-20 (1) 20-22 (2) 22-01 (3) 01-04 (4) 04-05 (3) 05-06 (2) 06-09 (3) 09-10 (2) 10-12 (1)	01-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1) 03-05 (1)* 05-07 (2)* 07-08 (1)*
Australasia	09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	09-10 (1) 10-11 (2) 11-12 (1) 16-18 (1) 18-20 (2) 20-22 (3) 22-23 (2) 23-00 (1)	05-08 (2) 08-10 (3) 10-12 (2) 12-17 (1) 17-19 (2) 19-22 (1) 22-01 (2) 01-05 (4)	03-04 (1) 04-07 (2) 07-08 (1) 05-07 (1)*
Caribbean, Central America & Northern Countries of South America	09-11 (1) 11-13 (2) 13-15 (3) 15-18 (4) 18-19 (2) 19-21 (1)	07-08 (1) 08-09 (2) 09-12 (4) 12-14 (3) 14-21 (4) 21-22 (3) 22-23 (2) 23-01 (1)	06-07 (3) 07-10 (4) 10-11 (3) 11-15 (2) 15-17 (3) 17-03 (4) 03-05 (3) 05-06 (2)	19-20 (1) 20-21 (2) 21-23 (3) 23-03 (4) 03-05 (3) 05-06 (2) 06-07 (1) 22-23 (1)* 23-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	08-10 (1) 10-12 (2) 12-14 (1) 14-16 (2) 16-17 (3) 17-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	07-08 (1) 08-11 (2) 11-15 (1) 15-16 (2) 16-18 (3) 18-22 (4) 22-00 (3) 00-01 (2) 01-02 (1)	10-16 (1) 16-18 (2) 18-19 (3) 19-02 (4) 02-04 (3) 04-07 (2) 07-09 (3) 09-10 (2)	20-21 (1) 21-22 (2) 22-03 (3) 03-05 (2) 05-07 (1) 22-00 (1)* 00-04 (2)* 04-06 (1)
McMurdo Sound, Antarctica	16-17 (1) 17-18 (2) 18-19 (1)	12-17 (1) 17-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	16-19 (1) 19-22 (2) 22-02 (3) 02-05 (2) 05-08 (1) 07-09 (1)	01-05 (1)

Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA TO:

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	10-13 (1)	09-10 (1) 10-12 (2) 12-16 (3) 16-17 (2) 17-18 (1)	08-13 (1) 13-16 (2) 16-17 (3) 17-21 (4) 21-23 (2)	19-21 (1) 21-22 (2) 22-00 (3) 00-02 (2) 02-03 (1)
Northern & Central Europe & European CIS	11-13 (1)	09-10 (1) 10-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	01-06 (1) 06-09 (2) 09-12 (1) 12-15 (2) 15-18 (3) 15-18 (3) 18-19 (2) 19-22 (1) 22-01 (2)	19-20 (1) 20-00 (2) 00-02 (1) 21-00 (1)*
Eastern Mediter-ranean & Middle East	11-13 (1) 15-17 (1)	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-16 (1) 16-18 (2) 18-22 (3) 22-00 (2) 00-02 (1)	20-23 (1) 21-22 (1)*
Western Africa	10-14 (1) 14-17 (2) 17-18 (1)	07-10 (1) 10-13 (2) 13-15 (3) 15-19 (4) 19-21 (3) 21-23 (2) 23-00 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-00 (4) 00-02 (3) 02-04 (2) 04-06 (1)	19-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
Eastern & Central Africa	14-16 (1) 16-18 (2) 18-19 (1)	10-14 (1) 14-15 (2) 15-16 (3) 16-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	13-15 (1) 15-18 (2) 18-19 (3) 19-21 (4) 21-23 (3) 23-00 (2) 00-02 (1)	20-00 (1)
Southern Africa	09-11 (1) 11-13 (2) 13-15 (1)	08-09 (1) 09-11 (2) 11-12 (3) 12-14 (4) 14-15 (3) 15-17 (2) 17-18 (1)	06-08 (2) 08-15 (1) 15-16 (2) 16-19 (3) 19-21 (2) 21-23 (1) 23-03 (2) 03-06 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-00 (1)*
Central & South Asia	09-11 (1) 19-21 (1)	08-09 (1) 09-10 (2) 10-11 (1) 18-19 (1) 19-21 (2) 21-23 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-11 (1) 17-19 (1) 19-22 (2) 22-02 (1)	05-08 (1) 19-21 (1)
Southeast	12-14 (1) 17-19 (1)	08-09 (1) 09-12 (2) 12-16 (1) 16-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	06-07 (1) 07-09 (2) 09-13 (1) 18-20 (1) 20-23 (2) 23-00 (3) 00-01 (2) 01-02 (1)	05-08 (1)
Far East	16-20 (1)	08-10 (1) 13-15 (1) 15-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-23 (1)	19-22 (1) 22-23 (2) 23-01 (3) 01-03 (2) 03-06 (1) 06-07 (2) 06-09 (3) 09-11 (2) 11-13 (1)	03-06 (1) 06-07 (2) 07-08 (1) 06-07 (1)*
South Pacific & New Zealand	10-12 (1) 12-17 (2) 17-18 (3) 18-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	07-11 (1) 11-17 (2) 17-19 (3) 19-21 (4) 21-22 (3) 22-00 (2) 00-02 (1)	07-09 (4) 09-10 (3) 10-13 (2) 13-18 (1) 18-20 (2) 20-22 (3) 22-02 (1) 02-04 (3) 04-07 (2)	23-00 (1) 00-01 (2) 01-04 (3) 04-06 (4) 06-07 (2) 07-08 (1) 23-01 (1)* 01-05 (2)* 05-06 (3)* 06-07 (1)*
Austral-asia	09-11 (1) 15-17 (1) 17-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	09-11 (2) 14-15 (1) 15-17 (2) 17-19 (1) 19-20 (2) 20-21 (4) 21-22 (3) 22-23 (2) 23-00 (1)	07-09 (4) 09-10 (3) 10-13 (2) 13-19 (1) 19-22 (2) 22-00 (3) 00-03 (4) 03-05 (3) 05-07 (2)	02-04 (1) 04-05 (2) 05-07 (3) 07-08 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Caribbean, Central America &	09-11 (1) 11-13 (2) 13-15 (3) 15-17 (4)	07-08 (1) 08-09 (2) 09-12 (4) 12-14 (3)	07-10 (4) 10-12 (3) 12-15 (2) 15-17 (3)	19-20 (1) 20-21 (2) 21-23 (3) 23-02 (4)

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Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	07-08 (1) 08-13 (2) 13-15 (3) 15-18 (4) 18-19 (2) 19-20 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-17 (3) 17-21 (4) 21-23 (3) 23-00 (2) 00-01 (1)	10-15 (1) 15-17 (2) 17-18 (3) 18-01 (4) 01-03 (3) 03-06 (2) 06-08 (3) 08-10 (2)	19-20 (1) 20-21 (2) 21-02 (3) 02-03 (2) 03-05 (1) 20-22 (1)* 22-02 (2)* 02-03 (1)*
McMurdo Sound, Antarctica	11-15 (1) 15-18 (2) 18-19 (1)	10-15 (1) 15-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	16-18 (1) 18-20 (2) 20-02 (3) 02-04 (2) 04-07 (1) 07-09 (2) 09-10 (1)	00-04 (1) 04-06 (2) 06-07 (1)

Time Zones: CDT & MDT (24-Hour Time) Western USA TO:

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	11-13 (1)	08-09 (1) 09-12 (2) 12-14 (1) 14-15 (2) 15-16 (1) 22-00 (1)	00-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-19 (3) 19-22 (2) 22-00 (3)	19-21 (1) 21-23 (2) 23-00 (1) 22-23 (1)
Central & Northern Europe & European CIS	*Nil*	07-09 (1) 09-11 (2) 11-13 (1) 13-14 (1) 14-16 (1) 22-00 (1)	12-14 (1) 14-16 (2) 16-17 (3) 17-23 (2) 23-01 (1) 06-08 (2) 08-09 (1)	19-23 (1)
Eastern Mediter-ranean & Middle East	*Nil*	07-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-15 (1) 22-00 (1)	12-15 (1) 15-17 (2) 17-19 (3) 19-23 (2) 23-01 (1) 06-08 (1)	20-22 (1)
Western & Central Africa	10-13 (1) 13-16 (2) 16-17 (1)	08-11 (1) 11-13 (2) 13-17 (3) 17-19 (2) 19-20 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-03 (2) 03-08 (1)	21-23 (1)
Eastern Africa	13-16 (1)	09-13 (1) 13-15 (2) 16-17 (3) 17-18 (2) 18-19 (1) 00-02 (1)	13-16 (1) 16-18 (2) 18-21 (3) 21-23 (2) 23-00 (1)	*Nil*
Southern Africa	09-11 (1) 11-13 (2) 13-15 (1)	08-10 (1) 10-12 (2) 12-14 (1) 14-15 (2) 15-16 (3) 16-17 (2) 17-18 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-22 (2) 22-00 (3) 00-02 (2) 02-06 (1) 06-08 (2) 08-10 (1)	19-21 (1) 21-22 (2) 22-23 (1) 21-22 (1)*
Central & South Asia	17-19 (1)	08-09 (1) 09-11 (2) 11-13 (1) 16-18 (1) 18-21 (2) 21-23 (1)	06-07 (1) 07-09 (3) 09-11 (1) 19-21 (1) 21-23 (2) 23-01 (1)	05-07 (1) 17-19 (1)
Southeast Asia	16-19 (1)	09-10 (1) 10-12 (3) 12-13 (3) 13-16 (1) 16-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	23-01 (1) 01-02 (2) 02-04 (3) 04-07 (2) 07-09 (3) 09-11 (2) 11-14 (1)	03-07 (1)
Far East	12-14 (1) 14-16 (2) 16-18 (1)	09-10 (1) 10-12 (2) 12-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-22 (2) 22-23 (1)	19-21 (1) 21-23 (2) 23-01 (3) 01-04 (4) 04-05 (2) 05-06 (1) 06-08 (2) 08-10 (3) 10-12 (2) 12-14 (1)	01-02 (1) 02-03 (2) 03-05 (3) 05-06 (2) 06-07 (1) 03-06 (1)*
South Pacific & New Zealand	10-13 (1) 13-15 (2) 15-18 (3) 18-20 (4) 20-21 (2) 21-22 (1)	08-10 (1) 10-12 (3) 12-15 (2) 15-18 (3) 18-22 (4) 22-00 (3) 00-02 (2) 02-03 (1)	07-09 (4) 09-11 (3) 11-13 (2) 13-17 (1) 17-19 (2) 19-21 (3) 21-03 (4) 03-05 (3) 05-07 (2)	22-23 (1) 23-00 (2) 00-03 (3) 03-06 (4) 06-07 (3) 07-08 (1) 23-01 (1) 01-06 (2)* 06-07 (1)*
Australasia	13-15 (1) 15-18 (2) 18-20 (3) 20-21 (1) 21-22 (1)	07-08 (1) 08-10 (2) 10-17 (1) 17-19 (2) 19-21 (3) 21-23 (4) 23-00 (3) 00-03 (1)	12-20 (1) 20-22 (2) 22-23 (3) 23-04 (4) 04-06 (3) 06-08 (2) 08-10 (3) 10-12 (2)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1) 01-03 (1)* 03-05 (2)* 05-06 (1)*
Caribbean, Central America & Northern	09-11 (1) 11-12 (2) 12-14 (3) 14-16 (4)	07-08 (1) 08-09 (2) 09-14 (3) 14-19 (4)	06-08 (4) 08-11 (3) 11-15 (2) 15-18 (3)	19-21 (1) 21-01 (3) 01-03 (2) 03-05 (3)
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Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	09-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-16 (3) 16-22 (4) 22-23 (3) 23-00 (2) 00-01 (1)	09-15 (1) 15-17 (2) 17-18 (3) 18-01 (4) 01-02 (3) 02-06 (2) 06-08 (3) 08-09 (2)	20-21 (1) 21-00 (2) 00-02 (1) 02-04 (3) 04-05 (2) 05-06 (1) 22-01 (1)* 01-03 (2)* 03-05 (1)*
McMurdo Sound, Antarctica	13-15 (1) 15-17 (2) 17-19 (1)	12-16 (1) 16-18 (2) 18-20 (3) 20-22 (2) 22-00 (1)	09-11 (1) 17-19 (1) 19-20 (2) 20-01 (3) 01-03 (2) 03-04 (1) 06-08 (2)	22-23 (1) 23-01 (2) 01-04 (1) 04-06 (2) 06-07 (1)

*Indicates best time to listen for 80 meter openings.
For 12 meter openings, interpolate between 10 and 12 meter openings.
For 17 meter openings, interpolate between 15 and 20 meter openings.
For 30 meter openings, interpolate between 40 and 20 meter openings.
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Looking Ahead in CQ

Here are some of the articles that we're working on for upcoming issues of *CQ:*

- "Antenna in the Sky ... and Power from It," by K8WPI
- "Behind the Numbers: How Geomagnetic Activity is Measured," by WB2AMU
- "A 'Flying Solo' Cable Tester," by KB2YTN
- "A Skeleton Sleeve-Fed Monopole," by K6MHE

Plus...

- "*CQ* Reviews: The Cushcraft R8 Multiband Vertical Antenna," by W2VU
- "The Care and Feeding of Analog Meters," by VE3ERP
- "Weathernode Paging," by KC5RTH

COMMUNICATIONS EXPO 2000 Hamfest and Electronics Show, September 17, 2000: The Greater Cincinnati ARA Communications Expo 2000 hamfest/electronics show is September 17: Kolping Center, north of Cincinnati, OH. Show open 8 AM through 4 PM. Commercial exhibitors indoors, flea market, radio-controlled race car races, ARRL officials, good food, free parking, excellent prizes, hidden transmitter hunts, interesting forums, VE exams, ladies' program, great atmosphere. Admission: $5/SASE by September 10; $8 at gate; 12 and under free. The Kolping Center is at 10235 Mill Rd. five minutes south of exit 36 of Interstate 275 in northern Hamilton County. Talk-in: 146.88–. See <http://w3.one.net/~rkuns/expo2000/>. Indoor exhibit chairman Gary Osborne, W8XS, <osborne@fuse.net>, 513-474-0287; fleamarket/advance ticket chairman Tom Denham, K8VOE, <tdenham@cos.net>, 513-779-3951; VE exams Scott Henninger, W8GS, <w8gs@arrl.net>, 513-683-7373; General Chairman Jim Weaver, K8JE, <k8je@arrl.net>, or 513-459-0142.

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The FT-100D is a high-performance, ultra-compact transceiver operating on the 160-10 meter HF bands, plus the 50, 144, and 430 MHz VHF/UHF bands. Known for its outstanding receiver performance, the FT-100D's easy-to-access DSP system is the cornerstone of the outstanding receiver capability. Providing Noise Reduction, Auto-Notch, and Narrow-Bandwidth Filter selection, the DSP system also includes a Microphone Equalizer for the transmit side.

The new and enlarged speaker of the FT-100D (ϕ66 mm) provides spectacularly clean audio output, to help you dig out those weak signals.

Whether at home or away, the fantastic new FT-100D is The Choice of the World's Top DX'ers. Step up to the FT-100D, and enjoy the thrill of the sunspot peak in style!

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FT-100D

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Today's elite-class operators demand the best RF weaponry available. Yaesu's exciting new MARK-V FT-1000MP answers the call, with an expanded array of receiver filtering, 200 Watts of power output, and Class-A SSB operation capability for the cleanest signal on the band. Enhanced front-panel ergonomics save you seconds in a pile-up or a contest "run," and Yaesu's HF design and manufacturing know-how ensures that no short-cuts have been taken in our effort to bring you the best HF transceiver money can buy. For more QSOs in your log, and more awards on your wall, there is only one choice: the MARK-V FT-1000MP from Yaesu!

Ⅰ. IDBT: Interlocked Digital Bandwidth Tracking System

The IDBT feature greatly simplifies operation by matching the bandwidth of the DSP (Digital Signal Processing) system to the net bandwidth of the 8.2 MHz and 455 kHz IF stages. The IDBT system accounts for the settings of the IF WIDTH and SHIFT controls, and automatically sets a DSP bandwidth which matches the analog IF bandwidth.

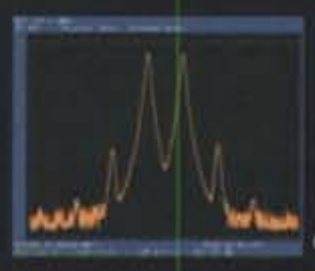
IDBT: A Breakthrough in Selectivity!

Ⅱ. VRF: Variable RF Front-End Filter

Protecting the MARK-V's receiver components from strong out-of-band signals, the VRF system acts as a high-Q "Preselector," located between the antenna and the main bandpass filter networks, providing additional RF selectivity on the 160-20 meter Amateur bands for multi-operator contest teams, DX-peditions, or for operation near MW/SW broadcast stations.

Ⅲ. 200 Watts of Transmitter Power Output

Utilizing two Philips® BLF147 Power MOSFETs in a 30-Volt, push-pull configuration, the MARK-V's transmitter puts out up to 200 Watts of clean output power, thanks to the conservative design of the PA section.



Class A 75 W PEP IMD

Ⅳ. Class-A SSB Operation

Exclusively available on the MARK-V FT-1000MP , a press of a front-panel button engages Class-A SSB operation of the transmitter, at a power output level of 75 Watts. Class-A operation produces incredibly clean signal quality, with 3rd- order IMD suppressed 50 dB or more, and 5th- and higher-order products typically down 80 dB or more!

Ⅴ. Multi-Function Shuttle Jog Tuning/ Control Ring

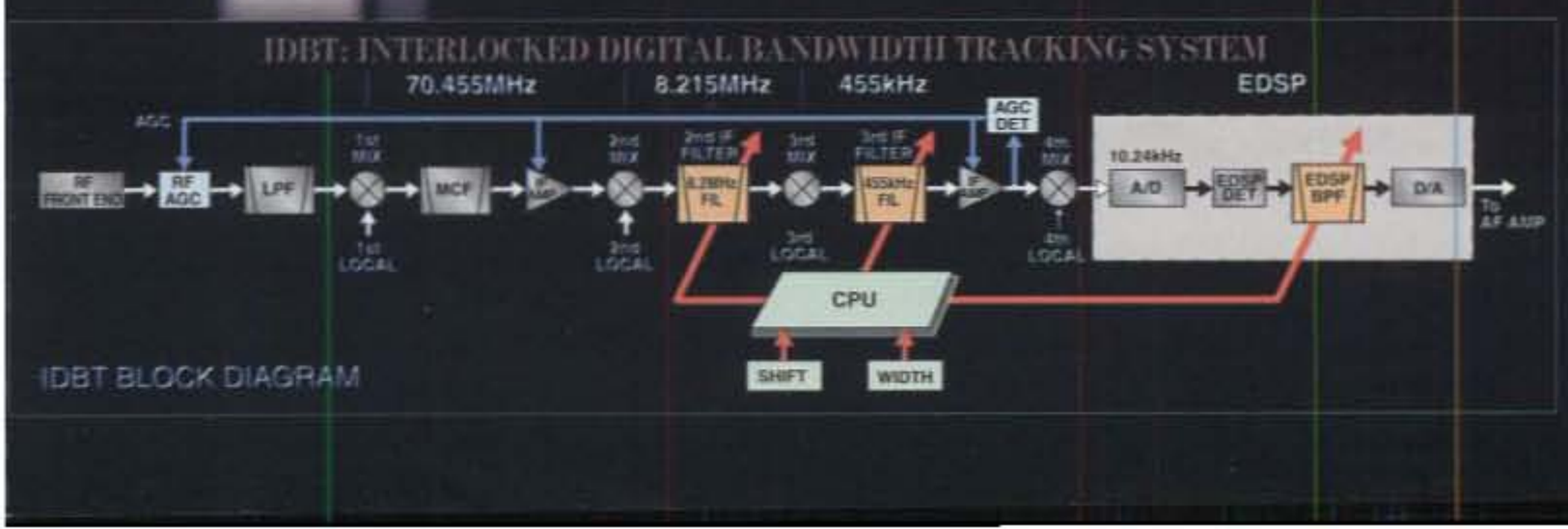
The immensely-popular Shuttle Jog tuning ring, which is concentric with the Main Tuning Knob, has a new look in the MARK-V: it now includes the activation switches for the VRF (left side) and IDBT (right side) features, so you don't have to move your hand position to activate these important circuits during contest or pile-up situations!

30 V / 13.8 V
wer Supply FP-29

Photo shows optional MD-100A8X Deluxe Desk Microphone

HF 200 W All-Mode Transceiver

MARK-V FT-1000MP



IDBT BLOCK DIAGRAM

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...the IC-718 was very easy to operate with a minimum of "manual" intervention.
QST, July 00

The ICOM IC-718 offers a nice collection of the more desirable features that are typically absent from transceivers in its price class.
QST, July 00

Makes Getting into HF a Piece of Cake.

The New Easy to Use IC-718

Whether you're new to HF or just looking for a capable second rig, the IC-718 is for you. It's simple. Buttons for the functions you use the most are prominent and easy to access. Selecting a frequency is as easy as punching in the numbers on the large, well spaced, keypad. And you can quickly tune up or down a band with the auto tuning step feature. It even has a band stacking register to "remember" your last used frequency. It's superior. The '718 features a continually adjustable noise blanker - a feature some high-end rigs don't even have. The IF shift helps reject nearby interference. And with the optional UT-106 installed, you can enhance the superior receiver performance with Digital Signal Processing (DSP). The Auto Notch Filter minimizes noise without compromising receive audio. A full 100 watts (40w AM) of adjustable power keeps you on the air for extended periods. Talk hands-free with the VOX feature. And a built-in keyer for CW enthusiasts. All this and more in a compact, easy to carry little package. Simple. Superior. Piece of cake.

Optional DSP capability. With the optional UT-106 installed, you can enhance the superior receiver performance with Digital Signal Processing (DSP). The IC-718 is the only rig in its price range to offer you the choice!

IC-718 features

- Simple Operation
  - One Touch Band Switching
  - Direct Frequency Input via 10 Button Keypad
  - Auto Tuning Steps (TS). Senses the rate the knob is turned
- Easy to Use Front Panel Controls
- Microphone Compressor
- IF Shift
- 100w of Output Power (40w on AM)
- Meter Functions (Output Power, ALC, VSWR)
- Built-in Keyer with CW reverse
- VOX
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