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THE RADIO AMATEUR'S JOURNAL

KENWOOD

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NEW! Computer Interface!

"DX-cellence!"

TS-940S

The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

- **100% duty cycle transmitter.** Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.
- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT- 940 antenna tuner status.
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.
- **Built-in FM, plus SSB, CW, AM, FSK.**
- **Semi or full break-in (QSK) CW.**
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **Programmable scanning.**
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.
- **1 yr. limited warranty.** Another Kenwood First!

Optional accessories:

• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-42S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL- 922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.

Interface IF-232C/IF-10B

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

More TS-940S information is available from authorized Kenwood dealers.

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All New Compact HF!

"DX-citing!"

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

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

- **Covers All Amateur bands**
  General coverage receiver tunes from 100 kHz–30 MHz. Easily modified for HF MARS operation.
- **Direct keyboard entry of frequency**
- **All modes built-in**
  USB, LSB, CW, AM, FM, and AFSK. Mode selection is verified in Morse Code.
- **Built-in automatic antenna tuner (optional)**
  Covers 80-10 meters.
- **VS-1 voice synthesizer (optional)**
- **Superior receiver dynamic range**
  Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range. (500 Hz bandwidth on 20 m)
- **100% duty cycle transmitter**
  Super efficient cooling permits continuous key-down for periods exceeding one hour. RF input power is rated at 200 W PEP on SSB, 200 W DC on CW, AFSK, FM, and 110 W DC AM. (The PS-50 power supply is needed for continuous duty.)

- **Adjustable dial torque**
- **100 memory channels**
  Frequency and mode may be stored in 10 groups of 10 channels each. Split frequencies may be stored in 10 channels for repeater operation.
- **TU-8 CTCSS unit (optional)**
  Subtone is memorized when TU-8 is installed.
- **Superb interference reduction**
  IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and optional filters fight QRM.
- **MC-42S UP/DOWN mic. included**
- **Computer interface port**
- **5 IF filter functions**
- **Dual SSB IF filtering**
  A built-in SSB filter is standard. When an optional SSB filter (YK-88S or YK-88SN) is installed, **dual** filtering is provided.
- **VOX, full or semi break-in CW; AMTOR compatible.**

Optional accessories:

- AT-440 internal auto. antenna tuner (80 m–10 m)
- AT-250 external auto. tuner (160 m–10 m)
- AT-130 compact mobile antenna tuner (160 m–10 m)
- IF-232C/IC-10 level translator and modem IC kit
- PS-50 heavy duty power supply
- PS-430/PS-30 DC power supply
- SP-430 external speaker
- MB-430 mobile mounting bracket
- YK-88C/88CN 500 Hz/270 Hz CW filters
- YK-88S-88SN 2.4 kHz/1.8 kHz SSB filters
- MC-60A/80/85 desk microphones
- MC-55 (8P) mobile microphone
- HS-4/5/6/7 headphones
- SP-40/50 mobile speakers
- MA-5/VP-1 HF 5 band mobile helical antenna and bumper mount
- TL-922A 2 kw PEP linear amplifier
- SM-220 station monitor
- VS-1 voice synthesizer
- SW-100A/200A/2000 SWR/power meters
- TU-8 CTCSS tone unit
- PG-2C extra DC cable.

Kenwood takes you from HF to OSCAR!

25th Anniversary

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Now even more affordable!

"Digital DX-terity!"

TS-430S

Digital DX-terity—that outstanding attribute built into every Kenwood TS-430S lets you QSY from band to band, frequency to frequency and mode to mode with the speed and ease that will help you earn that dominant DX position from the shack or from the mobile!

- **Covers all Amateur bands**
  160 through 10 meters, as well as the new 30, 17, and 12 meter WARC bands. High dynamic range, general coverage receiver tunes from 150 kHz to 30 MHz. Easily modified for HF MARS operation.
- **Superb interference reduction**
  Eliminate QRM with the IF shift and tuneable notch filter. A noise blanker supresses ignition noise. Squelch, RF attenuator, and RIT are also provided. Optional IF filters may be added for optimum interference reduction.
- **Reliable, all solid state design.**
  Solid state design permits input power of 250 watts PEP on SSB, 200 watts DC on CW, 120 watts on FM (optional), or 60 watts on AM. Final amplifier protection circuits and a cooling fan are built-in.
- **Memory channels.**
  Eight memory channels store frequency, mode and band data. Channel 8 may be programmed for split-frequency operation. A front panel switch allows each memory channel to operate as an independent VFO or as a fixed frequency. A lithium battery backs up stored information.
- **Programmable, multi-function scan.**
- **Speech processor built-in.**
- **Dual digital VFOs.**
- **VOX circuit, plus semi break-in with sidetone.**

Optional accessories:
• PS-430 compact AC power supply • SP-430 external speaker • MB-430 mobile mounting bracket • AT-130 compact antenna tuner covers 80-10 meters, incl. WARC bands • AT-250 automatic antenna tuner covers 160-10 meters, incl. WARC bands • TL-922A 2 kW PEP linear amplifier • FM-430 FM unit • YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters • YK-88SN (1.8 kHz) narrow SSB filter • YK-88A (6 kHz) AM filter • MC-42S UP/DOWN hand mic. • MC-60A/80/85 deluxe desk mics. • SW-2000/200A SWR/power meters • SW-100A SWR/power/ volt meter • PC-1A phone patch • HS-4, HS-5, HS-6, HS-7 headphones

25th Anniversary

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CQ The Radio Amateur's Journal

ON THE COVER: Bruce Kerns of Kantronics looks over their new PC 2400 at the Lawrence Kansas plant. Photo by Larry Mulvehill, WB2ZPI.

JULY 1986 **VOL. 42, NO. 7**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

Injustice is relatively easy to bear; what stings is justice. —*H.L. Mencken*

Up in Canada right now there's an amateur who's wondering what it's all about. He fought the good fight, was morally and ethically right. He had the weight of evidence, the truth of technology, and the firm belief that all of the above would lead to a golden aura of justice.

Well, Jack Ravenscroft, VE3SR, was not only stung by justice, he was impaled and hung out to dry. His crime was that he was right, fair, and observed the rules. Those with a penchant for fighting windmills have to keep in mind that windmills sometimes bite back.

The story is quite simple. Jack and his family moved to Kanata, Canada near Ottawa from their previous home in Quebec. Jack was duly licensed as VE3SR and as such obtained a license (permit) to erect a 50 foot tower at this new home for his amateur radio activities. The permit was granted, and when the Ravenscrofts moved in, Jack did install the tower and several antennas.

A neighbor at that time began to experience a series of problems that resemble a bad grade-B sci-fi movie or worse: trouble with the microwave oven, furnace turning on and off, and the electronic organ making strange high-pitched squeals. Couple this with interference to stereo and TV. The neighbors complained to the Canadian Department of Communications, who in turn checked out Jack's equipment and antennas. Jack was operating his amateur radio station properly and well within the terms of his license. The interference was indeed greatest when Jack's antenna was pointed directly at the neighbor's home (145°). The Minister of Communications wrote the neighbor:

"The malfunction of various devices in your residence is not the result of any improper operation of the amateur radio station but rather the inability of these devices to adequately reject the amateur's transmissions. Manufacturers in Canada and abroad are aware of the need to design any items using solid state electronics to operate satisfactorily in the presence of radio waves but often have chosen to modify affected units as a lower cost alternative to including the added protection in all units sold."

The neighbor apparently was not satisfied with that letter and began a law suit which resulted in an interlocutory injunction against Jack's amateur radio operation. The judge determined that the Department of Communication and the Minister of Communication took no action to remedy the situation. In essence he said that the notice of culpability, namely the fault of the home entertainment devices, was inaction. The judge also determined that it would be useless to try to add filters to the neighbor's devices because "it would take a fair amount of time and would cause a good deal of inconvenience to the plaintiffs and loss of use of the equipment."

So, on April 7, 1986, Judge W.T. Hollinger in District Court of Ontario (Court File No 1559/85) determined that Jack Ravenscroft, VE3SR, was a legal nuisance and will stay off the air and not cause interference. He further stipulated that Jack would pay special damages of $58.60 and "general damages in the amount of $2500.00 for inconvenience and interference with the enjoyment of their (*the neighbors—ed.*) various pieces of electronic equipment."

As of April 1986, then, every Canadian amateur, not only Jack, is a potential nuisance. Since there is now legal precendent, I wouldn't be surprised if there weren't more cases appearing soon. I also hope that Jack appeals this decision. The Department of Communication and the Minister of Communication should probably be busy sending out resumes, for obviously the Canadian justice system doesn't want to be bothered with or influenced by the facts.

You're not alone, Jack. In this country we have over 400,000 potential nuisances. We have all sorts of regulations and specifications for amateur radio equipment (and amateurs), but nothing really on home entertainment devices. Jack, if it's any consolation, it's going to happen here, too, sooner or later. It won't make any sense here either.

If You've Got A Yen, Act Now!

If you've been thinking about adding one of the newer imported rigs to your station, you should probably act soon. With the Japanese Yen dropping to the low 160s in exchange for a dollar, the price for imported gear should be going up soon. It's not that people will be making bundles of money. It's just what the exchange rate comes out to in terms of dollars. It also means that importers here who have contracted for equipment (in terms of Yen) now find upon delivery that they are paying considerably more than they thought they would. For example, a 200,000 Yen transceiver was $1,111.11 when the Yen was at 180 and $1,234.57 when it dropped to 162. It's nothing personal, just world economics. You'll probably notice similar changes in some of the newer British and German gear.

Let's Make It Work

At the big one this year in Dayton, Fried Heyn, WA6WZO, the ARRL Southwestern Director, came over to me and gave me a frequency chart with a big announcement for the ARRL National Convention in San Diego. The convention will be from September 5th through the 7th. Fried told me that the convention group was following what I had been writing about and would issue FREE convention passes for all students 18 and under. Furthermore, there would be special student forums with astronauts, scientists, and amateurs. So, if you're going to be in the area or are making plans to attend this one, why not include a few young people in your party. These folks are putting their money where their mouth is, so let's help them and amateur radio by encouraging as many young people as possible to come out and find out about the wonderful world of amateur radio. For information on how to get those FREE convention passes write to: Bob Zakoski, Youth Activities Chairman, Box 3026, Olivenhain, CA 92024.

Speaking of Dayton

This had to have been the most unusual Dayton Hamvention that I've been to. First, the traditional Dayton weather of cold and rain was replaced with sun and warmth. It was about 90° for the entire weekend. You couldn't have asked for better weather. However, you could have asked for a little air conditioning. The committee this year did an outstanding job and really went out of its way to accommodate the exhibitors, who put in a rough weekend. We appreciate it.

Two bits of adversity this year. One was a small fire caused by an overheated and overloaded extension cord (what else would you expect with all those hams) and was handled most professionally. The area was cleared quickly and without panic. Everything was checked out by the fire department and the hamfest committee, and the area was reopened once it was declared safe. On Sunday a transformer blew and a lot of the convention area was without power for most of the day. Although obviously equipment couldn't be demonstrated, I did walk around to see people buying stuff in relative darkness by the light of flashlights, and I even held my cigarette lighter so that one dealer could write up and complete a sale. At Dayton nothing can deter a determined amateur from his appointed rounds.

If you missed it, shame on you. There was more new stuff to see and try than ever before. There was great stuff at the fleamarket, and everyone should have gone home with something. It really was an exciting time. I had the honor of presenting the latest DX Hall of Fame plaque to Jim Smith, P29JS/VK9S. The story of Jim's achievements appeared in last month's DX column. I hope that at least one of the presentation pictures turned out okay, and that someone sends one in.

Over the next few weeks we'll be at Rochester, Birmingham, and Dallas. If you're in the area stop by the *CQ* booth and say hi. Bring your kids, and if possible, bring your neighbor's kids. These hamfests and local events help spread the word about amateur radio. Help them succeed by taking part and urging others to do the same. You'll all have a good time and a lot of fun. That's what it's all about.

73, Alan, K2EEK

TOO GOOD TO BE TRUE?

PAKRATT™ Model PK-64

shown with enhanced
HFM-64 option installed

★ MORSE ★ BAUDOT ★ ASCII ★ AMTOR ★ PACKET ★

FIRST FIVE MODE DATA CONTROLLER

The Pakratt model PK-64 by AEA is the world's first computer interface that offers Morse, Baudot, ASCII, AMTOR *and* Packet all in one box (hardware *and* software included) at a price many competitors charge for Packet alone (from $219.95 Amateur net). Do not let the low price fool you; coming from any other company but AEA it WOULD be too good to be true. The PK-64 works with virtually any voice transceiver. The Pakratt is the easiest of any to hook up and have operating in just a few minutes.

In Packet mode, the PK-64 offers virtually all the features of every other Packet controller on the market, plus many important features left out by others due to cost constraints. For example, we have included a hardware HDLC, true Data Carrier Detect (DCD), multiple connect with up to ten stations simultaneously and full implementation of version 2.0 of the AX.25 protocol.

Because the PK-64 was designed specifically for the Commodore 64 (or C-128 and SX-64) computer, we have been able to do many things not economically feasible with general RS-232 interface controllers. For example, the Pakratt includes true split screen operation with on-screen status indicators and an on-screen tuning indicator.

ENHANCED HFM-64 MODEM OPTION

The standard PK-64 will operate all modes with a phase-lock-loop (PLL) detector roughly equivalent to all popular packet modems in the marketplace (except we have included extra filtering). The enhanced HFM-64 modem option offers true independent dual channel filtering with A.M. detection (like the famous CP-100 Computer Patch™). The enhanced HFM-64 option also offers a hardware LED tuning indicator (like the CP-100) and a front panel variable threshold control for setting maximum sensitivity under various band ,conditions. We recommend the HFM-64 option for anyone keenly interested in weak-signal heavy-QRM HF operation. For anyone desiring to operate FM RTTY with the standard North American tone pair or CW receive, the HFM-64 is required. The HFM-64 is field installable with no soldering or test equipment required.

WORKS WITH THE POPULAR C-64 COMPUTER

AEA designed the PK-64 around the low-cost C-64 because of the special architecture features making it especially suited to Amateur Radio applications. The C-64 should not be viewed as a mainframe, but rather a very economical accessory to your data communications system. Many owners of expensive computers such as IBM, TANDY, APPLE, KAYPRO, ATARI, etc., are now buying the low cost C-64 and dedicating it to their operating position. They simply cannot find software for their machine that even approaches the power and user friendliness of the PK-64. Plus, think of the convenience of having only one controller and keyboard to go from one mode to another without having to redo cabling!

The PK-64 is so complete that all you need to do is wire up a microphone connector to the end of a cable (provided) and you are ready to go. There is no need to track down special terminal software, cabling or even a power supply. It all comes with the PK-64. So do not be the last on your block to own the most exciting new product in years. See the PK-64 at your favorite dealer or write for our specification sheet now.

Prices And Specifications Subject To Change Without Notice Or Obligation

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AEA Brings you the Breakthrough!

Our Readers Say:

Amateur Radio Operators Against Drunk Drivers

Editor, *CQ*:

I am a 17-year-old high school student in Los Angeles, and have had my Advanced class license since August 1985. Recently, I was painfully affected by the death of Alexandra (Alex) Vincent, a very fine young lady who attended our high school, the Oakwood school in North Hollywood. In the midnight hour on Monday, February 24, while Alex was with her mother waiting for a tow truck as she was stranded on the Ventura freeway in Van Nuys, she was struck by a drunk driver and thrown 20 feet. She died in her mother's arms. Our tragic loss of Alex set me to thinking about why the whole thing had to happen and how it would be possible to prevent such a tragedy from happening to somebody else. We amateurs have such wonderful privileges and abilities to enhance our technical knowledge, support public communications, and, whether we know it or not, save lives. All it takes is a ham who is mobile with a hand-held or mobile radio to report a suspicious looking driver to a base station. He or she then passes to the base the highway location, direction, approximate speed of the vehicle, along with the vehicle information (type, color, year if possible, and license plate), which the base then passes to the local sheriff or highway patrol. The base station should also record the vehicle information in the station logbook or records, so that if a drunk driver is brought under "suspicion" of vehicular manslaughter, as is the case with Alex, the amateur can provide further evidence against the drunk driver, from past observance and recording.

In the month since Alex's tragic death, I have made an effort to make fellow hams aware of the dangers of drunk drivers, and the abilities that the hams have in stopping them. A highway patrolman will be talking to our local radio club, the San Fernando Valley Amateur Radio Club, W6SD, in April. There he will provide details about how to identify a drunk driver on the road, and how to report one most efficiently. I strongly urge all readers to get involved and contact your local sheriff or highway patrol, and have an official talk to your local radio club about the details of reporting a drunk driver, and how the hams can best be of assistance. It is very easy to do, and very well worth the cause; drunk drivers are a special problem, and any time a ham reports a drunk driver, he is potentially saving someone's life. Isn't it worth taking up three minutes of repeater time in order to help prevent a possible catastrophe? It only takes about three extra minutes to report a dangerous, possibly drunk, driver. If the highway patrol receives a concrete enough, well-defined report, they WILL take action. We cannot eliminate drunk driving, but, with your help, we can stop certain people in the process, and prevent tragic death, as experienced by the beautiful 17-year-old Alexandra Vincent, from happening to other innocent people.

Richard Balser, KB6HQS
Los Angeles, CA

What Am I?

Editor, *CQ*:

About my newest high tech software, the DX EDGE™. Two afternoons ago I sat watching the terminator line on my Commodore 128 computer separate sunset from sunlight. It left Spain and advanced across the Atlantic Ocean to America. It touched Florida before it touched Tennessee, advancing by the drawing of a new curve each 15 minutes. All my clocks were in time to the second with WWV at the National Bureau of Standards at Fort Collins, Colorado.

I thought, What am I? The answer came, I am what I am—a proud, educated human. I sat there quietly, a human speck beating in synchronism with the mighty cosmos.

Robert Wessel, K4PR
Nashville, TN

Shared Genius

Editor, *CQ*:

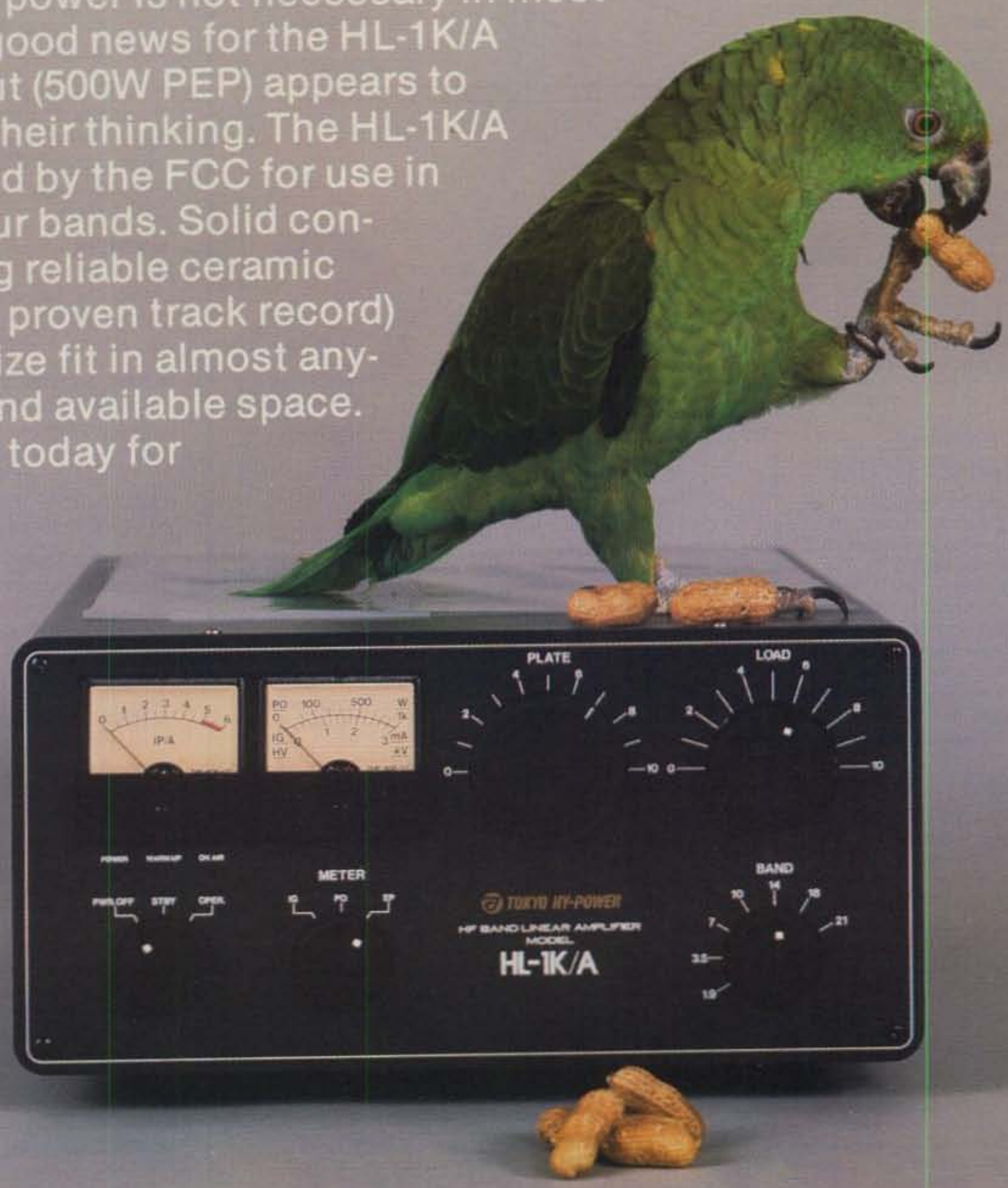
While my widespread reputation for self-undepreciation is not without firm foundation, I must protest when I am given the entire credit for shared genius. If your Technical Representative, W1ICP, had done his homework, he would have reported (*CQ*, April, 1986, page 42, first paragraph, last complete sentence) that the authors of *The ARRL Antenna Book* (1939) were George Grammer *and* Byron Goodman.

Grammar got top billing because he was older, or something. It didn't seem important to me at the time. On the other hand, Mac may have me confused with the late Mr. Grammer. We *both* threatened to take Mac as a tax deduction.

By Goodman, W1DX
East Hartford, CT

Talk Power For Peanuts. HL-1K/A Kilowatt Tabletop HF Amplifier

Improve your peanut-whistle with some talk power from THL. Really good signals can be had with modest power and antenna set-ups and the FCC says that really high power is not necessary in most cases. That is good news for the HL-1K/A since the output (500W PEP) appears to be in line with their thinking. The HL-1K/A is type accepted by the FCC for use in the U.S. amateur bands. Solid construction (using reliable ceramic tetrodes with a proven track record) and compact size fit in almost anyone's budget and available space. Write Encomm today for the full details.



- *WARC COVERAGE
- *600 W PEP Max 1.8 thru 21 MHZ OUTPUT
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- *QUIET OPERATION
- *DUAL METERING SYSTEM
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Announcing

• **Amateur Radio Exams** - MIT Radio Society and UHF Repeater Assoc. will give exams on July 23, Aug. 20, Sept. 17, Oct. 22, Nov. 19, and Dec. 17. Given at 7 pm, MIT Room 1-134, 77 Mass Ave., Cambridge, MA. Reservations requested 2 days in advance. For more information, contact Ron Hoffmann at 617-253-0160.

• **Harrisburg, PA Exams** - Exams given August 24, Oct. 12, Dec. 6. Registration must be 35 days in advance. Contact John Obradovich, W3IS, 12 Hickory Place, Camp Hill, PA 17011.

• **Young Ham of the Year Award Program** - Annual award, certificate or trophy, will be given to a ham under 18 years of age by *The Westlink Report*. Nomination period is from Jan. 1 to Sept. 30. For more information, contact Young Ham of the Year, c/o Westlink Report, 28197 Robin Ave., Saugus, CA 91350.

• **VE7EXPO** - Operation from EXPO 86 will be from May 2 to Oct. 13 from 1700–0500 UTC. For more information and frequencies of operation, contact VE7EXPO ARS, 202 13640 67 Ave., Surrey, BC, Canada V3W 6X5 (604-590-1014).

• **WB0UPK** - Special event on July 4–5 from 1500Z on the 4th to 0100Z on the 5th on 3.950, 7.250, 14.295, 21.425, and 28.600 MHz from Neligh, NE. Contact WB0UPK, 804 East First St., Neligh, NE 68756.

• **K1MUJ** - Special event by Eastern Connecticut ARA from 1400–2300 UTC July 5 on CW 40 kHz from bottom 80–10 meters; SSB center of General phone band ±10 kHz 80–10; Packet to be announced on W1AW BBS. SASE and QSL to KB1SP, 73 Second Island Rd., Webster, MA 01570, for certificate.

• **K7YPT** - Special event of High Plains ARC from Fort Laramie from 0000Z July 4 to 0000Z July 5 on phone 3.850, 7.250, 14.250, 21.360, 28.550; CW 50 kHz up from lower band edge. QSL for SASE to K7YPT, P.O. Box T, Torrington, WY 82240.

• **KD8FJ** - Special event from Thompson, OH on July 4 from 1400 UTC on. Operation on lower end of 40 meter General phone band. For certificate send SASE to KD8FJ, 386 Cedarbrook Dr., Painesville, OH 44077.

• **W0KEM** - Hannibal ARC special event on July 5–6 from 1500–2100 UTC on phone 7.245, 14.290, 21.400, 28.770; CW 7.125 and 21.125 MHz. QSL and SASE (9 × 12) for certificate to W0KEM, Rt. #1 Box 55A, Payson, IL 62360.

• **WE4K** - Kentucky ARS special event from 1500–0000Z July 5 and 6 in lower 25 kHz of General phone bands on 40 and 20 meters and RTTY segments of 40 and 20. For QSL send SASE to WE4K, 128 Meadow Lane, Bardstown, KY 40004.

• **W5SC** - Special event from Texas ARRL and VHF/FM Convention on July 12 from 1200–0400Z and July 13 from 1200–1800Z; 10, 15, 20 meters, lower portions of General CW and phone bands. Send QSL and SASE to W5SC, 90 Brees Blvd., San Antonio, TX 78209.

• **W9DUA** - Sangamon Valley ARC event July 12–13 from 1300–1900 UTC on all General phone bands with some operation in Novice bands. Send QSL and SASE for certificate to KY9D, 3110 South 13th, Springfield, IL 62703.

• **Boy Scouts Special Event** - The Boy Scouts Connecticut Camporee will have a special event from 8 a.m. to 10 p.m. each day July 12–20 from Winsted, CT. Over 3,000 scouts will attend from all over the US, as well as other countries. SSB on JOTA frequency 3,940, 7,290, 14,290, 21,360, 28,990; CW 3,725, 7.125 on Novice bands. QSL with SASE to Seq. Alumni Assn., c/o Al Schwartz, 18 Russo Dr., Hamden, CT 06518.

• **K2CT** - The Albany ARA will help celebrate Albany, NY's tricentennial by sponsoring the WARM Award and activating the club call, K2CT, for special event stations. For more information, contact K2QF, AARA, 1 Fiddlers Lane, Rensselaer, NY 12144.

• **K8EPV** - Special event sponsored by the Eastern Michigan ARC July 19–20 from 1400–0200Z both days on SSB 3870, 7235, 14235; CW 3710, 7110. Certificate for QSL and SASE to CBA or 654 Georgia, Marysville, MI 48040.

• **KD9UL** - Special event of Illinois Valley ARC on July 20 from 1300–0100 UTC on bottom 25 kHz of General phone bands; CW bottom 20 kHz of Novice bands. For certificate and QSL send SASE and QSL to Bruce Boston, KD9UL, 815 East Third St., Beardstown, IL 62618.

• **Flat Hammock Island** - The Tri-City ARC will operate KA1BB from Flat Hammock Island in Long Island Sound on July 20 from 1300–2000Z in the lower 20 kHz of the General phone and CW 40, 20, 15 meter bands, and center of 40 meter Novice band. QSL with SASE to Tri-City ARC, P.O. Box 686, Groton, CT 06340.

• **W8BXR** - Special event of Davenport Radio Amateur Club on July 25 from 1700–2200Z, July 26 from 1500–2300Z, and July 27 from 1600–2200Z on phone and CW 80–10 meters, 10 kHz up from lower end of General class bands. For certificate send SASE and QSL to Davenport RAC, 2131 Myrtle St., Davenport, IA 52804.

• **W8UMD** - Treaty City ARA special event on July 26–27 from 1400–2200Z each day on SSB 7235 and 14285 and CW 14060, plus July 27 from 0000–0200Z on 3880 SSB. For certificate send SASE to W8UMD, P.O. Box 91, Greenville, OH 45331-0091.

• **W9CZH** - Pike County ARC special event on July 26–27 from 1700–1700Z in the low end of the General class 75, 40, 15 meter phone and CW bands. CW in the 40 meter Novice band on July 26 from 2000–2330Z. For certificate send QSL and SASE to PCARC, RR1 Box 311, Winslow, IN 47598.

• **Sooland ARA Event** - Sooland ARA will operate a special event from Sioux City, IA on July 23–27 from 5–10 pm CDT on 14.285 MHz ±10 kHz. Ops will use own calls but will add "Rivercade" to CQ's and contacts. For certificate send contact number and SASE to Loren Barbee, WBØYOW, 1015 16th St., Sioux City, IA 51105.

• **Racing Day** - Special event from East Aurora, NY on July 27 from 1400–2100 UTC on 3900 and 7235 kHz using the call W1QFC. Pioneer Radio Operators Society event. QSL with SASE to W2QFC, 308 Parkdale Ave., East Aurora, NY 14052.

• **The following hamfests, etc., are slated for July:**

July 4, **Harrisburg Annual Hamfest,** Harrisburg, PA. Contact Dave, KC3MG, 131 Livingston St., Swatara, PA 17113 (717-939-4957).

July 5, **Crawford ARS Firecracker Hamfest,** Meadville, PA. Contact CARS Hamfest-86, P.O. Box 653, Meadville, PA 16335 (814-724-2432).

July 6, **Murgas ARC Hamfest,** Wilkes-Barre, PA. Contact 717-388-6863.

July 9–12, **Mobile Amateur Radio Awards Club Convention,** Asheville, NC. Contact WA3TUC.

July 11–13, **1986 Wyoming Hamfest,** Douglas, WY. Contact 1986 Wyoming Hamfest, P.O. Box 3842, Gillette, WY 82716-0390 (SASE).

July 11–13, **Texas State ARRL and VHF/FM Society Convention,** San Antonio, TX. Contact Convention, Texas VHF/FM Society, P.O. Box 18506, San Antonio, TX 78218.

July 12, **South Milwaukee ARC Swapfest,** Oak Creek, WI. Contact South Milwaukee ARC, P.O. Box 102, S. Milwaukee, WI 53172-0102.

July 12, **Mt. Beacon Hamfest,** Poughkeepsie/LaGrange, NY. Contact Julius Jones, W2IHY, RR2, Vanessa Lane, Staatsburg, NY 12580 (914-889-4933).

July 12, **Eau Claire ARC Hamfest,** Eau Claire, WI. Contact Gene Lieberg, KA9DWH, 2840 Saturn Ave., Eau Claire, WI 54703 (SASE).

July 12, **Mt. Nittany Ham Festival,** Pleasant Gap, PA. Contact Chuck McMullen, K3CM, 7 Holly Circle, State College, PA 16801.

July 12, **Straits Area ARC Swap and Shop,** Petoskey, MI. Contact 616-347-8693.

July 12–13, **International Peace Garden Hamfest & Computerfest,** International Peace Garden between Dunseith, ND, and Boissevain, Man. Contact MARA, Box 64, Minot, ND 58702.

July 12–13, **Maple Ridge Hamfest,** Maple Ridge, BC, Canada. Contact Bob Haughton, VE7BZH, Box 292, Maple Ridge, BC, Canada V2X 7G2 (604-467-4915).

July 12–13, **Lake Canton Field Day,** Lake Canton, OK. Contact Tim Mauldin, WA5LTM, Lake Canton Field Day, P.O. Box 19097, Oklahoma City, OK 73144 (405-521-5048).

July 13, **Wood County ARC Ham-A-Rama,** Bowling Green, OH. Contact Chuck Dicken, WD8ICP, 1002 Revere Dr., Bowling Green, OH 43402 (419-352-0865).

July 13, **North Hills ARC Hamfest,** North Hills, PA. Contact N3DOK.

July 13, **DuPage ARC Hamfest & Computerfest,** Downers Grove, IL. Contact DuPage ARC, P.O. Box 71, Clarendon Hills, IL 60514 (312-985-0527 evenings or weekends).

July 18, **Hamfest USA,** Moorestown, NJ. Contact Hamfest USA, 15 E. Camden Ave., Moorestown, NJ 08057 (609-234-3926).

July 18–20, **Glacier-Waterton International Hamfest,** Waterton Homestead Campground, Alberta, Canada. Contact Hamfest, P.O. Box 148, Milk River, Alberta, Canada T0K 1M0.

July 19, **SCARC 86,** Augusta, NJ. Contact Donald R. Stickle, K2OX, Weldon Rd., RD#4, Lake Hopatcong, NJ 07849 (201-663-0677).

July 19–20, **Atlanta Hamfestival,** Atlanta, GA. Contact Atlanta Hamfestival, Inc., P.O. Box 77171, Atlanta, GA 30357 (SASE).

July 20, **Zero Beaters Hamfest,** Washington, MO. Contact Zero Beaters ARC, P.O. Box 24, Dutzow, MO 63342.

July 25–27, **Northwest DX Convention,** Renton, WA. Contact Western Washington DX Club, P.O. Box 224, Mercer Island, WA 98040.

July 26, **Ski Country ARC Hamfest,** Glenwood Springs, CO. Contact Bob Ludtke, K9MWM, 1001 Grand, Glenwood Springs, CO 81601 (303-945-5966).

July 27, **BRATS Maryland Hamfest & Computerfest,** West Friendship, MD. Contact W3GXK, BRATS, P.O. Box 5915, Baltimore, MD 21208.

July 27, **Hays ARC Swapfest & Auction,** Hays, KS. Contact Andy Oldham, N0FBS, 117 N. 8th St., Wakeeney, KS 67672.

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Building Ideas For A Consolidated Control Console

BY JOHN J. SCHULTZ*, W4FA

Tired of turning or throwing several switches to tune-up a transmitter? Tired of listening to the same dull tone on CW for sidetone? Tired of reaching over for the volume control every time a particularly loud station comes on? Tired of the jumble of wires associated with various station accessories? If so, what I'll facetiously call a "CCC" (Consolidated Control Console) might be the answer. Actually, the name is rather descriptive, since in order to simplify station operation one has to first analyze what controls and switches have to be manipulated for a particular function and then find a way to consolidate the controls involved for more convenient station operation. The process is not complicated, and just a small "CCC" can vastly simplify station operation in many cases.

This article describes two "CCC's." Readers might wish to duplicate one or the other or just borrow ideas from them for a custom design. Both can find application with practically any transceiver on the market.

The small "CCC" in use with a typical transceiver.

A Small "CCC"

The small "CCC" shown in the photograph is constructed in a small slope panel enclosure (similar to a Radio Shack No. 270-264). The circuitry can be assembled from commercially available PC boards or from the ground up following the schematics shown with this article. The small "CCC" is self-powered and performs two very useful functions—simplified transceiver tune-up on SSB and microphone preamplification/equalization for improved talk-power.

The tune-up idea goes back to a previous *CQ* article (January 1982) and nas a very simple basis. Most transceivers have very awkward tune-up procedures, even the newest and most expensive of them. For example, for tune-up on SSB most transceivers require that a mode switch be set to a "tune" position or some constant carrier position such as FSK or AM. Then a drive control has to be set at minimum and the transmitter keyed. Now the drive level can be slowly increased as a PA stage, antenna tuner, etc., is adjusted. The transmitter is then unkeyed and the mode switch reset to SSB. Possibly, the drive control has to reset to an operate level. The whole awkward procedure can be replaced if a variable-level, sine-wave tone is fed into the microphone input of the transceiver for tune-up. The single frequency tone produces the equivalent of a carrier signal, and as its level is increased the effect is the same as increasing a drive control. However, not a single control on the transceiver has to be manipulated or reset! One can increase the tone level with one hand while simultaneously making tune-up adjustments with the other hand (e.g., adjusting antenna-tuner controls for minimum SWR).

The sine-wave oscillator used in the small "CCC" is shown in fig. 1. It is a very conventional RC phase shift oscillator operating at about 1 kHz. Q1 is the oscillator itself, and Q2 is a simple buffer oscillator.

*c/o CQ Magazine

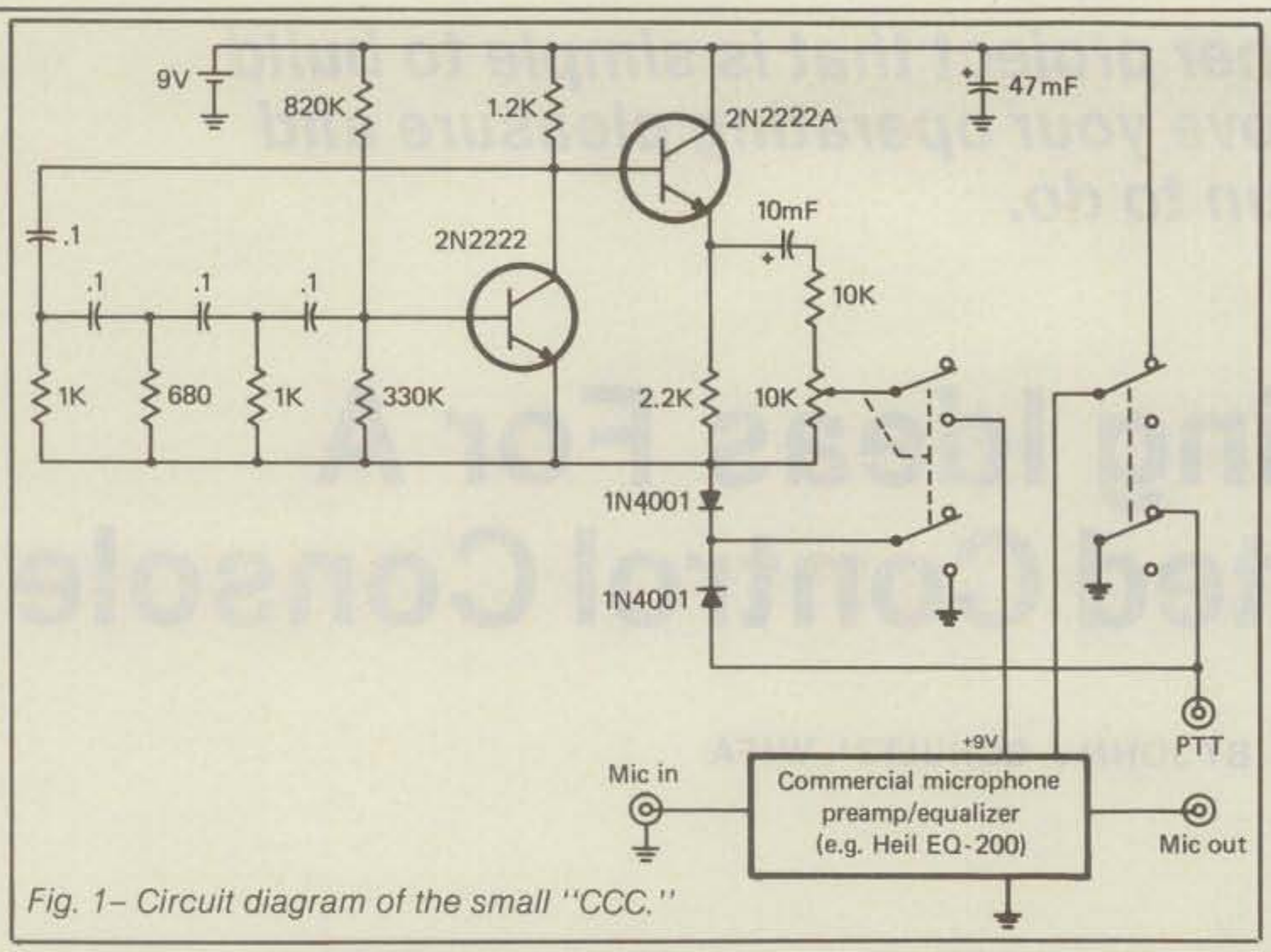


Fig. 1– Circuit diagram of the small "CCC."

If you do build the circuit don't try to "simplify" it by eliminating Q2. In some cases it will work alright without the Q2 stage, but under some load conditions the Q1 stage will not function properly without the isolation provided by the buffer stage. Similar oscillators can often be found being sold by surplus outlets, since a great many were produced by hi-fi manufacturers for use as a level adjustment aid in tuners, amplifiers, etc. The actual frequency of oscillation is not important as long as it is in the more or less flat audio response band of an SSB transmitter, roughly 500 to 2000 Hz. It is, however, extremely important that a sine-wave oscillator be used and not a square-wave oscillator. Be careful of this point if you buy a commercial audio oscillator kit, especially ones that are labeled "Signal Injectors."

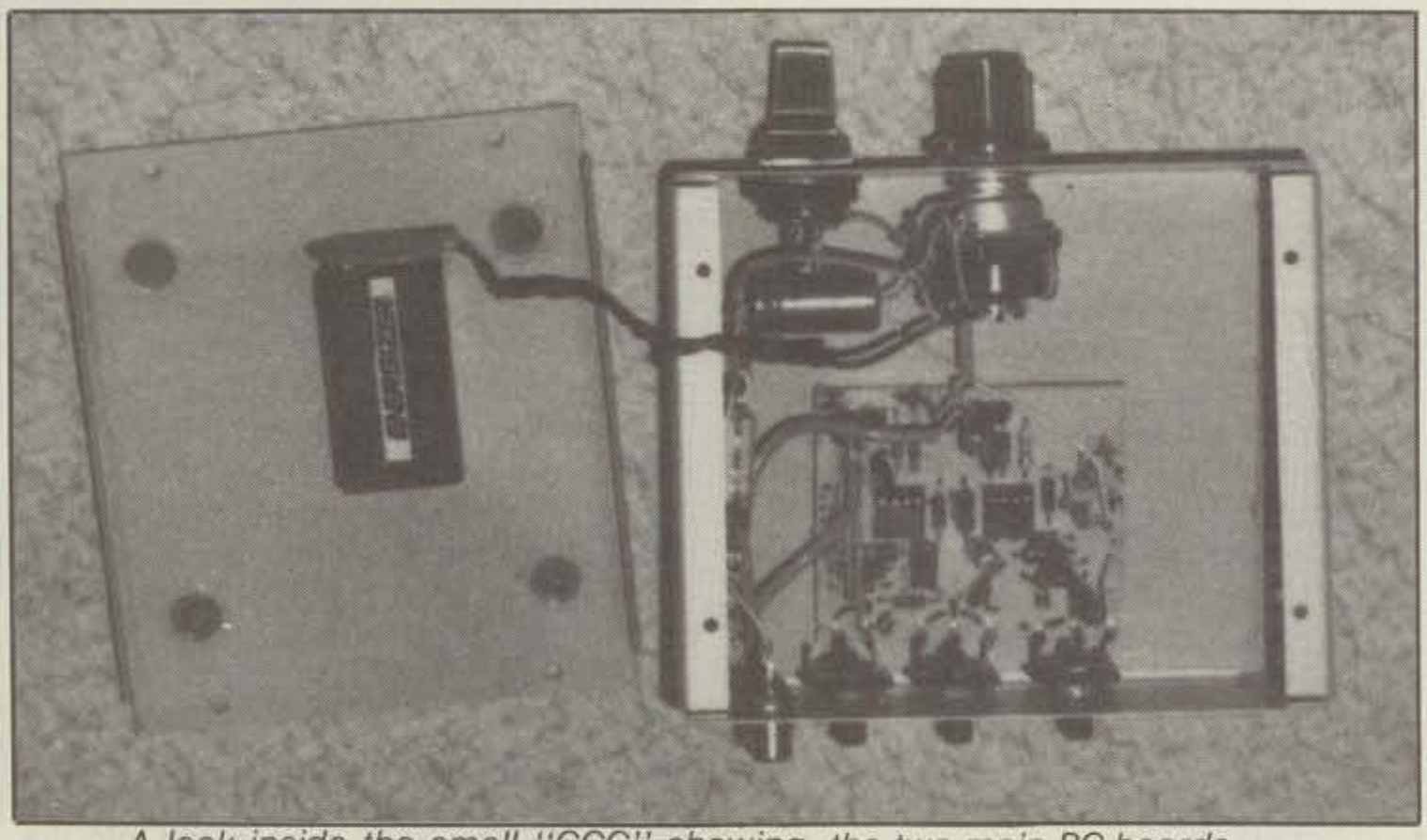
As can be seen from fig. 1, the potentiometer which controls the output level of the oscillator (a Radio Shack type 271-215) also has a dual DPDT switch mounted on its shaft. One switch section is used to key the PTT line in a transceiver and simultaneously applies power to the oscillator, by establishing its ground return connection. The diodes isolate the switch functions. As shown, the circuit is suitable for the most common type of PTT line which requires a positive-going ground connection. If the reverse were true, the circuitry could be reversed by reversing the diodes and switching the positive line to the oscillator. The other switch section simply connects the oscillator output to the microphone line. If anything, the oscillator output may be too high for some transceivers. In this case one may have to experiment a bit by putting resistors (10 k to 1 meg.) in series with the oscillator output connection to the microphone line. When properly set up with the usual 100 watt transceiver, rotation of the oscillator output potentiometer over about 180 degrees will result in a very smooth, gradual increase of transceiver output from a few watts to full power output. At the low power setting practically any transceiver should be able to endure any length of tuning time. Of course, when tuning one does have to remember that a signal is being radiated and that its frequency is that of the suppressed carrier plus the oscillator frequency on USB and minus the oscillator frequency on LSB.

A separate PTT switch provides for manual PTT switching as a convenience item for normal operation.

The second main part of the small "CCC" is a microphone preamplifier/equalizer so one can tailor a microphone's response for best speech intelligibility. The circuitry used is shown in fig. 1. It is that of the Heil Sound EQ-200 unit which was reviewed earlier in *CQ* (July 1982). As described in more detail in the review, the circuitry consists of a low-frequency attenuate/boost stage and high-frequency attenuate/boost stage bracketed by input and output amplifier stages. The unit has proved to be extremely effective in brightening the response of many dull, flat sounding microphones. The unit has three controls for gain, low-frequency attenuate/boost, and high-frequency attenuate/boost which are mounted on the rear panel of the small "CCC," since once they are adjusted, there is rarely any need to further touch them.

The internal photograph of the small "CCC" pretty well shows how the PC boards and components are mounted. There is nothing critical about the mounting of components or the placement of the controls. The front-panel controls (the PTT switch and the level control for the tune-up oscillator) were mounted a bit to the left simply to provide space for additional controls as new ideas are incorporated into the unit. An earlier version of the small "CCC," for instance, had a few pushbutton switches incorporated to control the scanning functions on an HF transceiver. In/out connections are made by phono-type connectors. The 9 volt battery which powers both PC boards is mounted to the bottom panel of the enclosure using back-to-back tape, although this mounting method is not really recommended. From a practical viewpoint, it would be much better to mount the battery in a battery clip on the rear panel to facilitate battery replacement. Don't be tempted to incorporate a small LED in the unit to indicate a power "on" condition. The battery drain of the LED will quickly deplete the 9V battery.

I wouldn't hesitate to label the small "CCC" as one of the handiest accessory items I have built for use with various SSB transceivers. The tune-up oscillator, besides serving its original function, has also come in handy with various transceivers to set speech processor levels. Using the oscillator one can very clearly see when a processor reaches a thres-



A look inside the small "CCC" showing the two main PC boards.

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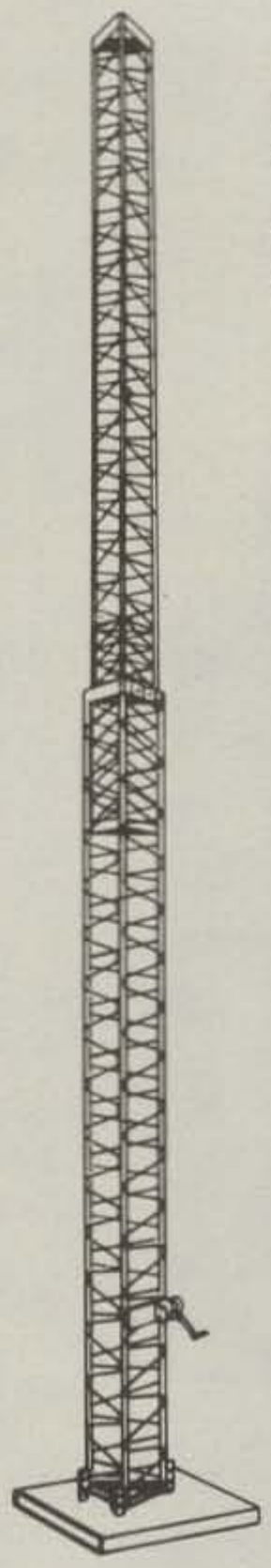

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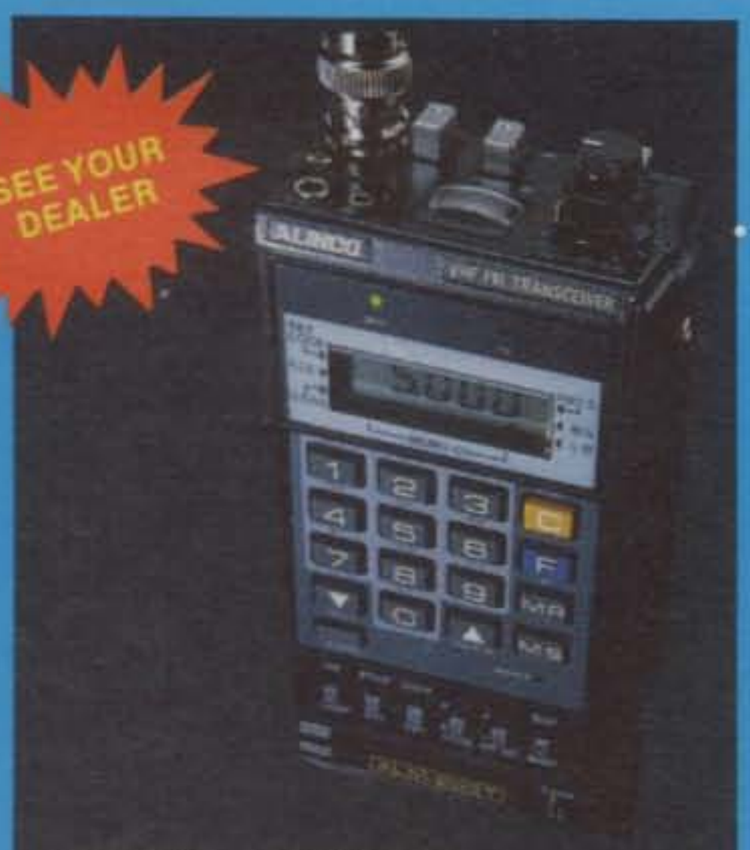

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CONSTRUCTION OF LEGS

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The larger "CCC."

hold clipping level as compared to the sometimes confusing indications on panel meters using a speech signal. In such a case, it is a great aid to set up a processor so it is not overdriven, but yet performs its intended function.

A Larger "CCC"

The larger "CCC," as shown in the photograph, is built into a Radio Shack 270-265 enclosure. It "pulls together" a number of items one might find separately spread around a station installation. In this case, it incorporates a loudspeaker, dual 9 volt and 12 volt regulated power supplies to power both internal circuitry and external accessories, a PTT switch, a tune-up oscillator of the type previously described, a headphone jack, loudspeaker volume control, a microphone preamplifier with variable gain control, an LCD digital clock, and finally even an on-the-air lamp indicator. Later on some more circuitry was added to provide for CW sidetone with variable volume and pitch. However, it should again be emphasized that the ideas incorporated in the larger "CCC" were a response to the needs of a particular station setup. The idea is not to suggest a specific "CCC," but to surface some "mix and match" ideas between the small and large "CCC's" that one can adapt to individual station requirements.

The total block diagram of the larger "CCC" is shown in fig. 2 with some specific circuits detailed in figs. 3 and 4. In spite of its varied functions, it is not all that complicated. The tune-up oscillator, as previously mentioned, uses the same circuitry as that described for the small "CCC." The power supplies use standard IC regulators and a transformer with split 18 VAC secondaries (or two separate 18 VAC transformers can be used). The loudspeaker volume control is a standard "L" pad type (Radio Shack 40-980). The microphone preamplifier is a small variation of the type Astatic uses for their amplified D-104 microphone. It can be adapted for

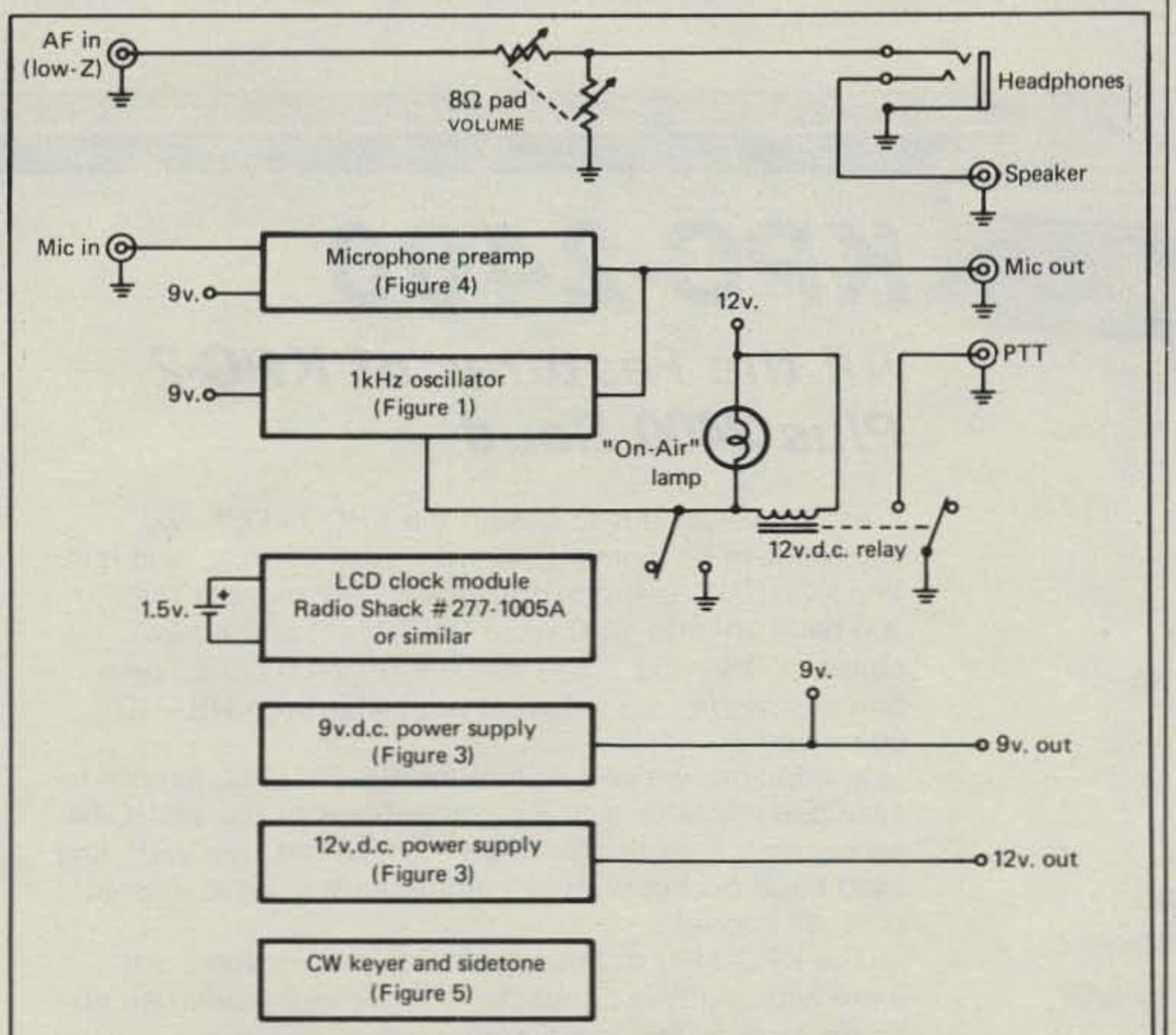

Fig. 2– Block diagram of the larger "CCC." Individual block diagrams are shown in other figures. Clock wiring is not fully shown, as a diagram comes with the module

Kantronics Introduces

2400 BAUD PACKET

Not Just For All Computers But For All TNC's Too!

WHY 2400 BAUD?

Packet channels are congested, and faster is better. So Kantronics has designed a 2400 baud PSK (phase shift keying) modem and included it in an all new KPC-2400. In addition, we are making this modem available in PC-board form to add to your TNC-1 or TNC-2, cables included! If you have a KPC-1 or KPC-2, we'll take it in trade for a new KPC-2400.

Since October 28, 1982, the rules have allowed for baud rates up to 19.6K. Of course, we've all been operating at 1200 baud with Bell 202 (1200 baud) standard tones. However, the bandwidth of our radios is fully capable of running up to 2400 baud, giving us congestion relief. Our phase shift modem (PSK) takes advantage of the bandwidth available and the reasonable linearity of the audio channels, and it is designed with the V.26TER CCITT specification in mind. To add to your TNC or trade for a new KPC-2400, see facing page.

KPC-2400

All the Features of KPC-2 Plus 2400 Baud

KPC-2400 Features

- AX.25 version 2 software
- Supports multiple connects
- All EPROM software is Kantronics written and U.S. copyrighted
- Advanced software HDLC, eliminating expensive chips
- In-house programmers/engineers
- In-house service representatives
- Periodic updates —we keep you on the air

When we set out to design the KPC-2400 ™, we wanted it to be compatible with existing units, and it is. The KPC-2400 features both the KPC-2 modem for 300 baud HF and 1200 baud VHF work, and a new phase shift keying (PSK) modem for 2400 baud operation. All modes are software selectable with HBAUD command!

In addition, we've retained the RS-232/TTL jumper for easy direct interface to PC compatibles or the VIC/C-64 series. Hence, with the KPC-2400 you get HF, VHF, and 2400 baud packet with all computers that have a serial port, all in one!

The KPC-2400 of course, retains the version 2 software with multiple connects, and we've included an on-board memory diagnostic routine too.

Suggested Retail $329.00

Speed Up Your TNC-1 Or TNC-2 To 2400 BAUD

Speed up your local area network with the new *2400 TNC Modem*™. The 2400 TNC Modem is a PC-board that mounts directly above your existing TNC PC-board. By adding the 2400 TNC Modem to TNC-1 or 2, you gain 2400 baud while retaining 1200 baud operation, switch selectable.

Two 2400 TNC Modems will be available—one for TNC-1's, and another for TNC-2's. If you purchased a TNC-1 or TNC-2, manufactured or kit version, the 2400 TNC Modem should be compatible. If you have a home brew case, the installation may require case modification.

The 2400 TNC Modem will be available in late June. You may order the 2400 TNC Modem through a Kantronics dealer or directly through Kantronics, using check, money order, Visa or Mastercard. *Suggested Retail $149.00 (includes shipping)*.

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That's right—Now you can trade in your Packet Communicator (KPC-1), or KPC-2, and for just $149.00, you'll receive a NEW KPC-2400!

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You may also schedule your exchange by calling the Kantronics order desk and giving your Visa or MC number. Just call (913)842-7745 between 9-12, 1-4 (Central Standard Time) Monday-Friday, and we'll take it from there.

To guarantee a quick turn-around time, Kantronics is *scheduling ALL exchanges*, and assigning authorization numbers. Any unit returned to the factory without prior scheduling and authorization number will not be given priority placement.

KPC-2400 EXCHANGE SCHEDULING FORM

To schedule your KPC-2400 exchange, please fill out the information below and mail this form, including $149.00 payment (shipping included) to **Kantronics, 1202 E. 23rd Street. Lawrence, KS 66046.** You will be notified by mail of your authorization number, and scheduled exchange date. **DO NOT RETURN YOUR UNIT WITH THIS FORM.** This form is being used to SCHEDULE returns.

When it is time to return your unit, please DO NOT SEND BACK ANY CONNECTORS, CABLES OR POWER SUPPLIES. Send back only the unit itself. Any cables, connectors, or power supplies received will not be returned. You will receive a new manual and a 9-pin connector with your new KPC-2400.

Name _____ Call Sign _____

Address _____

City _____ State _____ Zip _____

Phone( ) _____ Date _____

Unit to be exchanged (check one) _____KPC-1 _____KPC-2

Serial Number _____

Payment (check one) _____Check or Money Order
_____VISA
_____Master Card

VISA or Master Card Number _____

Exp. Date _____

Any unit returned to the factory without payment, authorization number and prior scheduling will not receive priority placement.

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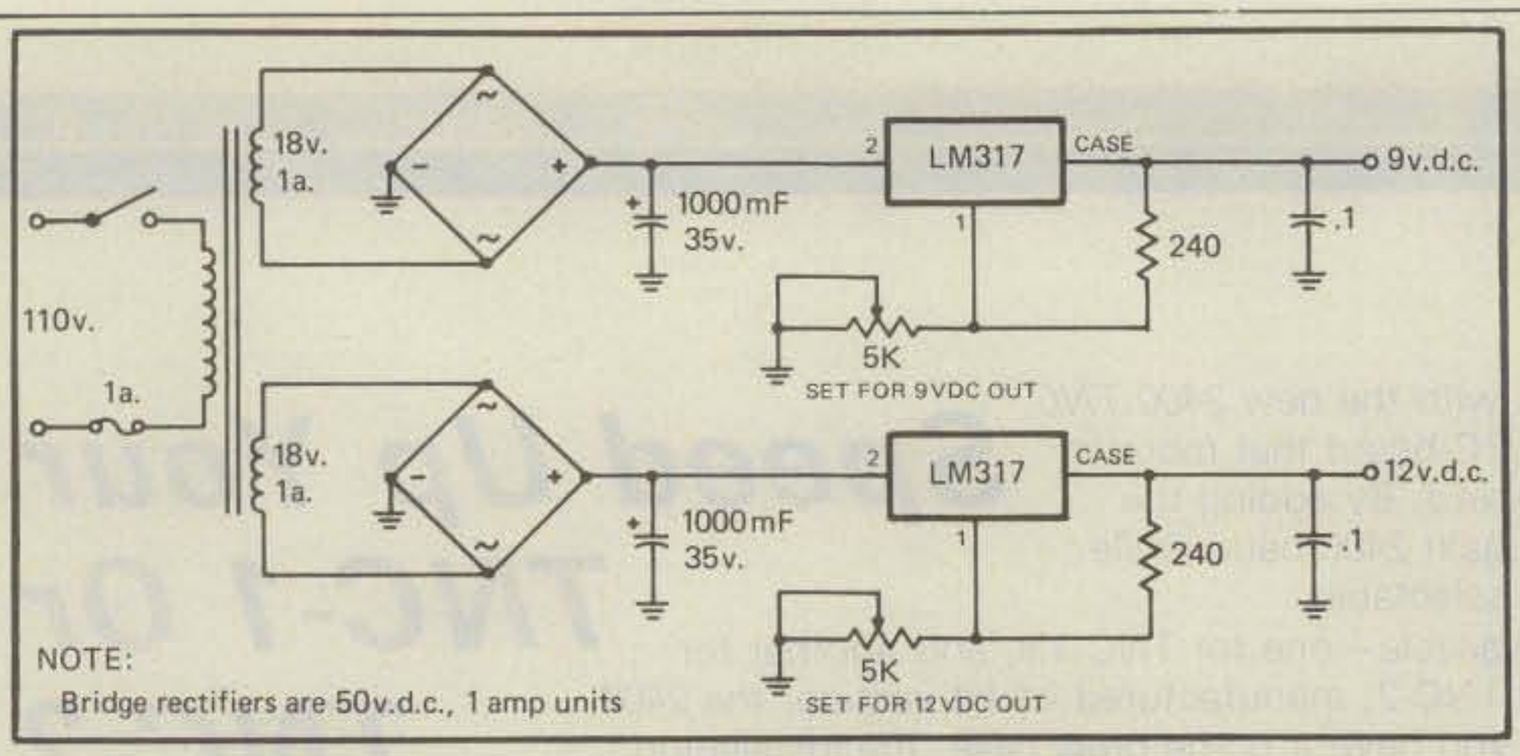


Fig. 3– Nine VDC and 12 VDC power supplies.

low-impedance microphones by using ahead of it almost any sort of 1:20 K ohm transistor interstage transformer as an impedance step-up device. The LCD clock, also a Radio Shack item, uses two miniature pushbuttons for both time-setting and month/date display functions. It operates off of a single AA battery which is contained in a mounting on the back panel of the unit. Details on how to wire it come with the clock module. As can be seen from the schematic, relay PTT line switching is used in the larger "CCC." This arrangement means a bit more power supply drain, which is of no consequence since the unit has an internal AC power supply, but means that it will universally interface with any transceiver's PTT line arrangement.

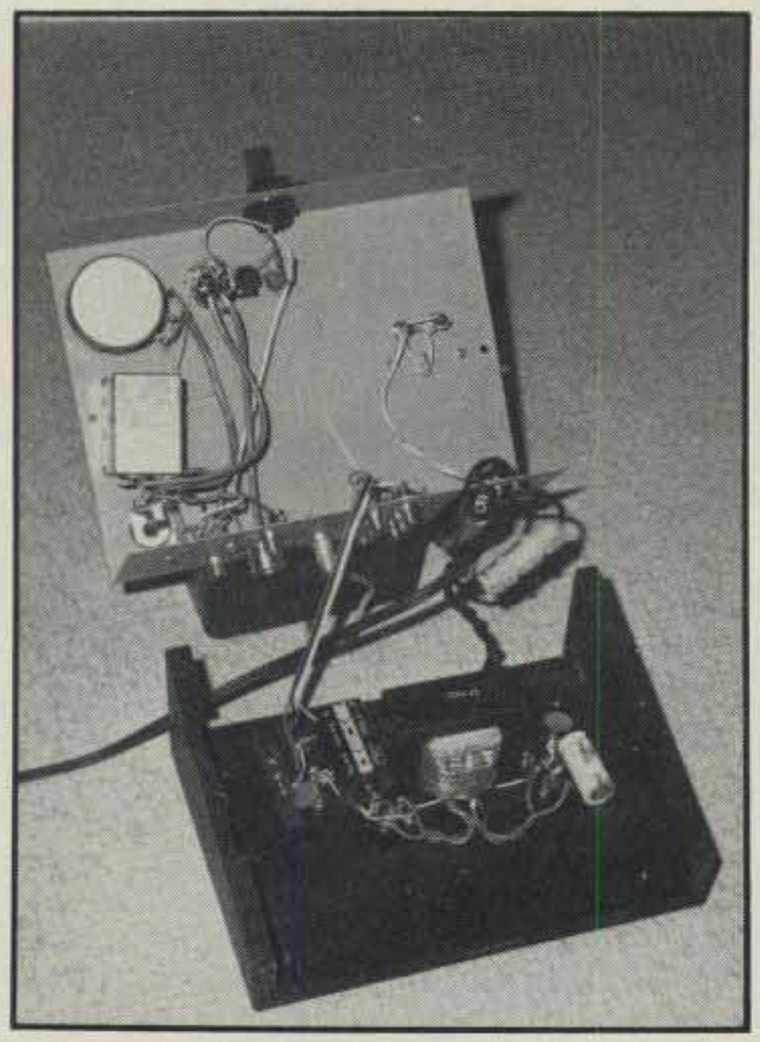
The reason for incorporating the headphone jack on the unit was not simply based on convenience. It was planned to later on incorporate both a keyer IC and separate volume/pitch sidetone controls in the larger "CCC" for CW operation. More than adequate room was left in the enclosure for this purpose, and the circuitry that was eventually installed is shown in fig. 5. It provides for complete flexibility as regards speed, volume, and pitch control. It is a great improvement over various keyer arrangements, both internal and external to a transceiver, where one cannot enjoy the flexibility of being able to adjust the various controls at will.

Again, as can be seen from the photograph, extensive use was made of phono connectors for In/Out connections on the larger "CCC." An 8-pin DIN connector was used for the microphone/out connector simply to provide extra interconnection possibilities for a single umbilical-cord connection to a transceiver having external scanning control possibilities (e.g., the Yaesu FT-One) via a microphone plug. In most cases it can be replaced by simple phono-type connectors for the PTT and microphone lines.

Construction of the larger "CCC" is far easier than it looks because of the way the Radio Shack enclosure is divided. Except for the power-supply components, all circuitry can be mounted on the top cover, which is, in fact, a wrap-around aluminum piece incorporating both the front and back panels. If one has a simple metal-hole-punch tool, one can punch out all of the connector/control mounting holes in a few minutes after their positions have been marked. The only real wiring precaution that must be observed is to use shielded wire for the In/Out connections to the microphone preamplifier. As an extra precaution against RF problems the microphone preamplifier was enclosed in a small sheet-metal box, although such a precaution is, admittedly, a bit overdoing it unless the specific need for such shielding can be demonstrated.

Operating convenience using the larger "CCC" doesn't leave too much to be desired. I wouldn't say that one can sit

A rear view of the larger "CCC." Liberal use is made of phono jacks for external connections. The battery to the left is a holder for the LCD clock only.



A look inside the larger "CCC." Power-supply components are mounted on the base with other components mounted on the top shell.

back in an armchair and use the "CCC" to completely control an amateur radio station, but operating conditions do approach that ideal when one considers that use of the "CCC" allows one to tune up a transceiver without adjusting any transceiver controls, adjust incoming received volume, adjust modulation via the microphone preamplifier gain, etc. It simply is a great convenience accessory regardless of which transceiver one happens to be using.

Summary

The "CCC" boxes developed in my stations simply because in spite of all the controls present on modern transceivers, a few features always seemed to be lacking. The features that were lacking were not really "great" ones, but they were ones that got to be annoying by their absence as a transceiver was used for extended operating periods. A very casual amateur band operator may, frankly, not find much value in a "CCC" box, but I'll be willing to venture that any reasonably active amateur will find that his version of a "CCC" will return extremely satisfying results as related to the time involved in constructing the unit. Who knows? Perhaps some manufacturer might even develop a commercial unit. Since only transceiver In/Out connections are required and since transceiver performance can be improved in several dimensions on both receive and transmit, the idea would seem to be ripe for further development. CQ

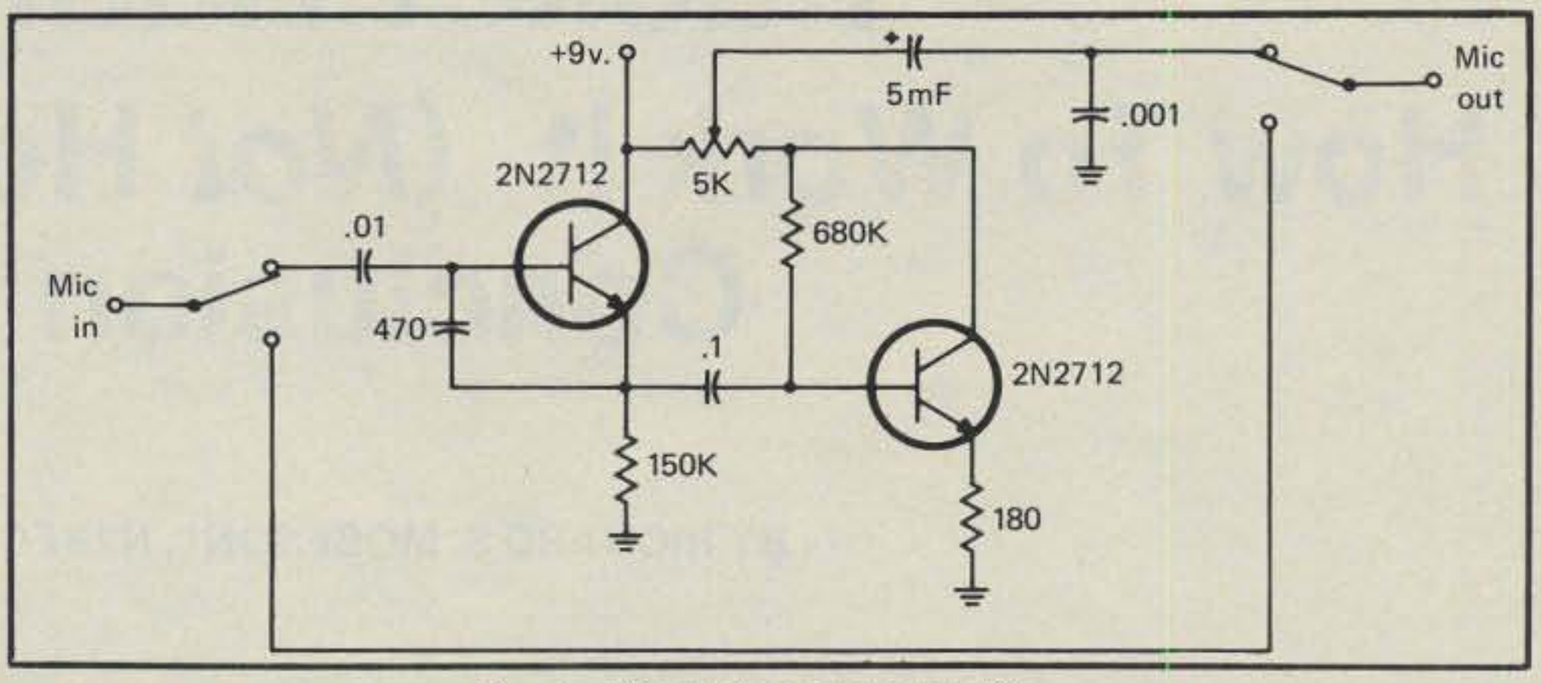


Fig. 4– Microphone preamplifier.

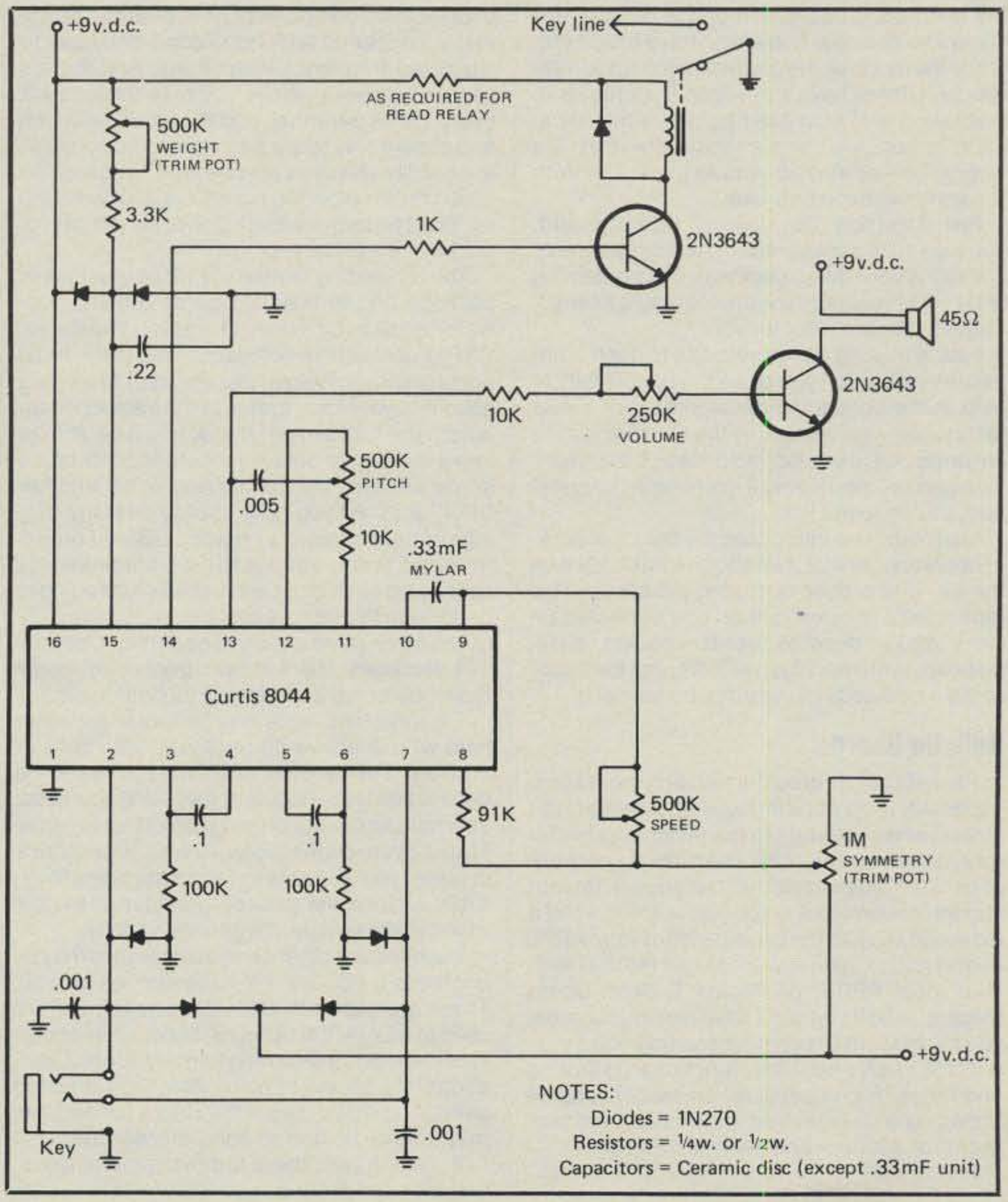


Fig. 5– The electronic keyer circuitry which was later added to the larger "CCC."

It's not as difficult as it sounds. You really can have a good time exploring the new world of packet radio even if you're not an engineer.

Packet Radio
How To Work It (*Not* How It Works)
Conclusion

BY RICHARD S. MOSESON*, N2BFG

Packet radio is touted as the fastest-growing mode in amateur radio today. And it may well be. But even so, it has drawn only a relative few hams into its ranks. Some who have tried it embrace the mode as the greatest thing since transistors. Others have thrown up their hands in frustration and sold their packet controllers. Each group will argue endlessly that it's wonderful—or terrible. And as usual, the truth lies somewhere in between.

Fact: If you don't like "talking" on a keyboard, you won't like packet radio. If a microphone or CW key is your thing, stick with it. If contesting or DXing is your primary amateur radio interest, forget it. Packet's not for you.

Fact: If making computers talk to each other excites you, and if you'd like the opportunity to help in the continuing development of a new technology, you're missing the boat if you miss out on packet. If you like radioteletype and yearn for a garble-free means of exchanging information, you've found it.

Last month we introduced the basics of packet operating: what it's all about, what it's like on the air, and proper operating practices. This month we'll concentrate on one of packet radio's major drawing cards—packet bulletin-board systems. Plus, we'll discuss the future of the mode and how you can be part of it.

Bulletin Boards

Packet radio is great for sending messages, especially if the person you want to reach isn't around when you want to reach him or is too far away to contact directly. The growing network of packet "digipeaters" will let you link up with distant stations, but if you just want to send a message, or read the latest bulletins from ARRL headquarters, you'll want to get familiar with your local PBBS, or Packet Bulletin Board System. (And if you don't have one in your area, you might want to consider starting one.)

PBBSs serve two basic functions: (1) Storing and forwarding of personal messages, and (2) providing a database of information and programs of amateur and general interest.

**28 Maple St., N. Tarrytown, NY 10591*

The database and message-storage functions are quite similar to those on telephone-based computer bulletin boards, except that you incur no telephone costs and have to share the frequency with others. And there's very little privacy. While you may designate a message as personal, and the PBBS will list it and show it only to the addressee, the contents are readily visible to anyone who's monitoring while you're uploading the message or while the recipient is downloading it (the price you pay for not having a price to pay).

The forwarding feature of PBBSs is unique to packet—and to bulletin boards running software written by Hank Oredson, W0RLI (or W0RLI-compatible software). This is the most popular BBS software, though, so chances are good that your local system will be equipped for automatic forwarding. If it is, you'll be able to leave messages not only for other users of the same system, but for someone on another "RLI" BBS. All you have to provide is the callsign of the recipient's "home" BBS. At predetermined times, various PBBSs automatically connect to each other and transfer files going to or through the other's system.

Let's look more closely at each major feature:

1. Messages. There are two general message types: personal and general (bulletins, etc.).

Personal messages may be sent to any other ham who is active on packet at your BBS or another. The @ symbol is used to mark the destination BBS. People are working now to set up a reliable means of using packet for National Traffic System messages, as well. When that's in place, you'll be able to send a message to virtually anyone via packet, provided there's a PBBS in the recipient's general vicinity.

Bulletins and other general messages may be posted in a PBBS's message section as well. These are generally addressed to **ALL** and are used to relay ARRL bulletins, announcements of club meetings, upcoming hamfests, etc. Operating hints, as well as notes directing interested users to specific files in the BBS's file section, may also be posted as general messages.

2. Files. Again, there are two general types: text files and programs.

Text files include things such as regional digipeater maps, lists of active packeteers in a specific area, or a guide to using the BBS. There are also calendars, lists of stations active on the bulletin board, info on connecting specific TNCs to specific radios, etc.

Programs are just that—public-domain computer programs that may be downloaded from the BBS computer to yours, then stored on disk for future use. Many have amateur radio applications, but there are also many general-interest programs available.

Checking In

Connecting to a packet bulletin board system is just li' e connecting to any other station—**C** (Callsig n), or **C** (Callsign) **Via** (Digipeater). PBBSs can only handle one user at a time, so if someone else is connected when you try to hook up, you'll get a "busy" message. If you have a printer hooked up to your system, it's a good idea to turn it on when you're connected to a BBS. First of all, there's a lot of stuff there you may want to save as hard copy. Second, the info comes in at 1200 baud—quite quickly if it's flowing smoothly—and it's very easy to lose things as they go by. Third, if your monitor has only a 40-column display, you'll need an 80-column printer to make sense of most maps or charts. (If you don't have a printer, be sure to have a buffer turned on, so you can review the material later.)

But how do you get your hands on that fast-flowing info? Bulletin boards are "interactive" systems. You have to tell them what you want. To do that, you have to "speak their language." The language, or set of instructions telling a computer to do a specific task, is embodied in the software—the program used to run the BBS.

W0RLI software, which is becoming the de facto standard for PBBSs, lets you give one-letter commands such as **L** (list), **R** (read), **W** (what—for a listing of program files rather than messages) and **B** (bye—to sign off). There are also more specific, two-letter commands such as **RM** (read mine) or **LB** (list bulletins).

(I won't list all the different commands here, just those needed for a basic explanation. More specific information on the W0RLI system is available in an excellent guide written by Jon Pearce, WB2MNF, of Medford, New Jersey. It's available as a text file on many RLI systems, and

arrangements are being made for TAPR to make copies available for an SASE. I highly recommend it.)

(Since the W0RLI system is the most popular, the commands I discuss here are for that system. Other systems may have different commands. If none of the letters I use has the desired effect on your BBS, just follow screen prompts to get more information about that specific system. Also, I will occasionally use "quotation marks" and/or (parentheses) to set off commands within the text of this article. They are not needed on the air. Don't use them.)

Let's Take A Tour

Welcome aboard the *S.S. PBBS*. We hope you'll enjoy your visit. Please plug in your TNCs and connect. Our first stop is the welcome screen. If you've been here before, it will greet you by name and let you know if you have any new messages. If you do, it will list the message number, the station it's coming from, and a brief title. It will also let you know how many messages have been posted since your last visit.

An **L** command now will list the titles of those messages, along with the callsigns of the originating and destination stations. If you have mail, typing **RM** will let you read your messages.

(Wait for a prompt, usually a **>**, before sending a command. And once again, be patient. If the BBS doesn't acknowledge your transmission or respond to your command, fight the temptation to send it again. Everything will eventually get through and the BBS will end up repeating itself if you've repeated commands.)

If this is your first time on the BBS, the computer will probably ask for your name and QTH, then give you the opportunity to list *all* the active messages on the system. On future check-ins the **list** command will only show you the messages that have been posted since your last check-in. (You may view earlier messages, but you have to give the BBS computer a starting point.) You may list the messages with the **L** command or, if you're not interested in seeing personal messages for other people, you may type **LB** to list only bulletins or **LA** to list only ARRL bulletins.

Okay, you've got your list. Now let's say you want to read message number 3011. Type: **R 3011** (return). The message will print out on your screen (and/or printer). You'll know it's finished when you get a **what next** request from the BBS. The wording will vary from system to system, but the general idea will be the same—"I'm done. What would you like next?"

If the message was addressed to you, it's good practice to kill it once you've read it. There are two ways to do this: either type **K** (msg #) or **KT** (msg #). The **K** will simply remove the file from the listing and free up the disc space for another message. **KT** stands for **K**ill **T**raffic. It not only kills the message, but automatically originates a message back to the sending station, letting him/her know the date and time that you picked up the original message.

Now it's your turn to send a message. Let's say you want to send me a message telling me how wonderful this article is. If I'm a regular user on your BBS, you just type **S N2BFG** (Return). The BBS will then ask you for a brief title. When you've done that, it'll give you the go-ahead to type in the message text. You may either type it from scratch, or if you've written it earlier and stored it in a buffer, you can just send the buffer contents (a good idea, since it takes up less time on the shared system).

When you're finished, you need to let the BBS know. On the RLI system, a **Control-Z** (Return) sends the "finished" message. You'll know it's been received when you get a **what next** message from the BBS.

What do you do, though, if you want to send me a message and I'm not a regular user of your BBS? It's simple, if you know which BBS I do use, and your system is part of the nationwide network of linked BBSs (look for a file named **LINKED.BBS** or something similar to find out which systems regularly "talk" with yours). Since my "home" BBS is WA2SNA-1, you address the message to **N2BFG @ WA2SNA-1**. The BBS will automatically forward the message to the SNA bulletin board, where I'll see it waiting when I check in.

If you don't want everybody else to read your message to me, you can mark it *personal* by typing **SP N2BFG**. If you do want everyone to read your message, you may make it a bulletin by typing **SB** and addressing it to **all**. (SB ALL). It will then show up on the listing of bulletins when someone types **LB**.

Important Note: When you send a message to a particular person, it's the recipient's responsibility to kill the message once it's read. When you send a bulletin, it's your responsibility to kill it after an appropriate amount of time. (For example, if you're announcing an event be sure to kill the bulletin the day after the event.)

Let's move on now to the next stop on our tour, accessible by pressing **W** on your keyboard, followed by a Return. We've now entered the realm of the files, and a list of what's on the BBS disk will appear on your screen, generally followed by a number. This is the file size in bytes.

Seeing what's inside these files is different from reading a message. Files and programs aren't read; they're **downloaded**. The command, logically, is **D**, followed by the file name. If the file is long, it may take quite a while to dump from the BBS computer to yours.

Yes, the data travels at 1,200 bits per second (baud), but not every packet gets through on the first try. Especially on a busy channel, it may take quite a few retries to get each packet through, and that can mean a longer-than-expected time to complete the download.

With most TNCs, you use regular terminal software, so downloaded files can be sent directly to disk. Others, such as the AEA PK-64, have their own software that won't permit this. In these cases you have to download the file into your buffer, then save the buffer contents.

The same procedures are used in reverse when you want to post a file on the bulletin board. To **Upload**, you use the **U** command, followed by whatever name you want to give the file. When the BBS is ready, it will tell you to send the file generally followed by a **Control-Z** to mark the end. (If you can't upload directly from disk, you'll have to put the file for transfer into one of your transmit buffers, then send the buffer on cue.)

Some systems permit you to check your file by immediately downloading it. Others, however, delay its appearance on the index until the **sysop** (control operator) has had a chance to review it and make sure it's legal, etc. So don't worry if you finish uploading a file, do a **W**, and don't see your file.

One warning on uploading files: Before you send your file, do a **W** to check the available disk space on the BBS computer. Then check the length of your file and make sure it isn't bigger than the available space. If you overfill the BBS disk, you can mess up all sorts of things and create lots of work for the sysop to clean it up. Some data could be lost forever. (If your over-

load causes a disk crash, which it could, everything on the disk could be lost.) So be careful.

However, several sysops have told me that overloading the disk on an upload is **just about the only way you can damage the system.** I know many active packeteers who are afraid of checking into a bulletin board for fear they'll break it.

According to sysop Jon Pearce, WB2MNF, "There's not a lot you can do to mess things up . . . they're pretty bulletproof." Basically, use common sense. Don't kill a bulletin or a message addressed to someone else. You can't kill a program file (only the sysop can do that). Also, don't be afraid to talk to the sysop. At minimum, Pearce said, leave him a message saying "hi" and giving him your name and QTH. Pearce also suggests that you find a local voice repeater where packet people gather and ask your questions there.

(By the way—BBS software [especially non-W0RLI software] is still being refined. Bugs pop up. If you think you're doing everything right and the BBS goes batty, the problem is probably with the BBS, not with you. If you can't get it to do what you want, disconnect and give it a rest.)

Gateways

Some BBSs offer "gateways" to their users —the ability to send your signal in on one frequency (2 meters, for example) and out on another (such as 20 meters). This permits you to do some HF DXing on packet without needing a TNC that operates on HF.

Remember, though, not to tie up the BBS calling CQ 20 during "prime time," weekday evenings when many people want to use the system. In fact, do all you can to make your BBS visits during prime time as brief as possible. This will let the greatest number of people enjoy the system's service.

We've seen how to list messages and files, read and send messages, download and upload files, and even use a gateway for HF packet. That's about all you can do on a BBS. All that's left to do now is leave. On most systems you send something like a **B** (for "bye") and the system will log you off and initiate a disconnect. This is better than your switching back to CMD and typing a **D** for disconnect.

That'll work, but the BBS is much happier if you do it its way. Remember, the BBS is your friend. It's a good idea to keep it that way. (The only time you should initiate a disconnect is if the BBS won't respond to your Bye command after several retries. It's happened to me at least once.)

We hope you've enjoyed your tour aboard the *S.S. PBBS.* Please check in again. And once again, we remind you that this is a shared system and encourage you to keep your future visits brief. (Many operators check in, pull down the list of new messages, then check out. After they figure out what they want, they check back in and request specific messages. This increases efficiency and reduces frequency clutter.)

DXing

Speaking of clutter, one of the worst Hertz-grabbers is BBS DXing, connecting with that BBS two states away, just to see what's there. Chances are, according to sysop WB2MNF, you won't find much on a distant BBS that isn't available on your home system. There's a lot of sharing, and the good stuff makes its way around quite quickly.

Pearce also noted that BBS DXing is real slow, your packet probably won't get through, and it "really hogs up the channel."

"Level 3"—How It Works

I recently had my first chance to try out a digipeater, or "switch," using "level 3" software. N2DSY-3, in Northern New Jersey, is the first wide-scale "beta-test" site for the N2WX software.

As explained in the main text, you connect directly to the "switch," then ask it to hook you up with the desired station. Here's how it works.

When you connect to the "switch," you get a standard connect message followed by some gibberish (at least that's what it looks like on my screen). After you see that, you have to send a carriage return, which "wakes up" the switch. It then gives you a prompt to enter the call of the station you want to contact, the calls of up to three digipeaters, the @ symbol, and an 11-digit number. Make a note of this number, because you'll only get it once. And you need it to make the connection.

In an example provided by N2DSY, to make a single-hop connection to W2PAT, type: **W2PAT @03100201100** (Return). It will respond **PAD: Connection Reset**; then when it makes the connection, it will say **Linked to W2PAT**. Whatever you send will then be passed along to W2PAT, even though your screen says you're connected to the switch.

If you get the number wrong, or if the station is busy or not available, you get a lengthy **Pad cleared** message and a **to** prompt letting you try again. If you goof a few times, the number will scroll off your screen, which is why you should write it down.

Use a regular disconnect to end your QSO. The station initiating the disconnect will get the standard message. The other station will see a **link terminated** message before being disconnected from the switch.

My first contact was over a 50-mile path on a busy frequency. And while it took a little while for the packets to get through, the switch acknowledged what I sent on the first shot each time, freeing me to send more or to carry on an additional QSO.

Having both stations "linked" through the switch rather than being connected directly to each other is no problem—unless you're linked to a bulletin board. When I first hooked up to a PBBS through N2DSY-3, it said "Hi, Gordon" (N2DSY) and gave me a list of his mail. That, however, is why software writers do 'beta tests"—to discover problems in the field before general distribution. And, "This is only a test."

Overall, though, I say bravo to N2WX!

"If you're going through six (Eastnet) digipeaters," he said, "then the whole East Coast is listening to you talk!" Jon added that some sysops, such as W3IWI in Maryland, limit the number of digipeaters you can use to reach the system. At W3IWI, any connect request with more than three digis in the path will be rejected. MNF's maximum is seven.

Crystal-Ball Time

Now that you have a pretty good idea of how

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Larsen PO-MM Magnetic mount	19.63	

IC-1271A 10W 1.2 GHz SSB/CW Base	1049.00	**929.95**
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EX-310 Voice synthesizer	41.25	
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packet in general and bulletin boards in particular work, what changes should you expect to confuse you in the future? Plenty, but the hope is that they'll make things easier and more efficient.

First of all, packet groups around the country are working on a "backbone" or trunk system for relaying traffic between bulletin-board systems at high speed. This trunking will be done on 220 MHz or higher frequencies, and at 9600 baud or higher speeds. Moving this relay traffic off of 2 meters will greatly help in reducing congestion on 145.01. Transmitting it at 9600 baud or higher will greatly improve efficiency of inter-system transfers.

Next, some packet systems are already experimenting with "level 3" software, written by Howard Goldstein, N2WX. This will bring about some fundamental changes, according to Gordon Beattie, N2DSY, of RATS (the Radio Amateur Telecommunications Society) in New Jersey. RATS is performing the first wide-scale test of level-three software. First of all, says Beattie, the new software will bring new names—a TNC will be called a **PAD** (for Packet Assembler/Disassembler) and a digipeater will be known as a **SWITCH** (for Switch).

Stations will connect directly to their local switch and ask *it* to connect to the station they're trying to contact. Stations may be able to dictate the routing or may have to leave that up to the computer at the switch. The digipeater (oops, switch) will attempt the connection, then let you know when it's complete.

There's one big advantage to this. Right now, when you're connected to someone, your TNC resends packets until it receives an **ACK**nowledgement from the destination station. On a multi-hop path or on a crowded frequency, that round trip can take ages. Under level three, you will get your **ACK** directly from your local switch, freeing your **PAD** to send the next group of packets.

Then it's up to the switch—which generally has more power and a better antenna location than you do—to fight it out with other stations on frequency to get your message through. A correctly received packet is acknowledged at each step along the path, eliminating the need for many retries. This, in turn, should greatly reduce congestion.

The future may also hold some specialization of frequencies. In crowded areas today, stations trying to rag-chew on packet often have to compete for time and frequency space with bulletin-board systems. If this gets much worse, which seems inevitable, the packet community will have to start coordinating itself (either by itself or through existing repeater coordinators) to try to get things better organized.

My personal recommendation is that certain packet frequencies be designated "BBS-primary" (145.01 and .05, for example), while others would be "QSO-primary" (145.03 and .07, to continue the example). Stations operating bulletin boards or digipeaters to link bulletin boards would "live" on the former, while "switches" devoted primarily to conversation would reside on the others. Coordinators should recommend frequencies to groups planning to put up digipeaters and try to encourage the building of networks on other frequencies similar to those established on 145.01.

Keeping Up To Date

General-interest magazines such as *CQ* and *QST* will cover the major developments in packet radio. But if you want to be fully informed and feel a part of "the packet community," you'll also want to subscribe to one or more specialized packet newsletters. Among the best known are *Gateway* published by the ARRL, *PSR Quarterly*, by TAPR (Tucson Amateur Packet Radio), and the *FADCA Newsletter* published by the Florida Amateur Digital Communications Association.

Don't feel you have to live in Arizona or Florida to join either of these last two groups. TAPR is the leading developer and promoter of packet radio in the United States and has members all over the country. FADCA is a major regional force in packet and also has widespread membership.

Contributions Welcome

There are two types of contributions packeteers (even new ones) can make to the future of packet radio: work and money.

"There's a lot of work yet to be done," remarked BBS sysop Pearce. "This isn't like 2 meter FM, where you can just get a rig and get on and join the guys. The system is still being developed."

Pearce added that there are opportunities available for folks who just want to help—and also for those seeking some recognition. "There's so much room for someone to contribute something—locally and nationally," he noted. "If you're willing to work on something, there's a good chance to become a leader and become well-known, locally or even nationally." Pearce added that TAPR is "real short of RF guys" and is always looking for help in writing and refining software. He stressed, though, that volunteers must be willing and able to do the advanced type of work required.

And if you don't have expertise to contribute, Pearce continued, money will do fine.

"The packet network isn't free," he pointed out. "Digipeaters and bulletin-board systems cost money. The average investment now is between $400 and $1,000." Pearce says the best way to offer financial support is by joining one or more packet organizations—TAPR, first and foremost, plus various regional groups and local clubs that are putting out the cash to build and maintain the packet network in your area. (TAPR, of course, has invested huge sums in developing the TNCs and the software that makes all this possible.)

Tying The Ribbons

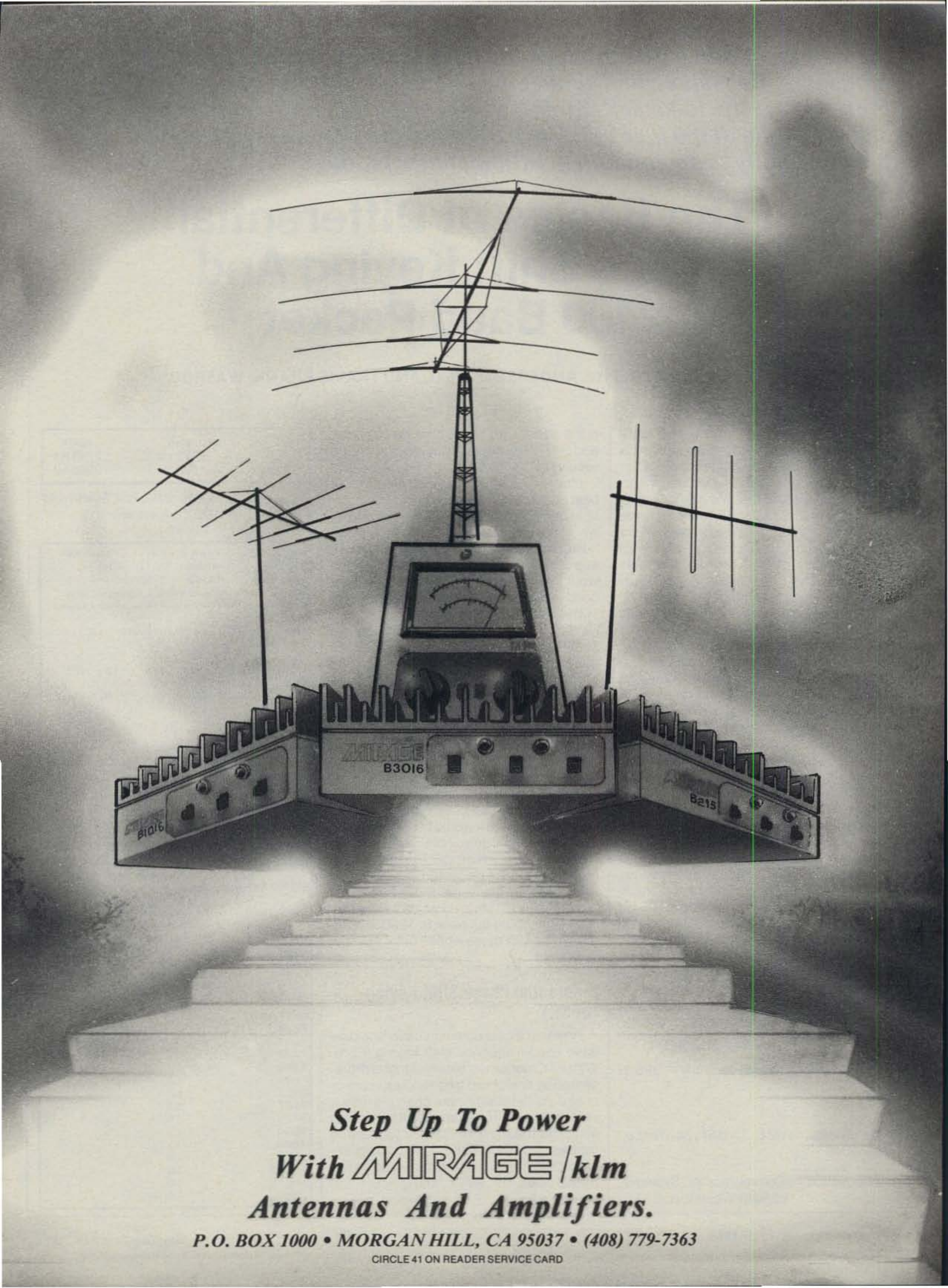
Well, inveterate rag-chewer that I am, I've rambled on here through two issues of this fine magazine with what probably could have been said in one . . . one small book. I hope you've gained some useful hints on getting through the maze of packet operating—and on keeping your blood pressure down.

Sometimes when you get heavily involved in something like packet (or DXing or contesting or whatever), it's hard to remember that this is basically a hobby. Luckily, though, editors have a way of restoring perspective. And about halfway through this project, as I was explaining to *CQ* editor Alan Dorhoffer what was heading his way in the mail, he stopped me and asked, "Rich, are you having fun with packet?"

"Yes," I answered. "The frustration has worn off and I'm having a ball."

"Great," said Alan. "You ought to end the article that way."

Editors also have a way of being right. CQ



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The Basics of Differential Phase Shift Keying And 2400 Baud Packet

BY TOM POLCYN, PHIL ANDERSON, W0XI, AND TRAVIS BRANN, WA5RGU*

An argument can be made that technology has pushed FCC rules toward a more liberal use of digital technology for our hobby over the last few years. Or perhaps it can be said that the rule changes have brought about more experimentation. Reality probably stands somewhere in between.

In the case of packet radio, the rules allow for baud rates faster than we currently have been working. On March 17, 1980 the FCC legalized ASCII at 300 bauds below 28 MHz and at 1200 bauds between 28 and 225 MHz. Then, on October 28, 1982 the FCC amended the rules so that any digital code could be used above 50 MHz. In addition, it raised the rate to 19.6 K bauds between 50 and 220 MHz. However, as all packet operators know, we communicate at 1200 bauds with frequency-shift keying (FSK) modems. In addition, while a few have talked about going to 9600 baud, current radios in use in our shacks all over the U.S. are not capable of supporting this rate with any form of modulation. This would include current 2 meter radios such as the ICOM 27H, ICOM 271, and Kenwood 9750, all good radios.

The average bandwidth of the audio channel in these radios is about 2400 Hz (300–2700 Hz). From a quick calculation based on the Hartley-Shannon Law, such a bandwidth or channel could support a theoretical rate of about 8300 **b**its **p**er **s**econd (**BPS**) at a S/N of 10 dB.

The Hartley-Shannon Law[1] states that the theoretical rate for a channel is

$$C = B * \text{Log}_2 (1 + S/N) \text{ BPS}$$

where *C* is the channel capacity in BPS, *B* is the bandwidth of the channel in Hertz, and *S/N* is the signal-to-noise ratio at the receiver.

However, most modems will attain at best perhaps 33% of the maximum attainable rate or channel capacity. Therefore, we should expect to be able to design, build, and operate a modem at VHF with an effective rate of about 2700 BPS. So, it would seem that 2400 baud would be a good target, providing a speed increase of 100% for packet operation.

With this in mind and assuming that we shall not see modified radios from the manufacturers for a couple of years, we set out to redesign the modems used in the Packet Communicators and TNCs. After a great deal of experimenting and some false starts, we settled on a 2400 baud **d**ifferential **p**hase **s**hift **k**ey (**DPSK**) format. The basics of DPSK are outlined below. The format has been highly successful in the telephone modem arena. In addition, we set out with the idea in mind that whatever we came up with, it would be added to and be downward compatible with existing Packet Communicators. That is, a new high-speed modem would be added to rather than replace the 1200 baud FSK modem now in use in all units. In this way operators could fall back to 1200 to communicate with those whose units are now upgraded.

Differential Phase Shift Keying (DPSK)

Amateur digital communications to date have used frequency shift keying (FSK). With FSK modems a binary signal is represented by one of two frequencies, mark or space. As the binary input changes from a zero to a one, for example, the modem shifts from a mark frequency to a space frequency. Hence FSK is labeled frequency shift keying. Standard mark and space frequencies for RTTY and packet are shown in fig. 1.

mode	mark	space
RTTY	2125 Hz	2295 Hz
packet	1200 Hz	2200 Hz

Fig. 1–Shown here are the FSK MARK and SPACE frequencies.

```
10   REM  ************************
20   REM   CHANNEL RATE VERSUS..
30   REM   SIGNAL-TO-NOISE RATIO
40   REM   AND CHANNEL BANDWIDTH
50   REM  ************************
60   REM
100   INPUT "BANDWIDTH/HZ ";B
110 SNR = 0
111   PRINT
112   PRINT "BANDWIDTH =";B;"HZ"
113   PRINT
120   PRINT "CAPACITY","S/N RATIO"

130   PRINT "--------","---------"

140   FOR I = 1 TO 21
145 C =   INT (B *  LOG (1 + SNR) /
      LOG (2))
150   PRINT C,SNR
160 SNR = SNR + 1
170   NEXT I
180   END

]RUN
BANDWIDTH/HZ 2400

BANDWIDTH =2400HZ

CAPACITY          S/N RATIO
--------          ---------
0                 0
2400              1
3803              2
4800              3
5572              4
6203              5
6737              6
7200              7
7607              8
7972              9
8302              10
8603              11
8881              12
9137              13
9376              14
9600              15
9809              16
10007             17
10195             18
10372             19
10541             20
```

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[1]Introduction To Communication Systems, *F.G. Stremler, Addison Wesley, p. 5.*

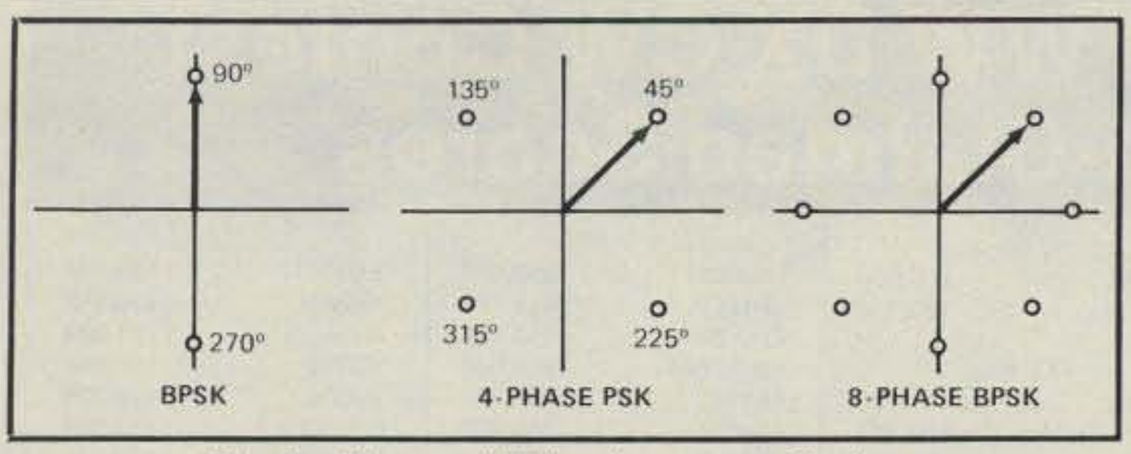

Fig. 2– Phase shift keying constellations.

Dibit	Phase change (see Note)
00	+45°
01	+135°
11	+225°
10	+315°

Fig. 3– Dibit phase table.

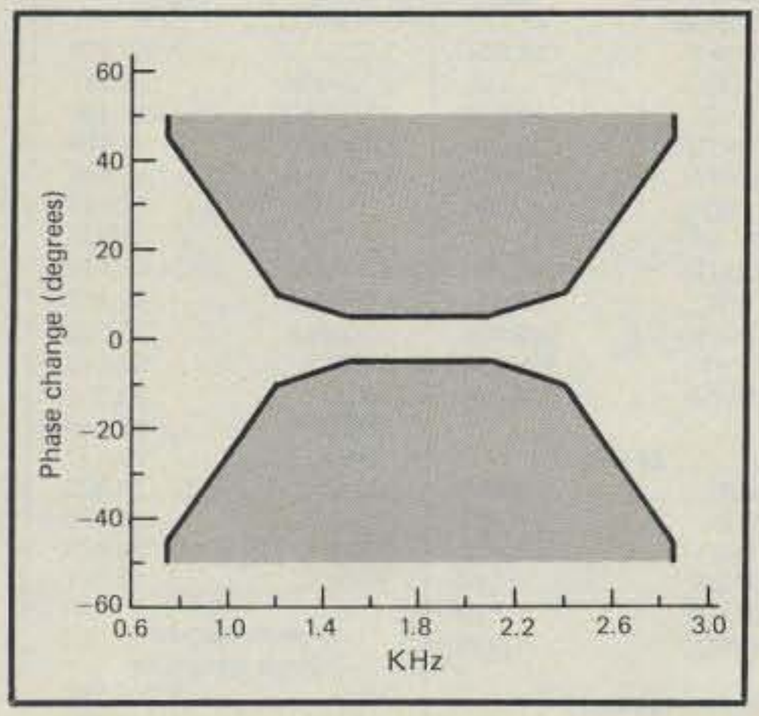

Fig. 5– Audio band phase distortion limits.

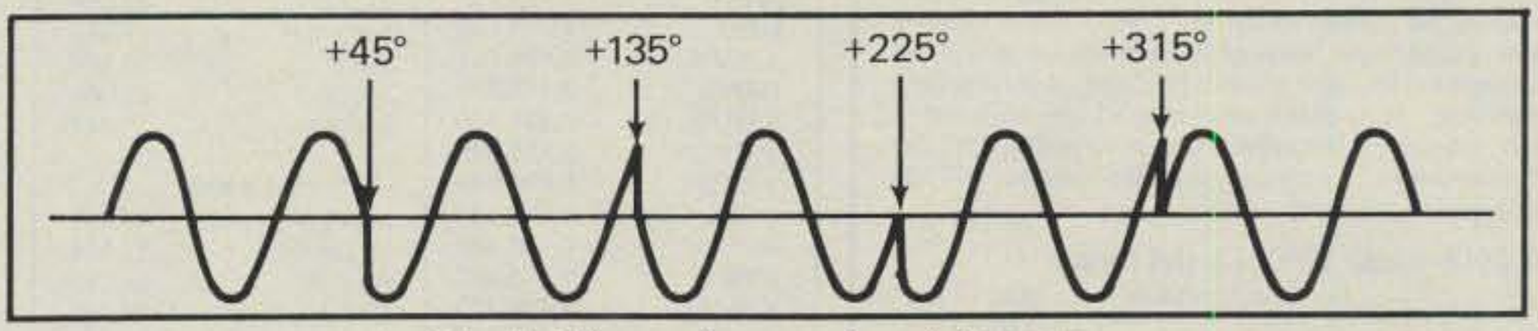

Fig. 4– Phase change signal diagram.

With differential phase shift keying (DPSK) the phase of the signal is shifted instead of shifting frequency. Hence, with PSK only one audio tone is used, 1800 Hertz. PSK can take several forms: binary, 4-phase, 8-phase, and so on. Constellation diagrams for these PSK forms are shown in fig. 2. No big or little dipper constellations are shown, but these diagrams do look like star patterns, and hence are named constellations.

For the 2400 DPSK modem we used the 4-phase scheme pictured in fig. 2. As stated above, the audio carrier was set for 1800 Hz. To this a little twist was added; the phase shifts will occur at 1200 baud, but the effective data rate will be 2400 baud. This is not magic; we used what is called a **dibit** process.

The data stream to be transmitted is divided into pairs of consecutive bits (**dibits**). Each dibit is encoded as a phase change relative to the phase of the immediately preceding signal element (see fig. 3). At the receiver the dibits are decoded and the bits are reassembled in correct order. The left-hand digit of the dibit is the one occurring first in the data stream. The phase change is the actual phase shift in the transition region from the end of one signalling element to the beginning of the following signal element. The meaning of phase change is illustrated by the line signal diagram shown in fig. 4.

The first two DPSK modems were built and one was installed in a modified KPC.[2] The second one was mounted on a TNC1. These units were then tested at 2400 baud with good results. (See the accompanying article on 2400 baud packet and bit error rates, this issue).

As a result of that experimentation, we decided to redesign the KPC into a KPC2400 packet unit, supporting HF packet at 300 baud, 1200 FSK (normal) packet, and this new speed, 2400 PSK packet. All speeds are accessible by software command.

For example, suppose that you were operating packet on VHF at 1200 baud. Then all you would have to do to go to 2400 baud packet on VHF is to enter the following command after the CMD: prompt:

CMD: HBAUD 2400

The unit will automatically switch to the PSK modem and interface it with your 2 meter rig and the microprocessor section of the KPC-2400.

Although we have not had experience with all rigs in use, it does seem that a TXD of 8 works best with the ICOM-27H, ICOM-271, and Kenwood 9750. As far as phase shift keying is concerned, we did not experience any problems with distortion as far as the audio passband of these radios is concerned. More experimentation and understanding would be helpful. In the telephone industry a phase distortion specification (CCITT recommendation) regarding the audio band is shown in fig. 5. A linear phase characteristic, of course, would be ideal, but we suspect that if one stays within the specifications used for wire-line operation, operations should be satisfactory.

In conclusion, we were delighted to operate the PSK modems for the first time. The packets seemed lightning fast. By now, of course, after a month of testing, the speed seems normal.

---

[2]KPC is the Kantronics Packet Communicator.

1985 CQ WW DX CW Contest High-Claimed Scores

The following are CW high-claimed scores. These are raw scores only, subject to verification.

U.S.A.
Single Operator All Band

K1AR	3,397,905
W1KM	2,713,558
N2LT	2,703,206
W3GRF	2,634,252
N4WW	2,482,248
K3TUP	2,323,376
K3ZO	2,157,396
W3BGN	2,090,889
K1EA	2,002,184
W2REH	2,000,432
AI6V	1,985,916
K3WW	1,723,153
W0ZV	1,675,080
N2MM	1,594,020
W3XU	1,592,032
K1IU	1,461,473
W9RE	1,458,345
K1VR	1,427,580
AA4S	1,338,951
W3VT/4	1,317,120
N1CQ	1,242,712
KB3TN	1,221,966
W1IHN	1,072,932
K3ZZ	1,058,255
K4JPD	1,049,688
KS1L	1,028,608
N4KG	1,015,230
N4RV	993,870
AK1A	993,580
W0WP	920,304
K1VUT	857,265
K2RD	856,655
N4TO	740,280
K5MM/7	738,684
K2OY	692,045
N4VZ	673,920

28 MHz

KQ1V	588
K4DDB	576

21 MHz

K1RM	275,100
K5GO	218,610
W8UA	170,640
W6YA	162,946
W4NL	162,162
N4BP	130,758
WB4TDH	116,702
K5TSQ	108,752
K9QVB	75,849
KE7C	68,931
N0BSH	64,640
W8QID	62,795
KE5CK	51,051

14 MHz

K2VV	655,046
K3RV	634,293
K2SX	480,340
K1BW	462,594
N5CR	453,870
KY2P	402,996
WD8LLD	303,674
N7TT	279,660
KB7G	275,232
W5FO	256,413
N4MO	229,750
WD8AUB	228,280
K2SG	217,392
N6GG	208,725
KA3NED	183,665
N7RO	165,678
K9RHY	155,680

7 MHz

K1MM	448,968
K1OX	440,342
N6QR	366,375
KA5W	281,936
WA8YVR/9	256,080
AA7A	245,508
AA4LU	176,896
N7BG	166,284
N2DT	139,482
N7RT	136,539
K8IA	103,800
N2KW	100,116

3.5 MHz

W1FV	197,120
N4RJ	123,165
K8GL	81,911
K9RX	58,696
K2RR	54,570
K9JF/7	45,056
WB9POH	41,888
K9RS	38,184
K0KX	27,066
W0UO	25,347

1.8 MHz

K5UR	47,005
K1ZM	33,818
AA1K/3	24,120
N4SU	22,792
N4PN	22,052
N9MM	19,966
N0XA	15,500
N4TX	13,847
W8UVZ	11,058

Multi-Operator Single Transmitter

K1KI	3,477,100
N2RM	2,907,366
N3ED	2,905,875
K4VX/0	2,716,780
K3OO	2,530,456
KM1C	2,251,770
N6ND	2,031,253
W8GWC	1,825,634
KT3M	1,809,804
K1XM	1,610,046
WD8IXE	1,547,535
N2PP	1,495,713
K2NJ	1,461,465
N6VR	1,319,921
K6ZM	1,297,545
N6AW	1,258,631
K3NZ	1,217,160
K9ZO	1,114,182
K5RR	1,039,346
W3AP	1,026,292
KY1H	1,024,380

Multi-Operator Multi-Transmitter

W3LPL	7,062,000
N5AU	5,395,995
K2TR	4,921,560
K1RX	4,387,976
AG2S	4,211,293
N3RS	4,054,258
W3GM	3,999,418
N6RO	3,966,270
KS8S	3,951,376
N6TU	2,786,544
W0AIH/9	2,473,172
K5LZO	2,308,941

DX
Single Operator All Band

EA9IE	5,736,784
9Y4VT	5,676,536
D44BC	5,462,283
CN8ES	5,451,250
PJ2FR	5,434,550
YV5TK	4,839,410
4V2C	4,281,212
C53AA	3,509,877
NH6J/KH0	3,341,986
VP2MEV	2,541,616
UP2BIM	2,150,640
YB0ARA	1,763,900
OH2BH	1,716,972
VG3BVD	1,668,832
NY6M/KH2	1,588,608
G3LNS	1,571,970
VS6DO	1,563,282
UB5EC	1,468,310
JI1QPU	1,340,808
HK1AMW	1,267,032
UP2BO	1,235,616
AH8A	1,231,796
K3UOC/YV4	1,168,272
RW9WA	1,136,770
ZC4CZ	1,127,648
G4BUO	1,111,456
HA0MM	959,406
JF1EQA	954,786
OA4ZV	940,168
OK1DBM	902,022
UW0LT	793,755
UA4RZ	785,902
KH6RS	779,712
UP2NK	777,960
UA9XR	768,690
RB5MF	759,304
UD9DKW	747,770
HG19HB	739,364
JH1OGC	703,768
OK1VD	692,512
VE2AYU	670,596
OK2BFN	667,652
UL7EDR	646,266
HZ1HZ	640,757
HB9AGA	636,768
OH6YF	629,825
JA7DLE	612,468
OZ7HT	605,935
UV9WW	602,784

28 MHz

ZS6P	65,680
EA7BU	5,106
YU3ER	4,032
YV7QP	2,664
JM1TUY	2,320
PY3BC	1,936

21 MHz

CX5AO	1,308,750
CE3DNP	752,496
LU4FDM	561,200
A25/G3HCT	336,288
I5MPN	307,195
VK6AJ	233,370
ZK1XT	225,432
VI4XA	224,655
YU2CT	201,360
CT3ET	188,960
JI1CBF	164,944
4X4JO	131,377
F6IRF	126,217
HB9CJG	125,928

14 MHz

YX5A	1,065,860
DK3GI	776,860
5H3BH	773,352
OH8OS	669,793
KH6MD	621,184
YU1DX	476,074
XE2GL	475,405
VE6OU/3	445,516
YT3A	417,600
AL7CQ	377,195
RR2RW	362,614
UL7CW	350,424
G4CNY	311,924
EA7CFW	274,789
JH7LVK	261,252
YU7RU	256,850
UB5WE	253,512
JK1MAZ	240,768
UB5NQ	219,500
UA4WI	200,236

7 MHz

KP4FI	696,864
XE2FU	665,728
YZ9A	637,144
YT3M	472,102
OH2KI/ZB2	445,897
JA5BJC	421,296
UA1DZ	406,080
UA1ALZ	294,264
HK1HHX	274,122
KL7RA	237,690
UM8MO	225,584
RA1AO	191,471
JA7HMZ	165,138
TF3CW	156,728

3.5 MHz

EA2IA	258,408
UA9FAR	228,900
VE2HQ	183,582
VG3BMV	172,805
IO3JSS	167,664
SM2EKM	154,464
G4FAM	143,165
YU3RU	141,944
XE2KN	136,218
4N3E	131,024
VG7IG	126,063
UA9AL	120,225
CT2CQ	117,789
UA9CBM	113,523
UR2RGN	105,840
UA9AB	100,464
YV3AGT	147,368
HB9AMO	95,201
LZ2CJ	81,900
RA9AKM	63,291
YO3KWJ	61,466
DK8NG	56,416
UG6GAW	55,440
YV1OB	51,042
YU7BW	46,209
CT1AOZ	43,416
IY4FGM	43,362
VE3MFA	37,026
YU4YA	35,840
RT5UY	30,956
OK2DFW	29,160
I2UBI	29,040
G3XWZ	28,305
TG9NX	25,920
UD0DC	24,576
KH6CC	23,901

Multi-Operator Single Transmitter

V3A	5,093,865
KP4BZ	5,041,452
KH6XX	4,212,528
OK5R	3,882,645
HG6N	3,430,224
CY0SAB	3,307,414
HG7B	3,019,548
UZ4FWO	3,046,956
HG5A	3,043,782
GJ0AAA	3,004,444
HG9R	2,774,904
UR1RWX	2,625,422
GB4DX	2,501,583
OH2VY	2,490,844
DF8ZH/CT3	2,251,956
K4TEA/KH6	2,137,620
UQ1GWW	2,133,515
UZ2FWA	1,958,264
HS0A	1,952,241
ZS3/W6QL	1,879,800
UQ1GXN	1,864,408
OH8AV	1,836,680
VG3IY	1,763,784
LA5X	1,611,484
YT2R	1,496,484
UP1BWW	1,472,310
OK3KAG	1,471,350
YT3T	1,363,407
DK0TU	1,302,128

Multi-Operator Multi-Transmitter

EA9CE	9,397,038
V2A	7,463,449
OK7AA	5,741,950
JA3YBF	4,519,400
DL0KF	3,909,040
OH7AB	3,794,640
NL7G	3,604,935
JA3YKC	3,012,256
JA7YAA	2,014,096
JA7YFB	1,975,125
DL0WU	1,587,404

QRPp
All Band

RB5IJ	267,997
4X6IF	248,060
OK3IAG	148,400
G4ELZ	130,938
DL9YX	95,064
JA7AS	86,612
YO8BSE	86,410
SM5CCT	66,096
OK1DKR	53,620
SP5LM	44,100
N1AFC	43,785
G4FDC	38,437
UB5REN	30,996
YO3CDN	28,896
W1SOX	26,700
W4OEL	26,076

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Same application as previous listing

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Laser Excitation, Alumor Co.

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United Technology

3,000 watts 450 MHz
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4,000 watts 145 MHz VHF
Point-to-Point — Indonesia

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Pulse for Satellite Test station, Hughes Aircraft.

5,000 watts 400 MHz
Pulse for Laser Excitation, University of California

2,500 watts 27.12 MHz
to ignite Argon Torch Photo-Emissions Spectrometry — Switzerland

1,500 watts 40 MHz
same application as above — The Baird Corporation

2,000 watts 27.12 MHz
Mass Spectrometry, VG Isotopes, England

2,000 watts 13.56 MHz
Sputtering — Munich, Germany

3,000 watts 6 MHz
Shortwave AM — Broadcast, Iraq

2,000 watts 70 MHz
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Japan

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CIRCLE 130 ON READER SERVICE CARD

Look out* Family Handyman, CQ *has a woodworking project. With simple tools you can make your own operating desk in almost no time, and best of all, it costs very little money.

How To Build A Low-Budget Operating Desk

BY GERALD SAMKOFSKY*, N4ZB

Quite often the last item considered when assembling a station is the table or desk used to support the never-ending gear placed on it. Obviously it should be strong enough and yet not ugly. If one is affluent enough to purchase an excellent custom desk, there need be no problem. On the other hand, equipment is often placed on a flimsy or unattractive table because of insufficient funds or lack of imagination.

I have two young friends who are now enjoying their General class privileges, but both agreed that a suitable desk would indeed be a welcome adjunct to their stations. We talked about various options, working within a limited budget. At that point my wife reminded me that my own station had been parked on a very old walnut table that had been scratched and dented enough over the years and deserved a rest. We had a group project of sprucing up our stations.

We checked the trade sheets and classified ads for used wooden or metal desks. The ads indicated that some were available in clean condition for $50 to $80, yet many were found to be too small or flimsy for our needs. While checking through a mail-order catalog, I noticed a photograph and description of a student desk which seemed quite sturdy, but the asking price was $199. "Well then," I thought, "why not build our own using the photo and description as our guide?"

The following is a list of materials needed to build the desk. As you can see, the material is quite inexpensive, and might even make use of some scrap lumber you may have around the house.

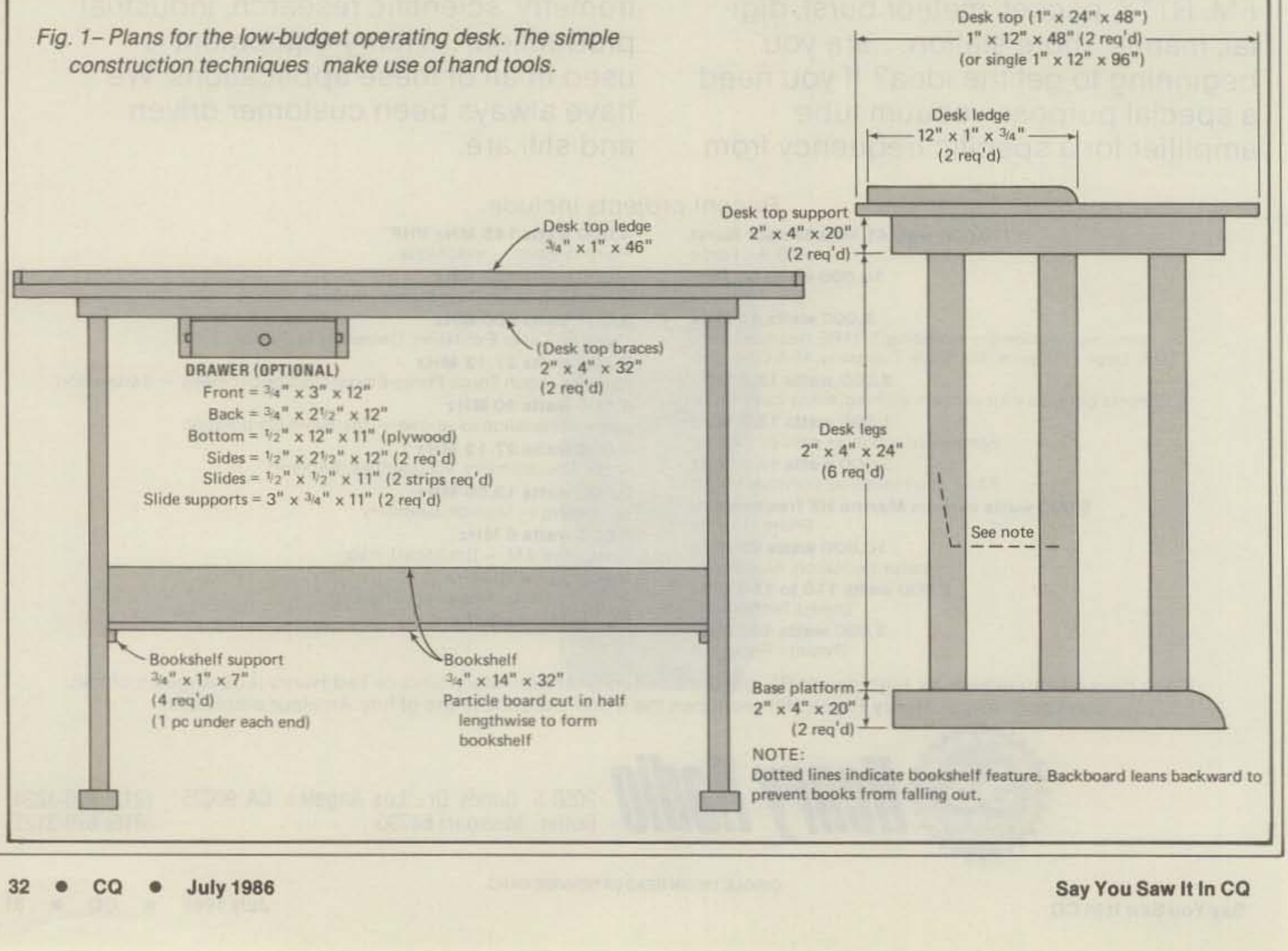
Materials and cost per desk were:

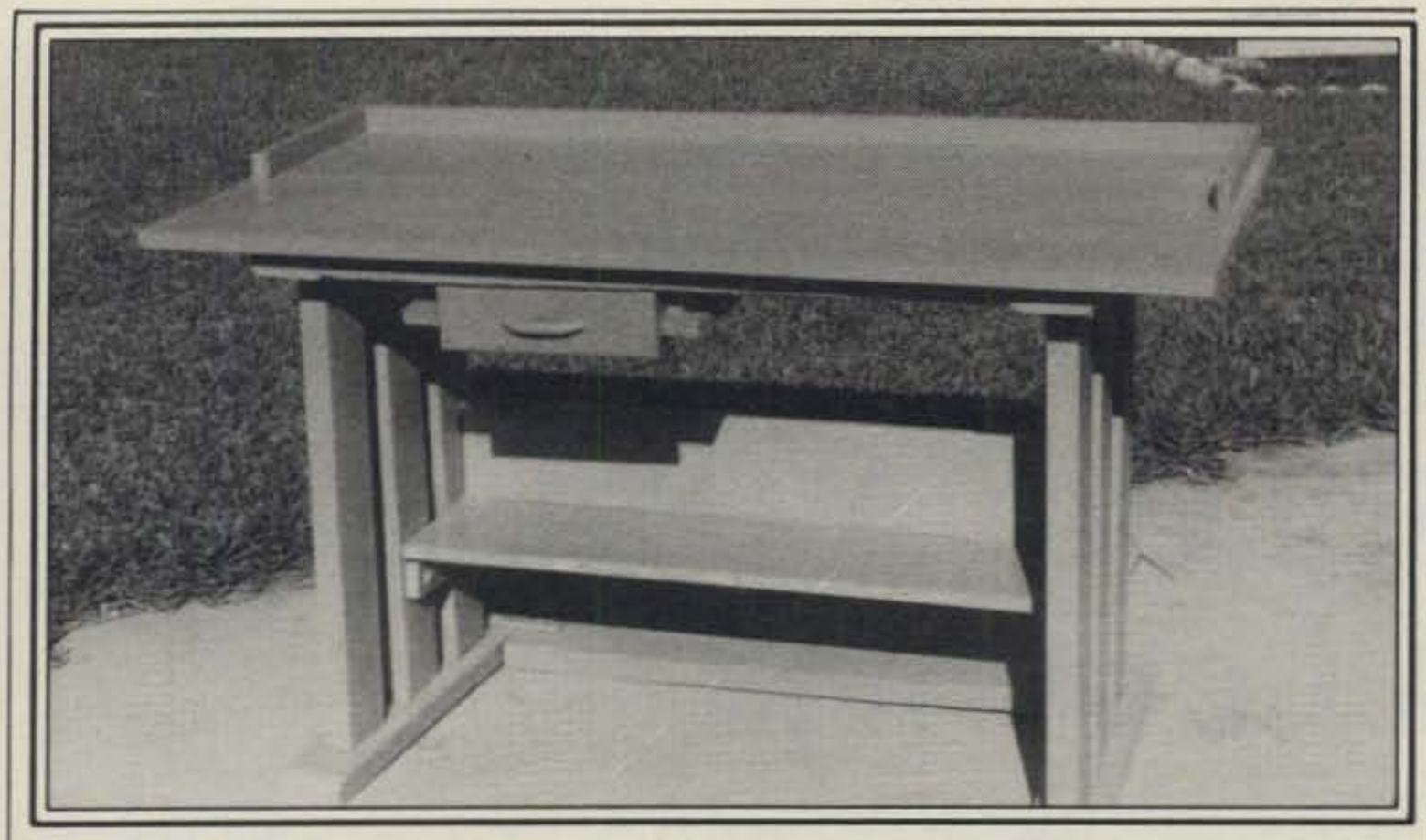
Desk top 1″ × 12″ × 96″, spruce	$5.00
Four 2″ × 4″ × 8′ pine studs @ $1.50 ea.	$6.00
Particle board, ¾″ × 14″ × 32″	$2.00
Shelf supports (scrap) ¾″ × 1″ × 36″	$.50
Desk-top ledge 1″ × ¾″ × 6′	$1.00
Hardware—3″ and 1½″ screws	$2.00
Paint and sandpaper	$2.75
Total	$19.25

For those desiring a drawer, wood cost would be approximately $3.00.

*1420 Mount Vernon Drive, Holiday, FL 33590

Fig. 1– Plans for the low-budget operating desk. The simple construction techniques make use of hand tools.





The finished product. Here it is fully assembled and painted, ready for use. The desk is both attractive and sturdy.

Using the drawings and picture, assembling the desk is actually very simple. Since I am badly vision-impaired, I could only use hand tools, which again simplifies construction. The use of 2″ × 4″ studs for 3 legs on each side along with supports made our desks unusually sturdy. They easily support over 150 pounds of equipment and books. The 32″ long book shelf contains my *CQ* magazines, *Callbooks*, and test instruments. The book shelf is mounted against the two rear legs on each side. Supports for the shelf are fastened to these legs. The shelf itself is canted up in the front.

We did add a drawer to our desks, as we were fortunate enough to obtain three drawers from an old cabinet. You can probably find a similar drawer or make one for not very much.

You can add whatever features you may need to customize the desk for your own station. The big thing to remember is that it can be done, and you can do it! CQ

How do you fill out a QSL card? Sounds simple, doesn't it? Well, it's not that simple to a lot of folks. W1ICP, however, does make it simple for us and the newcomer alike.

How To Fill Out A QSL Card

A Lost Art?

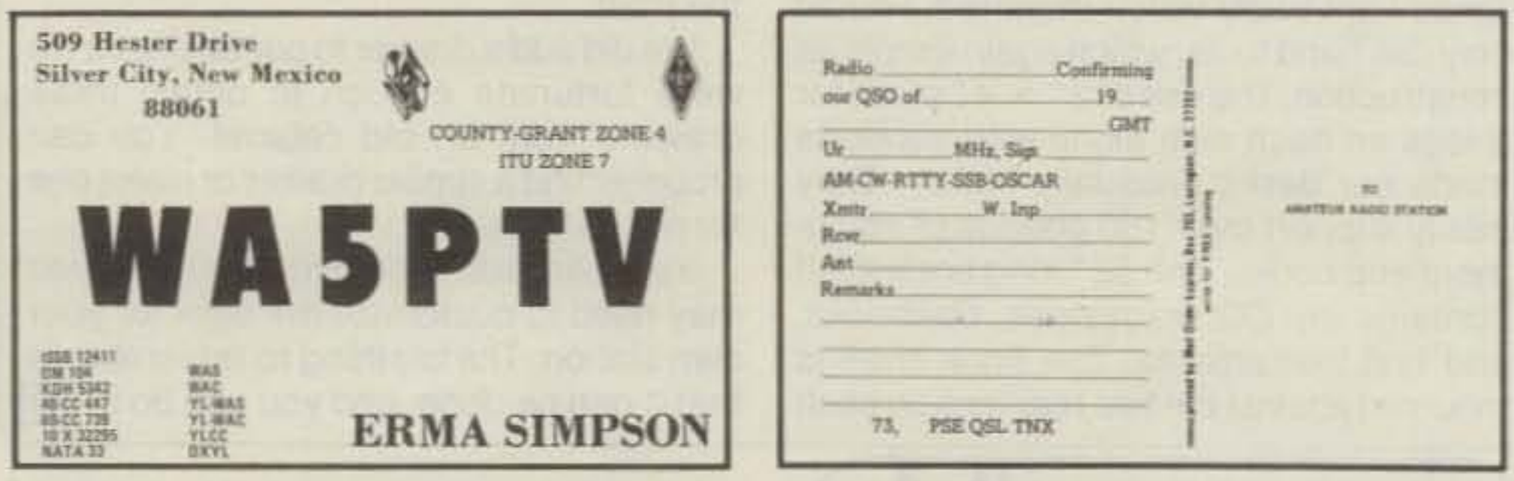
BY LEW MCCOY*, W1ICP

There is no doubt that sending and receiving QSL cards is one of the big attractions of amateur radio. At heart nearly all amateurs are basically hobbiests (which really means, for the purpose of this article, "collectors"). A large percentage of us have at one point or another collected stamps, or coins, or rocks, or Lord only know what. When you become a radio amateur, you also become a collector of QSLs.

At the very beginning of your amateur career there is the joy of getting that first QSL for that first contact. After that, QSL cards can become much more important. Nearly all amateurs go through a certificate hunting/accumulation stage. This may be a WAS (Worked All States), a WPX (Worked All Prefixes), a WAZ (Worked All Zones), a County Hunter's Award, or probably, the ultimate, a DX Chaser. In any case, there are literally hundreds of different awards. In order to obtain these awards you must not only work these different places, but also get a confirmation in the form of a QSL card.

There are several points to keep in mind when making out a QSL for the other station. I'll try to cover all these points in this article. But first you must keep in mind that the information you normally put on your card is not necessarily the information for which the guy on the other end is really looking.

For example, the clown writing this article (me) once went up to Catron County (rather rare) here in New Mexico, and made about 100 contacts operating portable, and sent out QSLs to everyone. Yeh, you guessed it. I forgot to put on the county I was in! Of course, I got back 100 or so letters, but my excuse was simple—I just wasn't interested in county chasing and just happened to be operating portable from a relatively rare place! Excuse the cliche, but it may not be your cup of tea but what goes on the card sent by you is very important to the recipient.



This is Erma Simpson's card. Erma gave me the idea of writing this article. As you can see, she is a certificate hunter and told me that she gets lots of cards and many of them have errors. On this side of the card is her call and much information, including the WAZ Zone and ITU Zone. The opposite side of the card has space a la postcard to list the station worked, report, date, time, band, etc.

As I mentioned above, there are certain things which must go on a QSL. These include time, band, mode, and so on. I'll try to cover all bases.

Time—Or What Time Is It Where?

More confusion results from amateurs using differnt times on their cards than probably any other one item. For myself, I feel that every amateur should be forced to learn Greenwich, or Universal Coordianted Time (UTC). (I should add that "Greenwich" is a term no longer used, but you'll hear amateurs using the term along with UTC. However, the two are the same.) By its very nature, amateur radio means communicating across various time zones, so the time I am using for local time is not the same as the other station's local time. Ahhh, but UTC is the same!

In Table I we have included a complete conversion chart for all the time zones in the Continental USA. By using the chart and keeping it posted in your shack you'll quickly become familiar with UTC. Learn to keep your log in UTC, and when you fill in the time on a QSL card be sure to use UTC.

Nothing can be more frustrating to someone than his having to check his own log for his contact with you if different times are used. In fact, some DXers who make thousands of contacts won't even bother answering a QSL made out in local time, and you can see why. Therefore, the information of the time of the contact should be on your card—**and should be in UTC.**

Of course, the **date** of the contact must be on the card. Here again there can be confusion if just numbers are used. Many people will use, for example, 3/2/86. Now the question: Is that the 3rd of February or the 2nd of March? I believe it is customary to have it month-day-year in that sequence, but not all people use that system. So why not write Mar/2/86 so there will be no confusion.

Technical Editor, CQ, 200 Idaho St., Silver City, NM 88061

Also, if you are using UTC you have to be careful to get the correct date on the card. It is easy, living in our country, to be past 0000 UTC and be in the next or previous day by local time.

What Report?

It has always been the custom to put a signal report of the station you worked on your QSL card. Also, it seems to be an axiom that the rarer the contact, the better the report you give him, regardless of his actual signal strength. I cannot pretend to tell you how honest to be in reporting, but for myself, I do like to get an honest report. I am sure that most rare DX stations expect to get inflated reports of their signals simply because the sender wants desperately to get that rare QSL.

If your contact is on CW, then be sure to include the "tone" report using the "RST" system (readability-strength-tone) in that order. And this brings us to another important item on the QSL card —**the mode.**

The Mode— And It Isn't Always Pie A La . . .

An important item on your QSL should be the mode you were operating at the time of the contact. In this day and age of amateur radio we are literally loaded with different types of operation. There is single-sideband (SSB), amplitude modulation (AM), slow-scan, fast-scan, CW, RTTY, AMTOR, Packet, FM, moonbounce, OSCAR, satellite, and on and on. Many certificates are based on a given mode, so it is important that there be a space on your QSL for the mode you used and that you fill in that space. Keep in mind that some contacts could be one mode to another and your card should so state. You, for example, may be on the phone, while the other guy is on CW. That information should appear on the card.

Your Call—His Call?

It sounds stupid to say that your call should appear on your QSL card, and I am sure that it does. However, many beginners—and some old timers for that matter—put their own call in the place where the call of the other station should go! It is a simple mistake to make, but lots of amateurs make that mistake.

Of course, everyone doesn't write completely legibly. In fact, most doctors, with all their education, seem to be in a class by themselves when it comes to being unintelligible. So why not print the pertinent information on the card? It could make all the difference to the other guy trying for a rare certificate.

One real way to foul up a QSL card is to write over or erase a portion of the card. Keep in mind that a QSL card is basically a confirmation of the contact. If the card is to be used to obtain a certificate, and it is altered, there is no way of knowing who did the altering, so it would be rejected. The same thing goes for using two colors of ink. It may be cute, but it just won't fly as a confirmation.

Band-Frequency

Of course the band or frequency on which you worked the other station is important. For myself, I always put down the band, but some amateurs actually write out the frequency. Again, many certificate hunters look for a certain number of

Universal Coordinated Time (UTC)	Eastern Standard Time (EST)	Eastern Daylight Time (EST)	Central Standard Time (CST)	Central Daylight Time (CDT)	Mountain Standard Time (MST)	Mountain Daylight Time (MDT)	Pacific Standard Time (PST)	Pacific Daylight Time (PDT)
0000	7 P.M.	8 P.M.	6 P.M.	7 P.M.	5 P.M.	6 P.M.	4 P.M.	5 P.M.
0100	8 P.M.	9 P.M.	7 P.M.	8 P.M.	6 P.M.	7 P.M.	5 P.M.	6 P.M.
0200	9 P.M.	10 P.M.	8 P.M.	9 P.M.	7 P.M.	8 P.M.	6 P.M.	7 P.M.
0300	10 P.M.	11 P.M.	9 P.M.	10 P.M.	8 P.M.	9 P.M.	7 P.M.	8 P.M.
0400	11 P.M.	12 Mid.	10 P.M.	11 P.M.	9 P.M.	10 P.M.	8 P.M.	9 P.M.
0500	12 Mid.	1 A.M.	11 P.M.	12 Mid.	10 P.M.	11 P.M.	9 P.M.	10 P.M.
0600	1 A.M.	2 A.M.	12 Mid.	1 A.M.	11 P.M.	12 Mid.	10 P.M.	11 P.M.
0700	2 A.M.	3 A.M.	1 A.M.	2 A.M.	12 Mid.	1 A.M.	11 P.M.	12 Mid.
0800	3 A.M.	4 A.M.	2 A.M.	3 A.M.	1 A.M.	2 A.M.	12 Mid.	1 A.M.
0900	4 A.M.	5 A.M.	3 A.M.	4 A.M.	2 A.M.	3 A.M.	1 A.M.	2 A.M.
1000	5 A.M.	6 A.M.	4 A.M.	5 A.M.	3 A.M.	4 A.M.	2 A.M.	3 A.M.
1100	6 A.M.	7 A.M.	5 A.M.	6 A.M.	4 A.M.	5 A.M.	3 A.M.	4 A.M.
1200	7 A.M.	8 A.M.	6 A.M.	7 A.M.	5 A.M.	6 A.M.	4 A.M.	5 A.M.
1300	8 A.M.	9 A.M.	7 A.M.	8 A.M.	6 A.M.	7 A.M.	5 A.M.	6 A.M.
1400	9 A.M.	10 A.M.	8 A.M.	9 A.M.	7 A.M.	8 A.M.	6 A.M.	7 A.M.
1500	10 A.M.	11 A.M.	9 A.M.	10 A.M.	8 A.M.	9 A.M.	7 A.M.	8 A.M.
1600	11 A.M.	12 Noon	10 A.M.	11 A.M.	9 A.M.	10 A.M.	8 A.M.	9 A.M.
1700	12 Noon	1 P.M.	11 A.M.	12 Noon	10 A.M.	11 A.M.	9 A.M.	10 A.M.
1800	1 P.M.	2 P.M.	12 Noon	1 P.M.	11 A.M.	12 Noon	10 A.M.	11 A.M.
1900	2 P.M.	3 P.M.	1 P.M.	2 P.M.	12 Noon	1 P.M.	11 A.M.	12 Noon
2000	3 P.M.	4 P.M.	2 P.M.	3 P.M.	1 P.M.	2 P.M.	12 Noon	1 P.M.
2100	4 P.M.	5 P.M.	3 P.M.	4 P.M.	2 P.M.	3 P.M.	1 P.M.	2 P.M.
2200	5 P.M.	6 P.M.	4 P.M.	5 P.M.	3 P.M.	4 P.M.	2 P.M.	3 P.M.
2300	6 P.M.	7 P.M.	5 P.M.	6 P.M.	4 P.M.	5 P.M.	3 P.M.	4 P.M.

Table I– A comparison of UTC to the various U.S. time zones.

contacts on a given band, so this information is important to them. Also, if the contact is a cross band, the card should so state.

To sum up the information, your QSL could look something like fig. 1. Of course that is just a sample. There is much more information you can put on your QSL. Many amateurs list the clubs and organizations to which they belong. When they were first licensed and the calls they held can be interesting information to the recipient. In fact, a QSL doesn't have to be just bare-bones information. I find that I enjoy a QSL a lot more if it contains information about the station and that amateur whom I worked. A list of equipment and antennas can be important. And some amateurs are individual chambers of commerce in that they extol certain virtues and features of where they live.

Also, keep in mind that the amateur whose card you want may be working many stations. By the time he gets your card he could very easily have forgotten the contact. A few remarks on the card will help him recall the QSO.

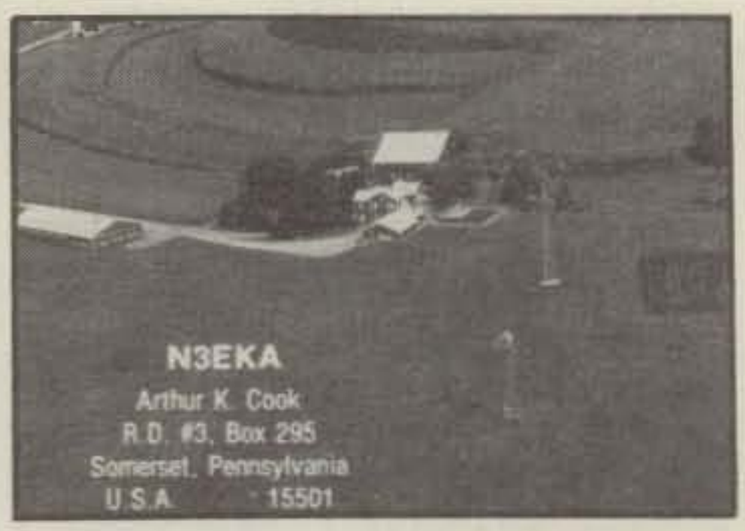
Getting QSLs

This article is primarily about properly filling in QSL cards, but a word or two about getting QSLs may be in order. To be very honest, unless you live in a very rare state or county, sending your QSL is no guarantee that you will get one in return. Keep in mind that even the most common of foreign DX stations receive literally thousands of American QSL cards, and it can be a real chore and expense to answer QSLs. Obviously the answer is to try to make it as painless as possible for the station whose card you are anxious to receive.

First, suppose you are chasing for a WAS (Worked All States) award. A certain proportion of the stations you work will send you a QSL even before you do. Another percentage will QSL upon receipt of your card. (Some stations don't QSL at all—under any circumstances—so we have to write them off.) When you are down to those few states from which you need a card, but have worked, then it is time to write a letter and enclose an SASE. Point out to the amateur that you need his card for WAS and you are enclosing the SASE. Usually this does the trick. I know many hams who actually wait for the low telephone rates and then call the amateur (slightly ridiculous when you think about it, but who said we have to be sane!).

Obtaining DX QSLs is a little more difficult. The ARRL maintains QSL bureaus, and it is very wise to use these bureaus for getting cards. Many DX stations use QSL managers who handle the chores, so it is always smart to find out if the DX station has a manager. Also, International Reply Coupons (IRCs) can be used to ease the monetary burden on the DX station. There are all kinds of tricks used by DX chasers to get cards. To learn the secrets of getting DX QSLs, it is wise to make the acquaintance of other DXers via DX clubs, and to read the DX columns in the magazines.

In conclusion, it is easy to make out a QSL card correctly. As I have pointed out, there is information that should go on the cards that isn't necessarily what you want, but it sure makes the guy you worked happy. CQ



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Trans. _____
Amp. _____ Ant. _____
Remarks:

73 _____
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Here's a great photo QSL from N3EKA. Art said that he chose this shot from over 60 aerial views. Not only is Art proud of his station, but he is also proud of the 165-year-old farm house and barn that he and his wife restored over a period of 7 years.

W1ICP

Lew McCoy

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On.....At.....UMT

Your Report.....Mode.....

Fig. 1–A typical QSL card that can be computer generated.

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It looks good on paper, but how do you know it works? In this second of two articles W0XI explains how to answer this question.

2400 Baud Packet and Bit Error Rate

BY PHIL ANDERSON, W0XI, AND TOM POLCYN*

As packet channels become more congested, it is logical to consider faster speeds for packet transmissions. With this in mind, several questions come forward immediately. Is it possible to double the 1200 baud packet rate in use today without modifying the 2 meter radio in use? Is it possible to obtain a reasonable bit error rate or receive enough packets without retry at a higher rate? Can the equipment be inexpensive? Could a new 2400 baud TNC be made compatible with existing TNCs and packet communicators?

Since 2400 baud telephone modems exist today, the answer to the first question would seem to be yes. Voice-grade telephone lines and VHF 2 meter channels have similar characteristics. The audio passband of a typical receiver is wide enough, and given a strong enough signal the channel should support 2400 baud as is. No interference from other stations, of course, is assumed.

Since most TNCs have an external modem port that supports 2400 as well as 1200 (command: HBaud 2400), a working 2400 baud modem could be supported by early TNC designs. Cost, of course, is an unknown until the modem is designed and production planning and parts ordering are estimated.

Assuming all of the above would have a favorable outcome, the basic question of 2400 baud packet comes down to whether or not a TNC with modem can be made to operate at 2400 with a limited number of retries. To answer that question, we designed and tested a CCITT V.26 modem (2400 baud) and attached it to a modified Kantronics Packet Communicator. The KPC also included the standard 1200 baud FSK (Bell 202) modem, implemented with the World Chip. We also attached a copy of the same V.26 2400 baud modem to a TNC1 for the distant link for testing.

The KPC-2400 was then subjected to a series of bit error rate tests, and the results were a bit surprising. Bit error rates for the 2400 baud differential phase shift keying modem (DPSK) were about equal to those for the standard KPC 1200 FSK modem. In addition, earlier tests[1] showed that the KPC modem at 1200 baud was about 1½ dB better than the regular TNC1 discrete modem.

These results are similar to a comparison made on telephone modems with various modulation schemes.[2] The theoretical best performance of a 103 modem (300 baud, FSK) is based on one error or less occurring out of 100,000 bits sent, when the signal is 4 dB louder than the in-band noise. This number is called the signal-to-noise ratio (SNR). Most 103 modems on the market today do not perform at this "best" dB level; most test with a bit error rate (BER) of 1 in 100,000 at from 8 to 10 dB. The 212A modem (1200 baud, DPSK) has a theoretical best at 7 dB with typical performance at about 14 dB. The V.26TER telephone modems have a theoretical best performance at one bit in 100,000 at about 10 dB. Actual off-the-shelf units test at about 17 dB. So, it would seem that our V.26 DPSK modem for the radios should be within 3 dB of the 1200 baud units. In fact, KPC2 (1200 baud FSK) and KPC-2400 (2400 baud DPSK) BER tests were about equal.

	sync	address	command	data	CRC	
#bytes	1	14	2	64	2	=644 bits
		A "typical" Ack Packet				
#bytes	1	14	1	0	2	=144 bits

Fig. 1–A "typical" data packet.

Packet Retries and The Bit Error Rate (BER)

While BER is the unit of measure for performance for telephone modems, it is a bit hard to relate to packet radio operation. As packet operators we are most interested in the number of retries necessary for a good QSO or file transfer. So, let us digress here to calculate the probability of receiving a packet given a certain BER. We can then relate BER with retries on a packet channel.

First, let us arbitrarily define a typical packet and packet exchange. A typical data packet and the corresponding acknowledgement packet are shown in fig. 1. The first byte of the data packet is the sync-header. Following that, let's assume 14 bytes of addressing. Then let's include 2 bytes of command and 64 bytes of data followed by the CRC which is 2 bytes. That makes a "typical" data packet equal to about 664 bits. Then we must include in any packet exchange the return or acknowledge packet. Let's assume that this packet includes the sync-byte, 14 bytes of address, one command byte, and the CRC bytes; this totals 144 bits. So, the trans-

*Kantronics, 1202 E. 23rd St., Lawrence, KS 66046

[1]*Tests on the Kantronics VHF-1200 modem using the World Chip were performed last April by Steve Goode, K9NG, and the results were forwarded to Phil Anderson, W0XI.*

[2]*V.22bis, "Data Communications," April 1985, p. 117.*

mission of one typical data packet with acknowledgement consists of about 800 bits.

Then, given the BER of the packet TNCs, what is the probability of receiving a good packet? The probability of receiving a good bit is 1– the probability of not receiving it, so

Probability of Receiving a bit (PRB)
= 1 – BER

Then, the probability of receiving 800 bits, or a proper packet exchange, is

Probability of Receiving a Packet (PRP)
= (1 – BER exponential 800,
or PRP = $(1 - BER)^{800}$

The probability of receiving a packet exchange given the BER of the TNCs is shown graphically in fig. 2. Note that the probability is over 90% when the BER is better than 1 bit error in 10,000. More errors than this would imply more retries. A BER of 1 bit in 1,000 indicates only a 44% change of correctly sending the packet with acknowledgement.

If we decided to digipeat, 56 bits would have to be added to each packet address. This would give the typical packet and return packet a total of 920 bits. In addition, with digipeating the data packets must be transmitted twice (once through the digipeater) and the acknowledgements must also be sent twice. The probability of digipeating a data packet correctly versus BER is also shown in fig. 2. The formula would be

PRP (digipeated) = (1 – BER exp. 1840,
or PRP = $(1 - BER)^{1840}$

Note that a BER of about 1 in 10,000 only guarantees a PRP (digi) of 84%!

```
]LIST

10  REM  ************************
     *
20  REM  * CALCULATE  PRP FOR BER
     *
30  REM  * KPC2400 BER TESTING..
     *
40  REM  ************************
     *
50  REM
100  PRINT "PRP","BER"
110  PRINT "---","---": PRINT
120 BER = .000001
130  FOR I = 1 TO 20
140  PRINT (1 - BER) ^ 800,BER
150 BER = BER + .00005
160  NEXT I
170  END

]RUN
PRP                BER
---                ---

.999200511         1E-06
.960020322         5.1E-05
.922374286         1.01E-04
.886203099         1.51E-04
.851448705         2.01E-04
.818055522         2.51E-04
.785970453         3.01E-04
.755142029         3.51E-04
.725521656         4.01E-04
.697061773         4.51E-04
.669716839         5.01E-04
.643443354         5.51E-04
.618199385         6.01E-04
.593944412         6.51E-04
.570640071         7.01000001E-04
.548249038         7.51000001E-04
.526735562         8.01000001E-04
.506065291         8.51000001E-04
.486205027         9.01000001E-04
.467123342         9.51000001E-04

        TWO STATIONS

]RUN
PRP                BER
---                ---

.998162131         1E-06
.910426689         5.1E-05
.830398452         1.01E-04
.757402104         1.51E-04
.6908194           2.01E-04
.63008682          2.51E-04
.574690881         3.01E-04
.524162416         3.51E-04
.478074824         4.01E-04
.436037572         4.51E-04
.397694699         5.01E-04
.362721864         5.51E-04
.33082301          6.01E-04
.301727811         6.51E-04
.275190356         7.01000001E-04
.250985782         7.51000001E-04
.228909108         8.01000001E-04
.208773354         8.51000001E-04
.190407795         9.01000001E-04
.173657126         9.51000001E-04

        DIGIPEATING
```

Bit Error Rate Testing At 1200/2400 Baud

As outlined above, a BER test was performed on a KPC-2400 at 1200 baud (FSK) and at 2400 baud (DPSK). The test arrangement was as shown in fig. 3. The

computer is used to set proper parameters within the KPC-2400. It is also used to send and then receive a pseudo-random pattern through the modem. The radios were attached to simulate the radio path. A dummy load was attached to the transmitter. Transmission level was regulated by the adjustable power output level on the ICOM 271.

The test is performed by looping the output of the transmitter back into the receiver and counting the number of bits that do not match over time. The computer is set to print on its screen the number of mismatches and the number of bits sent.

Initially, the loopback was made up of a straight wire. We wanted to check that the "perfect" direct-wire channel would perform without error; it did.

Next, we attached the radios back-to-back and performed tests at 1200 and 2400 baud. The BER at both rates was about the same, consistently under 1 error in 10,000. Volume on the receive radio didn't seem to make much difference with the DPSK mode. In addition, it was possible to detune the receive + or − about 4 kHz and the test continued to produce errors at about the same rate. This was probably due to the linear nature of the FM detection process.

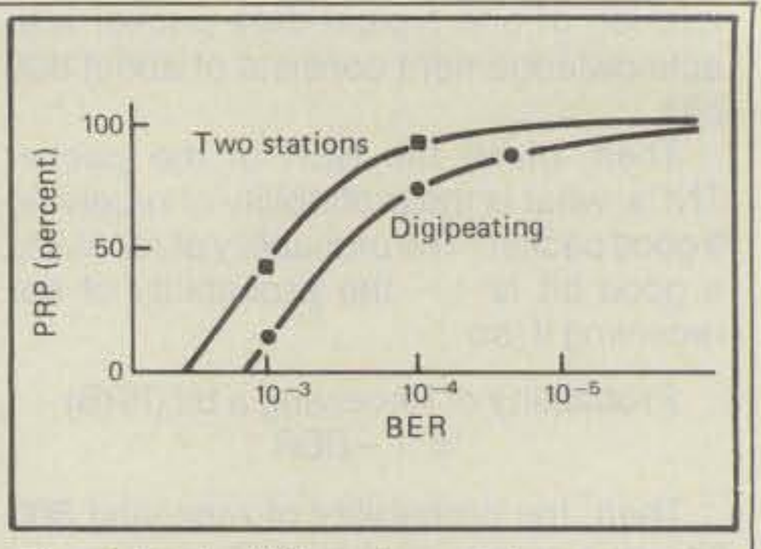

Fig. 2–Probability of receiving a packet versus BER.

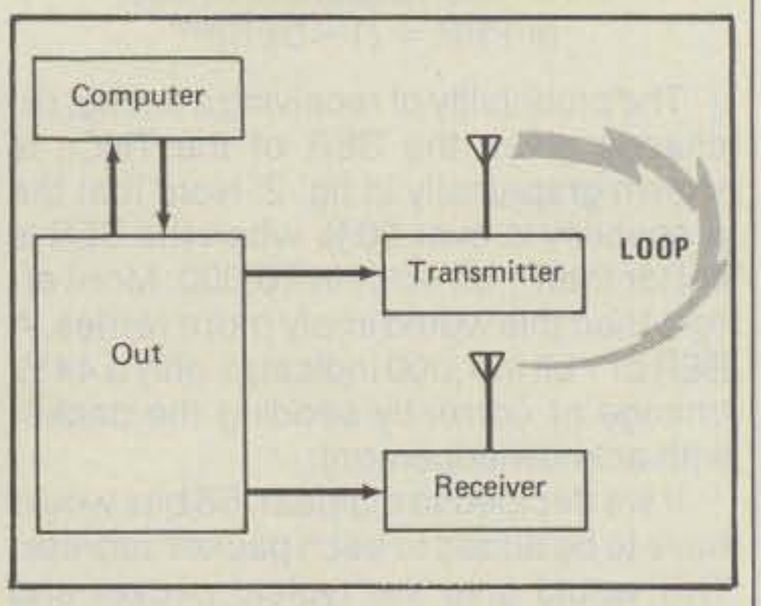

Fig. 3–BER testing arrangement.

Conclusion

With these tests completed, it seems that the initial questions are answered in the affirmative. It is possible to operate at 2400 baud and transfer packets with a good retry count. Bit error rates are comparable to that with 1200 baud FSK modulation, assuming equal channel and radio conditions. In addition, and perhaps the biggest point, it is possible to operate at 2400 baud without radio modification. We used an ICOM 27H, an ICOM 27A, an ICOM 271, and a Kenwood TR-7950.

In addition, we tested the modem as an attachment to the TNC1, separate from the KPC-2400 where it was integrated. The same results were had. One interesting point is worth mentioning here. We found that the KPC microcomputer had the speed to handle the HDLC in software at 2400 baud and keep up. The TNC, of course, uses a hardware HDLC chip at extra cost.

In conclusion, it appears that 2400 baud DPSK packet could be a useful addition to the amateur packet community, considering the crowding and congestion that is already upon us. Such an addition would, of course, be most useful if it were downward compatible with existing TNCs; that is, if the new 2400-baud TNC could also operate 1200 by software switch. CQ

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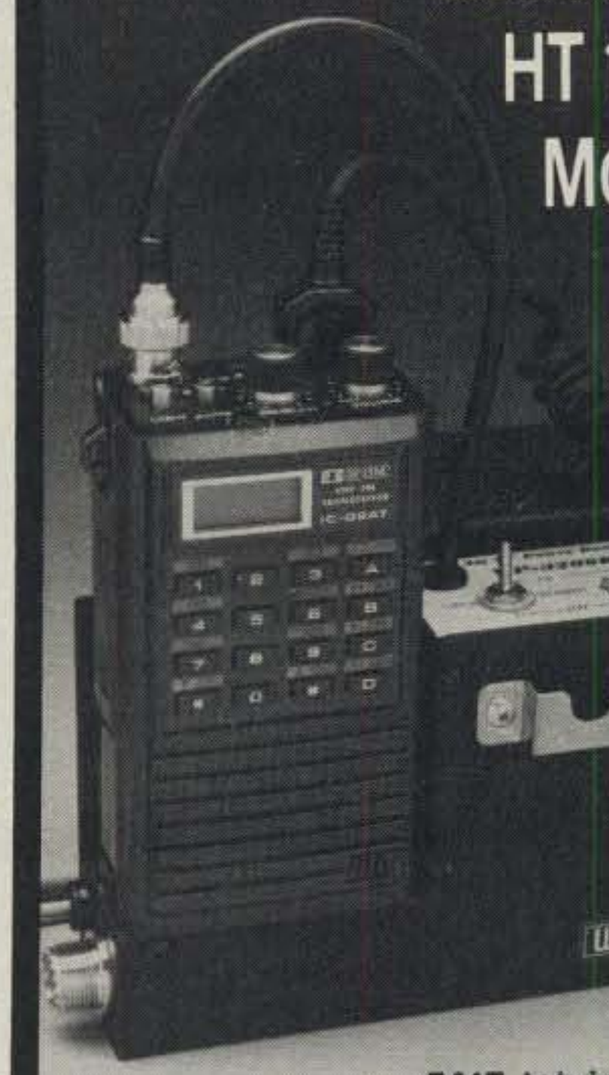

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QRP

a monthly feature by
ADRIAN WEISS, K8EEG

THE ART OF VERY LOW POWER OPERATING

QRP Field Day 1985 Results

The old axiom claiming that spring turns a young man's fancy to love may be true in most cases, but not in regard to radio amateurs. To them, the coming of spring means that Field Day is not far behind! This is especially true of hard-core QRP contesters who've spent the months since last Field Day agonizing over their mistakes and the "if we'd only done this or that" options that could have put them over the top! Now's the time to put together an improved strategy which benefits from last year's blunders. And this column can make a valuable contribution. The reports included here provide many insights into the "do's" and "don't's" of FD QRPing. But regardless of the individual results—ectasies of joy or groveling disappointment—the theme is the same for all: operating FD with QRP is exciting fun, especially when away from the home shack, whether out in the wilderness, at 14,000 ft., or merely in some farmer's "north 40."

Ever since we instituted the *Milliwatt*-QRP-ARCI Field Day Program as a "piggyback" ride on the ARRL Field Day in 1970, many veterans of QRO club ventures have "switched" to the QRP approach and enjoyed FD for the first time. Others have tried FD for the first time with QRP and enjoyed it. Operating in the bedlam of FD is not easy for anyone, QRO or QRP, but there's a big difference in the amount of satisfaction that can result from a good effort. With QRO, only the raw numbers count—either you make thousands of QSO's or you're some kind of lid. But with QRP, making any contacts at all is satisfying to start with, and making a lot of them is even more satisfying! You have to start somewhere. I don't often like to think of my first FD with QRP. I was loaded for bear: borrowed VW van for comfort; pre-installed 900 ft. longwire for that necessary edge; homebrew 2 watt rig for 40/20/15m; food, beer, and everything else I figured I would need "to show 'em." Results? A crummy total of 3 (yes, 1, 2, 3!) QSO's and 3000 mosquito bites! I mention this in passing not so much to tarnish my image as a successful QRPer, but to remind you fellows who are entertaining the idea of QRP FD that everyone has to start somewhere. If you take me up on the invitation to try QRP FD, I hereby give you permission to compare your first FD results with mine. When the guys at the club kid you about your low QSO's total, you can respond with something like: "Heck, that shows how ignorant you guys are. Ever heard of Ade, K8EEG/ W0RSP, the guy who writes about QRP for *CQ*? Yeah, that's the one. Heck, I beat the pants off his first FD score, not even in the same ballpark with mine!" That'll be okay with me as long as it stops short of outright slander. I do have an image to preserve, you know.

Before getting to the reports, let's have a look at the overall picture. Last year was the first time QRP FDers could earn the *Milliwatt Achievement Certificate* by operating in the under 1 watt category. W9PNE and K9NG qualify for the award this year. Note that the power multiplier for the 1 watt category is ×8, but ×4 for 5 watt stations. Ten hardy QRPers took up the challenge along with top-scoring club entry K9NG. This year shows a total of twelve 1 watt entries (K9NG and KA4LKH in the club category included), a good surge of interest in "milliwatting" that also is evidenced in the entries for the QRP-ARCI's Spring and Fall QRP QSO Parties. And the "milliwatters" once again put in a respectable performance. Considering the combined 27 entries in the one-transmitter/two-operator, 1 watt and 5 watt categories, "milliwatters" placed 3rd, 6th, 7th, and 8th in terms of total QSO's. KN1H's 373 QSO's was a bit short of W8ILC's outstanding 1984 total of 425 QSO's, but not far behind. Half of the "milliwatters" posted more than 100 QSO's. Two "milliwatt" entries really pushed the limits. WB2IPX posted 14 QSO's with 100 milliwatts output, and hidden in W9PNE's 225 total are 38 QSO's at 100 milliwatts! These are remarkable results in the context of the intense competition of FD. They also reveal that there are some really super operators out there during FD who are sharp enough to copy a 100 mw signal. The 5 watt category shows a general increase in QSO totals when compared to last year's results. The top three 5 watt entries exceeded last year's "normal" upper limit—excluding big gun N4BP's astounding 1046 QSO's—and W0KEA/ KA0KRW almost broke the 500 level. Let's get on to the reports, starting off the milliwatters with **Tom Jones, KR2V,** sounding the "converts' " theme:

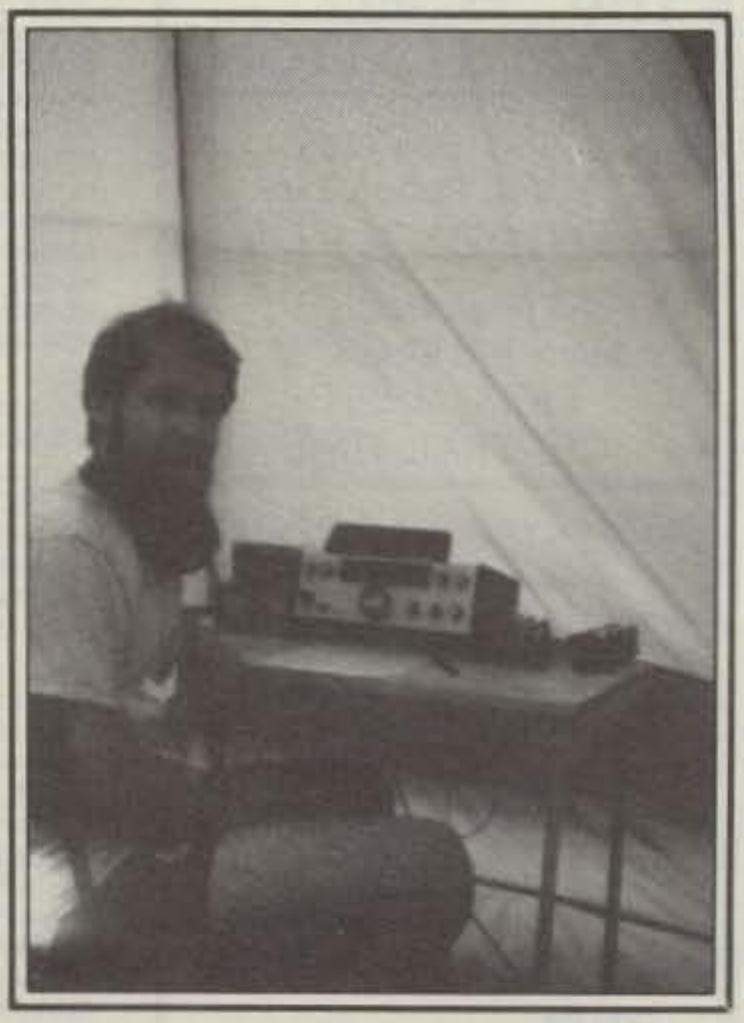
"My normal FD activity has been operating from the van with 100 watts using a 40 ft. push-up tower and 2-el quad on 20 meters. This combination puts out a terrific signal, but it just didn't seem to me that this was all there was to FD. The '85 FD was the year for a big change, and it found me and my 11-year-old daughter Tanya (chief cook and bottle washer) heading north to the Adirondacks. During the year I had purchased an Argo 509 and used it with my monobander with great success, but I wondered how it would work with simple antennas and contest QRM. We operated from a tent at a state campground with a dual-band full sloper with reflector, joining the few '1 watters' active during FD. The contest was unbelievably slow-starting for us, with only 6 contacts the first hour! It seemed that no one could hear our signal, and I wondered, 'Is this power class even worthwhile? After all, isn't a contest aimed at logging a maximum number of contacts?' Things did get a little rosier later on and we managed a reasonable score of 70 CW and 22 SSB contacts. However, I am sure I have never worked so hard for so few contacts! What about next year? W-e-l-l, we'll be out there again with QRP CW and probably a better antenna setup. How did I ever get into a crazy hobby like this anyway?" That's the spirit, Tom!

QRP Field Day Club Standings

Top-20 Club Scores 1979–1984

	Call	Year	QSO's	Score
1.	N4BP	'82	1170	7170
2.	K9NG*	'85	503	6186
3.	K8BX	'81	854	5274
4.	K9NG*	'84	418	5166
5.	W3TS	'85	776	4806
6.	N6UU	'84	731	4536
7.	K8IF	'79	732	4488
8.	N2RI	'83	699	4344
9.	N5AF	'82	685	4260
10.	K8IF	'82	684	4254
11.	W2LZ	'85	667	4152
12.	KN9W	'83	643	4008
13.	W2LZ	'83	637	3972
14.	AC2U	'81	627	3912
15.	N2RI	'82	625	3900
16.	W3TS	'84	597	3732
17.	W6SKQ	'85	589	3684
18.	WB9JVX	'82	584	3654
19.	K8IF	'84	568	3558
20.	N2RI	'81	555	3480

**One-watt club entry.*



Tom, KR2V, inside the roomy tent for his first QRP FD. A homebrew table (legs are four lengths of ¾ inch pipe inserted into pipe mounting flanges on 2 × 4's at each end of the ¾ inch plywood top—neat!) mounts the Argo 509 and accessories. Tom went the milliwatt route first time out.

833 Duke St. #83, Vermillion, SD 57069

Randy, KA9HAO/7, at his Mogollon Rim 8000 ft. AZ site. Seems like a novel solution to the operating position problem, with the Argo 515 and accessories on the rear floor of the station wagon and solar panel leaning against the bumper. Dipoles for 40/20/15 meters are hung from trees and the tent provides living quarters.

Chuck Lindsay, NJ7M/ex-KA7PMP, prepared for FD by revamping a "basket-case" Argosy that he picked up for $75, fixed for another $25, and added a CW filter for $45. Then Chuck attacked the current-drain problem: "As designed, the Argosy used 3 amps to produce 4–5 watts output, since the LO-HI power switch simply changed the bias level on the drivers. By running the output directly from the driver pair, I managed to get the current down to 1.4 amps at 4 watts and 850 ma for 1 watt output. Also, I changed the AGC time-constant, added an AGC-defeat switch and front-end attenuator for some RF gain control. I found a nice north-south ridge on a mountain north of town with a couple of tall firs. Used a sling-shot, 3 oz. weight, and 20 lb. monofil to get a pilot line up at 78 ft. and then hauled up the extended Double-Zepp fed with open wire and rigged so that I could use it on 40m at night and then short out sections to operate 20m the next morning. It worked very well and I was very surprised to work many east coast stations on 40 with no repeats needed." Chuck's 215 contacts show what a good antenna will do!

Les Shattuck, WB2IPX, new president of the QRP Amateur Radio Club International, wins this year's "purist" award: "This year I had only a short time to operate, so I decided to try something different. Yes, very different—100 milliwatts output from a crystal-controlled, single 2N2222 transmitter which I built a few days before FD. My antenna was a trap vertical with several radials, and I used the Arognaut for the receiver (I really took it along because I didn't think I could make any QSO's with this power level). Not much time, but very surprising results. You can just imagine how I felt when I made my first 100 milliwatt QSO! And 14 QSO's later, I am a born-again milliwatter!"

Al Bates, W1XH, points out the trials and tribulations of lone ranger versus club outings: "I was talking to another QRPer who was also Class 1B this year. We both came to the conclusion that one person portable is a bummer. FD is more enjoyable when you are part of a multiple transmitter/operator station. You get to try and compare other people's rigs, to try new and exotic antennas. You get more help during station setup and tear-down, with someone to take care of the food and publicity and other little details. You get to swap war stories over a cup of coffee at 3 AM Sunday morning. You get to stand back and say 'I am a part of all this'!" **Randy James, KA9HAO/7,** seems to feel the same way: "I've been in AZ since October '84 and I'm wondering where the QRPers are in this state? At any rate, going solo for QRP FD was pleasant but not too successful. The site was on the Mogollon Rim at 8000 ft. with many tall pines for dipoles. The 20 QSO's are a result of 7 hours of operation with the Argo 515 cranked down to 800 mw. I got bored and decided to pack it in after that. Maybe next year I'll meet some other AZ QRPers and get a real FD effort going." Incidentally, Randy's QTH, if any takers are reading this, is 5151 E. Presidio Rd., Scottsdale, AZ 85254.

Legendary milliwatter **Brice Anderson, W9PNE,** the guy who showed the world what milliwatts can do, gave up on Saturday setup because of thunderstorms, but Sunday made up for that: "It was great to find 28 MHz open. In the first hour I had 21 QSO's on that band, all with 100 mw output. Results on 28 MHz were tremendous at this power level and good on 14 MHz, but nil on the other bands." In addition to the centerfed 134 ft. wire at 25 ft., Brice tried out a small loop: "The half-wave loop was only 8 ft. 11 in. on each side and fed at the middle of one vertical side with coax. It was suspended vertically between two small trees with the bottom only 3 ft. above ground. The loop circumference was only half that of the full-wave Quad loop and hence exhibited no gain. Some directivity is obtainable along the plane of the loop and in the direction of the feedpoint side, but not much. Although I could work stations on 20 meters with either the centerfed or the small loop, I had a better percentage of returns to first calls on the loop. Interestingly, I even had good luck on 15 meters with this loop, tuned through the MFJ-941B transmatch. I have about a dozen different loop antenna configurations to study this summer in my quest for effective but very small loop antennas (4 ft. square for 20m) with no radials or ground connections. I heard QRPers KN1H and W3TS once each but couldn't make contact." They probably were skimming for strong sigs, Brice!

John Collins, KN1H, set up on the summit of Mt. Ascutney in Windsor, VT, which turned out to have its drawbacks: "With the help of a pulley, about 400 ft. of nylon line, a little trigonometry, and the guy wires of a nearby communications tower, I got the apex of an 80m inverted Vee (fed with open-wire) up to about 100 ft. With 750 mw I was ready to take on all comers, but the commerical 2 kw balun was shorted (fortunately I brought along a small homebrew unit), and the RF from nearby TV and FM broadcast stations made my memory keyers and audio filter totally useless! Then there was the QRO FD station set up about 100 yards away! My band choices were reduced to whatever band he *wasn't* on! In spite of all, FD was still a success. Conditions were so good on 80m at night that I made more QSO's there than on any other band—most

QRP Field Day 1985

One Watt Stations

Station	CW	SSB	Total QSOS	Total
*KN1H	264	109	373	4626
W9PNE	225	0	225	2850
NJ7M	215	0	215	2730
KK7C/WB7BIV	190	3	193	2466
W1XH	139	1	140	1830
KR2V	70	22	92	1254
NS6X	70		70	840
KV7X	31	0	31	522
KA9HAO/7	17	3	20	390
WB2IPX(100 mw)	14		14	318

Five Watt Stations

*W0KEA/KA0KRW	417	69	486	3066
W0UY/K0WRY	151	229	380	2430
N2RI	269	84	353	2268
N9DHX	0	305	305	1830
VE3HIE	184	0	184	1254
WD5BRR	149	0	149	1044
W6YVK	0	149	149	894
WD9AEU	110	26	136	816
NU4B	103		103	768
N0BQW	0	76	76	606
KT1H	29	61	90	540
NM7M	60	0	60	510
WD9EGW	64	0	64	384
KA2KMU	35		35	360
KH6CP	17	16	33	348
KA5QAP	21	0	21	276
KA0FDL	0	30	30	180

Club Stations

K9NG	461	42	503	6186#
*W3TS	491	285	776	4806
W2LZ	667	0	667	4152
W6SKQ	411	178	589	3684
NC9O	58	189	247	3114#
W0VM	427		427	2712
KA4LKH	23	274	297	1932
K5IS/N5AE	138	70	208	1398

** Award winners.*
 # One-watt club stations.

1985 Field Day at Lake of the Woods, Oregon
(Each ring represents an increment of 500 miles)

	Ring 1	Ring 2	Ring 3	Ring 4	Ring 5	Ring 6	Rings 7 to 9
80m	32	25	3	2	—	—	—
40m	39	41	—	—	—	1	—
20m	3	12	10	14	7	1	—

Table I– Distribution of contacts by distance ring—KK7C.

came back after just one call, even on SSB! This year's lesson was that even a very simple station can be effective at the milliwatt level, and if you stay up late enough, the QRO station will go to bed and you can work the world!" Indeed! KN1H racked up 373 QSO's, enough to walk away with the **One-Watt FD Trophy** for this year.

Jim Stevens, KK7C, new editor of the *QRP Quarterly* (QRP-ARCI), turned a 16-hour trip to a Mercury Net convention's QRP Forum into a full FD outing with **Bob Joiner, WB7BIV:** "It was my first 24-hour FD, and the first one with a companion operator who was motivated and capable. Due mainly to working with Bob, this was definitely the best ever for me. Having one mind free to monitor, log, dupe, and analyse the data while the other chased contacts made an incredible difference in our ability to perceive changes in propagation and figure out what was happening to our signal. We used WB7BIV's Argo 509 for operating, with a pair of HW-8s on the side to monitor propagation on other bands. Bobtails for 80, 20, and 15m were aimed east, while a G5RV was aimed north-south. Our results are tabulated in increments of 500 miles skip rings in Table I, and a summary by band is helpful: *20 meters*—7 hours, 47 QSO's. Due to a mounting mistake setting up in Friday evening darkness, one tail of our 20m bobtail wrapped around the feedline. It worked, but we found ourselves calling many stations who did not answer, so we switched to the G5RV. When we called closer-in stations on the G5RV they came back, so we never switched to the bobtail. Forty QSO's were with the G5RV. *40 Meters*—9 hours, 81 QSO's. Nineteen QSO's with the 80m bobtail in an hour and 55 minutes: the rest with the G5RV. We would perhaps have been more successful with outer distance rings if we had gone back to the bobtail when the skip stretched out. *80 Meters*—7 hours, 62 QSO's, all with the G5RV. On receive, the bobtail overshot the near-in stations, attenuated signals from the plains states and Mississippi Valley, and amplified signals originating east of Ohio. But our 1 watt signal just couldn't compete with the 100 watt short-skip stations that those eastern listeners could copy well with their low dipoles."

5 Watt Category

Paul Zimmerman, WD5BRR, tried his first QRP FD and "It was a blast! This was the most enjoyable FD to date after being licensed 20 years. I had a really great place—my in-laws' farm high in the plateaus of northwest Alabama, way out past nowhere with virtually no man-made noise. One can receive UHF and VHF TV stations from 100 miles away clearly. There's enough space for a 160m rhombic, but I settled for a 134 ft. centerfed and 450 ohms poly-balanced line hooked to an HW-9 through an HFT-6 transmatch on 40/20/15 meters. Took time out for visiting, so this year's score does not nearly represent maximum potential. Actually, the weakest link was the operator! The HW-9 performed flawlessly. I give it a high recommendation for portable operation, and the built-in audio filter made copying the chaos much easier. I was amazed at the signal strengths at this QTH. I had upscale readings on the S-meter nearly all the time and operated with the speaker most of the time. My intention is to return to the same spot each year, gradually improving both the antennas and stamina of the operator! By the way, I have read your book *The Joy of QRP*, and offer compliments and thanks for an excellent work. Your discussion of FD was very helpful in planning, and your suggestions as to proper use of propagation turned out to be quite accurate in practice!"

Tom Hamblin, VE3HIE, tried out his future QTH: "It was a very pleasant FD and the first from the 10 acres that we plan to retire on in only 23 more years! No problem from thunderstorms this year. The XYL supplied sustenance while in-laws Nel and Seab, VE3OBS, kibbitzed. I used the tune-and-pounce method, tuning as fast as I could with minimum audio selectivity on the Argo. This was my 10th QRP FD since 1972 and it turned out well."

Larry Maso, NU4B, also found some elevation for his effort: "I set up shop on my parents' land on Chilhowee Mts. in eastern Tennessee and operated my HW-9 from the rear seat of a Subaru hatchback using a 40 meter dipole and 2-element wire Yagis for 20 and 15 that I found in *CQ* a while back. This was my first time QRP solo, so I had a goal of 100 QSO's, which wasn't hard at all. The biggest thrill was hearing HP1AC calling CQ up in the high end of 20m and then working him! It made my Saturday night even though I didn't list him in my entry. I had a great time!"

Ken Horning, KA2KMU, acted the "free spirit" at a price: "I decided to go it alone this year. The Cape May county ARC had a secure site, a generator to recharge my battery, and a bit of food and drink, so I figured why not? I took a little good-natured ribbing for being 'exclusive' and for hiding my linear in the toolbox, but members and visitors alike were admitting that QRP was indeed a serious and viable facet of amateur radio. My log isn't really impressive as FD operators go, but I worked out on four bands with my HW-9 and a piece of wire. I enjoyed the activity and I had space for a 150 ft. wire, something I don't have space for at home."

Tom Lappin, W0UY, and **Kent Hoskinson, K0WRY,** capitalized on their experience last year: "Enclosed are the results of our second QRP FD, much improved. A 3-element tribander up about 30 ft. proved to be the best addition in equipment. Our score was also boosted by operating the entire 24-hour period rather than for 19 hours as we did last year. SSB operation on 15 and 20 meters was more fruitful than we expected and proved to be very helpful in racking up the contacts. Worked 47 states this year, but I think that Maine has fallen off the edge of the earth—didn't hear a peep from there!" KH6-land may not have fallen off, but it seems close to the edge according to **Zachary Lau, KH6CP,** and partner **AH6EK:** "Vertical curtain arrays were used to obtain the low-angle radiation needed for FD from here. The 1 watt level from the Argo 515 was used for QSO's with KH6's on 40 meters. But short 20/15 meter openings kept the score down." Fifteen of their 33 QSO 's were with KH6 stations, but they worked K6DYP on 40m and the rest of the mainland stations on 20/15 meters.

Brad Hutton, KT1H, was kept from portable operation by other duties, but managed to operate a bit from the home QTH and reflects: "Too bad everyone didn't go QRP. Most operators on the other end don't really believe me when I tell them that I'm running QRP. The 'price of admission' for running QRP is fully realized from the flattering comments emanating from the other end, however!" Indeed! Some days the only nice thing I hear is from a QRO type on the other end.

Charles Bright, KA0FDL, hoped to get out in the field after reading last year's FD report here, but couldn't, so he went at it 1E from the picnic table in his backyard: "My setup consisted of my Argo 509 and motorcycle battery and Hustler 6BTV vertical. I only had a chance to get in about 2 hours, but did manage 30 contacts in 25 sections/24 states. As an added bonus, my QSO with KN0A resulted in a QSL from my 49th state toward WAS QRP on SSB. Only South Dakota to go!" Ah yes . . .

Bob Brown, NM7M, who taught physics at Berkeley before retiring to Anacortes Island, WA, heads up the "old dogs—new tricks" category this year: "Even though I was first licensed in '37, this was my first effort at FD. It was my hope that it would have gone better, but I had to pull the plug early. I learned lot, and if I give it a try again next year, I'll know how to play the game. On the technical side, I really saw the limitations of the Ten-Tac Argosy II, particularly with that cursed AGC always on. With a heavy mix of QRO stations in the contest, all it took was one dot or dash on a nearby frequency to wipe out the signal of the guy I was working! The other thing I learned is that a dipole up here in the northwest corner of the country is really silly.

Because of time restrictions, Charlie, KA0FDL, only managed to get as far as the picnic table in the backyard, but his smile shows that even that far makes a difference! The 30 QSO's he made in 2 hours helped.

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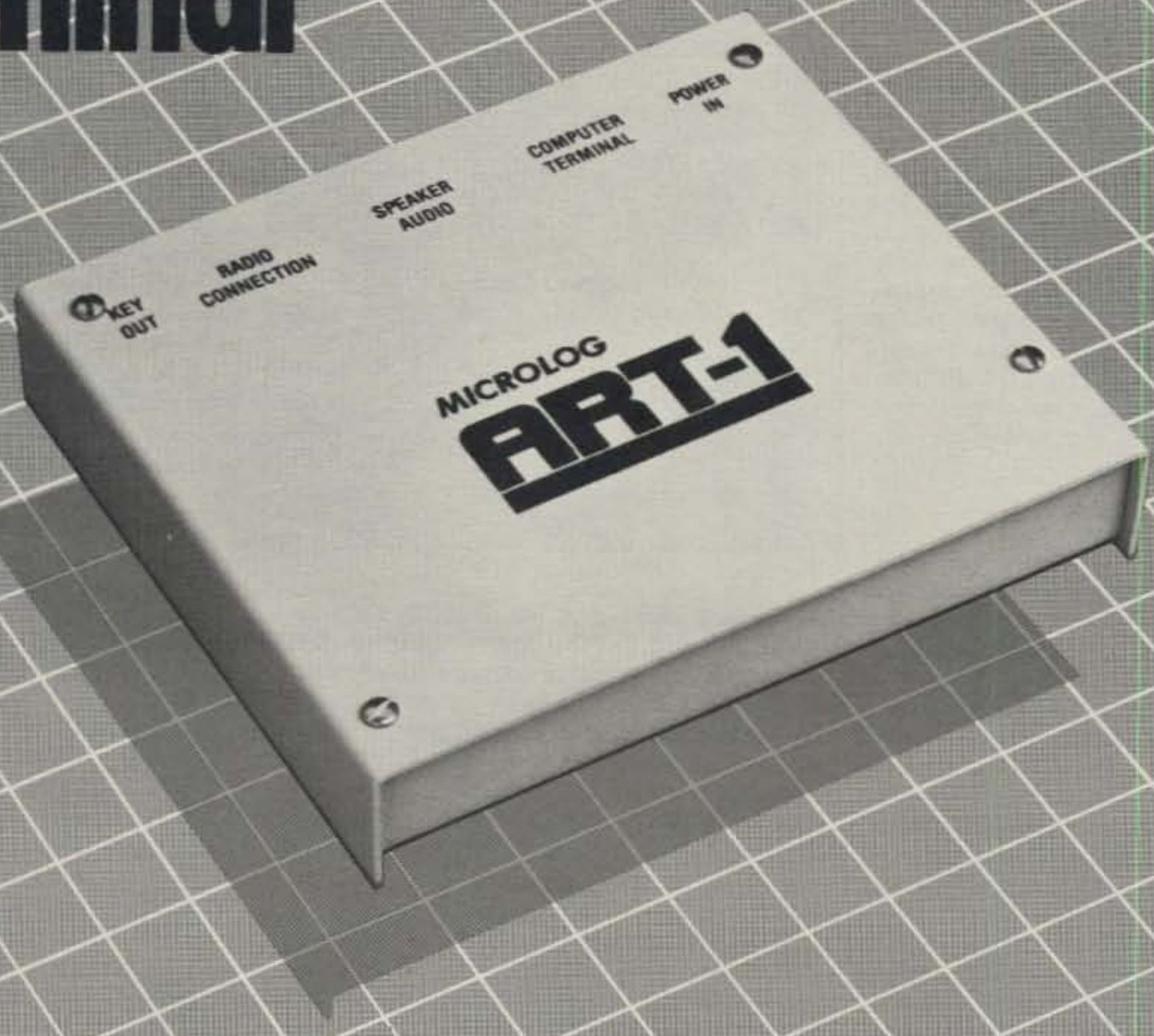

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You waste half of your RF by pumping it out into the Pacific. In that regard, I'll probably work up some sort of 'spider-web' 2-element quad, with emphasis on a high f/b ratio, that can be suspended between trees next time. Finally, it was a bit disappointing to hear only one other QRPer—Jim, KK7C." Bob ends his report with a literary touch: "As T.S. Elliot said, "That's how the Field Day ends, not with a BANG but a whimper!" Alas, poor Yorick!

Finally, **Phil Krichbaum, W0KEA,** and **KA0LRW** topped the 5 watt entries to take the FD trophy for that class, but almost missed the action: "We decided to do this FD outing on Thursday, one day before we gathered up the gear and headed out. We operated from an 'A-frame' cabin south of the Aspen ski area at 11,400 ft. and 2 miles from power lines, so no noise. The biggest problem was noise at night from porcupines chewing on the plywood paneling. A pair of 40 watt solar panels charged golfcart batteries to power the Argosy which fed a TH-3 at 25 ft., an extended Zepp on 40, and a longwire on 80. This was our first try at QRP FD and hope to do better next year!" Just remember, guys, don't get into a territorial dispute with your nocturnal visitors!

The Clubs

Well, the HAH! is back after a year of simmering over the fine publicity I gave them in last year's report! They sure showed me! As a 1 watt club entry, the ×8 power multiplier put them at the top of the heap again, and they moved up to the #3 spot in the Top-20 List. To add insult to injury, they included a piece of dead weather-balloon in their entry, presumably implying something about the deflation of someone filled with hot-air, if I read the message correctly. Even if I don't read it right, all it shows me is that the HAH! can't even work a balloon without rendering it inoperable! Ringleader of the HAH! (Harper Air Hawks) **Red Reynolds, K5VOL,** reports: "The HAH! took the airwaves with 8 operators, a 509 and 515, and a real tower under the beam. (*Ed.: Give up on the tower-replacing anti-gravity generator idea, guys?*) Two longwires, a vertical, and tuned-feeder dipole rounded out the antennas. (*Ed.: Almost, see below.*) Lightning forced both stations out of action for 3 hours, but we claimed a new high of 503 QSO's at the 1 watt level. Had it not been for the lightning, we could have had around 600, which also limited us to only 100 or so solar QSO's. One problem was the wind forcing our balloon vertical into the trees and 'pop went the balloon.' (*Ed.: See, what did I say earlier!*) W9ZSJ said we would fix that problem next year by using a cast-iron balloon! It seems planning for the next year by evaluating previous results really works. We moved the operating positions about 100 ft. east so we could orient the longwires to favor last year's high-density QSO areas. Worked well to the east, but we didn't get as much from the south this year because of antenna orientation. We hope more of the QRP guys will try 1 watt operation. I don't think I could go back to a QRO FD effort with the noisy generator even if I had to. Batteries are a lot quieter. Besides, we beat the pants off the local ham club and their 200 watts!" Good show, fellas. Owing to the rules for QRP FD, the HAH! is not eligible for the trophy this year since a given station may win a class only once each 3 years. However, the club does qualify for the **Milliwatt Achievement Award** for 1 watt entries. The **TRAC (Tuesday Amateur Radio Club)** opted for 1 watt operation on its first FD outing, and included **Jan, AJ9L, Morgan, KA9ERZ, Mike, KC9NF, Jerry, N9DKQ, Don, N9EIG, Skip, NC9O, Gary, ND9X,** and **Tim, WD9FJP.** Skip describes the group: "Our whole club is a bunch of rag-chewers at heart, so this whole contest scene is new to us, and we all gained a lot of experience and will do better next year. Some of us have operated QRP before and for others it was a whole new ball game. It was a little frustrating to some operators when it took three or four calls to get a reply. While to us who have operated QRP, it was a joy to get a reply with the first or second call." Skip was the catalyst: "It took considerable convincing of our members that we would be able to make contacts at the 925 mw level. I kept checking into our weekly CW net with outputs from 250 mw to 2 w without anyone detecting much difference." That did the trick and the group went all out on the antenna: "Our antenna was the key to our success. We used a 5-element 40 meter bobtail curtain 272 ft. long. It was supported at one end by a 60 ft. tree and at the other by a 40 ft. 2 × 4 mast on a sledding hill, which put both ends at about the same height. Boy, what an antenna!" With the Argo and this antenna, TRAC's first outing netted a commendable 247 QSO's, everyone had fun, and the gang is looking forward to next year with more antennas.

Barry Strickland, KA4LKH, was another QRPer who enticed QROers into trying QRP FD: "I prefer to operate alone, but thought that recruiting some more operators might be in order. Most of the fellas knew that I enjoyed most of my operating at under 1 watt. I was generally greeted with skepticism when I mentioned QRP FD, but with my guarantee that we could power up to a tremendous 5 watts and that I would set up all the antennas, radios, camper, and cook and supply the beer, we ended up with 6 recruits, only one of which had operated QRP before!" Barry negotiated for use of the local stadium for several reasons, but primarily: "It has 4 light poles over 80 ft. tall and 2 middle poles over 90 ft. tall. I put up 80m and 40m full-wave loops above 60 ft. and their performance was very good. But 15 meters was open and the ZL-Special was the 'hot' antenna. It didn't take the gang very long before they realized the potential of low-power transmitting. Perhaps we have a few permanent converts! We had quite a few old-timers drop by who entertained us with tales of the old days. Our most 'mature' visitor was Green, W4GBR, who is pushing 90 years and has been in amateur radio since they used smoke-signal CW. All-in-all, it was an enjoyable occasion for everyone and I'm very glad that I put out the invitation!" Good effort, Barry!

Veteran **Bob Spidell, W6SKQ,** led the "Zuni-Loop Mountain Expeditionary Force" (including **N6LZN, KF6BC, K6MDJ,** and **N6GA**) to a 7100 ft. elevation and an intensified effort to find the ideal combination of antennas. A ZL-Special from earlier years was used on 15 meters. For 20m, a Six-Shooter Broadside Array at 90 ft. above ground was finally hung: "W6SKQ tried to top the 90–100 ft. pines with his accurate arm, but after several failures, opted for the trusty slingshot approach. We fed the array with 300 ohms twinlead." A 2-element Delta-Loop wire beam and a full-wave loop for 80 meters completed the antenna setup. Bob compared 20m results with last year: "Operation on 20m appeared like it would last all night given the way all operators attested to its effectiveness. I should note that last year we could not hold our own on 20 SSB with the Vee-beam, but with the Six-Shooter Array we had no trouble—just knocked 'em off one by one with ease. When we shifted operations to 40m and the Delta-Loop beam, it worked flawlessly, starting out with QSO's with NJ, OKLA, SD, MT, MI, and CT— not bad for 2.4 watts output! This continued all night with K6MDJ at the controls. We were all impressed—maybe a 3-element Delta-Loop next year! (*Ed: With all those trees and space, why not see if 6 elements makes a difference?*) But the 80m horizontal loop produced an interesting insight. We worked mostly 6's and 7's and not much of anything else, which suggests that it did have a fairly high radiation angle." The gang's attention to antennas paid off with nearly 600 QSO's.

The **Walton Radio Association, W2LZ,** was out for its tenth consecutive QRP FD after operating the previous 24 with QRO. Paul Rogers, W2TFL, reports: "We set up in a large field about 3 miles from Walton. Tall pines and maples around the perimeter of the field offer excellent masts to hang lines, via bow-and-arrow, for an excellent array of antennas 60 ft. up, including 4 dipoles and a 40m 3-element colinear array. A tribander up 30 ft. completed the antenna system." The effort netted 667 QSO's, boosting the club's position in the Top-20 List. The **Principia ARC,** headed by **Bill Stocking, W0VM,** has been setting up at the local school for several years and has steadily improved. After a rather unsuccessful 1980 outing with generators, the group decided to switch to battery power, and in 1981 made 235 QSO's, then 297 in 1982, 394 in 1983, was knocked off the air by a storm in 1984, and has posted 427 QSO's this year. Bill notes: "We do have better than average antennas for FD. Our main antenna is a tuned doublet 132 ft. long, fed with open-line, in the form of an Inverted-vee with the center at 40 ft. and ends at about 20 ft. This represents two half-waves in phase with a gain of 1.8 dB on 40 meters, and probably more than that on 20 and 15 meters. We plan to have a bi-directional quad fed with open-line next year for 20/15 meters. Vertical polarization will give it a wide azimuthal directivity pattern that should get us lots of east and west coast contacts." That sounds like a good one!

Finally, the Club Plaque goes to the **Berry Mountain ARC, W3TS,** this year. The club includes **W3TS, KV3V, KC3RX, WB3IDP, WB3BJV, and N3ELR, and Mike, W3TS,** reports: "We tried to plan a bet-

QRP Field Day Trophy Winners

Five Watt Class

1970	K4OCE	220	1470
1971	WA6ABP	137	1175
1972	W7DRA	55	562
1973	WA5WYO*	79	1098
1974	W0IYP	439	2748
1975	WB8OSM	220	1470
1976	K6TG	128	918
1977	N2AA	389	2790
1978	WA4IAR	442	2804
1979	WD5BKO	287	1872
1980	K1JX*	741	9042
1981	N4BP	999	6144
1982	N5EM	259	1704
1983	WA0VBW	435	2760
1984	N4BP	1046	6426
1985	W0KEA	486	3066

Milliwatt Class

1981	K5WNH/0	239	3018
1982			
1983	N0BYC	241	3042
1984	W8ILC	425	5250
1985	KN1H	373	4626

** One-watt entries adjusted to ×8 power multiplier.*

ter setup for this year. We used an 80m dipole at 55 ft., coax-fed, a 2-element wire Yagi at 55 ft. for 40m (quite difficult to string up!), a ZL-Special for 20m, and sloper for 15m. This year we ran one TX on CW and one on SSB for the entire 24-hour period. I operated my homebrew suitcase XCVR from an array of solar panels, and since no batteries were included, the sun had to be out in the clear or no RF output! I called a few stations, and then had to wait for the clouds to pass before I could send the exchange! This year we jumped bands more frequently and it seemed to pay off with more QSO's; but also, having one rig on CW and another on SSB gave us more stations to work than with both rigs on CW (4 band segments versus 8 segments)." Mike's homebrew rigs have appeared in the *QRP Quarterly* of the **QRP ARCI** and *SPRAT* of the **G-QRP-C** and he's shown them to the gang at Dayton Hamvention. Very neat work! Congrats to the gang on breaking 600 level this year.

QRP FD 1985, overall, seems to have been more successful than most, since no really heart-wrenching Murphy stories were received. It is encouraging to read satisfied reports from first-timers during these years of low solar activity and poor propagation. That shows that QRP will work during any part of the sunspot cycle, and you don't have to wait until it 1990 to take a shot at QRP FD! Prospective first-timers should note the central theme of the above reports: the antenna system is the key to success. Without a good antenna, even hardened veterans have a difficult time of it. One great advantage of going out on FD is the opportunity to try *big* antennas like the Six-Shooter Array and bobtail at great heights—can't try 'em in the suburbs! And what a difference they make! Planning for FD ranks second in importance—figuring propagation into the formula and selecting site and antenna accordingly. I discuss the subject of planning and operating QRP FD in great detail in my book *The Joy of QRP: Strategy for Success* ($10.95 postpaid from me) which will help out first-timers a lot. In addition, membership in the **QRP Amateur Radio Club International** runs $6.00, which includes the constantly improving *QRP Quarterly* four times per year. The club sponsors the annual Spring and Fall QRP QSO Parties, plus several sprints (including Novice) and regional QRP nets. Send to: William K. Harding, K4AHK, 10923 Carters Oak Way, Burke VA 22015. The QRP-ARCI welcomes part-time QRPers as well as diehards.

Rules/Scoring: Number of QSO's × Power Multiplier (5 watts = ×4, 1 watt = ×8) × Battery/Solar Multiplier (×1.5) + Full Portable Bonus (150). Only FULL PORTABLE stations eligible for awards (away from AC mains, permanent home QTH antenna structures, and home facilities).

The W3TS site with operating positions in a crank-up camper amidst a nice stand of tall trees for antenna supports.

The W3TS SSB operating position with KC3RX (ex-KA3LCU) at the mike and Argosy, with KV3V at the right doing logging duty.

W3TS himself doing what every homebrewer does—operating FD with his personally designed suitcase 40m transceiver (actually, about the size of a textbook) which was featured in a recent issue of QRP Quarterly. *Note the added touch—a hand-key. A bank of six solar cells at the upper edge of the table provided total solar power—except when the clouds floated by. This is QRPing at its absolute best!*

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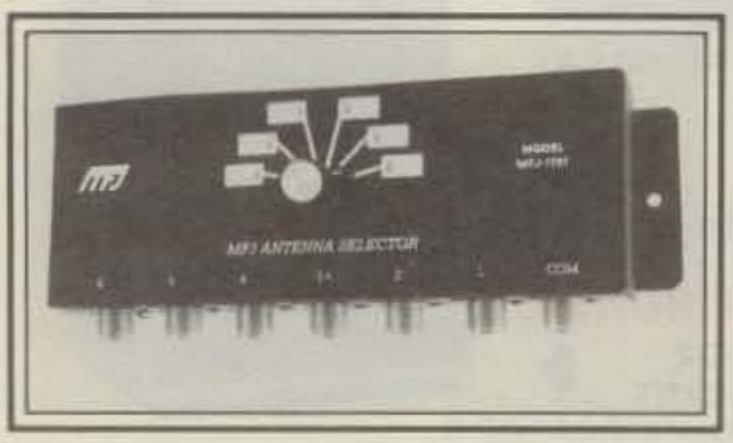

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MFJ Enterprises, Inc. is now producing the MFJ-1701, a 6-position antenna switch. This switch has SO-239 connectors, negligible insertion loss, low VSWR, and low crosstalk between adjacent outlets. All unused terminals are automatically grounded for static/lightning/RF protection. The MFJ-1701 can be used for 52 to 75 ohm systems, and can be mounted on a desk or wall. In addition, the MFJ-1701 handles 2000 watts SSB, 1000 CW.

The antenna switch sells for $29.95 and is mounted in a black aluminum cabinet. It is backed by MFJ's one-year unconditional warranty. For more information, contact MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762, or circle number 103 on the reader service card.

Delta-Zulu Case For HT's

A new line of engineered cases designed to fit the 2AT/3AT/4AT series of handheld radios has been introduced under the Delta-Zulu label by Crowley Manufacturing Co. Made from heat-embossed and precision-sewn cloth backed vinyl, this lightweight case allows the user to reach all of the controls on the HT, including tone pad. Unique to the Delta-Zulu case is an ergonomically designed zippered battery door that makes possible battery-pack replacement without having to remove the handheld from the case. A specially designed bottom seam configuration stabilizes the unit and reduces the likelihood of tip-over.

The Delta-Zulu case is available in black or burgundy and comes with a 90-day limited warranty. The case is priced at $24.95. For further information, contact Crowley Manufacturing Co., 95 Federal St., Lynn, MA 01905, or circle number 104 on the reader service card.

ColoRadio Research Model 950A Multi-Protocol Terminal

ColoRadio Research has announced the new Model 950A terminal, with built-in Packet, AMTOR, ASCII, Baudot, and CW capabilities. The 950A can be operated either stand-alone with an attached IBM PC/XT style keyboard, or from any computer which has RS-232C or 8-bit parallel TTL. Its two microprocessors include an 8085 with 32K bytes of ROM, 24K bytes of RAM, and 2K of EEPROM for storage of important buffers and Packet variables, and a TMS32010 digital signal

processor for intelligent modulation and demodulation of FSK and CW signals. This modem allows full programmability of modem tones in 1 Hz steps from 1 to 3000 Hz at any baud rate from 45 to 1200. The video terminal portion of the instrument provides 80 columns and 24 rows of text.

The manufacturer offers a 30-day money-back guarantee and a 2-year warranty on 950A, keyboard, and monitor. The stand-alone 950A (including keyboard and monitor) is priced at $699 ($599 through 8/31/86). For users who have a computer, the 950A controller is $499. Zenith ZVM-1220 (amber) or ZVM-1230 (green) monitor is $100, and price of the IBM PC/XT style keyboard is $100. For more information, contact ColoRadio Research, 710 Grove Ct., Loveland, CO 80537, or circle number 102 on the reader service card.

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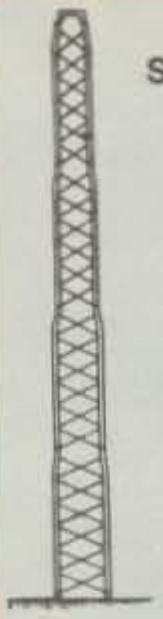

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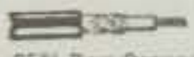

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A50-5 5-el 6 mtr Beam	$79
215 WB NEW 15-el 2 mtr Beam	$75
4218 XL 18-el 2 mtr Beam	$95
3219 19-el 2mtr Beam	$89
220B 17-el 220MHz Beam	$89
424B 24-el 432MHz Beam	$75
ARX2B 2mtr Vertical	$39

hy-gain

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Discoverer 3-el Conversion Kit	
EXPLORER-14 SUPER-SPECIAL	
QK710 30/40 mtr. Add-On-Kit	
V2S 2-mtr Base Vertical	
V4S 440MHz Base Vertical	
TH5MK2S Broad Band 5-el Triband Beam	
TH7DXS 7-el Triband Beam	
TH3JRS 3-el Triband Beam	
205BAS 5-el 20-mtr Beam	
155BAS 5-el 15-mtr Beam	
105BAS 5-el 10-mtr Beam	
204BAS 4-el 20-mtr Beam	
64BS 4-el 6-mtr Beam	
12 AVQ 20-10 mtr Vertical	
14 AVQ 40-10 mtr Vertical	
18 AVT/WB 80-10mtr Vertical	
18HTS 80-10 mtr Hy-Tower Vertical	
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28BS 8-el 2 mtr Beam	
214BS 14-el 2-mtr Beam	
2BDQ 80/40 mtr Trap Dipole	
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4BTV 40-10 mtr Vert.	$89	G7-144 2-mtr Base	$119
G6-144B 2-mtr Base.	$89		

Mobile Resonators	10m	15m	20m	40m	75m
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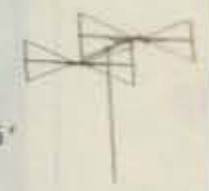

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Alliance HD73 (10.7 sq ft rating)	$119.95
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Telex HAM 4 (15 sq ft rating)	$Call
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Telex HDR3000 Heavy Duty (25 sq ft rating)	$Call
Kenpro KR500 Heavy Duty Elevator Rotator	$189
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Standard 8 cord cables	$.19/ft
(vinyl jacket 2-#18 & 6-#22 ga)	
Heavy Duty 8 Cond cable	$.36/ft
(vinyl jacket 2-#16 & 6-#18 ga)	

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10 ft Stack Sections

20G $39.50	45G $112.50
25G $49.50	55G $149.50

All 20G, 25G, 45G and 55G Accessories In Stock at Discount Prices - CALL!

Foldover Towers	Model	Height	Ant Load*	Price
	FK2548	48 ft	15.4 sq ft	$899
	FK2558	58 ft	13.3 sq ft	$949
	FK2568	68 ft	11.7 sq ft	$999
	FK4544	44 ft	34.8 sq ft	$1199
	FK4554	54 ft	29.1 sq ft	$1299
	FK4564	64 ft	28.4 sq ft	$1399

25G Foldover Double Guy Kit	$249
45G Foldover Double Guy Kit	$269

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.
All Foldover Towers Shipped Freight Prepaid Continental USA! Foldover Prices 10% Higher West of Rockies.

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RS20A	16	20	89
RS20M	16	20	109
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B215	2M	Yes	2W	150W	$259
B108	2M	Yes	10W	80W	$159
B1016	2M	Yes	10W	160W	$249
B3016	2M	Yes	30W	160W	$199
D24	440	No	2W	40W	$179
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CIRCLE 22 ON READER SERVICE CARD

With summer upon us more people will be out in their boats. A Mayday at sea is quite a different matter from a disabled car. WH6O shares his first-hand knowledge of handling Mayday traffic.

Maritime Distress Communications Via Amateur Radio

BY RMC TOMMY H. MORGAN*, WH6O

"MAYDAY, MAYDAY MAYDAY THIS IS THE SAILING VESSEL NOVA; HELP WE'RE LOST AND IN TROUBLE HELP HELP." . . . Well, you just heard a MAYDAY being sent on the 20 meter phone subband. What are you going to do? Panic? Shut off your rig and act like it didn't happen? Or are you going to remain calm and cool and give this poor soul the help he seems to desperately need? What about the things you need to ask? If you're not a professional radio operator or just don't have any experience handling distress traffic, you might not know the right questions to ask and whom to call. In this article I'll give you some of the most important questions to ask and information you need.

When dealing with distress situations the main thing to remember is to remain calm. Keep your head, and project that everything is under control. Let the person in distress know that someone heard his call and that you are going to do all you can to help him out of his dilemma. This is *very* important. If you are calm, chances are he will also calm down.

Here is a list of questions that should be asked before you call anyone;

1. What is your position? (Get this in latitude/longitude if it is possible. Also get the time the position was taken and how it was obtained—i.e., LORAN C, OMEGA, Dead Reckoning, Celestial, etc.)

2. How many people are on-board your vessel and are there any injuries?

3. What is the nature of your distress (if it hasn't already been given) and are you in immediate danger? (Is this situation life threatening?)

4. What is the name of your vessel and what is the owner's name?

**U.S. Coast Guard Communication Station, Honolulu, HI*

Okay, you have four very important questions answered (hopefully). Now what are you going to do? Call the U.S. Coast Guard. They are the guys trained to handle maritime distress cases. Coast Guard **R**escue **C**oordination **C**enters (**RCC**) are manned 24 hours a day 7 days a week throughout the year. We will discuss how to get in contact with the right people later in this article.

When you get the Coast Guard Duty Petty Officer or Officer on the line, identify yourself as an amateur, tell him what you have heard, the frequency you heard it on (make sure he has the frequency correct), and the information you have obtained.

So you've read question number four and are wondering why we need the owner's name. As you know, there are some strange people out there with access to amateur radio equipment and sometimes they throw out a MAYDAY call just for kicks. If you ask the person the owner's name, this may cause your "distress" to just kind of fade away. Also the owner can usually provide additional information about the vessel and the people on-board in a genuine distress situation.

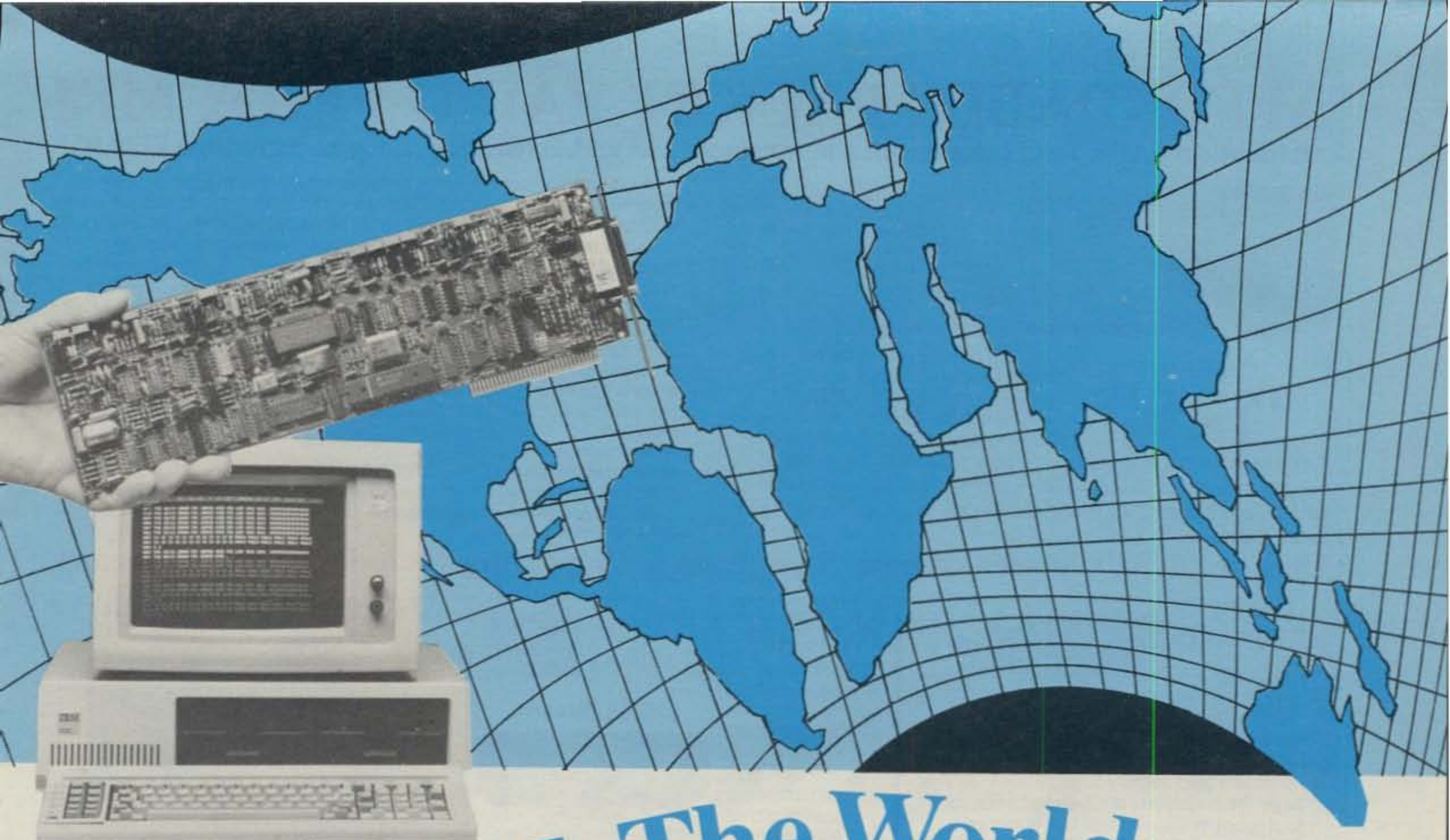
Even if you suspect a hoax, give the Coast Guard a call anyway. You'll never be wrong calling.

Most distress calls made in the amateur bands are on established net frequencies. For instance, the net frequency of 14,314 MHz has seen its share of distress calls on both the east and west coasts. If you should tune up to your favorite net and hear a distress in progress, the best thing you can do is *Not Interfere!* If you have information that might help with the case, give RCC a call and pass your information to them over the telephone. If a Coast Guard Communication Station is on the frequency with the distress vessel, they normally will not acknowledge any interfering stations. Net Control should have shifted the net to an alternate frequency, and you can go there to find out any information they know about the case. Normally there is plenty of information floating around on the alternate frequency. If you live near one of the Coast Guard Communication Stations, please do not call that station for information concerning a distress. The Communication Station personnel cannot give out any information concerning distress traffic. The Communications Act of 1934 and Coast Guard Regulations prohibit communications personnel from divulging any information. Calling the Communication Station ties up the phone lines, causes unnecessary work for the personnel on watch, and won't get you any information.

Another thing to remember is that even if the person in distress does not have an amateur callsign, he has every right to use the amateur bands for life-saving assistance. If you know the person has been bootlegging a call for phone patches or anything else, you still should do everything you can to help him. Let the FCC worry about the legalities involved!

In most local phone directories on the inside front cover with the emergency numbers, you will find a number for the nearest Coast Guard RCC in your area. If there is no Coast Guard listing in your phone directory, the following can be used: Atlantic Area, RCC New York, 212-668-7055; Pacific Area, RCC San Francisco, 415-437-3700. The Coast Guard will accept collect calls concerning distress. No matter where the maritime distress is, you can call either of these numbers and give them the information you have obtained.

These are some basic guidelines to help you if you should hear an emergency. Getting this information to the Coast Guard will give RCC personnel something to get the ball rolling in the right direction, and it may save someone's life! CQ



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CIRCLE 124 ON READER SERVICE CARD

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Unlike machine specific TNCs, you never have to worry about your MFJ-1270 being obsolete because you change computers or because packet radio standards change. You can use any computer with an RS-232 serial port and an appropriate terminal program. If packet radio standards change, software updates will be made available as TAPR releases them. Also speeds in excess of 56K bauds are possible with a suitable external modem! Try that with a machine specific TNC or one without hardware HDLC as higher speeds come into widespread use. You can also use the MFJ-1270 as an inexpensive digipeater.

It features the latest AX.25 Version 2.0 software, hardware HDLC for full duplex, true Data Carrier Detect for HF, 16K RAM, simple operation plus more.

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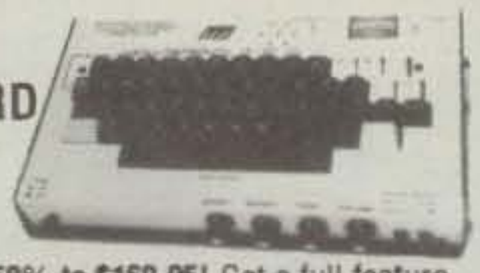

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MFJ's cross-needle SWR/Wattmeter gives you SWR, forward and reflected power —all at a single glance! SWR is automatically computed —no controls to adjust. Easy-to-use push buttons select three power ranges that give you QRP to full legal limit power readings. Reads 20/200/2000 W forward, 5/50/500 W reflected and 1:1 to 1:5 SWR on easy-to-read two color scale. Lighted meter. Needs 12 V. ±10% full scale accuracy. 6½ x 3¼ x 4½ inches.

2 KW COAX SWITCHES

MFJ-1702 **$19.95**

$29.95 MFJ-1701

Instantly select any antenna or rig by turning a knob. Organizes coax cables and eliminates plugging and unplugging. Unused terminals are grounded to protect your equipment for stray RF, static and lightning. 2 KW PEP, 1 KW CW. For 50 to 75 ohm. Negligible loss, SWR, and crosstalk gives high performance. SO-239s. Convenient desk or wall mounting.

MFJ-1702, $19.95. 2 positions. Cast aluminum cavity construction gives excellent performance up to 500 MHz with better than 60 dB isolation at 450 MHz. Heavy duty, low loss switch has less than 20 milliohm contact resistance, less than 0.2 dB loss and SWR below 1:1.2. 2 x 2½ x 1 inches.

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ANTENNA CURRENT PROBE MFJ-206 $79.95

This new breakthru MFJ Antenna Current Probe lets you monitor RF antenna currents—no connections needed! Determine current distribution, RF radiation pattern and polarization of antennas, transmission lines, ground leads, building wiring, guy wires and enclosures.

- **Indicate transmission line radiation** due to high SWR, poor shielding or antenna unbalance.
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- **Determine if ground** system is effective.
- **Pinpoint RF leakage** in shielded enclosures.
- **Locate the best place** for your mobile antenna.
- **Use** as tuned field strenght meter.

Monitors RF current by sensing magnetic field. Uses an electrostatically shielded ferrite core, FET RF amplifier, op-amp meter circuit for excellent sensitivity, selectivity. 1.8-30 MHz. Has sensitivity, bandswitch, tune controls, telescoping antenna for field strenght meter. 4 x 2 x 2 inches.

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Antennas & Accessories

a monthly feature by
KARL T. THURBER, JR., W8FX

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

This 'n' That

This time around columnist W8FX takes a look at more reader mail, as well as several new products and books for the hamshack. He also takes note of some new amateur software you're certain to find interesting. Stay with us.
—K2EEK

Last month we continued our reach into the W8FX mailbag with several interesting letters. We took special note of the Extended Double Zepp antenna, and presented more details on the G5RV antenna and its inventor, Louis Varney. We also highlighted some new antenna products and software, and perused some new and interesting reading matter. This time we would like to keep the same ball rolling with a look at more mail, more new products and software, and more reading material. First another foray into the mailbag.

Into The Mailbag

Notes from W9INN. We've carried on some interesting and productive correspondence with Bill Fanckboner, W9INN, proprietor of the antenna firm which bears his callsign, W9INN Antennas. In a letter from him late last year Bill enclosed an interesting sheet entitled "General Considerations in Locating and Adjusting Horizontal Antennas," which he encloses with each dipole antenna he sells. This handout provides some very interesting and practical material on height considerations for HF antennas, resonating to frequency, use of antenna tuners, and feedline imbalance. The portion on imbalance is an especially interesting one, and it takes an unusual approach to this problem. According to Bill's experimentation, if difficulty is experienced in getting a dipole's SWR below about 1.5:1, with the system otherwise properly installed, there may be a problem with antenna balance, with one side of the antenna having greater capacity to ground than the other side. Assuming that each leg of the dipole was cut to the proper length to start with, this condition may be alleviated by a slight adjustment of flattop length on either side of center, using the step-by-step procedure outlined in the sheet. According to Bill:

"Despite the fact that most of the information [in the handout] is well known, the part on imbalance is not well known. In fact, I have never seen this information explained anywhere . . . that it is possible to bring the SWR on a dipole down to a virtual 1:1 SWR condition by unbalancing physically [making one side of the antenna slightly longer than the other side], to balance electrically. We discovered this principle sometime ago when developing antennas for the Antenna Supermarket."

Bill continues: "If there are telephone or power lines under one end of the antenna, they tend to reduce the capacity to ground, and thus require that the antenna be lengthened on that end. Also, due to the difficulty of repositioning the antenna after each adjustment, an incorrect conclusion may be reached, as to whether that end of the antenna should be increased or decreased in length. So, at least a couple of adjustments should be made to confirm that the conclusion is correct."

"One other point with regard to balancing a dipole: the ends must be kept in the clear, at least a few feet from branches and leaves. These tend to raise the feedpoint impedance by disturbing the electrostatic field around the end of the antenna to the extent that it may be impossible to find a combination of element lengths that will produce a very low SWR. The reactive and resistive values at the feedpoint may be so high that a "match" with a 50 ohm line may not be possible. So, it is important to keep the ends of the antenna in the clear, to the greatest extent possible."

Bill's educational materials also include a reprint of the first chapter of the late John M. Haerle, WB5IIR's excellent antenna book, *The Easy Way,* which deals with straightforward facts on antennas, including highly controversial and confusing areas such as SWR, transmatches, and baluns. Adds W9INN:

"John Haerle died a day or so after giving me permission to reprint [the first chapter from] his book . . . He had a weekly net during which he discussed a different subject each week, and he was widely followed because of his ability to translate technical subjects into language the average amateur could follow. He always felt [that] the guys spent too much time arguing subjects and principles that were pretty well resolved in the 1920s. So, he made an effort to get the [correct] information spread around. Since his death, the collection of these talks has been formed into *The Easy Way*."

For those not familiar with the WB5IIR book, it is, indeed, a collection of speeches and papers that serves as an excellent tutorial and source book on antenna theory and applications. Examples of areas covered include antenna and feedline fundamentals; basic antennas, including the G5RV, Zepp, and Windom; special antenna types, including the sloper and Beverage; beams, including Yagis, W8JKs, and Quads; and 160 meter applications. The book is presented in an easy-to-read, conversational sytle; although there are no drawings or illustrations, there are many examples and handy tips proviced. W9INN advises that it can be obtained from Overtones, Inc., 1710 Highland Park Rd., Denton, TX 76205, for $13. I also see that it is available from the Ham Radio Magazine Bookstore, Greenville, NH 03048, for $11.95 plus shipping.

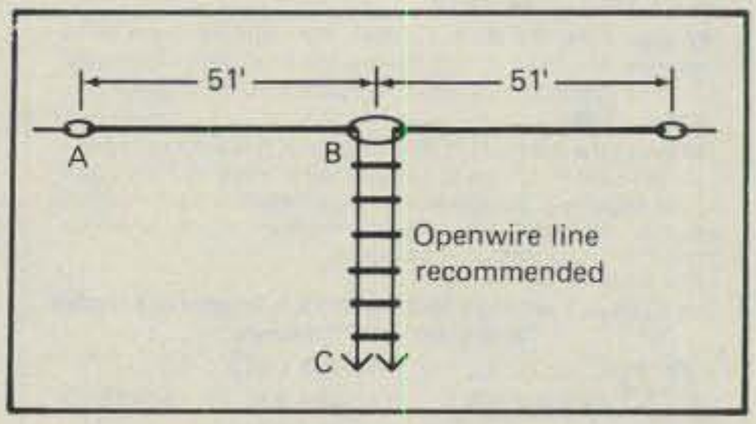


Fig. 1– The G5RV antenna. This sketch appeared in the October 1985 issue. As pointed out by Fred Bonavita, W5QJM, the trick in obtaining more consistent feedline performance across all bands lies in optimizing the feedline length. The idea is to avoid antenna currents on the transmission line by varying its length in relation to the band(s) involved and one side of the antenna. The text describes the importance of dimension AB + BC.

G5RV Update. In the October 1985 column we continued our ongoing coverage of, and feedback on, the popular G5RV antenna with a letter from Fred Bonavita, W5QJM, relating to his ex-

The following lead-in lengths result in a resonant length that is within 0.050 of maximum off resonance.

Feet	Inches	Feet	Inches	Feet	Inches
4	3	4	4	4	5
4	6	4	7	4	8
4	9	4	10	4	11
5	0	5	1	68	11
69	0	69	1	69	2
69	3	69	4	69	5
69	6	69	7	69	8
69	9	180	3	180	4
180	5	180	6	180	7
180	8	180	9	180	10
180	11	181	0	181	1

Fig. 2– G5RV optimum dimensions. Surprisingly, the 33 foot feeder usually used with the G5RV does not appear in the table. Indeed, lengths of around 69 and 181 feet may be closer to the "ideal," if the earlier work of W1XT and W5QJM is properly applied to this antenna and feedline system. A little extra math by H.P. Forbes, KC5KJ, shows that if a length in the 33 foot range is used, one of 33' 1" would be best, though not an optimum one. (Our thanks to KC5KJ for some number-crunching and the table above.)

317 Poplar Drive, Millbrook, AL 36054

periences in determining optimum feeder lengths. To recall, the G5RV is a special type of multiband, centerfed antenna, with each leg cut to 51 feet, for an overall length of 102 feet. Several feed methods may be used, but the most common method makes use of 450–600 ohm openwire line: a 33 foot feeder is typical and seems to give good results on most HF bands.

In the October column we took note of Fred's comments (based on earlier work by W1XT) which suggest that the usual 33 foot feeder length is not the optimum one to use. Fred explained that it is best to cut the feeder so that its length, plus the 51 feet of flattop, would not be an even multiple of 16 feet for 80, 40, 20, or 10 meters, or an even multiple of 22 feet for 15 meters. Referring to the antenna configuration shown in fig. 1, the idea is to try to get a combination of lengths AB and BC which, when divided by 16 and 22, will produce an answer as close as possible to a "point-5" response (such as 5.5, 8.4, 3.6, etc.) and as far as possible from a "point-0" response (such as 7.0, 4.1, 6.9, etc.).

H.P. Forbes, KC5KJ, took Fred's idea a little further: "Upon reading [the October column], it seemed a perfect application for a computer to figure feeder lengths that would be optimum for the antenna. I put it on the computer and am enclosing the results, [along with] the PASCAL program used to produce the results.

"From your column, the optimum would be when AB + BC divided by both 16 and 22 gives a whole number plus a fraction of 0.5. The enclosed results give all of the feeder lengths up to 200 feet that give an answer within 0.1, .05, .01, .005, and .001 of the desired 0.5, i.e., in the ranges of 0.4 to 0.6, .45 to .55, .49 to .51, .495 to .505, and .499 to .501. Thought you might find this interesting."

In fig. 2 we've chosen to reproduce the table which shows feeder lengths that lie within .05 maximum off-resonance. Disregarding impractically short lengths, it can be seen that the most fruitful feeder lengths (dimension BC) lie in the vicinity of 69 and 181 feet; surprisingly, a 33 foot feeder doesn't seem to constitute an optimum length. Consider these lengths not as absolute values, but rather as good points of departure for feeder pruning for five-band operation.

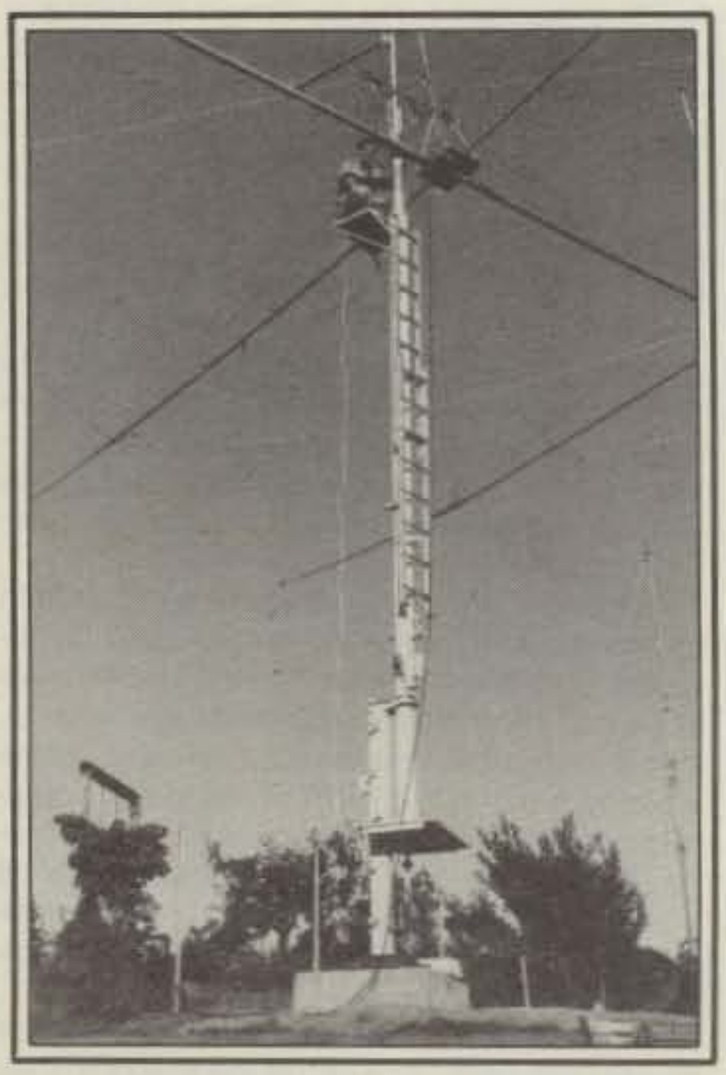
N7AM Antenna Update. Going back nearly three years, in the August 1983 column we featured the "Big Signal from Bremerton" that belonged to Jack Riggs, N7AM. At the time Jack had a most impressive 5-element, 80 meter vertical array and a 3-element, 40 meter Quad which served to put Bremerton, Washington on the DX map. Jack recently sent us some details on his modified installation, which is equally impressive. Extracting from Jack's rather lengthy letter regarding Quad and tower construction details is highly instructive, and well worth the space required:

"The tower now has a 3-element, 20 meter Quad, a 3-element, 40 meter Quad, and a 2-element, 80 meter Quad. The tower rotates, making it really nice for peaking signals on 80 and 40. This last move for the tower [from the front to the backyard of a city lot] makes three times that we have rebuilt the system . . . due to high wind storms.

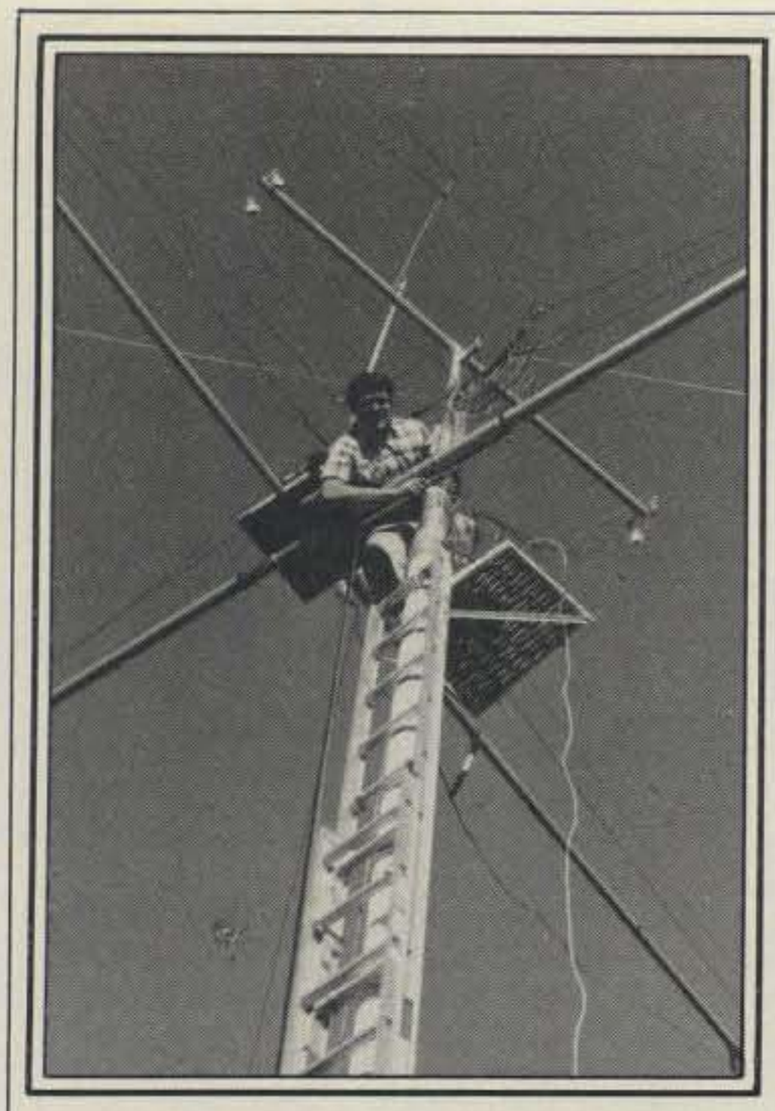
"In rebuilding the system, a new base was fabricated of ⅜ inch steel square casing, reinforced with a 1 inch thick mounting flange. This beefing up of the base allowed a more rigid structure, especially with the raising fixture attached. The 3 inch booms were reinforced with an additional 3 inch boom ripped the full length and then 'winched on' over the other boom, to give a double thickness. The boom was then strapped every foot with cable straps. This procedure stiffened the boom without adding weight. The 3 inch boom originally was not stiff enough to get the job done during the wind storms.

The N7AM Quad installation with a satellite dish in the foreground. Beam is pointed toward Europe in this view.

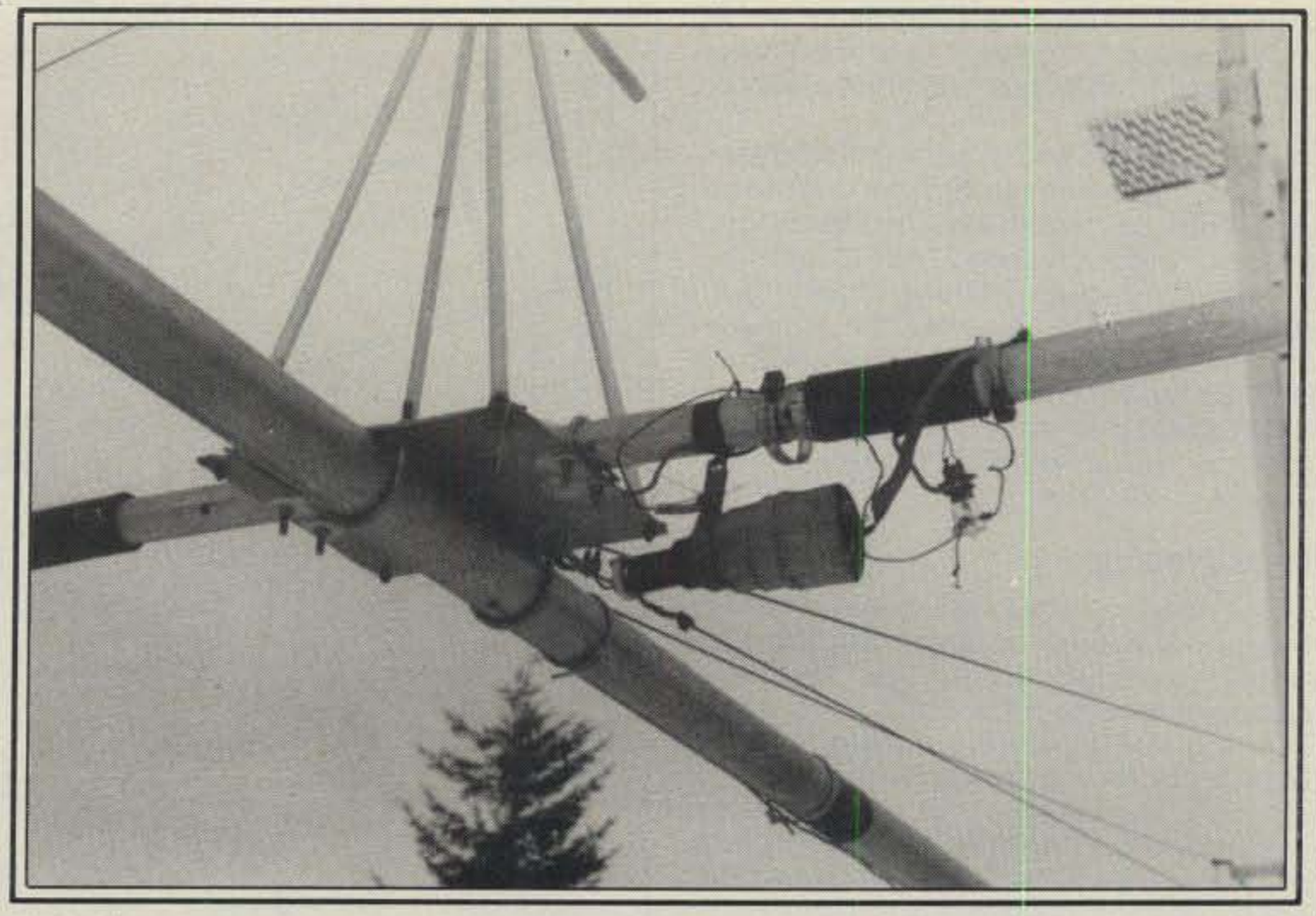
"From the original photos [which appeared in the August 1983 column], the 40 meter boom was 40 feet long. For better guying and bracing for the wind, a 10 foot section was added to the boom on each end, making the boom 60 feet long. This has helped the elements for better guying. [However], this boom length later



N7AM Quad installation showing the first base used. The base had to be reengineered after complications arising from damage in a severe windstorm. The new base is considerably stronger and more rigid.



N7AM Quad installation showing Jerry, NC7U, getting the topside work done in order to be able to get the lateral guys attached to the boom.



N7AM Quad installation, this view c˙ the "business end" of the 80 meter reflector, showing the vacuum condenser and relay. Note that the element is insulated with plastic pipe to allow for better tuning and reading of the loop resistance and for de-icing.

caused a poor front-to-side ratio to occur, due to its resonating at 40 meters. We had to add wire to get the resonant frequency far removed from 7 MHz; this made our front-to-side ratio look much better.

"The lower boom is also 60 feet long to accommodate the two elements, the reflector and driven element for 80 meters. On the first design we used a Gamma Match for 80, but we could not switch from phone to CW at all without going out to the platform and retuning the Gamma for either CW or phone. The latter design uses a much better system, allowing us to switch from CW to phone using a quarter-wave transformer for impedance matching. We change lengths by switching from CW to phone with vacuum relays. An added bonus with this system is the increase in bandwidth, and the SWR swing, which is very low. The driven-element impedance in this configuration is around 100 ohms, with the reflector spaced at 40 feet. Using RG-8/U 50 ohm coax, a 70 ohm quarter-wave transformer gives us a good match. Using transformer feed we get a chance to look at our loop resistance and can de-ice the driven element during severe icing conditions."

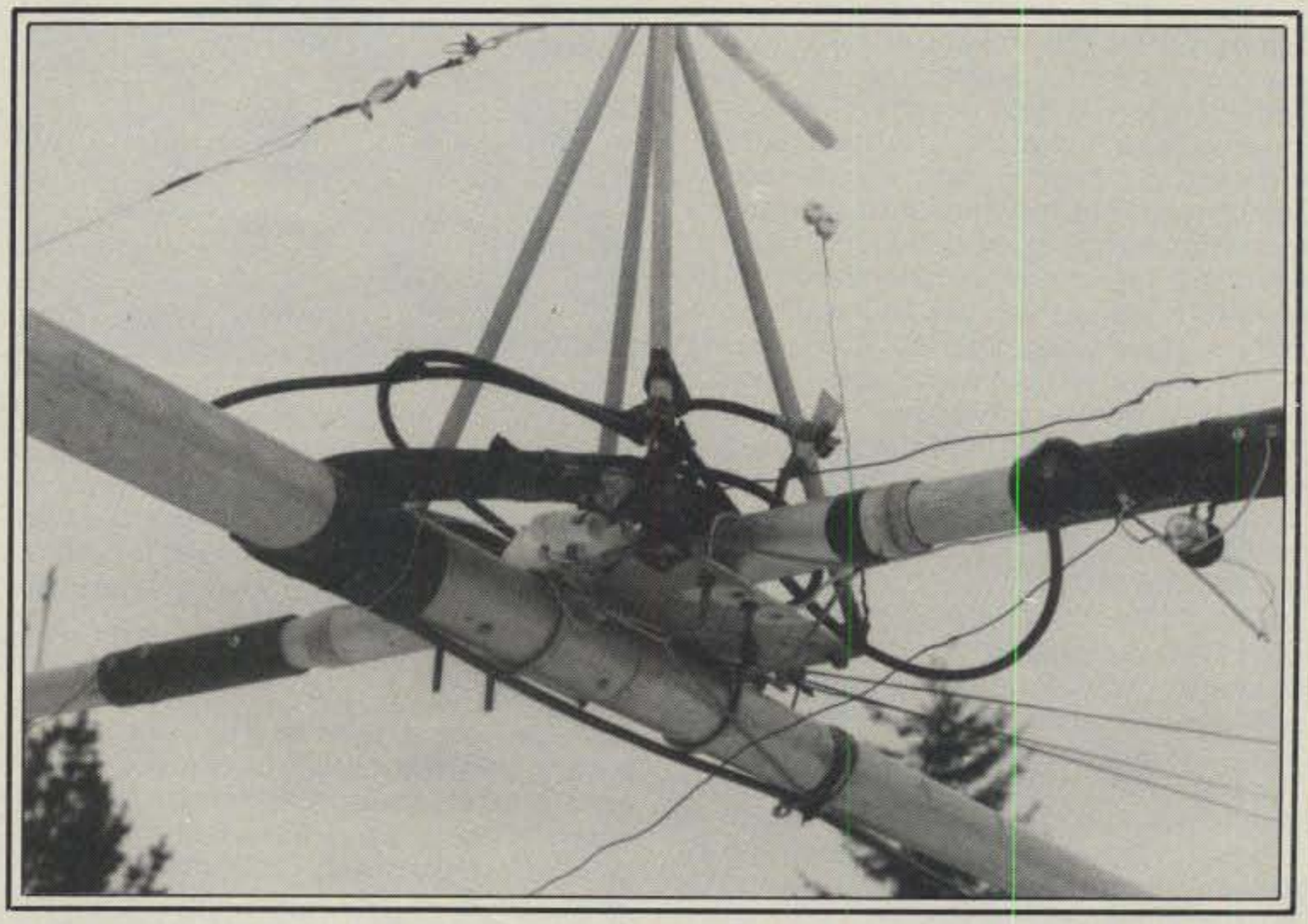
Admittedly, these details make for some lengthy reading, but they lead up to some solid conclusions by N7AM regarding the Quad. The use of a platform (see photos, all courtesy N7AM) allows easy access to the elements for tuning, and this easy access has helped Jack to learn a great deal about Quad tuning quirks. Some of Jack's observations:

1. *Frequency vs. Gain Curve.* When compared with a Yagi, the Quad displays a better frequency versus gain curve. The Quad can be tuned for best forward gain, SWR, and front-to-back (F/B) ratio, to occur at the design frequency. With respect to the 80 meter Quad, the frequency versus gain curve exhibits a sharp drop-off on the low frequency side, with a flat response from the design frequency upwards for 35 kHz.

2. *Double Dipping.* When tuning and using the 40 meter Quad, Jack notices that when checking the loop resonance, two pronounced "dips" were found, one at the true Quad length [calculated from the formula: driven element loop length (ft.) = 1005/F(MHz)], and another about 500 kHz lower. He believes this double-dip phenomenon is associated with the dipper also seeing a resonance that is associated with the half-wavelength [L = 468/F(MHz)] calculation. In any case, Jack observes, if two Quad loop dips are observed, it is the higher frequency one that is the correct one.

3. *Element Spacing.* Jack asserts that the spacing of the Quad elements is particularly important for optimum performance—especially the need to make the spacing greater than 0.1 wavelength. He advocates a minimum of 0.11 wavelength spacing for best F/B ratio and forward gain.

4. *Matching.* While the Gamma Match, having a high "Q," works well for a narrow band of frequencies, a better way to match a Quad driven element is by the quarter-wavelength transformer method. The quarter-wave transformer exhibits a lower "Q," allowing better bandwidth as well as a DC path for examining the loop resistance. Another benefit of using this type of matching arrangement is its suitability for switching of transformer line lengths to go from CW to phone band segments. Since most



N7AM Quad installation, showing the "business end" of the 80 meter driven element, with the quarter-wavelength transformer and associated vacuum relays to switch from phone to CW. The driven element is insulated from the boom to allow for transformer feed and the reading of loop resistance and de-icing.

Quad driven elements have a radiation resistance of around 100 ohms, a 70 ohm matching section and 50 ohm transmission line are about right.

Jack concludes with some overall estimated performance figures: the 20 meter Quad has a very narrow beamwidth with good bandwidth, an 8 dB forward gain, and a 27 dB F/B ratio. The 40 meter Quad shows 9 dB forward gain and an outstanding 34 dB F/B, while the 80 meter antenna has a respectful 6 dB gain and a 28 dB F/B. Not too shabby, indeed, and thanks to N7AM for again sharing his antenna construction and tuning experiences with column readers.

Good Reading

This month we would like to make note of, first, an SWL-oriented antenna book, and several computer books. *The Shortwave Listener's Antenna Handbook* is by Robert J. Traister, WB4KTC. This authoritative, 204-page book constitutes a comprehensive guide to SWL antennas, with complete information provided on the design, construction, and installation of horizontal, vertical, and directive types. The book begins with an examination of antenna requirements and some practical tips on antenna selection. The author also gives a thorough explanation of the tools, materials, and construction practices involved in antenna building and installation. In addition to coverage of a variety of antenna types and configurations, the book also provides considerable information on towers and various types of supports, including counterweights. Topical areas covered include antenna types, indoor and limited-space antennas, portable antenna systems, and antenna tuners and couplers.

Bob's book is TAB Book No. 1487, published at $9.95. It's available from many electronic suppliers and bookstores. The book can also be obtained for this amount plus $1.00 shipping from Miller Publishing Co., P.O. Box 691, Thorndale, PA 19372 (themselves publishers of the monthly SWL journal *The Shortwave Guide*, which we mentioned in a recent column).

Three computer books which have recently come to our attention may be of interest to *CQ* readers. The first is *Computer Communication Techniques* by E.G. Brooner and Phil Wells. This is a solid, illustrated tutorial which tells you how to get your computer to "talk" with other computers, what hardware and software you need to do this, and how to readily tell what devices will or will not work with your computer. Also covered are areas such as connecting your computer to telephone lines, the standards and protocols used for data transmission, and accessing information services such as CompuServe and The Source. Videotext and teletext systems are also covered. The soft-cover 142-page text is published at $15.95 by Howard W. Sams & Co., Inc., 4300 West 62nd St., Indianapolis, IN 46268.

Also of interest is *A Hobbyist's Guide to Computer Experimentation* by John D. Lenk. Written by a highly experienced electronics author, the book covers a variety of computer experiments which are practical with personal computers. The book is well-illustrated with easy-to-follow diagrams and photos, and the explanations are clear. The 283-page hard-cover book is published by Prentice-Hall, Inc., Englewood Cliffs, NJ 07632. It is priced at $25.95.

The third computer book we would like to mention relates to a subject popular with many hams: that of "free software." The book is *Free Software for the IBM-PC*, and it's by Bertram Gader and Manuel V. Nodar. True to its title, the book is, in effect, a listing of over 600 public-domain IBM-PC software programs that one can obtain for free by downloading from the various information services and bulletin boards. The $8.95 soft-cover book is published by Warner Books, 666 Fifth Ave., New York, NY 10103.

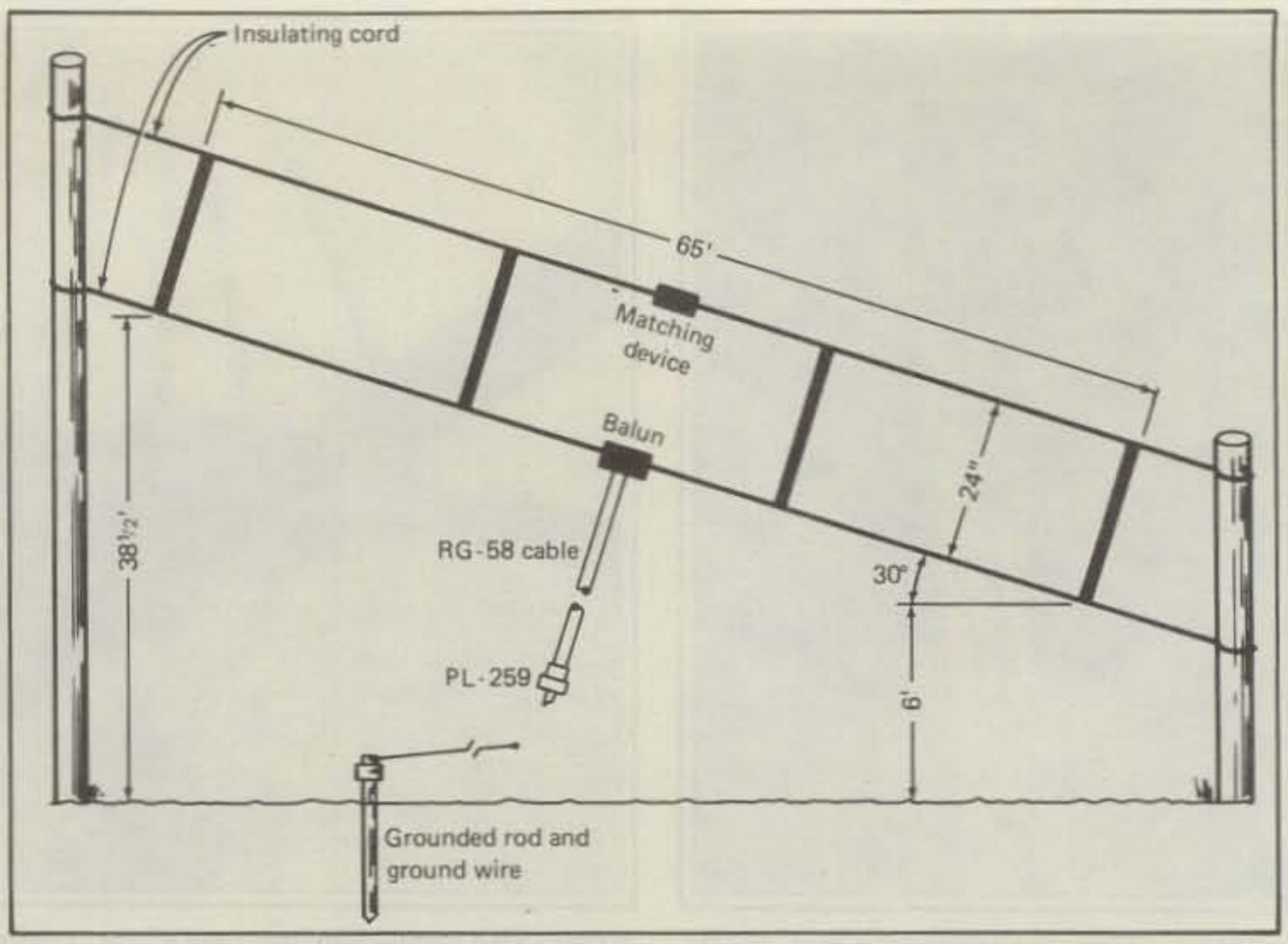


Fig. 3– J&R Enterprises SWL-65 antenna. See text for description of the SWL-65 antenna. Note that although shown here installed as a "sloper," the antenna may also be used horizontally or in other configurations. (Note: The above installation and dimensions are offered as a guide. Your installation can vary from the one shown.)

CarFinder™ is an unusual device that helps locate cars in large parking lots. Working up to 750 feet, the system includes a keychain transmitter, receiver, and parts necessary to cause the vehicle's horn to honk and lights to flash on command. (Photo courtesy Design Tech International, Inc.)

New Products

SWL Antenna. An unusual broadband, 60 through 11 meter SWL antenna is offered by J & R Enterprises, Rt. 3, Box 389, Chapin, SC 29036. The 65 foot, coax-fed dipole is designed to cover the spectrum from 4.5 to 30 MHz with even performance over the entire range. The antenna, shown in fig. 3, has a "width" of 24 inches and uses high-impact PVC spacers to separate the two wires of the dipole. The antenna weighs in at but 5 pounds, while the SWR is claimed to be 2.5:1 or less over the entire operating range. The device is intended for reception only. Price is $59.95 plus $3.00 for shipping.

CarFinder. Just for fun I'd like to mention a novel device which we have seen advertised but have not yet tried. It's the CarFinder™ offered by Design Tech International, Inc., 941 25th St., N.W., Washington, DC 20037. It's a gadget to help you find your car in a crowded parking lot such as at an airport, shopping mall, or stadium. Consisting primarily of a small keychain transmitter and a car-mounted receiver, the device allows you to briefly honk the car's horn and flash its lights in order to be able to spot it from where you stand. Offered as a complete kit, the CarFinder is FCC-certified and comes factory set to one of 50 different codes. List price is $99.50 plus $3.00 shipping. Contact the manufacturer for more details.

Software at a Glance

Uncle Bill's Software. I've recently noted ads from Bill Clarke, WA4BLC, who offers two inexpensive programs for the Commodore 64. Both programs employ the sound and color features of the C-64 in their operation. One of these is for antenna design and the other is for code practice.

Uncle Bill's Antenna System, as he calls it, is a menu-driven HF antenna modeling and design package. Graphically oriented and easy to use, the program consists of two parts. The first portion designs or selects standard, full-size horizontal, vertical, and Yagi antennas. Construction dimensions are given in listing format, or as labels on the computer-generated models.

The second portion of the program designs dipoles of reduced size and is intended for the ham who does not have the needed space to erect full-size antennas. This program option includes the generation of loading-coil winding data.

There are three parts to the Code Course program. In part 1 the student is introduced to each character by allowing him or her to press a key, hear the properly sent Morse equivalent, and view the character on the screen. Part 2 sends a properly formed Morse character, and the student responds by pressing the appropriate key. If the response is incorrect, the character will be resent; this continues until the proper response is made, or until the student requests assistance. Progress is graded at the end of each session in this part. In part 3 random groups of Morse characters are sent, in groups of five characters each; sending speed is selectable from 5 to 20 WPM. The student writes down the characters as they are sent; only after each group is sent is it displayed. Throughout the program Morse is actually sent at 20 WPM using the Farnsworth method (variable sending speeds are attained in part 3 by adjusting the spacing between characters).

Each program is available on disk or tape for $9.95, and may be obtained from Bill Clarke, WA4BLC, at Uncle Bill's Fine Software, P.O. Box 2403, Falls Church, VA 22042. I understand that Bill also offers a special deal on the Code Course for amateur radio clubs that are teaching a formal license class. Contact him for details.

Software from RAK. One of the earliest distributors of inexpensive amateur radio and personal productivity software for the Commodore 64 and Vic-20 was RAK Electronics, P.O. Box 1585, Orange Park, FL 32067-1585. We covered some of RAK's offerings several years ago in the column, and recently we received a much expanded list of C-64 software which proprietor Richard A. Knox, WR4K, offers.

I was surprised to see such a large offering, still, of Vic-20 software—some 15 disks and individual programs, including several Vic CW and RTTY programs. On the C-64 side I noted 17 ham radio and personal productivity programs, plus three disk collections (ham radio, utilities, and games); the most expensive program in the lot ($24.95) was a CW and RTTY package for the C-64. Most programs are available on either cassette tape or disk media.

Morse University. Following in the tradition of Morse code and operating skill learning devices such as the AEA BT-1 Basic Trainer, MM-2 Morse Trainer, Doctor DX, and Doctor QSO™, AEA last year came out with the Morse University™ especially for studying for the Novice license. Offered as a complete package which is said to contain everything necessary to pass the amateur exam, the "starter kit" includes the Morse training program cartridge for the Commodore 64 and the ARRL's *Tune in the World* booklet, along with an ARRL welcome letter on amateur radio and information on how to locate a local amateur radio group that offers testing.

Basic Morse code is learned using a character by character teaching routine. Practice can be either with individual letters or in groups of up to nine characters. Morse proficiency is developed through practice sessions that offer several options: the trainer routine provides random code practice at programmable start and finish speeds, over a user-settable duration. You have the choice of either five-character or random character code groups, and may choose either the "fast code" (Farnsworth) or the "slow code" method. You may also enter text from the keyboard for customized practice sessions, or for providing good examples of how code should sound. A sending analysis routine is included which enables the student to connect a key to the computer in order to manually send Morse characters or a sentence of text. The computer will analyze the student's "fist" and show where improvement is needed.

Perhaps acknowledging the popularity of the C-64 as a superb game-playing machine, AEA has incorporated a "receiving audio/video game" into the cartridge. Similar to some typing tutor programs, this feature is said to make the code learning process more fun, while at the same time adding an element of pressure not found in other random methods of code practice. The receiving game presents 19 houses, each with a three-element Yagi beam on its roof, at the bottom of the screen. If the characters presented by the game aren't typed correctly on the keyboard, or if they're not typed fast enough, an antenna on one of the houses is destroyed by a lightning bolt (oh, no!). The game ends when all 19 Yagis are destroyed. The score in terms of both number and percentage of correct responses is displayed on the screen so that the student can track his or her improvement.

For more information on AEA's training package and starter kit, contact AEA, Inc. at P.O. Box C-2160, Lynnwood, WA 98036-0918.

Bits 'n' Bytes

Calling All Atarians. Early in the year we received a sample copy of *Ad Astra*. This is a monthly publication published by and for the members of the Atari Microcomputer Network, a radio amateur group using Atari microcomputers in their hobby. The Net is a non-profit organization of hams, SWLs, and Atari computer enthusiasts who share a common interest in exchanging information on Atari applications, programming, and operation. Amateur radio operators and SWLs are especially encouraged to directly participate in the weekly on-the-air meetings. The national net meets every Sunday at 1600Z on 14.235 MHz, with Dave Byrd, KD7VA, as net coordinator.

Ad Astra, successor to an earlier journal of the same name, is published six times per year by the net, and is an optional part of membership. Net membership is, of course, free, while members who wish to receive the journal are asked to help offset printing and postage costs by remitting an annual donation of $10 (U.S. funds) to the Editor, Gil Frederick, VE4AG. For more details on the Atari Microcomputer Network and *Ad Astra*, contact Gil at 130 Maureen St., Winnipeg, Manitoba R3K 1M2 Canada.

While the copy I received was the first issue of the new series and was somewhat roughly organized and printed, the issue nevertheless contained some very detailed technical information on topics such as expanding the Atari 800's memory to 256K and interfacing the Panasonic KX-P1091 printer.

Wrapping It Up

That's about it for this month's foray. We've again looked at some reader mail, particularly focusing on the G5RV antenna and N7AM's impressive low-band Quad installation. We've also looked at several amateur and computer books, examined some new ham products, highlighted some new hamshack software, and made note of an Atari computer amateur resource group. Next month it will be more Antennas and Accessories topics of current interest. See you then.

73, Karl, W8FX

Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Novice Enhancement Proposal

The FCC is currently considering an ARRL proposal that would increase Novice operating privileges. It is obvious to me that this is an attempt to save the 220 to 225 MHz band by increasing amateur activity on this band. I hope that our amateur radio service will be able to retain 220–225 MHz, but I do not believe the entry level (Novice) license should be ruined in the attempt to save this band.

The proposal only offers special 10 meter privileges in addition to what a Novice can obtain by just upgrading to Technician, and 10 meter activity is presently close to its least useful point. Even if 10 meters were at a high point of activity, it would not be wise to adopt this proposal. If a Novice wants Technician operating privileges, the best way to attain them is to upgrade to the Technician license.

One reason the current proposal should not be adopted is that it would drastically reduce the incentives to upgrade from Novice to Technician. Except for 6 and 2 meter operation, the future proposed Novice would already have most Technician privileges. Such a reduction in increased operating privileges would be sure to decrease incentive to upgrade to Technician.

A more important argument against the current proposal is the change it would cause in the Novice written examination. The scope of the current 20 question Novice test is appropriate for use with aspiring new amateurs. The new required Novice examination would be both longer (perhaps 40 questions) and much more difficult than the existing Novice test. The new test would have to include questions about the new emission and frequency privileges that would be granted. The simple entry-level Novice test would be gone, taking many prospective Novices with it. The new Novice test would probably be integrated into the VEC program and be taken away from the individual volunteer examiner.

I have no doubt that adoption of the existing ARRL "Novice Enhancement" proposal would decrease the combined total of our Novice and Technician licensees, which is not in the best interest of our amateur radio service.

2814 Empire Ave., Burbank, CA 91504

Eighty-year-young Al Obright, WA6DOF, of Hawthorne, California retired from Northrop Electronics in 1970. Al has been a licensed amateur since 1958. He is always glad to help new operators. His station includes a Ten-Tec Century/21 transceiver and a vertical antenna. I recently enjoyed a pleasant and long contact with Al.

A dictionary description of "deja vu" is that it is something that is unpleasantly familiar. The current "Novice Enhancement" proposal includes the unpleasantly familiar matter of Novice voice privileges. When the Novice license was initiated in 1951, it included 2 meter voice operating privileges, which led to many Novices making more voice contacts than code contacts. This failure to obtain enough code operating experience resulted in a lot of Novices being unable to pass the 13 wpm code test required to upgrade to the General license, resulting in many long-term Technicians. I am one of the people who proposed extending Novice code privileges to Technicians to give Technicians an opportunity to obtain on-the-air operating practice that is commonly essential to upgrading to a General license. The ARRL Board of Directors was initially opposed to Technicians having any high-frequency (3 to 30 MHz) operating privileges, but the FCC eventually adopted this change. The proposed Novice voice privileges would again decrease code operation by Novices. I have always advised my students to try all bands and all modes to acquire desired first-hand operating knowledge. However, I believe that code proficiency is the facet of operation that is most difficult to acquire; consequently, I urge Novices to operate as much radiotelegraphy as is required to attain good code proficiency, and to acquire excellent code proficiency before trying any other emission mode.

The Novice license is serving its purpose, as it has since its inception 35 years ago. It is an entry-level license with a low code requirement (5 wpm) and a very basic requirement of associated regulations and fundamental electronics. There is very little wrong with the existing Novice tests, and operating privileges could easily be improved. The current Novice ticket is providing the easy introduction to amateur radio that is needed for non-technical people.

Previous Novice columns have covered desired changes that have not been implemented, as well as unwanted changes that are in effect. I am not attempting to repeat the entire contents of those previous columns, but I will mention a few of the main points; some of these prior columns are listed in this article.

The most important changes that have not been implemented concern Novice bands. The 10 meter band is almost useless during this low part of the current sunspot cycle. In addition, the usefulness of 15 meters is greatly reduced. These existing conditions force Novices to do more operating on the 40 and 80 meter bands. However, the FOT (frequency of optimum transmission) between America and Europe/Africa often runs through the 40 meter Novice band, resulting in reception of extremely strong international shortwave broadcasts every 5 kHz (7105, 7110, etc.) throughout the 7100 to 7150 kHz 40 meter Novice band. The most common deterrent to 80 meter operation is the longer antenna required to operate on the 3700 to 3750 kHz 80 meter Novice band. In addition, the upper end of the 80 meter Novice band is subject to foreign voice operation interference.

The preceding facts make it obvious that Novices require additional frequency segments to provide suitable operating opportunities with reasonable expectations of good communication results. A 20 meter Novice band is long overdue, and 14,100 to 14,150 kHz is the reasonable

segment to use, since it is basically not used for transmitting purposes by American amateurs holding any grade of license. The existing 30 meter band is ideal for Novice use; it will provide good long-range communication opportunities during the night. This 10.10 to 10.15 MHz 30 meter band already has Novice limitations (code and 200 watts PEP maximum output) applied to it. The existing 40 meter Novice band is 7100 to 7150 kHz, which means that it does not share any common frequency spectrum with amateurs in ITU Regions I or III, since the 40 meter band is 7000 to 7100 kHz (only) in those regions. Extending the American 40 meter Novice band down 25 kHz (7075–7150 kHz) would improve long-range communication opportunities for Novices. Similarly, extending the bottom end of the present 80 meter Novice band (making it 3675–3750 kHz) would ease the interference problem at the top end of this Novice band. The expansion of the 80 and 40 meter Novice bands, plus creation of new Novice bands on 30 and 20 meters, would greatly increase Novice band activity. Since Technicians share the use of Novice bands, their opportunities to upgrade would also be enhanced by these band changes. Novices and Technicians comprise almost 40 percent of our amateur operators, yet they have access to less than 9 percent of the high-frequency spectrum (300 of 3450 kHz, total).

Some of the changes which have occurred, which I believe degraded the American amateur radio service, are mentioned in this paragraph. The Novice license was initiated to provide a simple, short-term introduction to amateur radio. Making it a 10-year term, renewable license detracted from the incentive to upgrade. The Novice license would be more effective if it were a 2-year term ticket that could not be renewed. The 200 watt PEP maximum output power limitation in the Novice bands is excessive; this limit would be more reasonable if it were 100 watts PEP maximum output. Amateur radio station power limitations would be more useful if they were stated in ERP (effective radiated power), taking into account feedline loss and antenna gain. While on the subject of Novice bands power limitation, I believe the present 200 watt restriction should not apply to General, Advanced, and Extra class amateurs. The so-called "Novice bands" are in reality the Novice, Technician, General, Advanced, and Extra class bands. They are the only frequency segments that may be used by all classes of American amateurs. One of the increases in privileges an amateur derives (in some cases) from upgrading is higher power operation. I am a low-power operator, but I do not believe it is appropriate to reduce power privileges of General through Extra class amateurs when they operate in Novice bands. Eliminating the requirement to change call-signs when one moves to a different call-sign area created another unnecessary area of confusion. This change should be eliminated to restore the uniform system that existed. There are many other changes that I find to be unwanted, but there is not enough space in this article to discuss all such items.

Previous Novice columns in *CQ* magazine contain associated information that may be of interest to you. Some of these columns are mentioned herein for those of you who have access to previous issues of *CQ*. Also, prior issues can usually be obtained at $2.50 each from *CQ* Magazine, 76 N. Broadway, Hicksville, NY 11801. The June 1981 issue contains an article about amateur radio frequency segments. The July 1981 column is devoted to Novice bands. The history of the Novice license is printed in the October through December 1983 issues. Also, 40 meter Novice band operation is covered in the December 1984 issue.

In summary, I believe the Novice ticket is getting the job done with its existing privileges. Operating activity would increase in the Novice bands if two existing bands were enlarged and two new bands were added. One of the comments I hear quite often is that amateur radio does not attract enough young people. I believe we can make changes that will attract more youngsters, and one of these changes is to make young people more aware of the advantages associated with code (radiotelegraph) operation. I have conducted amateur radio licensing courses, at least one per year, since 1948. Some of these courses were limited to young people, and I quickly learned that they require a different approach than I use with more mature students. Nevertheless, I do not think that there is anything wrong with an amateur radio service that is primarily of interest to young adults through senior citizens. If you are sufficiently interested in this matter, please send your comments to the FCC, Personal Radio Branch, 1919 M Street NW, Washington, DC 20554. It is a good practice to send a copy of your comments to ARRL, 225 Main Street, Newington, CT 06111.

Photographs Wanted

Photographs of Novices in their shacks provide introductions to a few of the newer amateurs. Photograph size is unimportant, but good definition, contrast, and subject matter are important. Color pictures can be used, but black-and-white photographs are preferred. Operating activities and achievements, plus a self-introduction, are needed with each picture. Send an SASE if a picture must be returned. A free one-year *CQ* subscription (or renewal) is awarded to the one amateur whose picture I select as the winner for the month. If you are a subscriber, please enclose the mailing label (or copy) from your latest *CQ* issue. One award is made each month, no matter how many photographs are printed. DX amateurs, who frequently work the American Novice bands, are also urged to submit photographs. I have not received a picture from a Novice in Hawaii or Vermont.

73, Bill, W6DDB

World of Ideas

a monthly feature by
DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

Understanding Modern Amateur Gear, Continued

Favorable response to our discussions of modern amateur gear continues to roll in, along with ideas and suggestions of additional areas you would like to see highlighted. Apparently we're "on the right track" and detailing aspects of interest in an easy to understand manner. Thanks! Such positive feedback naturally requires favorable response, so this month's column will progress further in that direction. Hopefully, our information will prove beneficial to both "understanding innards" and operating today's quite sophisticated transceivers. This time we'll break the discussion into two general sections. The first part will consider basic use and familiarization of new rigs—those typical "out of shipping box" entanglements that occasionally surface during the first day of operation. The second part is interrelated; it's a simplified explanation of a rig's internal circuits affecting tunings.

Today's amateur gear, with its complex circuits and multi-knob panels, might initially seem intimidating, but that situation isn't really much different from times of yesteryear. In fact, a slight shift in thinking can actually make today's gear simpler and easier to use. Remember the Johnson series of transmitters, Hallicrafter receivers, and their complexity of knobs? Today's transceivers don't require those involved tune/load/dip maneuvers, and crystal phasing/band-hunting adjustments have now faded from normal view. Frankly, I never figured how one used an absorption wavemeter for zeroing a transmitter on a received frequency. Ah, the golden times of old did indeed have their own types of perplexities. In other words, complexities are mere signs of the times . . . whatever the times . . . and radio amateurs have a "mental advantage" in grasping such evolutions. Mere pep talk? We doubt it. You're probably considered the electronic whiz of your family, right? I'm merely suggesting putting some of that high-level intelligence to good use.

Eastwood Village No. 1201 So., Rt.11, Box 499, Birmingham, AL 35210

New Rig Familiarizations

Everyone enjoys being the first kid on the block with a new toy, and radio amateurs are no exception to that rule. Fortunately, today's manufacturers are supporting our enthusiasm by introducing a variety of new models at frequent intervals. The end result of such "mutual gratification" is unlimited pleasures. However, our eagerness to enjoy that gear before actually learning how to use and appreciate it often creates its share of perplexities. That situation is especially noticeable if the rig under consideration is a brand new model. The first day(s) one owns and operates (or attempts to operate) such rigs reminds me of the proverbial "brief period of adjustment" used to describe newlyweds. One typically questions, for example, if the rig is operating as it's supposed to, if there are internal defects, or if there are unrealized "cockpit problems." Since those units are fresh from the factory, amateur friends don't have similar rigs available for comparison and our own technical knowledge may be taxed to its limits. There may be a natural tendency to feel somewhat isolated at this time, but we have several encouraging aspects to our advantage. Today's amateur gear is essentially perfected to the finest degree, and manufacturers' quality control is close to phenomenal. The old "pulled from box dead" syndrome still exists and items still become damaged/defective during shipping, true, but the odds of occurrence are unbelievably low. Some of you may be thinking our words are encouraging but new gear is still quite complex for basic/CW-minded amateurs. As an additional confidence builder along this line, we asked several national 800-number equipment dealers if they could assist amateurs purchasing complex-type new-model transceivers. Our inquiries concerning preshipment rig checkout and preprogramming both memories and VFOs for a nominal charge received a unanimous "yes," thus assuring a high degree of "out of shipping box success" to a new owner. Our position thus equates to enjoying our new rig while learning about its internal circuits along the way. Of course the best bet in this area involves using our own knowledge and assets rather than relying on others. Let's take a closer look at that position.

Troubleshooting "Cockpit Problems"

Since modern transceivers are generally design perfect and complex in operation, it's quite understandable that "cockpit" or operator confusion surfaces during early days of rig use. I've helped numerous amateurs overcome those problems, and my single most "secret tool" for solutions was that particular unit's instruction manual. Years of experience in this area now convince me that anyone can enjoy today's most complex rigs and fully use all of their features by following a similar concept. *Read your new rig's instruction manual thoroughly before attempting to operate the unit*. After firing up the rig, again use the instruction manual as your personal guide to operation and use of

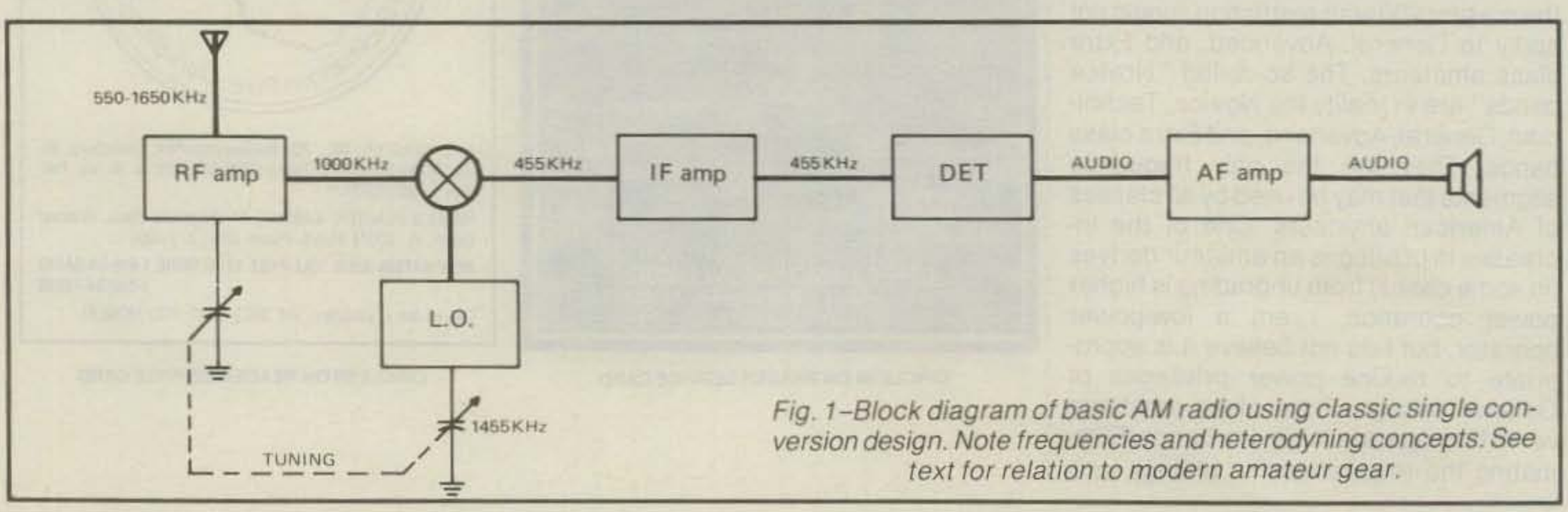


Fig. 1–Block diagram of basic AM radio using classic single conversion design. Note frequencies and heterodyning concepts. See text for relation to modern amateur gear.

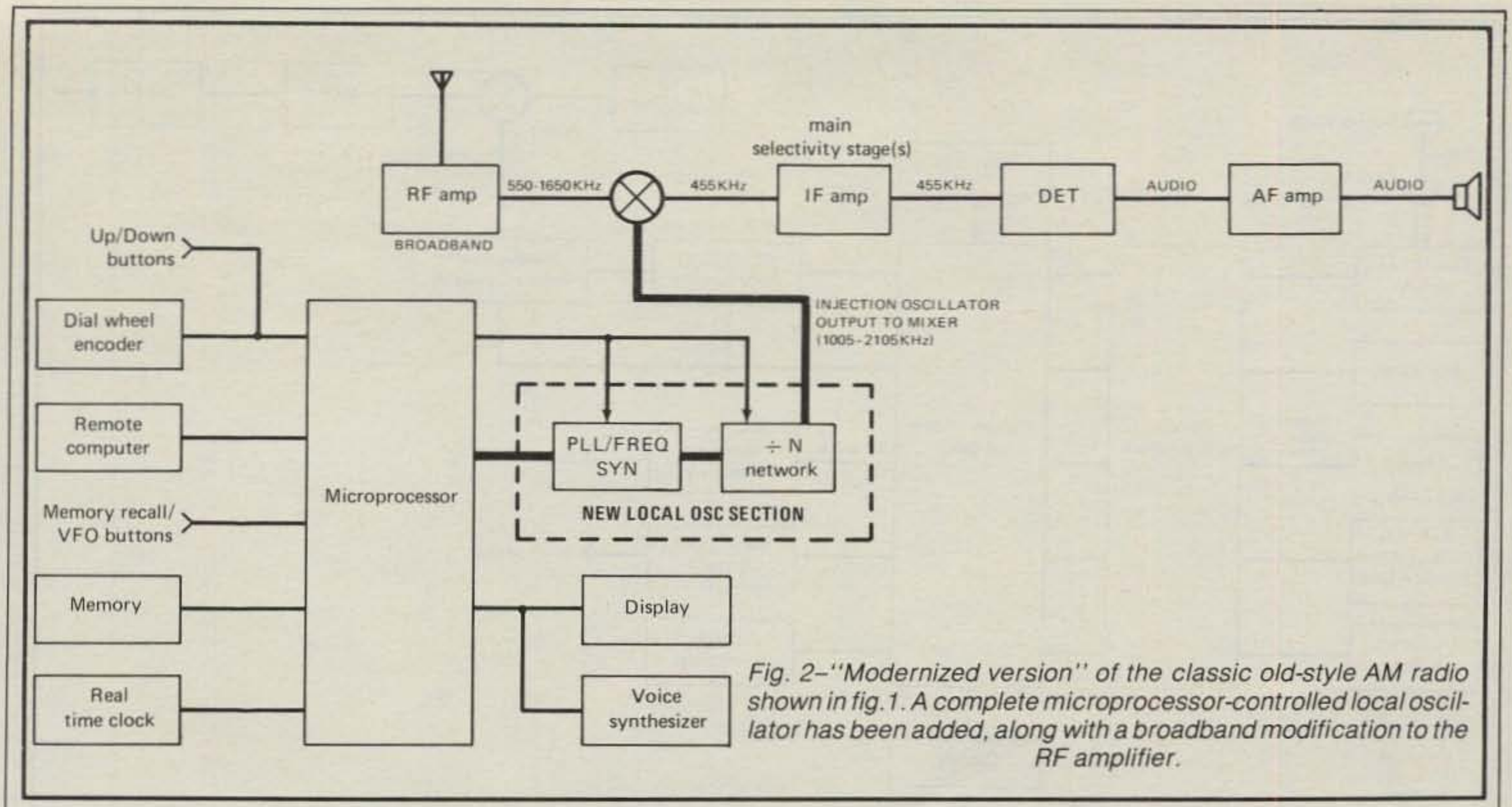


Fig. 2–"Modernized version" of the classic old-style AM radio shown in fig. 1. A complete microprocessor-controlled local oscillator has been added, along with a broadband modification to the RF amplifier.

each knob. Go through operating steps along with the manual's examples, and then modify them to your own style of use. You have many years to enjoy the rig. A couple of days familiarization at that era's beginning returns high dividends over the long run.

Some of the best electronic-related advice I've heard came from a well-known consulting engineer: "assume nothing." Related to amateur gear that means avoid assuming how a unit functions or accepting "outside opinions" unless they're factually qualified. Since we're discussing new transceivers, their most qualified "voice" (and your personal tutor) is the unit's own instruction manual. Nearly every unit's manual will guide you through "basic operations": presetting all knobs, switches, etc., to their "standard" position; checking/confirming all rear panel, inside pots, connectors, switches are correct; then adding extra "frills" as you become familiar with the rig.

Most "cockpit problems" today center around microprocessor-controlled tuning methods used in deluxe-style transceivers. Should you personally encounter perplexities in this area, I suggest triple checking to ensure the unit isn't operating in memory recall mode, operating split VFO and inhibited from out-of-band transmission, using a non-programmed memory, or placed on dial load. Remember, also, to check filter switches: if optional filters are omitted there, the rig will seem dead. Take the viewpoint of looking for what's wrong rather than what's right, and you'll probably find the problem in miniscule time. Since microprocessor-controlled tuning concepts directly or indirectly account for a creditable number of new rig misunderstandings, and since many of their functions are directly controlled from a main tuning dial, let's now look further in that direction.

Basic Concepts of Digital and Microprocessor Tuning

Surely the most innovative development affecting amateur transceivers during recent times has been the inclusion of microprocessor control and digital tuning concepts. Prior to this evolution, all rig functions were handled in a strictly analog manner. Variable frequency oscillators were tuned with capacitors for frequency selection while heterodyne oscillators were used with switch-selected crystals for band selections. Both RF and oscillator stages were gang tuned to maintain an IF difference. Today's RF amplifier stages use broadband/untuned designs, however, while frequency-selecting variable capacitors behind a rig's main tuning knob have been replaced with LED beam chopping wheels in light-tight boxes. LED light interruptions are then converted to digital counts (light equals binary 1, dark equals binary 0, for example) which are interpreted by the rig's internal microprocessor. That item in turn controls both ranges and frequencies covered by a rig's oscillator(s).

As a simplified example of the previously mentioned digital evolutions, let's hypothetically update the "old fashioned" AM radio shown in fig. 1. Using its classic description, all (550 to 1650 kHz) signals are received by the antenna and directed to the RF amplifier. Assuming that stage is tuned to 1000 kHz and the (mechanically ganged) local oscillator is tuned to 1455 kHz, the mixer's resultant difference (455 kHz) is selected and amplified by the IF stage. After that single conversion, following stages are fixed in bandwidth and frequency. If the RF stage is retuned to 610 kHz, the mechanically tracking local oscillator tunes to 1065 kHz to maintain a 455 kHz difference. Get the idea? Let's now "modernize" the design (see fig. 2). First we broadband modify the RF amplifier to pass all signals between 550 and 1650 kHz equally. This eliminates its need for a tunable capacitor and gang tuning. It also shifts all selectivity requirements to IF stages, but we can handle that situation with more IF stages and sharp tuned filters.

Next, we replace the local oscillator's circuitry with a PLL or frequency-synthesized oscillator followed by a "divide by any number" digital circuit and control those stages with a microprocessor. The radio can then tune any station between 550 and 1650 kHz by feeding a microprocessor/computer-controlled injection signal between 1005 and 2105 kHz to its mixer. The microprocessor can also be input-controlled by a light interrupting dial wheel, up/down buttons, computer program, etc., for tuning, while its frequency information is also stored in memory. If a real-time digital clock is interfaced with the microprocessor and additional software is added, the radio could wake us to one station, store our frequency/station preferences by hours, cross-analyze data, develop a daily listening sequence to fit our personality, and operate the radio accordingly. Those expansions could be put to better use, however, by including additional (shortwave) band and mode circuits plus transmit capabilities in the radio—the modern transceiver concept.

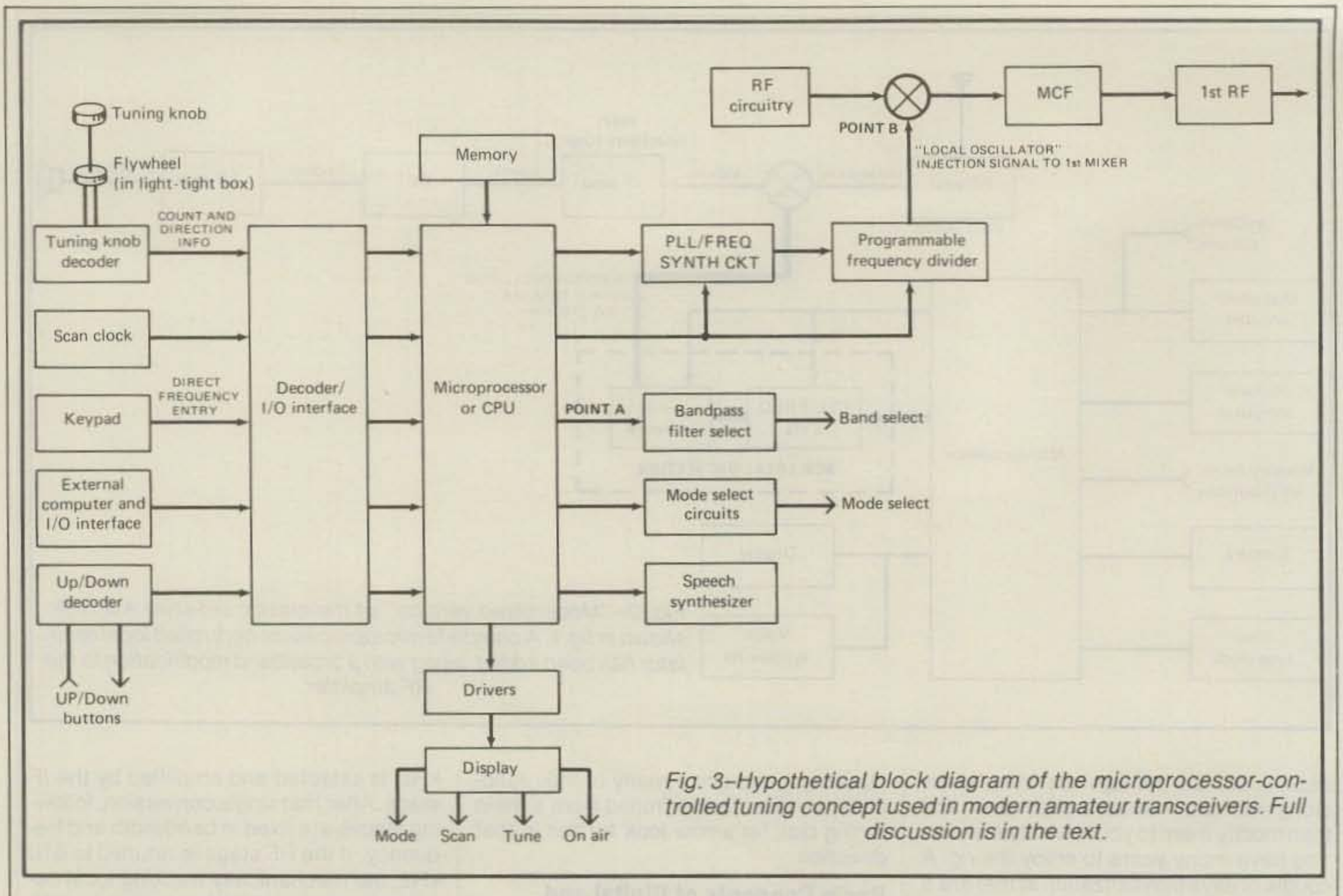


Fig. 3–Hypothetical block diagram of the microprocessor-controlled tuning concept used in modern amateur transceivers. Full discussion is in the text.

Although various makes and models of microprocessor-controlled transceivers fluctuate somewhat in individual design and block-diagram layout, they all use a general concept such as that analogized in the previous discussion. Realizing that fact and visualizing what actions are required for operating/tuning a particular rig is the keynote to its understanding. A hypothetical example of that concept is shown in fig. 3. Once again I emphasize that while your own rig's diagram may be slightly different from this one, your knowledge of what's happening will allow you to draw a comparable diagram of its circuits.

In order for a transceiver to select different transmit and receive ranges, its microprocessor must activate the proper receiver input and transmitter output filters (see point A). A local oscillator signal must also be fed to the first mixer for tuning (see point B). Some rigs use a master PLL/frequency synthesizer and programmable frequency divider here (like the figure's example), while others "call up" one of several separate oscillators. Overall, however, the "end idea" (local oscillator out at point B) is the same. Following those initial band and frequency selections, subsequent IF stages in most transceivers are usually fixed in range and conventional in design. Exceptions to that rule are tapoffs from mode related stages such as demodulators (if your rig includes both frequency and mode memories) and AGC/squelch tapoffs (if the rig also includes scanning functions).

Since the transceiver's frequency tuning and detection stages are now under microprocessor control, several forms of operation are possible. We can program the microprocessor from a small keypad, for example, step its counts from up/down buttons, or interface it to an external terminal or modem. We can store operating information in various memories, manipulate their data using an external interface, include a real-time clock, or, maybe in the future, let the micrprocessor evaluate our personal operating preferences and reprogram the transceiver accordingly. We can also interface the digital counts from that item to a speech synthesizer, or anything else the modern mind might conjure.

Returning to fig. 3, let's now take a closer look at operations of various micro-

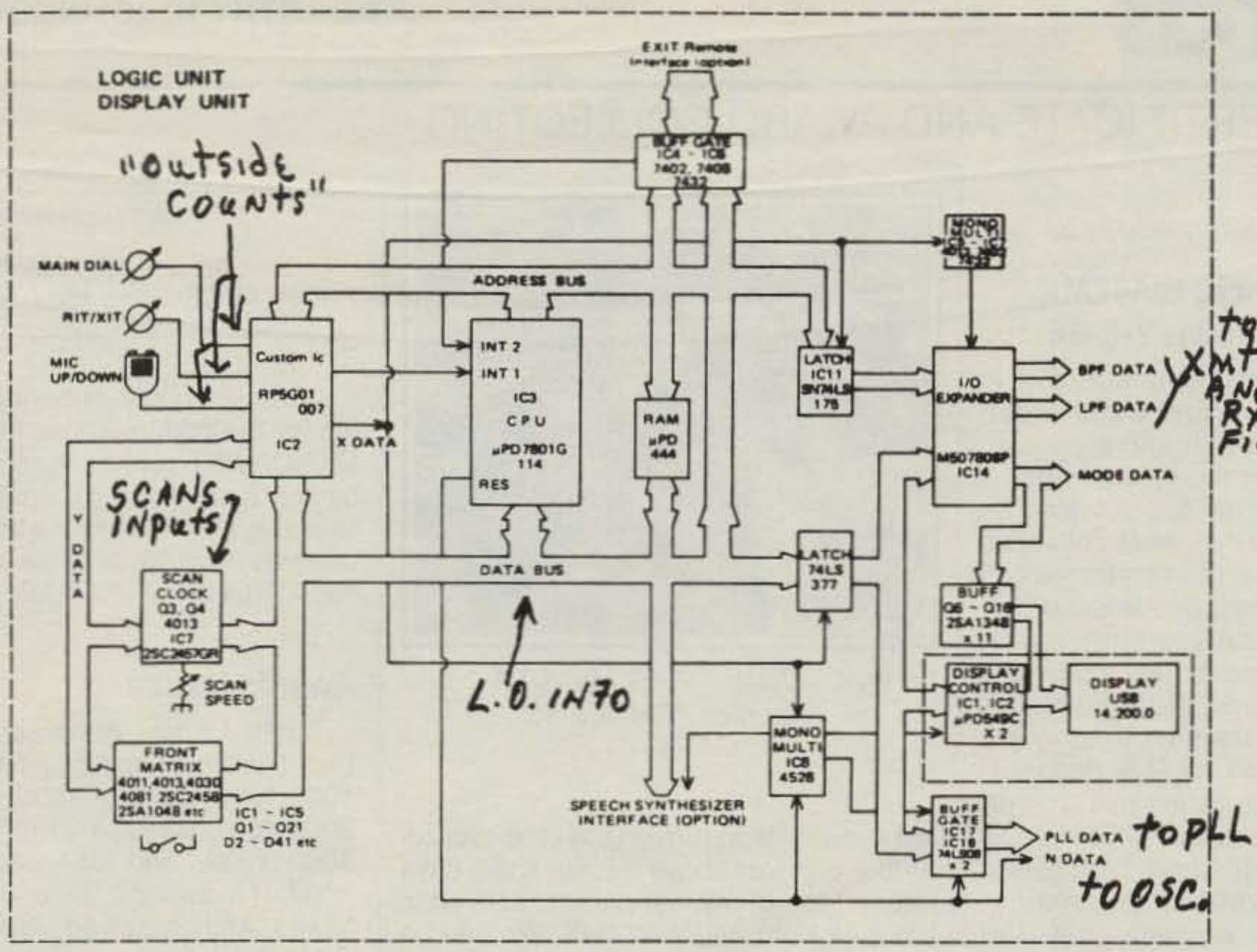


Fig. 4–Logic/microprocessor control section of ICOM's new 751A.

processor-related circuits. A shaft from the transceiver's main tuning knob turns an LED beam chopping flywheel inside the rig. Two LEDS and phototransistors are mounted on each side of that wheel and are used to sense both counts and which beam activated first (direction of rotations, or whether to count up or down). We might also point out that many "deluxe" transceivers now let their LED/phototransistor encoders serve double duty—the dual VFO concept. Voltage pulses from the phototransistors are next converted to microprocessor level pulses by the decoder and used for "telling the microprocessor" to count up/down and how many times. That output information then controls the PLL/local-oscillator circuits. The microprocessor also outputs information to the rig's display (and speech synthesizer), selects filters, stores/retrieves information in memory, interfaces with external systems, and much more. It's the "heart" of the rig's small computer. Some manufacturers call that chip a microprocessor, incidentally, while some call it a CPU; either nomenclature is acceptable to us. Notice that up/down scan pulses can be "clocked" into fig. 3's decoder from the dial or mic. Notice, also, the microprocessor and memories can be "preloaded" without affecting the transceiver *if* PLL/local-oscillator output is disabled at point B. As you look back over fig. 3, several more expansions/frills will probably come to mind. Possible this clarifies why there is so much excitement and development in modern transceiver designs. Their capabilities are limited only by one's imagination.

I've included one final inspiring bit of study in fig. 4. This is a block diagram of *only the logic/microprocessor-control section of* ICOM's brand new IC-751A. The custom IC interfaces "outside counts" to the CPU. Its inputs are scanned for data by IC7. The CPU's "local oscillator output driving information" moves along the data bus to the 74L5377, then to the display and buffer to the PLL. The "N" data selects oscillator frequency divisions. Study the figure a few minutes, and the other "support blocks" will also become understandable. Aren't modern rigs interesting!

Conclusion

We've come a long way in both this month's column and the three previous "Understanding Modern Gear" (March, September, and October 1985 issues of *CQ*), but there's always room to delve further. If you would like to see additional discussions along these lines, let me know. I aim to please, and I proceed according to your input. Hopefully I'm making you feel a bit more comfortable about owning and operating today's sophisticated gear. Comparing the internal circuits and overall capabilities to their initial costs, today's transceivers are quite a bargain. Enjoy!

73, Dave, K4TWJ

Awards

a monthly feature by
DOROTHY H. JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The Story of the Month for July is:

LeRoy C. Ullrich, WAØLMK
All Counties #504, 2-5-86

"I was introduced to amateur radio in 1965 and obtained my Novice and General class licenses in that same year. In November of 1965 I stumbled across a group of amateur radio operators on 3.947 MHz who said they were collecting counties. I still don't remember why I joined them, but I really got 'hooked.'

"Down through the years my county hunting was interrupted many times, but only for short periods. During the late 1960s I spent my summers in graduate school and this led to my M.S. degree in biology in 1969. Also during this time my wife, Eva, and I raised two children. The oldest, Kim, graduated from high school two years ago and is attending a local junior college at the present time. Our youngest child, Kelly, will graduate from high school this year and is planning to attend college next fall to pursue a degree in electrical engineering.

"After 20 years of county hunting, my dream of working all counties finally came true. I will always remember the evening of January 21, 1986. I arrived home from work at approximately 2345 GMT and checked into the net because Ira, KA4SAX, had planned to go to Calloway County, Kentucky that evening. When I checked in I was informed that Wes, WAØYFQ, was just starting his vacation and was going to be in Butler and Muhlenberg Counties in Kentucky. What an elation I felt knowing that I would be able to work three of my last five counties in one evening!

"When I had completed the contacts for the last three Kentucky counties, I announced the last two counties I needed, and Jack, W5VQR, popped up on frequency to say that he was in Wichita County in Kansas on his way home to Oklahoma. I made a contact in Wichita County and suddenly was down to only one county to go. Bob, KC5CV, was NCS that evening, and he said that Charles, N4EED, was running in Mississippi and was close to Quitman County, Georgia, my last one. Charles agreed to go across the state line and I was able to contact him in Quitman County. What an evening! Little did I know when I arrived home from work that I would work all five of my last counties in one evening. I was so nervous that I did not even think to turn on the tape recorder that was just above the rig. A few days later a tape of my last contact arrived in the mail from Bill, WA3ZMY. We can be proud that we have so many thoughtful people among the County Hunters.

LeRoy C. Ullrich, WAØLMK, USA-CA All Counties #504, 2-5-86.

"Since my beginnings in county hunting I have attended several national conventions. In fact, my first convention was in Kansas City in 1974, and it was one I will never forget. All during the convention tickets were drawn for prizes. To my surprise, at the end of the banquet, when they drew the ticket for the door prize, they drew my call and I went home with a new Yaesu FT-101B. I used this rig for many years on the nets and only replaced it about two years ago. In 1977 the County Hunters Convention was closer to home in Rochester, Minnesota, and I was able to serve on the host committee.

"I cherish all the contacts I have made on the County Hunters Nets and even more the wonderful acquaintances that we have made at the conventions and during trips through the United States. When we are traveling, we always try to stop and meet some of the County Hunters, and these visits are usually the highlights of our trips. They show us the flavor of the country which we would not see otherwise. We look forward to seeing our old friends and meeting new friends at future conventions and mini-conventions.

"Besides amateur radio, my wife and I are involved in several hobbies. One hobby that we especially enjoy together is working on and using our log cabin in northeastern Minnesota (Cook County). I have a corner of the cabin reserved for a ham shack, so you may hear me working on the nets as 'WAØLMK/North.' If any of the County Hunters enjoy camping, fishing, or just being out in the wilderness, stop in and share it with us.

333 South Lincoln Ave., Mundelein, IL 60060

USA-CA Special Honor Roll

Carl E. Andersen, W3XE
All Counties #507, 3-20-86

"After a couple of boring weeks waiting for the confirmations and getting the USA-CA All Counties number, here I am back at county hunting again. I would like to thank all the mobile stations and net controls who helped me to qualify for #504. 73, LeRoy, WAØLMK"

Awards Issued

Carl E. "Andy" Andersen, W3XE, completed them all and qualified for USA-CA 1000 #918, USA-CA 1500 #742, USA-CA 2000 #661, USA-CA 2500 #604, USA-CA 3000 #539, and USA-CA All Counties #507. All awards were dated 3-20-86, Mixed. Andy received USA-CA 500 #217 on April 12, 1963.

Larry Allen, K1ZIT, has added the gold seals to his certificate to indicate the following: USA-CA 1000 #917; USA-CA 1500 #740; USA-CA 2000 660 and USA-CA 2500 #603, all endorsed 20 M B, dated 3-5-86.

Peter Kragh, K2UPD, has claimed USA-CA 2500 #605, USA-CA 2000 #662, USA-CA 1500 #743, and USA-CA 1000 #919, Mixed, 3-24-86.

Phillip R. Pritchett, WD5P (ex: N6ATS), sent for USA-CA 2000 #663, All SSB, 3-29-86.

Barry C. Dutcher, KA1CLV, won USA-CA 1500 #741, All CW, 3-14-86.

Elemer A. Bielek, HA9RE, qualified for USA-CA 500 #2097 (#2 to Hungary) and USA-CA 1000 #920 (#1 to Hungary), Mixed, 3-29-86.

USA-CA 500 certificates went to:

R.S. Unsworth, G3WPF, USA-CA 500 #2092, All CW, 3-14-86.

USA-CA Honor Roll

3000		W3XE	742
W3XE	539	K2UPD	743
2500		**1000**	
K1ZIT	603	K1ZIT	917
W3XE	604	W3XE	918
K2UPD	605	K2UPD	919
		HA9RE	920
2000			
K1ZIT	660	**500**	
W3XE	661	G2WPF	2092
K2UPD	662	WA2LEW	2093
WD5P	663	SV1JG	2094
		F6BVB	2095
1500		KA5RNH	2096
K1ZIT	740	HA9RE	2097
KA1CLV	741	OK1ASJ	2098

James William Duggan, WA2LEW, USA-CA 500 #2093, Mixed, 3-19-86.

Cliff A. Saccalis, SV1JG, USA-CA 500 #2094, Mixed, 3-20-86.

Jacques Bocquet, F6BVB, USA-CA 500 #2095, Mixed, 3-24-86.

Joseph C. Cannon, Jr., KA5RNH, USA-CA 500 #2096, All SSB, 3-29-86.

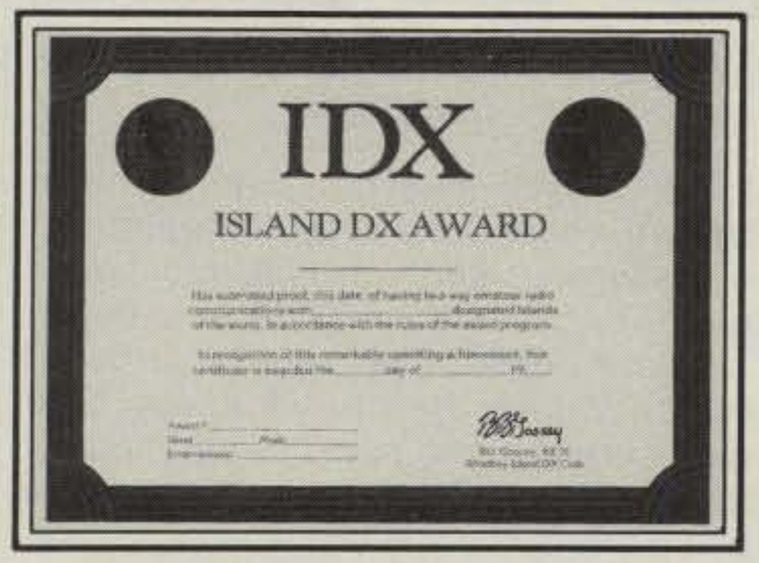
Jaroslav Plasil, OK1ASJ, USA-CA 500 #2098, All CW, 3-31-86.

Awards Available

IDX—Island DX Award. This award is sponsored by the Whidbey Island DX Club and is available to licensed amateurs and shortwave listeners worldwide. Awards are issued for SSB, CW, RTTY, SSTV, OSCAR satellite, as well as mixed and single band accomplishments.

Fifty (50) IDX Islands are required for the basic award. Certificates are also issued for 100 and 150 islands and for the maximum number of islands possible at the time. All DXCC Countries which are bonafide "islands" are the only qualifying contacts. A special IDX listing follows.

To be valid, all contacts must be made *after* October 1, 1977. To apply, prepare a list of contacts in prefix order. Please *number your contacts 1 through 50, etc.* Include the station worked, IDX island name, band, mode, date, and GMT.



The Island DX Award offered by the Whidbey Island DX Club.

Do not send QSL cards! The award is issued on the honor system. Have your list verified by another amateur or local radio club official. Send your verified list of contacts with $5.00 in US funds and a 4″ × 9″ business-size SASE. Foreign stations may substitute the fee by enclosing 12 IRC's. Send application and fee to Whidby Island DX Club, 2665 North Busby Road, Oak Harbor, Washington 98277 U.S.A. Rules governing this award are reviewed annually in September. An SASE should be enclosed with all correspondence.

Island DX Country Listing: A3, A9X, BV, C2, C6, CE0A, CE0X, CE0Z, CO, CM, KG4, CT2, CT3, D4, D6, DU, EA6, EA8, EI, GI, FB8W, FB8Z, FC, FG (Guadeloupe), FG, FS, FH, FK, FM, FO0 (Clipperton), FO, FP, FR (Glorioso), FR (Juan de Nova), FR (Reunion), FR (Tromlin), FW, G, GM, GW (U.K.), GC, GU (Guernsey), GC, GJ (Jersey), GD, GI, EI, H4, VR4, HC8, HH, HI, HK0 (Bajo), HK0 (Malpelo), HK0 (San Andres), IS, J3, VP2G, J6, VP2L, J7, VP2D, J8, VP2S, JA–JR, KA (Japan), JD, KA1 (Minami), JD, KA1 (Ogasawara), JD, 7J1 (Okino), JW, JX, KG4 (see CO, CM), KH1, KB, KH2, KG6 (Guam), KH3, KJ, KH4, KM, KH5, KP6 (Kingman), KH5, KP6 (Palmyra), KH6, AH6, WH6, NH6, KH6, KH7 (Kure), KH8, KS6, KH9, KW, KH0, KH2, KG6 (Mariana), KC6 (West Caroline), KC6 (East Caroline), KP (Desecheo), KP1, KC4 (Navassa), KP2, KV, KP3, KS4, HK0 (Ranser), KP4, NP4 (Puerto Rico), KX, OH0, OJ0, OX, XP, OY, P29, PJ (Neth. Antilles), PJ (St Maarten), PY0 (Fernando), PY0 (Peter-Paul), PY0 (Trindade), S7, S9, CR5, SV (Crete), SV (Dodecanese), T2, VR8, T30, VR1, T31, VR1, T32, VR3, TF, TI9, UA1, UK1 (Franz Jo.), VE1 (Sable), VE1 (St. Paul), VK (Lord Howe), VK9 (Willis), VK9 (Christmas), VK9 (Cocos), VK9 (Mellish), VK9 (Norfolk), VK0 (Heard), VK0 (Macquarie), VP2A, VP2D (see J7), VP2E, VP2G (see J3), VP2K, VP2L (see J6), VP2M, VP2S (see J8), VP2V, VP5, VP8 (Falkland), VP8 (Orkney), VP8 (Sandwich), VP8 (So. Shetland), VP8 (Georgia), VP9, VQ9, VR1 (see T3), VR7, VS5, 9M6, 9M8, VS6, VS9 (see 8Q), VS9K, VU7 (Andaman), VU7 (Laccadive), XF4, YB, YC, YD, YJ, YV0, ZD7, ZD8, ZD9, ZF, ZK1 (North), ZK1 (South), ZK2, ZL (New Zealand), ZL (Auckland), ZL (Chatham), ZL (Kermedec), ZM7, ZS2 (Marion, Pr. Ed), 1S, 3B6, 3B7, 3B8, 3B9, 3C0, 3D2, 3Y, 4S, 5B, ZC, 5R, 5W, 6Y, 8Q, VS9, 8P, 9H, 9M6, 9M8 (see VS5), 9V, 9Y.

The IDX Award depicts countries which are bonafide "islands" and recognized on the ARRL DXCC listing. Any qualifying DXCC country either omitted from this list by error or those which have been recognized after the release of this list will be added the next time the IDX list goes to press. In the meantime, applicants may count new countries (islands) in their tally.

CW County Hunters Confirmed Contacts January 1, 1986

Special Honor Roll—All Counties—CW: W8RSW #1, W2MEI #2, KA5A #3, W1JTD #4, W3HQU #5, W3ARK #6, NG0T #7, WB0ODS #8, N2RT #9, W1AQE #10, N5QQ #11, WA6VJP #12.

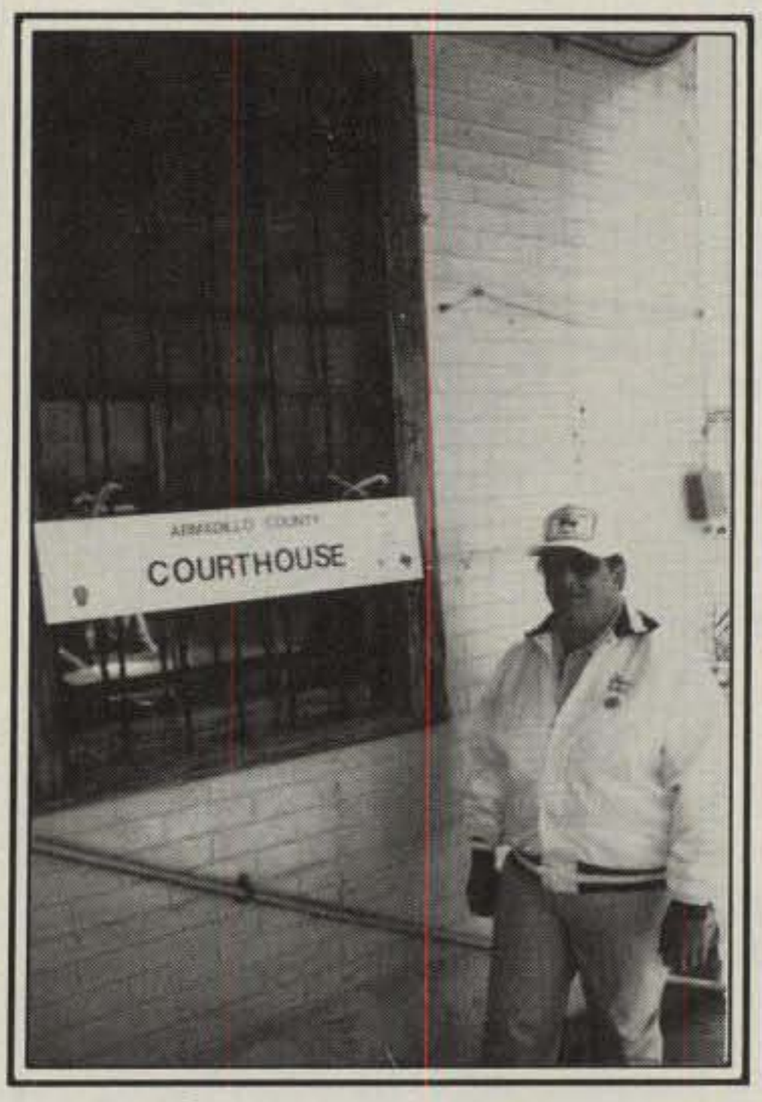
	Jan. 86	Jan. 85		Jan. 86	Jan. 85		Jan. 86	Jan. 85
W9VEN	3064	3064	W8WVU	2758	2720	W9MYY	2205	1875
K3LK	3063	2992	W8YL	2757	2729	WB1EIL	2020	*
W0FBB	3051	*	W5VGF/6	2753	*	W3HQU	1934	(2nd time)
N6QA	3021	2987	W1TEE	2741	*	VE3KZE	*	1725
W7GHT	3000	2954	N2CWG	2722	2600	VE1ASJ	1702	*
KA4IFF	2988	2872	W6NNV	2671	*	W3XE	*	1539
K8KIR	2955	2904	KN4Y	2591	2380	KA1CLV	1512	1250
K7EQ	2947	*	K8MW	2567	2314	WA4KER	1262	502
W1SBU	*	2925	WD4SIG	*	2489	N5QQ	1250	(2nd time)
W2EMW	2903	2770	OK1APV	*	2480	VE3IR	*	933
W7IEU	2899	2665	W7HZL	2400	1544	NF0X	868	*
W4POA	2850	*	N9DR	2374	2365	KA1CV/QRP	707	*
W8RYP	2845	2710	N0CYB	2350	1887	WB1AOD	597	*
K3ZMI	*	2824	N7TT	2301	*	KA8MSU	449	435
N0CKC	2822	2695	W4BV	2239	*	W6CF	385	*

**No info. (Thanks to Buster Boatman, N0CKC, for the foregoing information. The new CW Net frequency is 14.066. It is basically a weekend net, although there is some activity during the week.)*

Tenth Asian Games Award. To commemorate the Tenth Asian Games in Seoul, Korea September 20th through October 5, 1986, the Korean Amateur Radio League (KARL) will issue special awards for contacts made from January 1st through October 5th of this year. The design of the award will be based on the official poster of the games. The awards will be issued in the following classes:

Class HL: Requires confirmed contacts with 10 Korean stations, which must include at least one Seoul station.

Class DX: Requires confirmed contacts with 10 different countries that will be participating in the Asian Games, and must include one Korean station. Do not include your own country.



Opening Day of Armadillo County, 3-2-86. K5RC at the Armadillo County Court House at Washington-on-the-Brazos, Texas, "Where the Old West Meets Ohms Law."

The special station HL8AG will be active during the games and will count as five contacts for either class. KARL will issue the awards beginning September 20th, and winners may also receive extra items as commemorative stamps or Asian Games mascots. Send certified log extracts together with a fee of $4.00 U.S. (or 10 IRC's) prior to September 20, 1987 to Korean Amateur Radio League, C.P.O. Box 152, Seoul 100, Korea. This award is also available to SWL's.

The prefixes of the Asian countries that will be participating are: A4, A5, A6, A7, A9, BY, DU, EP, HL, HM, HS, HZ, JA, JT, JY, OD, S2, V8, VS6, VU, XV, XW, XZ, YA, YB, YI, YK, 4S, 4W, 7O, 8Q, 9K, 9M, 9N and 9V.

The Jakarta Award. The Jakarta Award (JA/SWL-JA) is available to licensed amateurs the world over. It is issued for confirmed contact with, or having heard from, stations in Jakarta (Ø call area only), the capital of the Republic of Indonesia, with the following requirements:

1. DX stations need confirmed contacts with, or having heard from, a total of 20 stations including at least one Jakarta club station.

2. Indonesian amateurs need confirmed contacts with, or having heard from, a total of 50 stations including at least 5 Jakarta club stations.

To apply, send the log extracts (GCR) in alphabetical order by prefix along with the award fee of $8.00 US or 16 IRC's to Award Manager, Mr. M.S. Lumban Goal, YBØWR, P.O. Box 96, Jakarta 10002, Indonesia.

The Jakarta Award from the Organisasi Amatir Radio Indonesia.

QSL cards are required for the application from the Indonesian licensed amateurs operating within the Ø call area. An SASE or sufficient funds for return postage is also required.

List of club stations in the Ø call area follows: YBØZAA, YBØZAB, YBØZAD, YBØZAE, YBØZAF, YBØZBA, YBØZBB, YBØZCA, YBØZCB, YBØZCD, YBØZCE, YBØZDB, YBØZDC, YBØZDD, YBØZDE, YBØZDG, YBØZEA, YBØZEE, YBØZZ.

TD-EA-CW Award. The Spanish Radioamateurs Union (U.R.E.), through its local group in Villarreal, has established the

The TD-EA-CW Award, sponsored by the Union de Radioaficionados Espanoles, Delegacion Local de Villarreal.

TD-EA-CA Award according to the following rules.

The TD-EA-CW Award is available to all amateur radio operators and SWL's throughout the world who are officially licensed by an IARU member country. Bilateral and direct contacts with the nine (9) EA districts must be confirmed (9 contacts). Contacts may be made over any period of years since January 1, 1976. Bands: authorized amateurs HF bands. Mode: CW only. Contacts made through repeaters, satellites, and other similar means of communication are not valid. Contacts made from or with mobile stations are not valid. All stations must be contacted from the same DXCC country. You cannot get one TD-EA-CW Award from several of your callsigns.

Other TD-EA-CA Awards available as endorsement stickers are: 5B-TD-EA-CA (9 districts × 5 bands = 45 contacts), 160-TD-EA-CW (9 districts on 160 meter band).

Send log and fee of $3.00 US or equivalent in IRC's, marks, or pounds to: Delegacion Local de U.R.E., La Mura 67, Villarreal (Castellon), Espana. *Note:* Decisions of the TD-EA-CW Award Committee regarding interpretation of the rules shall be final.

Virginia Beach Certificate. For stations located outside a 90 mile radius of Virginia Beach, Virginia, work five different VBARC cub members or work one club member and club station WA4TGF when designated as a special event. The opera-

The Virginia Beach Amateur Radio Club Certificate.

tor of WA4TGF must be a different member of the club. Send as confirmation a list of stations worked, with QSL information and an SASE to: WA4TGF, Virginia Beach Amateur Radio Club, 4821 Rosecroft Street, Virginia Beach, VA 23464. Club members can also earn this certificate if they are listed by ten other applicants as being one of the stations worked to qualify for the award.

Jerusalem Award. The new qualifications for the Jerusalem Award are a log extract showing four two-way contacts with amateur radio stations in Jerusalem and 3 IRC's to cover the cost of postage. The new qualification of only four contacts reflects the drop in recent years of the number of Jerusalem amateurs active on the HF bands.

For stations within Israel, the qualifications for the Jerusalem Award are ten contacts with Jerusalem amateur radio stations, at least seven of which are on HF. The other three may be on VHF simplex. Send log data with fee to: Ben Dalfen, 4Z4JS, Chairman, Jerusalem Amateur Radio Club, P.O. Box 9184, Jerusalem, Israel.

Notes

Here in midwest America we are once again enjoying the summer holidays. I hope things are going well where you are.

73, Dorothy, WB9RCY

Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

To appease the many requests from shortwave listeners I have given the RSGB SWL Contest extensive coverage in this month's column. Letters from SWL's bemoan the fact that they feel left out because very few contests include an SWL category in their format.

Adding an SWL category to an existing contest should be no problem. As a matter of fact, it would give the contest an additional source of information in checking logs. As a suggestion, why not give it some consideration when you draw-up the rules for your next contest?

Anyway, here is one activity that will not add more signals to the already crowded bands. We still receive complaints from non-contesters that the QRM on contest weekends makes it impossible for them to keep their daily schedules. Actually, there is only a limited number of major competitions and that activity is usually in the lower portions of the bands. State QSO parties and other domestic competitions almost always limit their operation to a narrow band of frequencies. Contest activity is always scheduled for weekends, leaving the rest of the week free for the "ragchewers" and the so-called nets. We get no complaints from the legitimate nets. They are usually found in the upper portions of the bands. So what's the "beef"?

Dale Hoppe, K6UA, a long-time donor of a plaque in the phone section of our World-Wide DX Contest, is phasing out his sponsorship of the USA multi-operator, multi-transmitter category. This spot was immediately picked up by the DX International Club of La Grange, Illinois, and they will be the donor of the 1986 award. (Many thanks, Dale, for your many years of support.)

The usual reminder: July 15th is the deadline for announcements for the October issue, and August 15th for the November issue. Send them to my home address, not via Hicksville. And surely do not send them to the old *CQ* address in Port Washington. We moved out of there over seven years ago. Yes, we still get mail forwarded from there.

73 for this time, Frank, W1WY

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

*	July	1	Canada Day Contest
*	July	4-5	Clinton ARC Special Event
*	July	5-6	Venezuelan SSB Contest
	July	12-13	IARU HF Championship
	July	12-13	RSGB SWL Contest
	July	**19-20**	**CQ VHF WPX Contest**
	July	19-20	AGCW-DL QRP CW Contest
	July	19-20	Colombian Contest
†	July	19-20	SEANET CW Contest
	July	26-27	Venezuelan CW Contest
	July	26-28	MARC County Hunters CW
	July	26-28	"Armadillo" CW Run
	Aug.	2-3	ARRL UHF Contest
	Aug.	9-10	European CW Contest
†	Aug	16-17	SEANET SSB Contest
	Aug.	16-17	New Mexico QSO Party
	Aug.	16-18	New Jersey QSO Party
	Aug.	23-24	All Asian CW Contest
	Sep.	3-5	YLRL "Howdy Days"
	Sep.	13-14	European Phone Contest
	Sep.	20-21	Scandinavian CW Activity
	Sep.	27-28	Scandinavian SSB Activity
	Oct.	4-5	IRSA World Championship
	Oct.	11-12	Pennsylvania QSO Party
	Oct.	15-17	YLRL Anniv. CW Party
	Oct.	18-20	CARTG RTTY Contest
	Oct.	**25-26**	**CQ WW DX Phone Contest**
	Oct.	29-31	YLRL Anniv. SSB Party
	Nov.	8	ALARA YL/OM Contest
	Nov.	8-9	European RTTY Contest
	Nov.	**29-30**	**CQ WW DX CW Contest**

† *Not official.*
* *Covered last month.*

1985 SAC Results North America

C.W. U.S.A.		Phone U.S.A.	
KA1DWX	**2,160**	**W1BZ**	**570**
W1BZ	1,118	WA1FCN	459
W1OPJ	4	**KY2P**	**156**
K2SX	**2,262**	**K6EID**	**1,344**
K3ZO	**16,958**	W6EOF	943
W3GM	14,880	G3MHV/W6	221
K4BAI	**1,032**	**W9SS**	**2,139**
K4FPF	735	**AJ9N**	**720**
K5BDX	**1,224**		
K8SS	**3,090**	**Canada**	
AJ9N	**2,016**	**VE1NG**	**6,360**
		VE8RCS	4,176
Canada		VE1AIH	384
VE1NG	**3,366**	VE3MAM	351
VE3LKR	132	VE3LKR	165
Panama		**Dom. Rep.**	
HP1XKR	**836**	**HI8A**	**800**

Boldface indicates certificate winners.

made, but basically the format is still the same.

It's a worldwide competition open to all amateurs on all six bands, 10 through 160 meters (no WARC bands).

Categories: Single operator, CW only, phone only and mixed mode. Multi-operator, single transmitter, mixed-mode only. Must remain on a band for at least 10 minutes at a time. (Exception: Only IARU member-society HQ stations may operate simultaneously on more than one band with one transmitter on each band/mode.)

Exchange: RS(T) and ITU zone. IARU HQ stations, RS(T), and official member-society abbreviation.

Points: Contacts within own zone or with an HQ station, 1 point. Contacts within own continent but different zone, 3 points. Contacts with different continents, 5 points.

Multiplier: Total number of ITU zones and IARU HQ stations worked on each band. (Note: HQ stations do not also count as a zone multiplier.)

Final Score: Total QSO points from all bands times the sum of the multiplier from each band.

Awards: Certificates to the top scorers in each category, in each state, ITU zone, and each DXCC country. In addition, achievement awards will be issued to stations making at least 250 QSOs or a multiplier total of 50 or more.

Entries with more than 500 QSOs are required to include a dupe sheet with their log. A three QSO reduction will be assessed for each duplicate QSO for which credit has been taken. Disqualification may occur if the overall score is reduced by 2% or more.

It is recommended that you check *QST* for more detailed information. A large SASE will get you official forms.

Mailing deadline for entries is August 13th to: IARU Headquarters, Box AAA, Newington, CT 06111.

IARU HF Championship

1200Z Sat. to 1200Z Sun., July 12–13

This is the old IARU Radiosport Contest with a new name. The operating time has been cut down to 24 hours and a few other minor modifications have been

RSGB SWL Contest

1400Z Sat. to 1400Z Sun., July 12–13

The RSGB Listener's Contest held last year was well received and is given worldwide publicity this year. It is now open to both British Isles and to overseas listeners. With the IARU Contest on the same weekend it should provide plenty of activity.

Use all six bands, 1.8–28 MHz, CW or SSB, but not both modes.

Scoring: Score 1 point for each station heard on 14, 21, and 28 MHz, and 3 points on 1.8, 3.5, and 7 MHz. Score 1 multiplier for each country heard on each band (ARRL country list). Call areas of the USA, Canada, Australia, New Zealand, and Japan will be considered as separate multipliers.

Final Score: Total points scored on all bands multiplied by the total number of multipliers from each band.

Prefix, Continent and ITU Zone

A2	AF	57	H4	OC	51	PJ2,3,4,9			VE,VY	2,3,		ZS	AF	57
A3	OC	62	HA,HG				SA	11		NA	4,9,75	1A0	EU	28
A4	AS	39		EU	28	PJ5,6,7,8			VK	OC	55,58,59	1S	AS	50
A5	AS	41	HB	EU	28		NA	11	VK(LHI)			3A	EU	27
A6	AS	39	HC	SA	12	PY	SA	12,13,15		OC	60	3B6-9	AF	53
A7	AS	39	HH	NA	11	PY0	SA	13	VK9(W)			3C	AF	47
A9	AS	39	HI	NA	11	PY0 (T)				OC	60	3C0	AF	52
AP	AS	41	HK	SA	12		SA	15	VK9(X)			3D2	OC	56
BV	AS	44	HK0(M)			PZ	SA	12		OC	54	3D6	AF	57
BY	AS	33,42,		NA	12	S2	AS	41	VK9(C,K)			3V	AF	37
		43,44	HK0	NA	11	S7	AF	53		OC	54	3W	AS	49
C2	OC	65	HL,HM			S9	AF	47	VK9(M)			3X	AF	46
C3	EU	27		AS	44	SJ-SM				OC	56	3Y	AF	67
C5	AF	46	HP	NA	11		EU	18	VK9(N)			4S	AS	41
C6	NA	11	HR	NA	11	SP	EU	28		OC	60	4U(ITU)		
C9	AF	53	HS	AS	49	ST	AF	48	VK0(H)				EU	28
CE	SA	14,16	HV	EU	28	SU	AF	38		AF	68	4U(UN)		
CE0A	SA	63	HZ,7Z			SV	EU	28	VK0(M)				NA	08
CE0X	SA	14		AS	39	T2	OC	65		OC	60	4W	AS	39
CE0Z	SA	14	I,IS0	EU	28	T30	OC	65	VP2	NA	11	4X	AS	39
CM,CO			J2	AF	48	T31	OC	62	VP5	NA	11	5A	AF	38
	NA	11	J3	NA	11	T32	OC	61,63	VP8(F)			5B	AS	39
CN	AF	37	J5	AF	46	T5	AF	48		SA	16	5H	AF	53
CP	SA	12,14	J6-8	NA	11	T7	EU	28	VP8	SA	73	5N	AF	46
CT	EU	37	JA	AS	45	TA,EU			VP9	NA	11	5R	AF	53
CT3	AF	36	JD,AS				AS	39	VQ9	AF	41	5T	AF	46
CU2	EU	36		OC	45	TF	EU	17	VR6	OC	63	5U	AF	46
CX	SA	14	JT	AS	32,33	TG	NA	11	VS6	AS	44	5V	AF	46
D2,3	AF	52	JW	EU	18	TI	NA	11	VU	AS	41	5W	OC	62
D4	AF	46	JX	EU	18	TJ	AF	47	VU7	AS	41,49	5X	AF	48
D6	AF	53	JY	AS	39	TK	EU	28	XE	NA	10	5Z	AF	48
DA-DP			W,K	NA	6,7,8	TL	AF	47	XE4	NA	10	6W	AF	46
	EU	28	KC6	OC	64,65	TN	AF	52	XT	AF	46	6Y	NA	11
DU	OC	50	KG4	NA	11	TR	AF	52	XU	AS	49	7O	AS	39
EA	EU	37	KH1	OC	61,62	TT	AF	47	XW	AS	49	7P	AF	57
EA6	EU	37	KH2	OC	64	TU	AF	46	XX9,CR9			7Q	AF	53
EA8	AF	36	KH3-7			TY	AF	46		AS	44	7X	AF	37
EA9	AF	37		OC	61	TZ	AF	46	XZ	AS	49	8P	NA	11
EI	EU	27	KH8	OC	62	UA1,3,4,6		19,20,	Y2-9	EU	28	8Q	AS,	41
EL	AF	46	KH9	OC	65		EU	29,30	YA	AS	40		AF	
EP	AS	40	KH0	OC	64	UA1 (FJL)			YB	OC	51,54	8R	SA	12
ET	AF	48	KL7	NA	1,2		EU	75	YI	AS	39	9G	AF	46
F	EU	27	KP1-5			UA-UZ2			YJ	OC	56	9H	EU	28
FT8W				NA	11		EU	29	YK	AS	39	9J	AF	53
	AF	68	KX6	OC	65	UA9-UZ0		20-26	YN,HT			9K	AS	39
FT8X	AF	68	LA	EU	18		AS	30,35,75		NA	11	9L	AF	46
FT8Z	AF	68	LU	SA	14,16	UB	EU	29	YO	EU	28	9M2	AS	54
FG	NA	11	LX	EU	27	UC	EU	29	YS	NA	11	9M6,8		
FG,FS			LZ	EU	28	UD	AS	29	YU	EU	28		OC	54
	NA	11	OA	SA	12	UF	AS	29	YV	SA	12	9N	AS	42
FH	AF	53	OD	AS	39	UG	AS	29	YV0	NA	11	9Q	AF	52
FK	OC	56	OE	EU	28	UH	AS	30	Z2	AF	53	9U	AF	52
FM	NA	11	OF-OH			UI	AS	30	ZA	EU	28	9V	AS	54
FO(Clip)				EU	18	UJ	AS	30	ZB	EU	37	9X	AF	52
	NA	10	OK	EU	28	UL	AS	30	ZC4	AS	39	9Y	SA	11
FO	OC	63	ON	EU	27	UM	AS	31	ZD7-9			J2,A	AS	39
FP	NA	09	OX,XP			UO	EU	29		AF	66			
FR	AF	53		NA	5,75	UP	EU	29	ZF	NA	11			
FW	OC	62	OY	EU	18	UQ	EU	29	ZK1-3					
FY	SA	12	OZ	EU	18	UR	EU	29		OC	62			
G-GW			P2	OC	51	V2-4	NA	11	ZL	OC	60			
	EU	27	PA	EU	27	V8	OC	54	ZP	SA	14			

Courtesy of QST.

Logs should show in columns: time in GMT, call of station heard, station being worked, RS(T), and points claimed. If both sides of the contact are heard, each station may be claimed. Each station heard can only appear once in the heard column on each band. The station being worked only once in three contacts, unless it is a new multiplier for the receiving stations.

Use a separate sheet for each band and a summary sheet showing the scoring. Duplicate logging for which points are claimed will be penalized at 10 times the contact value.

Certificates will be awarded to the leading station in each country, providing that station scores at least 50% of that section winner's score, and to the three leading entrants in each section of the British Isles.

All entries must be received no later than August 11th by: R.A. Treacher, BRS32525, 93 Elibank Road, Eltham, London SE9 1QJ, England.

CQ WW VHF WPX Contest

0000Z Sat. to 2400Z Sun., July 19–20

This is the second annual CQ World-Wide VHF Contest. Complete and detailed rules can be found in the April issue, but will be reviewed here briefly for those who do not have that issue.

Bands: All bands from 6 meters through 23 cm may be used (50, 70, 144, 220, 432, 902, and 1296 MHz).

Classes: 1. Single Operator—(a) all band; (b) single band; (c) all band low power; (d) single band low power (30 watts PEP). 2. Multi-operator—(a) all band; (b) single band. 3. Portable (temporary power source only). 4. FM only.

Exchange: Call sign and grid square (4 digits, e.g. FN20).

Scoring: One point per QSO on 50, 70, and 144 MHz; 2 points on 220 and 432 MHz. Four points on 902 and 1296 MHz. Stations may be worked once per band regardless of mode.

Final Score: Multiply total QSO points times the sum of different prefixes worked on each band.

A prefix is considered to be the three letter/number combination which forms the first part of the callsign. (A station in a call area different from that indicated in the call is required to sign portable. The location of the portable call determines the prefix.)

Awards: A large selection of certificates and plaques will be awarded to the top scorers in each class in all major geographic areas, North America, Europe, and Japan. And in each US state, Canadian province, European countries, and Japan call areas. Additional areas will be considered if returns justify.

Mailing deadline for logs is August 31st. They should be sent to: *CQ* VHF WPX Contest, c/o S.C.O.R.E., P.O. Box 1161, Denville, NJ 07834. They can also be sent to: *CQ* VHF WPX Contest, 76 N. Broadway, Hicksville, NY 11801.

AGCW-DL QRP Contest

1500Z Sat. to 1500Z Sun., July 19–20

This is the summer edition of this QRP CW-only contest. The same station may be worked on each band, 1.8 through 28 MHz. There are five classes:

Class A—3.5 watts or less input. *Class B*—10 watts or less, for single operators. *Class C*—10 watts or less for multi-operators. *Class D*—QRO stations, over 10 watts input (may work only QRP stations). Class E—SWL's.

Class C may operate the full 24 hours; others must take a 9-hour break.

Exchange: RST, QSO no., and power input, i.e., (559001/5) (579001/QRO). Add "X" if using crystal control.

Scoring: QSO within own country, 1 point. With other stations in own continent, 2 points. With DX outside own continent, 3 points. (Double points if using crystal control.)

Multiplier: One for each DXCC country, and one for each DX station worked. Call areas in JA, PY, VE, W, and ZS count as separate multipliers.

Final Score: Total QSO points from all bands times the multiplier as indicated.

Awards: Certificates for the first places in each class and band.

Use a separate log sheet for each band, and a summary sheet showing the scoring, name and address, and other essential information. Mail logs within six weeks of the end of the contest to: Siegfried Hari, DK9FN, Spessartstrasse 80, D-6453 Seligenstadt, West Germany (include 1 IRC for a copy of the results).

Colombian Contest

0000Z Sat. to 2359Z Sun., July 19–20

There have been a few changes in the format of this year's contest. A close check of the rules is suggested.

It's still a worldwide type contest on all six bands, 1.8 through 28 MHz, CW only and SSB only.

Classes: Single operator, single and all band, multi-operator, single and multi-transmitter. (There is only one single band class, that used on 14 MHz.)

Exchange: RS(T) plus a three-figure QSO number starting with 001.

Scoring: *For non-HK's*—QSOs with

HK's 10 points, with other countries 5 points, with own country 1 point.

For HK's—QSOs with other countries 10 points, with other HK's 5 points.

Multiplier: Number of different countries and HK call districts worked on each band.

Final Score: Total QSO points times the sum of the multiplier from each band.

Awards: Certificates to each station showing a minimum of 50 contacts, at least 10 of which are HK's on SSB or 5 if on CW, will receive a certificate. Plaques to the overall winning HK and non-HK in each class and each mode. Also for HK's in each call area.

Use a separate log sheet for each band. Indicate the multiplier in a separate column only the first time it is worked on each band. A summary sheet showing the scoring and other essential information and the usual signed declaration are also required.

Disqualification rules regarding taking credit for duplicate contacts, violation of rules and regulations, etc., will be strictly enforced.

Mailing deadline is August 30th to: L.C.R.A. Contest Committee, Apartado Aereo 584, Bogota, Colombia.

SEANET DX Contest

C.W.: July 19–20 SSB: Aug. 16–17

The object of the contest is to contact stations within the SEANET area. The same station may be worked once on each band. Cross-band or cross-mode contacts are not allowed. Multi-operator stations are limited to one signal during the same time period.

Classes: Single operator, single and all band, and multi-operator all band only.

Exchange: RS(T) plus a three-figure QSO number starting with 001.

Scoring: Stations outside SEANET area —(a) Contacts with stations within the NET area with the following prefixes: 20 points on 160; 10 points on 80 and 40; 4 points on 20, 15, and 10 (DU, HS, YB, 9M2, 9M6, 9M8, 9V1, V85).

(b) With stations in other NET areas: 10 points on 160; 5 points on 80 and 40; and 2 points on 20, 15, and 10.

(c) Contacts between stations outside the NET area have no value.

(d) Multiplier of 3 for each NET country worked.

Stations within SEANET area: (a) Contacts with stations outside NET area—10 points on 160; 5 points on 80 and 40; 2 points on 20, 15, and 10.

(b) Between stations within the NET area: 6 points on 160; 3 points on 80 and 40; 1 point on 20, 15, and 10.

(c) Contacts with stations in own country have no value.

(d) Multiplier of 2 for each NET country worked, 3 with country outside NET area.

Final Score: Total QSO points times the sum of the multiplier.

Awards: The three highest scoring stations on CW and on SSB will receive plaques. There are other awards for each class.

Entries must be received no later than October 20th by the CEBU Amateur Radio League, P.O. Box 304, Cebu City, Philippines 6401 (Att: SEANET Contest).

SEANET Area Prefixes: A35, A51, AP, BV, BY, C21, DU, FK8, FR, FW8, HL, HS, H44, JA (etc.), JD1, KA, KC6, KH2-3-4-5-6-7-8-9-Ø, KX6, P29, S2, S79, T2, T3's, VK (all), VQ9, V85, VS6, VU2, VU7, XU, XV5, XW8, XX9, XZ2, YB, YJ8, ZK, ZL (all), 3B6-7-8-9, 3D2, 4S7, 5W1, 8Q7, 9M2-6-8, 9N1, and 9V1, 1Z9.

County Hunters CW Contest

0000Z Sat. to 0200Z Mon., July 26–28

The MARAC County Hunters Net is sponsoring this year's contest. Mobile and portable operation from less active countries is welcome and encouraged.

The same station may be worked on each band, and mobile and portables from each county change for QSO credit. Mobiles operating on a county line give and receive one QSO number, but each county is valid as a multiplier. (Mobile and portables must identify by signing M or P after their call.)

Exchange: QSO no., category (M or P), RST, county and state for US stations, province or country for others.

Scoring: QSO's with fixed stations are worth 1 point, with mobile and portables 3 points.

Multiply total QSO points by sum of US counties worked for final score.

Frequencies: 3575, 7055, 14065, 21065, 28065. On 20 and 40 mobile and portables should call CQ below the suggested frequency. Fixed stations use above the suggested frequencies.

Awards: Certificates to winners as follows:

F—Fixed or fixed portables in each state, province, and country with 1000 or more total score.

P—Portable in each state operating from a county other than its normal location with 1000 or more score.

M—Mobile in each state operating from 3 or more counties with a minimum of 10 QSOs from each county.

Plaques to the top-scoring mobile, portable, and fixed station in the US meeting the above requirements.

Mobile and portables who change states calculate their score for a state certificate, and total score for plaque.

A summary sheet showing the scoring is requested and a check sheet of counties worked is a must for entries with 100 or more counties.

Mailing deadline for logs is September 1st to: Jerry Burkhead, N6QA, 7525 Baltic St., San Diego, CA 92111.

Armadillo CW Run

0000Z Sat. to 2400Z Sun., July 26–27

This is the CW section of the Armadillo Run sponsored by the Texas DX Society. Like the SSB section on May 3–4, it follows the same format used by the County Hunters contest. Check their rules in this issue for exchange, scoring, etc.

Don't forget to look for the new Armadillo County created to commemorate the Texas Sesquicentennial. (Contacts with this county are worth 5 times QSO points.)

There will be special Armadillo Run stations on between 1300Z and 0100Z each day to activate their assigned counties on 20 and 40 meters. Mobiles must be in each county a minimum of 30 minutes.

South Australia will also be celebrating its 150th anniversary, and they plan to run joint activities with the Texas "Run." Australian counties wiil also count as multipliers. Armadillo County in South Australia counts 10 times QSO points and VK5 countacts count 5 times QSO points.

I strongly advise that you send a large SASE to Tom Taormina, K5RC, 12610 Barbizon, Houston, TX 77089 for more detailed information and a list of the many awards that will be available to winners.

Logs must be received within a month after the end of the contest and go to: The Texas DX Society, 350 Magnolia Bend, New Caney, TX 77357.

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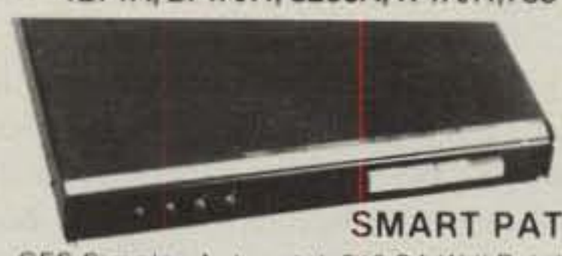

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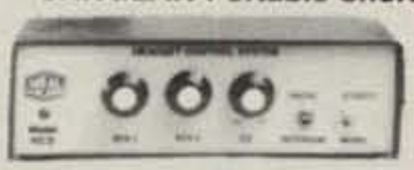

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Ticket Talk

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INFO ON AMATEUR RADIO LICENSING

Testing The Handicapped Applicant

Ham radio is an ideal pastime for those with physical impairments. It allows the disabled to have unlimited contact with the outside world—without leaving their homes! It is their eyes and ears! For many it is their *only* recreation. Amateur radio permits them to be on an even footing with everyone else in the hobby and provides an immediate means of summoning help in an emergency. Most handicapped amateurs will tell you that life would be dull indeed without ham radio!

Amateurs with handicaps must be tested just like everyone else. No waivers of the licensing rules are allowed and no operator qualification requirements are lowered. That's the way the handicapped want it! As a group, they objected some years ago when the FCC looked into the possibility of reducing licensing requirements for the disabled. One of the main reasons given for a "no code" class of license was that it would make amateur radio more readily available to the handicapped. The disabled simply don't want to be treated differently from the rest of us. It does, however, present some testing problems that must be dealt with now that all amateur radio operator examinations are conducted by volunteers.

While requirements for the various licenses cannot be lowered, the rules do authorize VE's to make special arrangements for testing of the handicapped. The instructions that the FCC issues to the various VEC's *require* VE's to take into account the particular physical disability a person has by permitting that person "to demonstrate the requisite qualifications in ways that accommodate the disability .... No qualified person should fail an examination solely because of a handicap," the FCC testing guidelines read.

The steps that must be taken to ensure that handicapped applicants are qualified to hold a particular class of amateur radio operator license are pretty much left to the volunteer testing team. For example, VE's may elect to eliminate questions that involve circuit diagrams when testing a blind applicant or change the question so that a discussion-format answer will suffice.

Persons with a hearing impairment may use transducers such as a vibrating surface or a flashing light when taking a code exam. A special Morse code test tape that accommodates the applicant's hearing range may also be used. The use of automated equipment to send or receive telegraphy is, of course, not allowed.

If hand coordination is difficult for writing purposes, the candidate may dictate the answers to one of the VE's to write down. The responsibility for all answers in a written amateur radio operator test lies with the volunteer examiner—not the Volunteer Examiner Coordinator. A VE can legally administer the questions selected by any VEC and allow the answers to be in keeping with the candidate's disability.

A volunteer examiner may read the questions to a blind candidate and record his answers. Written examinations in braille are allowed, but may be unavailable from the VEC. Any needed special equipment must be provided by the handicapped applicant. There is no requirement that the volunteer examining team provide it.

Where a candidate's physical disabilities require a special procedure, such as the use of a transcriber or sign-language reader who is not one of the administering VE's, a statement—preferably from a doctor—must be attached to the FCC Form 610 application by the VE team and forwarded to the VEC office. This statement must outline why the special procedure is needed. The VEC is required to make that statement a part of his test session records.

The main point to remember when testing handicapped applicants is that the knowledge and skills needed to qualify for an amateur license are exactly the same for everyone and no qualified person should fail an examination solely because of a handicap.

It takes three accredited volunteer examiners to conduct tests—even for a single handicapped applicant. The required "Public Notice" must still be given *even if the test session is not open to the public*. This notification can be in any form, including a short announcement on your local repeater.

P.O. Box 10101, Dallas, TX 75207

From The Mailbag

. . . a roundup of general-interest questions that have been submitted to us

Who is eligible—and who isn't—to be a U.S. licensed amateur radio operator? Just about anyone can become an American ham operator, including aliens as long as they are not a representative of a foreign government. Aliens who are already licensed by their country as amateur radio operators and whose government has entered into a bilateral reciprocal licensing arrangement with the United States are issued a U.S. license without further testing. Amateurs operating under reciprocal licenses hold comparable privileges in the U.S. An exception occurs when a particular frequency band is not available to an alien amateur in his or her home country. Amateurs operating under U.S. reciprocal licenses cannot operate on spectrum used by U.S. amateurs if that spectrum is not available to them in their own country.

Just what is "incentive licensing"? Incentive licensing is a method adopted in the late 1960s of strengthening the Amateur Radio Service by motivating its operators to learn more about electronics and the radio art. It is a system that allows additional privileges when an amateur upgrades to a higher level license class.

I know what ham and CB radio is. Just what is GMRS? The *General Mobile Radio Service* has had a long and interesting history. GMRS is really the old Class "A" Citizen's Band Service. The FCC allocated 460–470 MHz to a 50 channel UHF personal radio service back in 1947. It was the initial Citizens Band. The *trans*fer re*sistor* (*transistor*, as it later became known) was not yet invented, and the cost of UHF transceivers proved too high for the mass market. Noting this, the FCC reallocated some of the 460 MHz band to business interests.

What remains to this day are eight paired personal radio channels. GMRS repeaters are authorized and the service has emerged as sort of a hybrid amateur, business, and personal radio service. Some call it FM CB. The FCC still feels that their original concept of unrestricted short-range communication has merit and now, some 40 years later, has plans to make this spectrum available to the public as an unlicensed *Consumer Radio Service*. The Commission has a public inquiry out on the issue now.

What is the easiest and fastest way to learn the code? A very common question. Most of my mail indicates that *CQ* readers consider the code a necessary evil that they want to get out of the way as quickly as possible so they can go on to some of the more interesting and efficient methods of

communication. One could write a book on the subject, and many have. Some quick do's and don'ts come to mind. Morse code communication is interpreted by ear, not visually. Forget those dot/dash charts completely. Get a good beginning code tape that teaches sound patterns.

I recommend those by Gordon West, WB6NOA. Once you have the sound patterns down, practice listening to transmissions at progressively faster speeds. If you intend to eventually upgrade to Extra class, then listen to practice tapes that transmit at faster character speeds, but with a longer space in between. This helps to eliminate the "plateau" that can develop as both *character* and *space* speeds are increased. Again, Gordon West's tapes are excellent! I am sure that there are others. Getting from zero to five words per minute—the entry level requirement—can take a few days or a few weeks.

Why are amateur radio operators called "hams"? No one knows for sure, but there are several theories. One of the most popular theories is that the letters HAM were derived from the last-name initials of three Boston-area amateurs around 1910. Another version is that they were the initials of an early amateur who used them as his callsign before call letters were authorized by the Radio Act of 1927. Then there is the story that British amateurs called themselves "am's," which Americans pronounced "hams."

The most believable version, however, is that early vaudevillians, minstrels, and semiprofessional entertainers were known as "hams." Amateurs broadcasting music (which was legal during the 1920s) could well have been the beginning of the ham radio operator.

My application appears to have been lost. What do I do? Lost applications do happen, but fortunately not very often. We suggest that you first contact a member of the VE team to be sure that you did indeed upgrade and to determine if others tested with you have received their licenses. Don't do this until at least two months after the examination session. The VEC will have a record of whether or not your application was forwarded to the FCC in Gettysburg, PA. The FCC has a set procedure for handling lost FCC Form 610 applications.

If the application was lost before it reached the VEC, the applicant must present another application to the VE's who originally administered the examination. The VE's again complete their portion of the application, and the application is forwarded to the VEC in the usual manner with an explanatory note.

If the application is lost after it reaches the VEC, the applicant must present the application to the VEC who coordinated the examination session. The VEC then forwards the application to Gettysburg with an explanatory letter. Any application mailed to the FCC that is not received within 90 days is considered lost and another must be prepared.

While time consuming, you need not be worried about a lost application. Both the VE team and the VEC are required to retain all pass/fail records, and it is merely a case of reconstructing the application. Every candidate who upgrades is given a Certificate of Successful Completion that allows temporary operation for up to a year until the new upgrade license is received.

Can I take a Novice test only at a VE test session for other license classes? Yes. The Novice volunteer testing program is an older program and only requires one General class or higher level VE. Technician through Extra class testing requires three examiners. Since successful completion of the Novice written (Element 2) examination is a prerequisite for higher class examinations, all VE sessions are prepared to administer it. No requirement exists that says you must take higher class or code examinations, and there is no cost to be administered a Novice examination unless you apply for a higher class examination.

From where do I get an FCC Form 610 application? Most VE's and VEC's have these available, or you can obtain one from your local FCC field office. FCC Consumer Assistance (telephone 717-337-1212) also will be glad to mail you one. They can also be mail-ordered from the FCC General Radio Branch, P.O. Box 1020, Gettysburg, PA 17325. If you have a Form 610 on hand, be certain that it is the June 1984 or the July 1985 issue since earlier versions are not suitable for the volunteer examination program.

I can't find my license. Can't the VE's verify my status from the Callbook? No. The rules require that a copy of your current license be appended to the reverse side of your FCC Form 610 before it is forwarded by the VEC to Gettysburg. Some VEC's (our program included) will allow you to be tested and then hold your application pending receipt of your most recent upgrade license (should you not have it yet) or until you are able to get a duplicate license from the FCC. A telephone call to FCC Consumer Assistance will get you a form letter license copy mailed out the same day.

Is there a shortage of amateur testing opportunities? Not really. We accredit Extra class amateurs (18 years of age and up) as volunteer examiners, and three VE's can hold a Technician through Extra class testing session *immediately*. To become a VE the rules require that your amateur radio record be clean—that is, no past record of suspended or revoked licenses. VE's also cannot be *directly* connected with the amateur license preparation or equipment business. The key word is *directly*. For example, working for a different division of a company that makes ham radio gear—or something of that sort—normally won't preclude you from being a volunteer examiner. Any possible conflicts should be brought to the attention of the VEC, who will make a decision regarding your VE eligibility. If you would like to help the ham ranks grow, write to us for a VE application (W5YI-VEC, P.O. Box 10101, Dallas, Texas 75207)!

See you next month, De W5YI—73

VHF

a monthly feature by
STEVE KATZ, WB2WIK

PRINCIPLES, PRACTICES, AND PROJECTS FOR THE VHFER

Power Measurement At VHF

I've been asked, "How much power is enough for VHF work?" Hmmm. How high is up?

There's no simple answer to such a question, since so many factors affect total station performance. Some of these variables have been addressed in previous columns, and we intend to continue these discussions as long as readers show interest in the topic. For now, let's spend a moment discussing the practical measurement of RF power in the VHF/UHF spectrum.

Probably the most accurate measurement of substantial (transmit level) RF power can be made using resistive absorption. It isn't terribly difficult to build a "dummy" load which offers precisely the desired terminating resistance with essentially zero phase-angle between current and voltage. This is, as we all should have learned to pass our amateur exams, the "perfect" load, assuming its resistance is matched to the impedance of the transmission line to which it is attached. One-hundred percent of the power applied to such a load will be dissipated therein, and all of that power will be converted to heat. The load is an efficient thermal converter to which a temperature measuring device may be attached for true RMS power measurement. By "true RMS" (root mean squared) power, I mean to imply that the power will be measured without regard to its RF waveform; thus, harmonics, spurii, etc., will all be included in the total power measurement.

A suitable converter of heat to electrical energy is a simple thermocouple, which produces a voltage proportional to the RF current in its heater. Since commercially available thermal converters which include a heating element and thermocouple encased in an evacuated envelope are both costly and fragile, amateurs are best off using small-mass thermistors (negative-coefficient resistors) or bolometers (positive-coefficient resistors) which are thermally, but not electrically, bonded to a suitable dissipative load. A measurement of the change in resistance of such a device will yield a highly accurate means of measuring true RF power in the load, and the initial calibration measurements may be made at DC (applied to the load), where accurate instrumentation is readily available.

24 Louis Dr., Budd Lake, NJ 07828

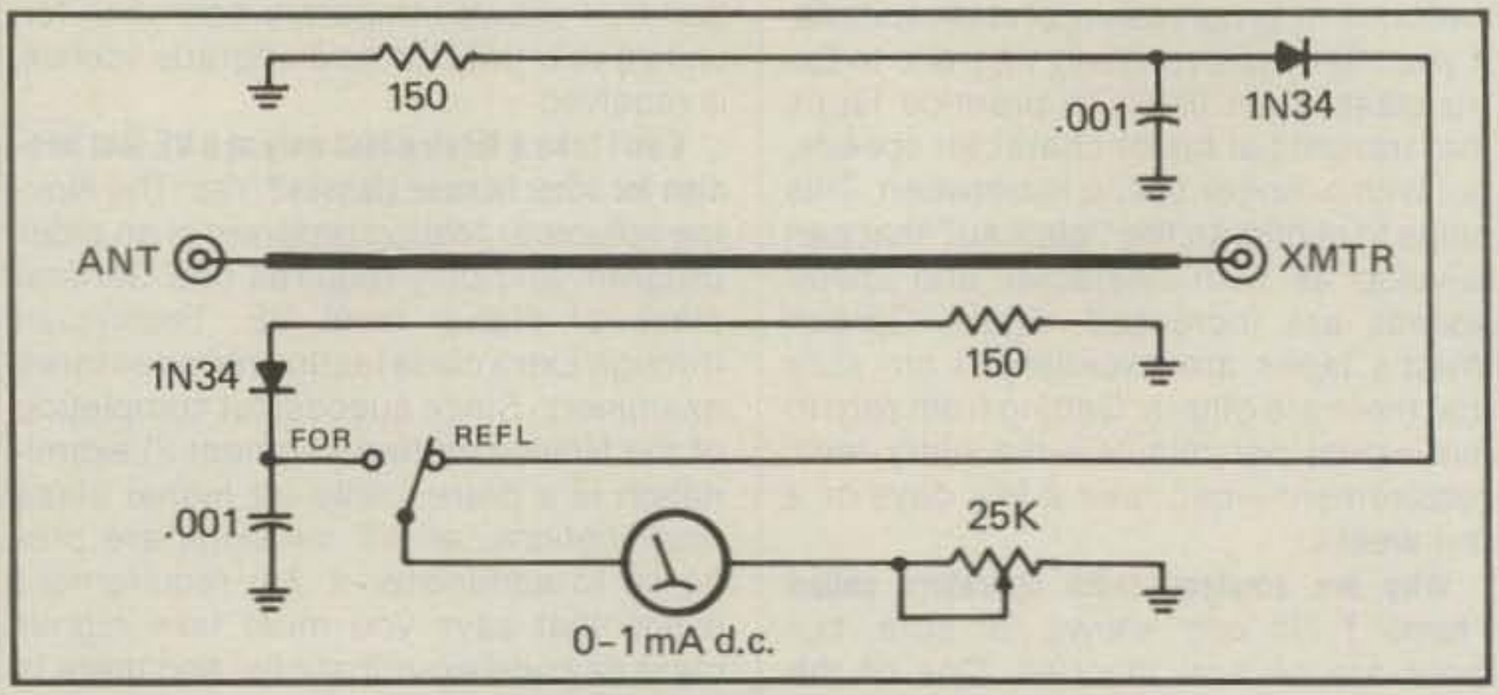


Fig. 1– Typical "Monimatch" SWR bridge circuit.

Why then aren't we all running around measuring our power with dummy loads and thermistors? Surely this is an inexpensive and accurate means of measuring RF power through the UHF spectrum, but it isn't very practical for checking line-to-load matching or tuning our transmitters while connected to our station antennas. For these more practical day-to-day functions we require some means of monitoring power in our transmission line. I use the word "monitor," rather than "measure," because any in-line device which dissipates no power of its own really isn't measuring power *per se*; it is measuring coupled currents from the transmission line to derive a relative power indication. This indication can be quite accurate, especially over a narrow frequency bandwidth, if proper consideration is given to the coupler design—and if the signal monitored is steady-state (continuous wave) and free of waveform distortion.

Probably the most famous in-line RF wattmeters are made by Bird Electronic Corporation, beginning with their ubiquitous model 43. The Bird 43 is the popular THRULINE® directional wattmeter which has undergone very few design changes in the past quarter century. Why change it? It works well. Anyone who has purchased a new model 43 instrument has read the "Theory of Operation" described in the Bird instruction book (Section 2). For those who haven't, the unit's operation can be summarized by the following text, taken directly from the Bird manual, page 2-1:

"Energy will be produced in the coupling circuit of the Element by both mutual inductance and capacitance from the traveling RF waves of the line section. The inductive currents will, of course, flow according to the direction of the travelling waves producing them. The capacitive portion of these currents is naturally independent of the direction of the travelling waves. Therefore, assuming that the Plug-in Element remains stationary, it is apparent that the coupling current produced from the waves of one direction will add in phase, and those produced from waves of the opposite direction will accordingly subtract in phase. The additive or 'ARROW' direction is, of course, assigned to the forward wave . . . It may be said that the THRULINE® doesn't know, doesn't care, and doesn't need to care where it is along a standing wave."

This may all be as obvious as the writer expresses it to be, but I'll bet the majority of us really haven't the foggiest idea what that text says. The important thing is, each THRULINE® "slug" ("Plug-In Element") is designed to produce >30 dB directivity, making it rather insensitive to the reverse direction wave when making forward power measurements; *i.e.*, under most practical conditions, the meter will accurately indicate forward power in a transmission line.

To accomplish this, Bird (and others, as will be discussed later) had to limit the frequency bandwidth of each element, according to the degree of coupling required to obtain the desired full-scale sensitivity. For example, a 10 watt (full-scale) element may only achieve an operating bandwidth of one octave (2:1 frequency ratio), while a 1000 watt (full-scale) element might achieve an operating bandwidth of more than a decade (10:1 frequency ratio). This

is because the 10 watt element provides very tight coupling to the line section, while the 1000 watt element is more loosely coupled and thus broader in response.

The Bird 43 and similar units use a variety of elements to cover the amateur radio spectrum and power ranges. Bird Electronics' "Standard Elements" include 47 different products, priced at about $50 each, to cover 2–1000 MHz with full-scale sensitivities of 5–5000 watts. Actually, a total of 60 elements would be required to cover all those possibilities, and 13 of these elements are non-standard (higher priced). So, for about $3650, plus the price of the meter itself (about $170), you can set yourself up to cover most all bases. Since this is more money than many of us have invested in amateur radio, buying a Bird with 60 "slugs" may not be practical.

Still, the THRULINE®-type wattmeter is the most economical approach to reasonably accurate transmit power measurement, especially at VHF/UHF. Why? Because its RF coupler is absolutely lossless to 1 GHz, and it will handle the amateur legal power limit without creating operational difficulties.

Let's look for a moment at the popular "Monimatch" coupler circuit used in the majority of broadband, inexpensive SWR bridges. It is this circuit, or a variation of it, that is found in most all the low-cost "wattmeters" intended for amateur applications. The center line simply conducts RF from one port to the other, while two pickup loops placed adjacent and parallel to the center line create RF current flow through each detector diode. If the center conductor and the case which surrounds it are properly dimensioned, it can appear to be a continuation of the coaxial transmission line in which it is installed; however, this becomes increasingly difficult at higher frequencies, where precision machining is a real necessity.

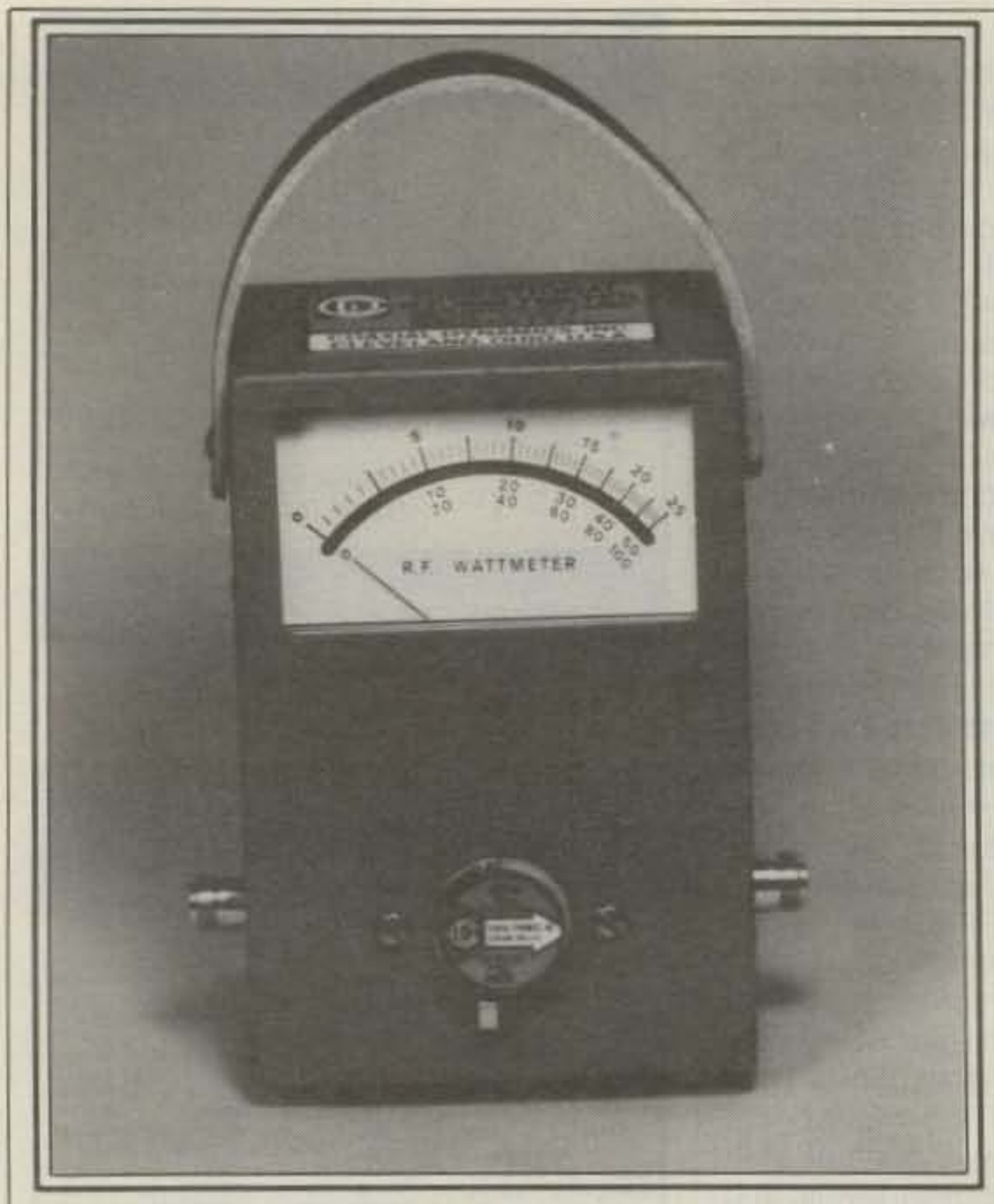
Even if the coupler is built as a precision coaxial line section, the "Monimatch" design suffers numerous drawbacks. The detector response will be an inverse function of wavelength, becoming increasingly sensitive at higher frequencies until the switching losses in the diodes become significant (*usually above 1 GHz*), at which point the apparent sensitivity will begin to reverse. In the popular amateur radio spectrum, the typical "Monimatch" detector will increase in sensitivity at about a 6 dB/octive rate, meaning recalibration will be required for each VHF amateur band. Also, since two different pickup loops, detectors, and terminating resistors are used for forward and reflected measurements, the likelihood of all this being matched well enough to make for meaningful VSWR measurement is quite poor.

In the more sophisticated amateur "wattmeter" products, frequency-compensating components are used to create a more broadband detector response, eliminating to some extent the need for recalibrating on each band. However, these methods usually involve direct connection to the RF line section—a hazardous and nearly always lossy approach, especially at UHF. Also, it is impossible to achieve an "optimum" degree of coupling for the intended power level when the designer doesn't know what power you intend to run. As a result, most of the amateur "wattmeter" products are tightly coupled to permit power monitoring at very low full-scale levels (2–20 watts), with resistors switched in series with the detector/meter circuit to permit higher power "measurement." With such closely coupled detectors there is always the possibility of RF harmonic generation at higher power levels (diodes are splendid frequency multipliers), or overheating the diodes (creating drifting meter indications and possible detector burn-out).

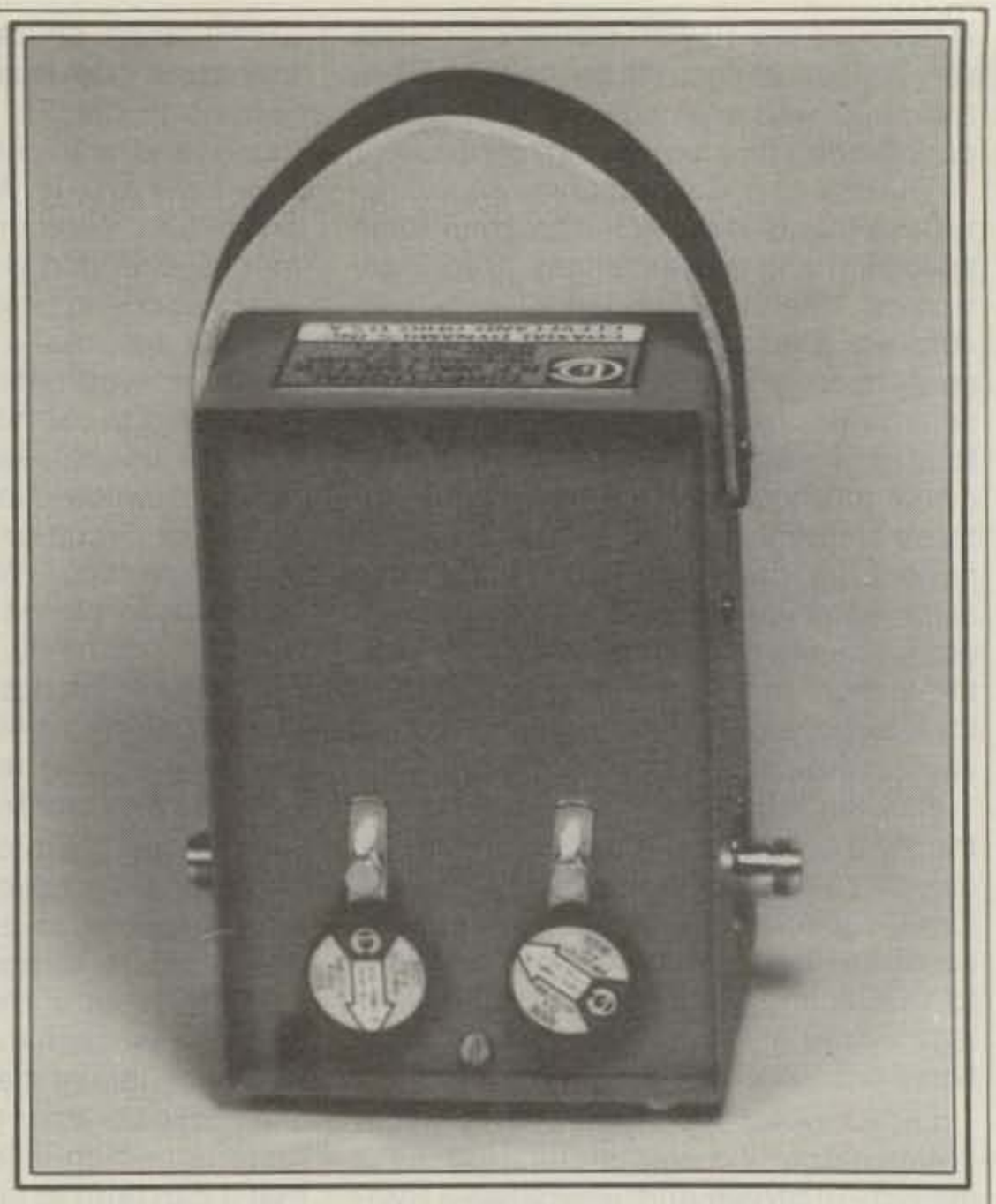
Some of the broadband, multirange "wattmeter" products I've seen use a microstrip (printed circuit) RF coupler, a good way to control design dimensions. Unfortunately, most of the microstrip coupler circuits I've seen in amateur equipment have a couple of major drawbacks: They use epoxy-fibreglas ("G10") circuit board material, which is lossy enough at VHF that it can burn at high power levels; and there is a lack of consideration given to making the printed circuit line a true 50 ohm transmission line. One needn't be a genius to do these things correctly, but if proper controls and methods are ignored, the results can be disastrous.

I have not yet seen a multiband, multirange amateur "wattmeter" which performed to its published specifications. There may be one out there, but it hasn't crossed my bench. Yet there is at least one manufacturer who has done an excellent job in the design and construction of a multiband, multirange VHF/UHF-only instrument: this is the EME model 140-1400, which covers the 144, 432, and 1296 MHz bands in four full-scale power ranges (e.g., 5-50-500-2000 watts on 144 MHz). There is no magic in the EME coupler. It is just built very well, with careful attention to maintaining a 50 ohm coupler impedance, and uses microwave detectors (hot-carrier diodes) coupled to the line section the usual "Monimatch" way. The band and power-range switches simply insert appropriate precision resistors in series with the meter circuit to permit factory calibration within a stated 10% accuracy. While the EME 140-1400 isn't perfect, it is a darned sight better than the typical multirange product and can be used in a 1.2 GHz transmission line without introducing measurable losses.

So what have we? We can measure dissipated power in a resistive load with the greatest precision, but this tells us nothing about our antennas or transmitter tuning to them. We can use "THRULINE" instruments to monitor power in our transmission lines with reasonable accuracy



The Coaxial Dynamics model 81000-A RF power meter is a "Bird clone" which offers a larger meter face and robust leather carrying strap. It can use Bird accessories (slugs, quick-change connectors), too.



The 81000-A from the rear. While the Bird 43 stores spare elements in side cutouts, the Coaxial Dynamics unit stores them in the rear panel, which is removable to allow remote operation of the line section.

(± 5%), but this approach requires a selection of detector elements for the frequency and power ranges we intend to use. We can use "Monimatch" SWR bridges as relative power indicators, but must bear in mind that many of the commercially manufactured products leave much to be desired. Or, we can use special-purpose variations of the "Monimatch" design in hopes for enhanced accuracy and performance.

This leads to my review of two products of interest to VHFers: the Coaxial Dynamics model 81000-A directional RF wattmeter, and the EME model 140-1400 three-band VHF/UHF directional power monitor. Since the Bird 43 is omnipresent in the amateur community, it hardly needs an introduction.

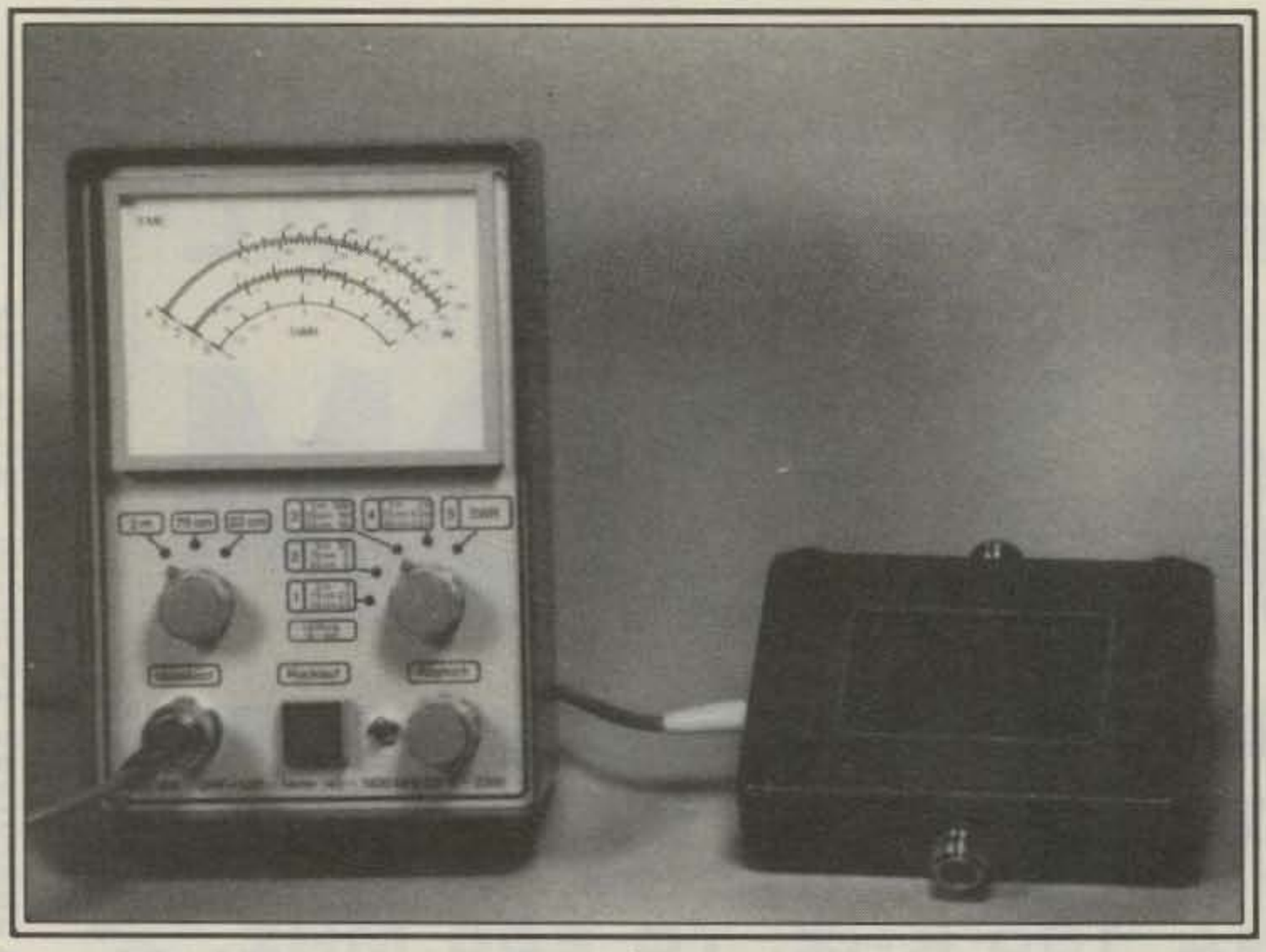
The Coaxial Dynamics 81000-A is what I call a "Bird clone." Somewhat larger than the Bird 43, it is intended for precisely the same function and even uses plug-in elements which are interchangeable with Bird products. The 81000-A and 43 use identical circuitry, with a single diode detector located in each plug-in element driving a 30 uA (full-scale) meter. The meter, with its 30 uA sensitivity, is part of the "secret" to the overall performance of these products. The detector can be very loosely coupled to the RF line, yet still generate sufficient voltage to full-scale the meter with only 5 watts of RF power conducted through the line section. A 1 mA meter, 33 times less sensitive, would require much tighter detector coupling and have resultant operational problems.

The 81000-A meter is larger than the 43's and somewhat more readable from a distance; it also has a mirrored scale which nearly eliminates parallax error. How important this is with a 5% instrument is something of a subject for argument, but the mirrored scale is attractive. The 81000-A, like the Bird 43, has a well-damped meter movement which serves to protect the needle while frustrating the user! The meter takes some time to move upscale (and back downscale), making the instrument inappropriate for PEP measurements; CW key-down, AM carrier, and FM measurements are easily made. No meter movement, no matter how responsive, is capable of following voice peaks for PEP measurement. This is best left to an electronic peak detector circuit, easily added to most meters and available as an option from both Coaxial Dynamics and Bird.

Coaxial Dynamics' product, like Bird's, allows the installation of a single plug-in element in the line section, plus storage of two more elements in the case. The element is easily installed and removed in the line section, and must be rotated in its socket 180 degrees for measurement of forward and reflected power. An arrow printed on the front of each element indicates the "direction" of the power to be measured. The 81000-A, also like the 43, has "quick-change" field-replaceable coaxial connectors mounted to the line section housing. Standard fittings are "UHF" female (similar to SO-239), but nearly all popular coaxial fittings are available as options. The connectors are very high-quality nickel-plated copper with teflon dielectric material, suitable for use at 5000 watts throughout the HF-VHF region. All connectors mount with four screws and may be changed in the field in a matter of minutes.

Since the 81000-A's case is practically bulletproof, it is unlikely that damage to the case would ever occur. The meter, however, could be damaged by severe shock or unusual environmental stress; for this reason, it is field-replaceable, sold as P/N C-43649-1. The plug-in elements are very rugged and are more likely to be lost than broken. (These "slugs" are small, and their cylindrical shape allows them to roll—maybe down the side of a mountain during a field operation!) The elements can be damaged, however, by the application of considerably more power than their full-scale ratings. The high-powered elements (500 watts–5000 watts) are not easily burned out.

The 81000-A's line section can be removed from the main wattmeter housing for remote installation. Such action re-



The EME 140-1400 MHz RF power meter. The rugged, die-cast RF coupler housing is to the right. Despite the meter's five scales, three-position bandswitch, five-position power range switch, and other controls, it is very easy to use and works remarkably well for a multiband, multirange unit.

quires removing 12 screws, removing the line section from the case, then replacing 8 screws—not done in a few seconds. As such, I usually remove the RF coupler (line section) from every "THRULINE" type instrument I buy the moment I bring it home, and I leave the coupler outside the meter case from that point forward. The factory-supplied coaxial cable which interconnects the line section and the meter is less than 3 feet long; however, this may be made nearly any length, as it carries only 30 uA DC maximum (no RF is conducted through this cable).

Coaxial Dynamics has produced a nice 17-page instruction manual which is a bit more readable than Bird's and includes similar information such as "Determining Load Power," "Determining VSWR," "Testing Lines, Connectors, Filters, and Related Components," "Impedance Mismatch Components," and the like. There are two VSWR nomographs included with the 81000-A, one for low values of VSWR and another for high values, and these are easily used.

Although I checked the accuracy of the 81000-A against a Bird standard, this is a bit like using a 10% multimeter to check a 10% resistor. It would be difficult to say for sure which—if either—is correct. The 81000-A and Bird 43 correlated almost perfectly across several amateur bands using plug-in elements made by both Coaxial Dynamics and Bird. Using an intentionally mismatched line, I checked to see if both the 43 and the 81000-A offered similar reverse power readings. They did, within 5%, at both 144 and 432 MHz.

Having owned several Bird meters for years, I am familiar with how well these instruments perform under a variety of conditions—hot and cold, dry and damp. Not having several years to spend evaluating the Coaxial Dynamics unit, I decided to perform some accelerated environmental tests on the unit I had (serial number 1471) by placing it first in a freezer at approximately zero degrees Fahrenheit, then in an oven at +120 degrees F, with a 10-minute transition period and 10 minutes of storage time at each extreme. The unit came through with flying colors. The meter would fog up when removed from the freezer (water vapor condensation, a natural effect), but would quickly unfog in the oven. I performed a mild "drop test" on the 81000-A, allowing the unit to fall (bottom-down) on a hard surface from a height of 3 inches. This simulates the rough handling my Bird units must often face at repeater sites! The 81000-A pulled through in good shape, with slight meter re-zeroing required.

In all, I'm pleased with the 81000-A. It is a bit bulkier to carry than the Bird 43, but performs about as well. Only time—and lots of field use—will tell if the Coaxial Dynamics product is as tough as the Bird 43, but I'm satisfied that the 81000-A is built well enough for amateur use. It is priced a bit below the new list price for a Bird 43, so if you're in the market for a factory-fresh unit, you might consider giving the Coaxual Dynamics 81000-A a try. This product is carried by franchised distributors. The factory can provide you with the name and location of a dealer nearest to you. Contact Coaxial Dynamics, Inc., 15210 Industrial Parkway, Cleveland, OH 44135.

Now, what about the EME model 140-1400? I've been using one for more that four months and am quite impressed. The 140-1400 is not as versatile as a Bird 43 or Coaxial Dynamics 81000-A, but it does work very well, and when you consider the total cost of the other wattmeters (with plug-in elements), it costs less. One thing that immediately impressed me about the EME unit is its remote coupler. It is very well put together, comes only with type-N receptacles, and is so well shielded that I successfully installed it in series with my repeater's duplexer output (antenna line) without creating all kinds of desense problems, as had been the case with every other "amateur" power-measuring product tried in this application. In fact, the 140-1400 has been installed at my repeater site (146.805 MHz) since December, through subzero and scorching hot weather (by the time you read this, it will be) with no problems.

The EME power meter uses separate panel switches (on the meter case, not the coupler) to select frequency band, full-scale power, and an "SWR" function. In the "SWR" mode there is a full-scale "set" adjustment with three sensitivity

ranges of its own; the "set" adjustment is a precision multi-turn potentiometer which allows for very precise setting at the full-scale mark. To read VSWR, the red button (bottom center of front panel) is depressed and held. This button is labeled "Rucklauf," of course; presumably, this means "reflected" in German. The remote RF coupler connects to the meter via a 3 foot long cable and very rugged multi-pin connector which plugs into the "Messkopf" socket. And, of course, the SWR full-scale "set" control is the "Abgleich." What do you want? This is a German instrument.

Despite my nonexistent ability to read German, I had no trouble figuring out how to use the EME meter. The band and power-level switches are labeled numerically in "cm" (for band) and watts, so it doesn't take long to get it all right. Checking the EME 140-1400 against a Bird 43 standard, I found the unit to read about 32% high at 144 MHz; ironically, it was more accurate at 120 MHz than at 144, showing 8% accuracy at the lower frequency. The other bands showed a similar trend. Using continuously variable-frequency power generating equipment at the local Hewlett Packard laboratory, I "swept" above and below the 2 meter band to check the detector's response. As I expected, the detector rises about 6 dB/octave (like any "Monimatch" circuit is wont to do) as the frequency is increased.

Applying exactly 25 watts RF power through the EME's coupler (as measured on a Bird 43 using a 100–250 MHz 25 watt element) terminated in a microwave resistive load, I obtained the following power readings:

Frequency	Indicated Power
115 MHz	23 watts
120 MHz	27 watts
125 MHz	30 watts
130 MHz	31 watts
135 MHz	32 watts
140 MHz	32 watts
145 MHz	33 watts
150 MHz	36 watts
155 MHz	38 watts
160 MHz	40 watts
165 MHz	43 watts
170 MHz	46 watts

This isn't as bad as it may first appear. While the meter wasn't terribly accurate at 144 MHz (its rated frequency of operation), it could be set up to be as accurate as you'd like. There are adjustable trimmer resistors for each band and power range, and it seems as though the factory didn't take the time to calibrate this particular unit properly—or perhaps it was originally set right, but was "bumped" out of calibration in shipment. In any case, it would take no more than a few minutes to properly calibrate each range against a known standard.

The good news is, the RF coupler is essentially lossless and is an excellent 50 ohm line section through 1.2 GHz. This means, of course, that the EME 140-1400 is a product that can be left "in-line" continuously without fear of its absorbing power or creating any mismatch of its own. Assuming future instruments will come through properly calibrated, I'd recommend the unit to anyone desirous of owning high-quality power monitoring equipment for 2 meters, 70 cm, and 23 cm. The EME 14-1400 MHz instrument is rated at 2000 watts maximum at 144 MHz, and 200 watts maximum at 432 and 1296 MHz. I did not attempt to put these maximum rated power levels through the coupler, but have been using the test unit at the 250 watt level on 2 meters for months with no evidence of drift or reliability problems.

The EME 140-1400 RF power meter and other products from EME are available from The "PX" Shack, 52 Stonewyck Dr., Belle Mead, NJ 08502.

Dayton

This was written just days after the Dayton Hamvention, and I'm still recovering. The gorgeous weather produced record-breaking crowds, and there were bargains a-plenty at the enormous flea-market. I picked up an unused Bird 6-position coaxial switch (these are great to 2.3 GHz) for $50, and a Bird 500 watt oil-cooled coaxial (resistive) termination for only $90; these prices represent a fraction of the value of these excellent products. I saw John Ittel, RF Product Manager for Coaxial Dynamics, Inc., at their indoor booth and let him know about the product review in this month's column. He was glad I liked the wattmeter. Had a chance to speak with Everett Gracey, President of Alinco Electronics, at his booth. Alinco has a new 220 MHz solid-state linear amplifier, so Mirage is no longer alone in this field, and they have two brand-new, higher-powered amps for 144 and 432 MHz. These products are so new that the display models were the only ones in the U.S. at that time. By now they should be available for sale. Reviews of these new amps are planned for this column.

I spent a lot of time at The "PX" Shack's booths, where two VIP's from Microwave Modules Ltd. (Liverpool, England) and Hans Peters, VE3CRU, proprietor of Transverters Unlimited (Toronto) joined Ivars Lauzums, KC2PX, and his lovely wife, Mara, for the three-day ham festivities. Standing behind the counter at the booth, I had the opportunity to meet hundreds of VHFers from around the country (and the world), and I heard some of the funniest remarks about VHF technology. One fellow insisted that BNC connectors have losses at 70 cm. (Balderdash!) I've measured thousands at 3 GHz and the losses are < 0.1 dB at that frequency.) Another claimed he has a 28 MHz receiver that "doesn't overload" (must have a 4CX1000A front end). It's great hearing some of these stories, and I thoroughly enjoy swapping stories with other VHFers.

Unfortunately, there was no official VHF/UHF Forum at the Arena this year. I heard that the fellows who had been organizing the forum were spending their own pocket money to do so, and there weren't many volunteers to run the show this year. K9XI and a few others organized an impromptu Saturday evening forum at one of the local hotels, and I would have loved to attend this session, but we had a prior dinner commitment with a small group (of about 20) at a downtown restaurant. I hope there is a formal VHF/UHF Forum in '87—complete with antenna range, noise-figure measuring competition, etc.—and if there is, I'll sure plan to attend.

There was a lot of interest in the 1986 *CQ* World-Wide VHF WPX Contest, scheduled for the 19th–20th of this month. Dozens of folks stopped by the *CQ* booths to ask about the results of the '85 contest, which have by now been published. By this time all certificates and trophies should be in the hands of their rightful winners. *Please* make an effort to get on for the '86 contest this month! There's no reason not to.

Coming

Next month we'll have more reader correspondence (some of it is very enlightening), a review of the SSB Electronic DX220 GaAsFET preamp for 135 cm, and all kinds of good stuff. Don't miss it!

73, Steve, WB2WIK

Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

The Royal Observatory of Belgium reports a monthly mean sunspot number of 15.7 for March 1986. This results in a smoothed sunspot number of 17 centered on September 1985. A smoothed sunspot number of 8 is forecast for July 1986, as the present sunspot cycle very slowly inches towards a minimum value. The highest sunspot count recorded during March was 38 on the 7th. The sun's surface was completely devoid of spots on March 14, 16–19, and 31.

The median value of 10.7 cm (2,800 MHz) solar noise flux observed during March was 77.0 as reported by the solar observatory at Ottawa, Canada.

Geomagnetic Storm of February 8-9

While intense geomagnetic storms seldom occur during the last months of a solar cycle, one did take place during February 8–9, 1986. This was the most intense and widespread storm to occur since 1960. The storm caused long periods of total blackout conditions on the HF bands. On the other hand, very widespread auroral activity associated with the storm produced unusual VHF ionospheric openings. For a vivid description of the storm's development and progress, and the unusual propagation which resulted on the VHF bands, see Steve Katz, WB2WIK's VHF column in the May issue of *CQ*, page 52.

July Propagation

With longer hours of daylight and the sun high in the northern sky, HF propagation conditions should be considerably more stable during July than they were during the radiostorm ridden spring months.

Twenty meters should continue to be the best band for DX propagation during the month. When conditions are at least Low Normal the band is expected to remain open to one area of the world or another from sunrise through the early evening. Peak conditions are expected for a few hours after local sunrise, and again during the late afternoon and early evening, when the band should open in almost all directions. When conditions are at least Low Normal, expect *20* meter openings towards South America, the South Pacific and Oceania until as late as midnight. When conditions are High Normal or better, the band should also remain open to most other areas of the world until as late as midnight.

Considerably fewer DX openings are expected on *15* meters and very few on *10* meters during July. This decline results from a combination of changing seasonal conditions and the present period of very low sunspot activity. When conditions are at least Low Normal, *15* should occasionally open towards the south. Look for some short-skip openings into the Caribbean area and Central America as early as 10 a.m., with a peak expected to all areas of Latin America between 3 and 5 p.m., local daylight time. When conditions are High Normal or better, the band may also open to Africa during the late afternoon from the eastern half of the country, and to Australasia and the South Pacific area during the late afternoon and early evening from the western half of the country.

Don't expect much DX on *10* meters during July, but some short-skip openings should be possible from time to time towards the Caribbean and possibly Central America as a result of sporadic-E ionization. When conditions are High Normal or better, an occasional opening deeper into South America may be possible, especially during the afternoon hours.

During the hours of darkness *40* meters should open to many areas of the world, but seasonally high static levels may at times make DX reception difficult. Higher static levels are also expected to hinder DX on *80* meters, but the band should open to some areas of the world during the hours of darkness. Not many DX openings are expected on *160* meters during July because of higher static levels and the increased hours of daylight. Best bet for *40*, *80*, and *160* meter DX openings is an hour or two *before* midnight for openings towards the north and

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for July 1986

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 5, 12, 31	A	A	B	C
High Normal: 2, 6, 8, 11, 18, 23-24, 30	A	B	C	C-D
Low Normal: 3-4, 7, 9-10, 13, 15-17, 21-22, 25-26, 29	A-B	B-C	C-D	D-E
Below Normal: 1, 14, 19-20, 27	B-C	C-D	D-E	E
Disturbed: 28	C-E	D-E	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 S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from 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 band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be fair-to-poor (C-D) on July 1st, good (B) on the 2nd, fair-to-good (B-C) on the 3rd and 4th, excellent (A) on the 5th, etc.

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular Meter band (10 through 160 Meters), as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 40 Meters) for a particular geographical region of the continental USA, as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. 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) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " 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.

3. 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. On the Short-Skip Chart appropriate *daylight* time is used at the *path midpoint*. For example, on a circuit between Maine and Florida, the time shown would be EDT; on a circuit between N.Y. and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are in HST. To convert to daylight time in other USA time zones, *add* 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in CDT zone, and 6 hours in the EDT zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 P.M. in Los Angeles; 18 or 6 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA, *subtract* 7 hours in the PDT zone; 6 hours in the MDT zone; 5 hours in the CDT zone and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave 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 10db loss, it will lower by one level.

5. 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.

CQ Short-Skip Propagation Chart
July & August, 1986
Local Daylight Savings Time At Path Mid-Point

Band (Meters)	Distance Between Stations (Miles) 50-250	250-750	750-1300	1300-2300
10	Nil	08-10 (0-1) 10-14 (0-3) 14-18 (0-1) 18-22 (0-2) 22-08 (0-1)	08-10 (1) 10-14 (3) 14-18 (1-2) 18-22 (2-3) 22-08 (1)	08-10 (1-0) 10-14 (3-0) 14-18 (2-0) 18-22 (3-0) 22-08 (1-0)
15	Nil	08-10 (0-2) 10-14 (0-3) 14-18 (0-2) 18-20 (0-3) 20-22 (0-2) 22-08 (0-1)	08-10 (2) 10-14 (3) 14-18 (2) 18-20 (3) 20-22 (2) 22-00 (1-2) 00-08 (1)	08-10 (2-0) 10-14 (3-0) 14-16 (2-0) 16-18 (2-1) 18-20 (3-1) 20-21 (2-1) 21-00 (2-0) 00-08 (1-0)
20	10-00 (0-1)	07-10 (0-2) 10-16 (1-4) 16-21 (1-3) 21-00 (1-2) 00-07 (0-1)	07-10 (2) 10-16 (4) 16-19 (3) 19-21 (3-4) 21-00 (2-3) 00-07 (1-2)	07-10 (2) 10-16 (4-2) 16-19 (3) 19-21 (4) 21-23 (3-2) 23-00 (3-1) 00-05 (2-0) 05-07 (2-1)
40	08-12 (1-2) 12-16 (1-4) 16-20 (2-4) 20-23 (1-2) 23-08 (0-1)	08-10 (2-3) 10-12 (2) 12-16 (4-2) 16-18 (4-3) 18-20 (4) 20-23 (2-4) 23-08 (1-3)	08-10 (3-1) 10-16 (2-0) 16-18 (3-1) 18-21 (4-3) 21-23 (4) 23-06 (3-4) 06-08 (3)	08-10 (1-0) 10-16 (0) 16-18 (1-0) 18-21 (3-2) 21-06 (4) 06-08 (3-1)
80	07-12 (3-4) 12-17 (4-3) 17-22 (4) 22-05 (3-4) 05-07 (3)	08-10 (4-1) 10-12 (4-0) 12-17 (3-0) 17-19 (4-1) 19-21 (4-2) 21-23 (4-3) 23-05 (4) 05-07 (3) 07-08 (4-2)	08-10 (1-0) 10-17 (0) 17-19 (0-1) 19-21 (2-1) 21-23 (3-2) 23-05 (4) 05-07 (3) 07-08 (2-1)	08-19 (0) 19-21 (1-0) 21-23 (2-1) 23-04 (4-3) 04-05 (4-2) 05-06 (3-1) 06-07 (3-0) 07-08 (1-0)
160	18-19 (1-0) 19-20 (1) 20-22 (3-2) 22-00 (4-3) 00-06 (4) 06-08 (3-2) 08-09 (1) 09-10 (1-0)	19-20 (1-0) 20-21 (2-0) 21-22 (2-1) 22-00 (3-2) 00-04 (4-2) 04-06 (4-3) 06-08 (2-1) 08-09 (0-1)	21-22 (1) 22-01 (2-1) 01-04 (2) 04-06 (3-2) 06-07 (1) 07-08 (1-0)	21-23 (1-0) 23-01 (1) 01-06 (2-1) 06-07 (1-0)

ALASKA
Openings Given in GMT

To:	15 Meters	20 Meters	40 Meters	80 Meters
Eastern USA	Nil	12-15 (1) 22-01 (1) 01-03 (2) 03-05 (1)	07-10 (1)	Nil
Central USA	00-03 (1)	13-16 (1) 23-01 (1) 01-04 (2) 04-05 (1)	08-12 (1)	Nil
Western USA	02-05 (1)	14-16 (1) 16-18 (2) 18-00 (1) 00-02 (2) 02-05 (3) 05-06 (2) 06-08 (1)	07-09 (1) 09-13 (2) 13-15 (1)	10-13 (1)

HAWAII
Openings Given In Hawaiian Standard Time

To:	15 Meters*	20 Meters	40 Meters	80 Meters
Eastern USA	12-14 (1) 14-15 (2) 15-16 (1)	02-05 (1) 05-07 (2) 07-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	18-20 (1) 20-00 (2) 00-02 (1)	20-21 (1) 21-23 (2) 23-01 (1)
Central USA	09-13 (1) 13-17 (2) 17-19 (1)	04-05 (1) 05-07 (3) 07-09 (2) 09-13 (1) 13-16 (2) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	18-21 (1) 21-22 (2) 22-01 (3) 01-02 (2) 02-03 (1)	20-22 (1) 22-01 (2) 01-02 (1) 21-02 (1)*
Western USA	08-09 (1) 09-11 (2) 11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1) 14-16 (1)**	04-06 (1) 06-08 (2) 08-11 (3) 11-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-21 (2) 21-23 (1)	18-19 (1) 19-20 (2) 20-22 (3) 22-02 (4) 02-04 (3) 04-05 (2) 05-06 (1)	19-20 (1) 20-22 (2) 22-02 (3) 02-03 (2) 03-04 (1) 23-03 (1)*

See explanation in "How To Use Short-Skip Charts" which appears in the box at the beginning of this column.
* Indicates best time for 160 meter openings.
** Indicates best time for 10 meter openings.
Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter distances, use the preceding Short-Skip Propagation Chart.

east, and just *before* local sunrise for openings towards the south and west.

DX Propagation Charts for July appeared in last month's column. For an assessment of day-to-day conditions expected during the month see the Last Minute Forecast which appears at the beginning of this column. This month's column contains Short-Skip Propagation Charts for July and August, as well as charts centered on Hawaii and Alaska. The Short-Skip Chart contains band predictions for one-hop openings between distances of approximately 50 and 2300 miles from your transmitting location.

Peak Sporadic-E Propagation

Optimum short-skip propagation conditions are expected during July as a result of a seasonal peak in sporadic-*E* ionization. During the daylight hours, considerable short-skip openings are forecast for *10* and *15* meters over distances ranging between approximately 400 and 1300 miles with openings occasionally extending out to beyond 2000 miles. Around-the-clock short-skip openings should be possible on most days on *20* meters, with the skip often as short as 300 miles and as long as 2300 miles. Short-skip conditions on *20* should peak during the later afternoon and early evening.

Good daytime short-skip conditions are expected on *40* meters, with openings between distances of approximately 100 and 750 miles. During the hours of darkness the skip should lengthen, with openings possible between 250 and 2300 miles. Conditions on *80* meters are also expected to be good during the daylight hours, with openings up to approximately 300 miles. During the hours of darkness good openings should be possible on this band up to the one-hop limit of 2300 miles, but the band could be quite noisy. While no short-skip openings are likely on *160* meters during the daylight hours, some should be possible up to about 1300 miles during the hours of darkness. When static levels are low, longer distant openings may also be possible.

VHF Ionospheric Openings

Intense sporadic-*E* ionization expected during July should result in numerous *6* meter openings and an occasional *2* meter opening. Fairly frequent *6* meter openings should be possible over distances ranging between approximately 600 and 1300 miles, with some openings extending out to 2000 miles, and possibly beyond. When *2* meters openings, it may be possible to work stations between 1000 and 1300 miles away. While sporadic-*E* short-skip openings can take place at just about any time of the day or night, statistics indicate that conditions should peak for a few hours before noon and again during the late afternoon and early evening. During July you can expect *6* meter sporadic-*E* openings on at least 3 out of every 4 days. Openings may last from a few minutes up to hours.

The *Delta Aquarids* meteor shower is expected to peak at about 8 p.m. EDT on July 28, with an hourly meteor count of about 20. This should make possible meteor-scatter-type openings on the VHF bands from late on July 27 through the early hours of July 29. While little, if any auroral activity is expected during July, it may pay to check the VHF bands during those days that are expected to be Below Normal or Disturbed.

73, George, W3ASK

DX

a monthly feature by
HUGH CASSIDY, WA6AUD

NEWS OF COMMUNICATIONS AROUND THE WORLD

I must go down to the shack again,
To the shack and a lonely band . . . .

It might be the time of the summer solstice and a full moon in the skies, but there are DXers yet who would give all the pleasant days of summer for a return of 10 meters. The bottom of a sunspot cycle is a hard time to bear, and a week back one of the Locals came up the hill to again ask: "When will it all end? Tell me!" He is not the only one to ask the question.

But while we heard the question, we really were not sure of an exact answer. An answer was definitely expected however, and we quickly fell back on the encyclopedic knowledge of Pat Hawker, G3VA, who will be remembered by some older DX types as a one-time contributer to *CQ*. We got right to the point—somewhat.

"Some months back," we expounded, Pat Hawker mentioned that the scientists at the Rutherford Appleton Laboratory in England have been studying the ionospheric records, finding therein not only information helpful in predicting future propagation conditions, but also finding that the monthly ionospheric index may be a better forecasting aid than the 12-month smoothed sunspot number. With ionospheric records of measurements from all over the world, they derive what they call a 'global effective sunspot number'; they call it a 'gessn.' Studying ionospheric records going back to the 1940s, they say the indications rather clearly show that the new phases of solar cycles generally begin around the middle of the calendar year. For example, the top of the sunspot cycles in 1958, in 1970, and in 1980 came in mid-year, while the bottoms of cycles in 1955, 1964, and 1976 also came in mid-year. Rather significant, yes?"

We paused to ask that question, as the look in the Local's eyes was telling us that it might be needed. But the Local was sticking with us. He nodded his head and quickly assured us: "Sure do! What you are telling me is that the bottom of the cycle will come in July and that's good news. That's what I like to hear."

We held up a hand. "Not so fast," we cautioned. "Maybe you should know that while it might be the middle of a year, it may not necessarily be this year. It might be 1987." This was not the news that the Local welcomed, but there was yet more to tell him. But before we could continue, he spoke again.

"Don't tell any bad news," he said. "There has to be more than just the pres-

77 Coleman Dr., San Rafael, CA 94901

This spot on Sable Island will be the QTH of CY0SAB during the 1986 CQ WW DX CW Contest. He will be there from November 18–25. (Photo via VE1AIH)

ent misery. Heck! At the last DX club meeting there was someone shouting about the DXer's Bill of Rights. Doesn't all of this tie in with that, things like tall towers, big beams, and DX every day of the year? Certainly there must be something like that, isn't there?"

While we had missed the meeting, the idea did have a familiar note. We were sure that someone had said it, and it was apparent that we were not yet out of the woods fielding the questions. We had to dig deeper.

"Well," we cautiously continued, feeling our way, "there was an article in 'Astronomy and Astrophysics' last year that reported that a scientist at the University of London was saying that the minimum of Cycle 21 might not show until February 1988, give or take a couple of months. He was also predicting that the new Cycle 22 would peak about August 1991, all of this being based on a study of sunspot cycles going back to 1712. His conclusion is that the current cycle might be longer than the average period because a fewer sunspot count at the top often indicates a longer cycle. It seems a high sunspot count tends to indicate a short cycle. So he's looking at early 1988 for a bottom."

We were well aware that this was not taking the discussion in the direction the Local was hoping, but does one argue with scientific pronouncements? Possibly very easily if one wants to believe only that which points towards what one wants. If you believe in it, it will be!

February in 1988," the Local groaned. "That's almost two years from now. Two more years of DX like we're having now. DX will never survive. Something has to be done."

Perhaps we were to willing to help. We quickly ran up another authority. "Jean Meeus over in Belgium, in a letter to 'Sky and Telescope,' does not agree with the fellow at the University of London. Using approximately the same base, the cycles from 1755 to 1976, Jean comes up with a different prediction. Jean in Erps-Kwerps says that after studying the last 20 cycles up to the present one, while longer cycles do tend to have fewer sunspots at their maxima, he feels that the correlation is not high, finding a coefficient of correlation of only −0.33. He also notes that the linear regression through the values of the 20 cycles studied, using the least-squares method, yield the formula 12.19–0.0102M for the duration of the solar cycle in years, where M is the maximum value of the smoothed monthly means. Thus, he figures the predicted length of Cycle 21 at 10.5 years and the predicted minimum to come in July 1986. How about that?"

That was a good question to ask. Somewhere in all these lucid explanations we thought at times we were losing the Local. But he was listening and finally he found his voice again. "You know something?" he said. "I like the way that fellow over in Belgium thinks. I like those figures, but I wish you'd write them down for me so I can study them further at home. You know, I do want to understand. But what does the Old Timer think about when the bottom of the cycle will be here? I like to hear all of what those scientists say, but the Old Timer is a DXer. Isn't he the one who knows everything about DXing and the cycles and things like that?"

Shanthini Venkatesam, VU2GO, got married a few months back, and this is a photo taken during the wedding ceremony. VU2GO's plans included a visit to the States in working towards a master's degree. (DX Family photo)

The WPX Program

Mixed

1208	I1POR	1210	JA1AJK
1209	OK3CQD	1211	I4FGG

S.S.B.

1793	IV3MJR	1799	IK2AEQ
1794	FD1HWB	1800	EA1AW
1795	JF1PHJ	1801	KO8KX
1796	F6HMJ	1802	KA1TY
1797	JK1MOC	1803	WB2DND
1798	W8AKS/6		

CW

2363	WP4D	2370	JN1GIV
2364	NI2N	2371	F6HMJ
2365	DJ2UU	2372	DL1JC
2366	FD6HSI	2373	EA3DBO
2367	OK1SN	2374	K7LJ
2368	OH3TO	2375	WP4F
2369	KU0S		

WPNX

228 KB4GID

VPX

245 WDX9IIK

Endorsements

Mixed: 450 I1POR, NF0N, W5EW, G4SDJ, I4FGG, AC2J. 500 I1POR, NF0N, G4SDJ, AC2J. 550 I1POR, NF0N, G4SDJ, AC2J. 600 I1POR, NF0N, G4SDJ, AC2J. 650 I1POR, NF0N. 700 I1POR, NF0N. 750 I1POR, NF0N. 800 I1POR, NF0N, I1JQJ. 850 KI3L, I1POR, NF0N, JA7FFN, I1JQJ. 900 KI3L, NF0N, I1JQJ. 950 I1POR, NF0N, I1JQJ. 1000 I1POR, NF0N, I1JQJ. 1050 I1POR, NF0N, 1100 I1POR, NF0N. 1150 I1POR, NF0N. 1200 I1POR, NF0N. 1250 I1POR, IT9QDS. 1300 I1POR, IT9QDS, I2MQP. 1350 I1POR, LA7JO, IT9QDS, I2MQP. 1400 I1POR, I2MQP. 1450 I1POR. 1500 I1POR. 1700 N7TT. 1950 N2AC.

S.S.B.: 350 IV3MJR, JF1PHJ, JK1MOC, KD9OT, KA1TY, WB2DND. 400 IV3MJR, JF1PHJ, JK1MOC, WB2DND. 450 IV3MJR, JF1PHJ, JG2MWA, JK1MOC, WB2DND. 500 IV2MJR, JF1PHJ, EA3AAY, WB2DND. 550 WB2DND. 600 WB2DND. 650 WB2DND. 850 IK5ACO, W7KWI. 950 W0ULU. 1200 NJ0C, AC2J. 1300 I2MQP. 1350 I2MQP. 1400 I2MQP. 1450 N7TT.

C.W.: 350 WP4D, FD6HSI, OH3TQ, DL1JC, K7LJ. 400 WP4D, FD6HSI, OH3TQ, DL1JC, K7LJ. 450 WP4D, FD6HSI, OH3TQ, DL2GBB, KJ8M. 500 OK2PO, WP4D, FD6HSI, OH3TQ, DL2GBB, KJ8M. 550 OK2PO, WP4D, JA2GCW,OH3TQ, EA5QR. 600 OK2PO, WP4D, JA2GCW, OH3TQ, EA5QR. 650 OK2PO, OH3TQ, DJ4VP, EA5QR. 700 OK2PO, OH3TQ, DJ4VP, EA5QR. 750 OK2PO, OH3TQ, DJ4VP. 800 OK2PO, OH3TQ. 850 OH3TQ. 900 OH3TQ. 1300 N7TT.

20 meters: WB2DND.
40 meters: DJ4VP, I1JQJ.
80 meters: DJ4VP, NM5Y, I1JQJ.

Asia: OK2PO, JF1PHJ, JH1GIV, WB2DND.
Africa: WB2DND.
No. America: W9IAL, NM5Y, I1JQJ, WB2DND.
Europe: JG2MWA, WB2DND.
Oceania: WB2DND.

Award of Excellence Holders: DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, YU2DX, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, I0JX, WA1JMP, K0JN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SM0DJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, K6JG, N4MM, I8YRK, W4CRW, SM0AJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD.

Award of Excellence Holders with 160 Meter Endorsement: W8RSW, W8ILC, W1BWS, G4BUE, LU3YL/W4, VE7WJ, W9NUF, N4NX, SM0DJZ, DK5AD, W3ARK, LA7JO, W4VQ, K6JG, W4CRW, N4MM, SM0AJU, KF2O, K5UR, OK1MP, N5TV, W8CNL, W1JR, W6OUL, W4BQY, W5UR.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, P.O. Box 1351, Torrance, CA 90505-0351 U.S.A.

Here are some of the locals in downtown Jiddah. From the left are Ahmed Nassery, HZ1FM, Ahmed Zaidan, HZ1HZ, Carol Poole from San Diego, and Bob Walsh, WA8MOA, who will be returning to the States this year. Bob has operated HZ1AB and is leaving Saudi Arabia to continue his schooling. (WA8MOA photo)

We had worried about the discussion going in that direction. We were well aware that the Old Timer went all the way back to Cycle 17. That's a long way back, possibly before many of the current big-gun DXers were even born. Back then the Old Timer started DXing when Guglielmo Marconi was still living and recounting the days of the trans-Atlantic tests. We found the Old Timer willing to talk, he often saying that DXers have a lot to learn and that old timers must be ready to help.

We listened as the Local explained his impatience with the progress of the current cycle and with DX being a sometimes thing. He even remembered to repeat all we had told him, the forecasts out of the University of London and what Jean Meeus over in Belgium had to say.

"Look," the Local finally said determinedly. "You've been through a lot of cycles. What should we expect from this one?" We could see that the Old Timer was thinking.

"You're on the right track," the Old Timer finally said, "and the more you learn about DXing the better you will understand the progress of the cycles. But have you read that article by Hutchins and Campbell a couple of years back in *Nature* magazine, in the June 1983 issue? Possibly you caught that one?" The Local had to admit that he had not. Actually, we also had missed it.

You might check it out," the Old Timer advised. "It's on page 524 in that issue and is entitled 'Are QSOs Activated By Interactions Between Galaxies?' Seems that DXers would have their attention drawn to a title like that."

It caught the attention of the Local. Here the Old Timer had not even said much about the bottom of the cycle and the Local was headed off in another direction. "QSOs?" he echoed. "Tell me more." The Old Timer did.

"Keep in mind that it is high-level stuff," the Old Timer said, "but those two scientists made a report on the principal morphological findings in a program of high-resolution imaging of QSOs." The Old Timer leaned closed to the Local, the knowledge being imparted meriting such caution. "It does seem that any DXer studying the article will learn something about QSOs." There was strong assurance in his voice. The Local was obviously impressed. "My hesitation in not mentioning this too often," the Old Timer continued, "is that while many might hear, possibly some will not understand. You can appreciate that, can't you?" The Local was quick to say he did. Eager DXers always understand most everything.

Gone was the worry about Cycle 21's demise. Gone was the longing for the start of Cycle 22 and the hoped for return of the Great Days of DXing. This one had a new area to work. "Think I might find a copy of that magazine at the library downtown?" he asked. The Old Timer said it might be a possibility. The Local was quickly gone.

Frankly, we were thinking of leaving ourselves. We could not remember ever before hearing about QSOs in that context.

The WAZ Program

10 Meter Phone

305 JA2MNB

15 Meter Phone

229	LU8DPM	232	I4YNO
230	I4LRH	233	DF3NZ
231	JL1HGH		

20 Meter Phone

555	W6EUF	557	I4YNO
556	DJ3ND	558	WB2DND

40 Meter Phone

36 W3AP

20 Meter CW

239	WA3CGE	240	KE2S

40 Meter CW

56 DL9YX

All Band WAZ SSB

3010	EA8BB	3014	EA4KK
3011	JK1MOC	3015	EA7AVU
3012	DJ3VM	3016	KR9F
3013	K8RJI	3017	CT1TZ

Phone and CW

5950	NG6T	5956	JE2PMC
5951	W2MD	5957	K2TK
5952	DK5TI	5958	KR9F
5953	IK5CQV	5959	DL2HBX
5954	DK9KJ	5960	UA3TT
5955	KV5I		

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (39 cents) size 4½ × 9½ to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is $4.00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application.

5 Band WAZ

Standings as of April 1, 1986

All 200 zones worked:

1. ON4UN	40. OH3YI	79. EA9IE
2. K4MQG	41. I4RYC	80. DL7HZ
3. SM4CAN	42. ZL1BIL	81. DJ9RQ
4. AA6AA	43. I4EAT	82. EA5SP
5. W8AH	44. ZL1BQD	83. EA2IA
6. W6KUT	45. TG9NX	84. SP3BQD
7. EA8AK	46. XE1J	85. LZ1NG
8. LA7JO	47. F5VU	86. N4JF
9. EA3SF	48. W3AP	87. CT2AK
10. OH1XX	49. YO3AC	88. HB9CIP
11. EA8OZ	50. K3TW	89. OK1MG
12. WØSD	51. XE1OX	90. CT4BD
13. KØZZ	52. VE7IG	91. VK6HD
14. ON6OS	53. OK1ADM	92. EA6ET
15. OK3TCA	54. CT1FL	93. VK3QI
16. K6SSS	55. WA1AER	94. LZ2DF
17. ZL3GQ	56. N4RR	95. ON4QX
18. OK3CGP	57. UWØMF	96. SMØDJC
19. SMØAJU	58. W4DR	97. CT3BM
20. OZ3PZ	59. OK1MP	98. K2TQC
21. I3MAU	60. W1NW	99. EA8XS
22. I2ZGC	61. OE1ZJ	100. HA9RE
23. 4Z4DX	62. HB9AHL	101. SM4CTT
24. N4KE	63. HB9AMO	102. A71AD
25. K5UR	64. LA6OT	103. LZ2CC
26. K9AJ	65. UR2QD	104. SM4CLE
27. SM3EVR	66. UK2RDX	105. LZ1HA
28. LA5YJ	67. ZS5LB	106. SM5AKT
29. DL3RK	68. F6DZU	107. CT4NH
30. N4WJ	69. DL4YAH	108. ZL4BO
31. G3MCS	70. LA7ZO	109. I1BSN
32. SM5AQD	71. W9ZR	110. DF6CY
33. WØMLY	72. W1NG	111. DK5AD
34. IØRIZ	73. VK9NS	112. DL6EN
35. ON5NT	74. N4KG	113. SM6CVX
36. OH6JW	75. YU7DX	114. LU8DPM
37. OK1AWZ	76. DL8MAG	115. SM6DYK
38. IV3PRK	77. OK3DG	116. DL7XS
39. DJ6RX	78. ZL1BOQ	117. DF7NM
		118. UA3TT

The top 13 contenders for 5 Band WAZ are:

1. JA1BWA, 199	8. LU6GV, 198
2. JA3EMU, 199	9. K4CEB, 198
3. N4WW, 199	10. W2YY, 198
4. K6YRA, 199	11. G3GIQ, 198
5. W8UVZ, 199	12. K7UR, 198
6. F6BEE, 199	13. W3GG, 198
7. W6GO, 199	

367 Stations have attained the 150 zone level.

But with the Local gone we could acknowledge our lack of knowledge and put the question to the Old Timer. We again learned that there are times when what you might hear correctly is not necessarily what you understand correctly. The Old Timer was smiling a bit.

"Actually the article in *Nature* was by two astrophysicists studying the spectrum red-shift in distant galaxies. They use the term *QSO* but not in the same sense we do. They think of QSOs as 'quasistellar objects.' Possibly the Local was thinking of Q-signals or something like that. Those scientists named do find that a large telescope atop a high mountain is helpful in their search for a QSO—not necessarily a high antenna and a sharp receiver."

We had to think this over. Possibly the Old Timer was leading us, but frankly we had thought in the same way that the Local apparently had. But we were still wondering about the bottom of the cycle. "When will the bottom be here?" we asked. "The bottom of the cycle? Isn't that what we are talking about?" We had not as yet seen enough cycles so that we could take them for granted. We ourselves wanted to know.

The Old Timer thought for a bit. Finally he spoke. "I think we are at the bottom. When sunspots with reversed polarity start showing they are considered forerunners of the new cycle. The spots from the old cycle tend to appear closer to the solar equator as the end of the cycle nears; the sunspots from the new cycle show in higher latitudes. Recently there have been some reverse-polarity sunspot groups, but not really in the high latitudes groups that I would like to see. In April they were showing around 20°, but they'll have to start showing in latitudes 28° or more from the equator before I will really consider them. But I do think that they are at hand. Maybe we will drag along the bottom of the cycle for a bit. Maybe even they'll take off and we will see good conditions before long. All you really can do now is wait and check WWV at 18 minutes after the hour."

We thought this over, some things not yet falling into place. "But why didn't you explain all of this to the Local?" we asked, and the Old Timer shrugged.

"Last week down in the village I ran into W6GPB," he said. "You might remember that Joe got on the Honor Roll back when they stopped counting deleted countries for that spot. I asked Joe how things were, not having heard him on the air recently. Joe told me that he now realizes he made a mistake some years back. He never should have turned 80 years old." The Old Timer paused, fixing an eye on us, asking pointedly, "Do you understand what Joe meant?" We thought we did, but frankly we were not really sure.

The Old Timer continued. "Things are going to arrive when they arrive, and that includes Cycle 22 and old age. All the anxiety about the new cycle will not hasten its arrival, but it is coming. The Local listens to everything. That is good, as it will help his understanding as he sorts things out. But the new cycle is close, closer than it was this time last year. It will certainly be here soon. It might even be here now. And if someone produces a theory that it may not come for some years yet, don't worry at all. Just wait for another opinion, and you can be sure that someone will show shortly with one more to your liking."

We thought but briefly at this and were quick to reply. "Like yours?" we said, and the Old Timer nodded.

"Like mine. And just believe it's coming and almost here, because that's the way it is, or so I think."

And that was it. As the Old Timer has noted more than once, things will come in their time, be it DX or sunspots. We were believing, but it was the "when" that worried us. But after thinking over for a bit, we got to thinking that while tomorrow may never come, we can recall a couple of cycles ending and new ones starting. And should anyone ask you if you think a new cycle will come, give them the benefit of your knowledge. Just tell them. "They always have!" Maybe even this July . . .

Thailand

Mike Fulcher, KC7V, was in Thailand a couple of months back, and as traveling DXers are often wont to do, he attended a meeting of the local DX club. In this instance it was the Radio Amateur Society of Thailand in downtown Bangkok.

Mike reports that the club station, HSØA, is active in the major contests, including *CQ* WW DX tests, the WPX test, the All-Asia, Radiosport, and a number of others. HS1YL, the XYL of Silent Key HS1WR, along with a group of other Thai amateurs, has been working to ease the restrictions currently imposed on amateur radio. At the present time it is necessary to obtain special and specific permission to operate in any of the contests. Bruce, HA1AOL, and Barry, HS1AOK, tend to think that the efforts are going to produce some good results. Another club station might be on the air during this summer with the hope that it will operate daily, but possibly only during the local evening hours in Thailand.

Mike, KC7V, notes that there is still strong interest in amateur radio in Thailand in spite of the restrictions. Over 80 people showed for the RAST meeting, close to 30 of these being in a group called "Volunteers"—those studying for amateur licenses and quite excited over the possibility of getting on the air.

The DX Bulletin

A couple of months back we were aware of a pending change in the well-known DX bulletin, called simply "The DX Bulletin" with Jim Cain turning over the operation to Chod Harris. But we could not mention it then. Now we can. It is a couple of months later. Perhaps you are already aware of the change. Anyhow, Chod Harris, VP2ML, might also be remembered as WB2CHO and other callsigns along the way. Chod has been licensed for over 20 years, has operated at more countries than you can count on your three hands, and these include Easter Island, Sierra Leone, Galapagos Island, Christmas Island, Senegal, and maybe even Montserrat. If you check your *QST* file for ten or more years back, you will find him there on the staff as a technical writer, among other things.

The new address for the bulletin is 816 Fourth Street #1001, Santa Rosa, CA 95404. You also might have caught him in some recent duties as a DX editor in another shack. Anyhow, if you are interested drop a line to the above address. You might find that things go easier with a DX bulletin in your hand.

Don Riebhoff

Those who were working southeast Asia most every morning and evening some years back, including XV/XU/XW and HS, will long remember Don Riebhoff and the action in downtown Saigon. Some might even wonder where Don is these days.

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Power Source	9.6V Nicd battery pack 9V Dry battery pack D.C. 8.4-16V	9.6V Nicd battery pack 9V Dry battery pack D.C. 8.4-16V
Transmitter		
RF Output Power	5.0 Watts (H), nominal at 12V 3.5 Watts (H), nominal at 10.5V 0.5 Watts (L), nominal at 10.5V	3.0 Watts (H), nominal at 10.5V 0.5 Watts (L), nominal at 10.5V
Modulation	Frequency modulation	Frequency modulation
Maximum Deviation	± 5 KHz	± 5 KHz
Transmit Spurious	– 60 dB	– 60 dB
Microphone	Electret Condenser Microphone	Electret Condenser Microphone
Receiver		
Receiving Methods	Double superheterodyne	Double superheterodyne
I.F.	1st 16.9MHz 2nd 455KHz	1st 21.4MHz 2nd 455KHz
Sensitivity	Less than – 0.25uV at 12dB SINAD	Less than – 0.25uV at 12 dB SINAD
Band Width	± 7.5 KHz at 6dB down	± 7.5 KHz at 6dB down
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Writing from the Beach Bar in coastal Portugal, specifically at Stool 9 and Glass 11, Don notes that he has been living in the manor house of a 2500 acre quinta (farm) on a hill overlooking the Atlantic, all this about 45 minutes west of Lisbon.

Always wanting to build a beverage antenna, Don notes he has 700 footers in all four directions and an 80 meter KLM 2-element beam on an 80 foot tower. Don finds that at times the action on 80 wounds his sensitive nature, and often the background sounds like a pack of growling dogs at dinner time. Considering how in other days Don would draw some horrendous pileups, things just don't seem to be the same as they were back in the late sixties. But then again, what is? But Don is active, signing CS0AT in the recent CQ WPX Test. Don also signs CT4AT from Portugal, and the QSL route for CS0AT or CT4AT is via W1JZ, Michael Samarco in Bellingham, Massachusetts. W1JZ also handled Don's QSLs before 1977.

As it is possible to obtain special prefixes for most any event in Portugal, Don notes any Portuguese call these days ending in AT probably belongs to him. Don usually jumps in for all the major contests. Thus when you hear the AT suffix, it most likely is Don.

DXers always share the good things of life, and here a group of international DX types join to obey the dictum on the wall plaque: "Share Thy Pizza With A Neighbor." All this was at a stopover in southern California last March. From the left you will see Dan Davitt, N6CGB, President of the So. Calif. DX Club; Noreen and Jim Russell, VR6JR/G3OKQ, enroute home to England; Klaus Hoss, ZK1XO/OE3KOA, enroute home to Austria; and Steve Locks, Secretary of the So. Calif. DX Club. Russ Mason, KG6IP, was there to take the photo.

Pitcairn Island

Jim Russell, VR6JR, has left the island and any QSL's should go to his home call, G3OKQ. Jim stopped in California enroute home to visit some of the locals. VR6AB goes to ZL4DW; these two calls have been mixed at times.

As of a couple of months back, the active calls on Pitcairn were the long-known VR6TC, Tom Christian; VR6YL, Betsie; VR6KY, Karr Young; VR6KB, Kay Brown; and VR6ID, Irma Christian. If you are looking for QSL routes for VR6 calls, VR6BR goes to KA9W; VR6HI and VR6RW to ZL1AMO; and VR6TC and VR6YL to W6HS.

During his stay on Pitcairn VR6JR ran up some 11,974 contacts. By now Jim is home again in Surrey.

9Y4NP

Allan "Nick" Percival, 9Y4NP, passed away in March. Nick was an airline pilot, a captain with

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. Deleted countries do not count and are dropped from listing as they occur. Total countries are now 316. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be made at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsement involving the issuance of a sticker is $1.00.

C.W.

ON4QX	316	W4BQY	312	W0IZ	303	N5DX	291	I5XIM	280
W9DWQ	316	W6ID	311	WA8DXA	302	K8LJG	291	W2LZX	280
W6PT	316	K4XO	311	YU2TW	301	I3OBO	290	W9NUF	280
K4CEB	316	DL3RK	310	SM3EVR	300	WA4JTI	290	W6YQ	280
N4JF	316	AA6AA	309	W6SN	300	W1WLW	289	HB9AFI	279
K9MM	315	N4MM	308	WB4RUA	300	W4BV	289	WA4DAN	278
N4PN	315	W9BW	308	W0SR	299	N8MC	288	DL1QT	277
DL7AA	315	K1MEM	308	K3FN	298	WA2HZR	286	G2GM	276
N6AV	315	OK1MP	308	W7CNL	298	W0HZ	286	NN4Q	276
W3GRS	314	SM6CST	308	K3UA	298	WD9IIC	284	KA3R	276
W8KPL	314	W4OEL	307	DJ7CX	297	K4CXY	283	I8WY	276
K6LEB	314	W1NG	306	EA2IA	297	K8PYD	281	K4SE	275
K6JG	314	K9QVB	306	K9IW	294	K1VHS	281	N4AH	275
N6CW	313	N4KG	305	WD9IIX	294	JH1VRQ	281	KQ9W	275
K9AB	313	AB4H	304	W9RY	293	K7ZR	280	K9BWQ	275
K6EC	312								

SSB

K2FL	316	F2MO	312	VE3MRS	306	K8NA	298	N8BJQ	286
W4EEE	316	I8YRK	312	VK3JF	306	JH4PRU	298	VE3CYX	285
K6WR	316	W0SD	312	KB5FU	306	K8VFV	298	KE4HX	285
W4UG	316	K9RF	312	EA1QF	305	EA9IE	298	K9MNT	285
W6EUF	316	K8LJG	312	NA5W	305	XE1NI	298	WA2FKF	284
VE3MR	316	K4MQG	312	KZ8Y	305	HP1JC	297	KB5RF	284
DL9OH	316	N4MM	312	KB8KW	305	K5DUT	297	VE3DLR	284
N4JF	316	I2LLD	312	XE1OX	305	KB3OQ	297	AG9S	284
I0ZV	316	VE7WJ	312	XE1J	304	YU7KV	297	KD8V	284
KD8VM	316	W9SS	312	WB1DQC	304	KE3A	296	WB3HAZ	283
I0AMU	316	N2SS	312	W6SN	304	WB3GPR	296	VE3MV	283
F9RM	316	LA7JO	312	VE7HP	304	KC8EU	296	IN3ANE	283
TI2HP	316	OE2EGL	312	W4UNP	304	KQ9W	296	KI3L	283
KS2I	316	K4XO	312	W6NLG	304	KB3KV	296	AE5B	282
YV1KZ	316	LU3YL	312	NY5L	304	W4BQY	296	CT1UA	282
W3GRS	315	K6EC	311	XE1KS	303	I8ACB	295	KC8YM	282
VE3MJ	315	W4SSU	311	W2LZX	303	I3OBO	295	AI9R	282
I8AA	315	I4LCK	311	KR9O	303	K7LAY	295	TG9EP	282
4Z4DX	315	W8PCA	311	WB3DNA	303	W0IYR	295	N1ALR	282
W9DWQ	315	K9BWQ	311	K1MEM	302	KK0C	295	W6YQ	281
W9JT	315	K6XP	311	N5FG	302	KA9ABC	295	K9TI	280
ZL1AGO	315	K9AB	311	W6FET	302	I8ZTE	294	N5FW	280
W4NKI	315	W1LQQ	311	W2FGY	302	NN4Q	294	ZL1BOQ	280
VE2WY	315	W7FP	311	K9HQM	302	WD0BNC	294	G4FAM	280
K6YRA	315	DK2BL	310	WA4DAN	302	I5BDE	294	VE6PW	280
W3AZD	315	IV3YRN	310	K9IW	302	I0SGF	294	KA8T	279
XE1AE	315	AA6AA	310	K9UAA	302	WD8PUG	294	KB5DN	279
VE3GMT	315	W8JXM	310	NJ2C	302	K4SE	293	EA3KW	279
ZL3NS	315	N6OC	310	KP4EQF	302	KC8JH	293	EA6DE	279
DJ9ZB	315	DL6KG	310	AI8M	302	AI5I	293	W9OKL	279
W4DPS	315	WA4JTI	310	VE3FJE	301	I1POR	293	JH8NYK	279
I4ZSQ	315	N4PN	309	WB4NDX	301	W9NUF	293	KX5V	279
OK1MP	315	K1UO	309	WA3HUP	301	WA4LOF	292	K4BYK	278
ZS6LW	315	9H4G	309	K8CMO	301	AC0A	292	I5EFO	278
I8KDB	314	W6DN	309	W8ILC/QRPp	301	I2MOP	292	VE3IUE	278
N4WF	314	W7OM	309	W9RY	301	VE3FEA	292	K3LUE	278
OZ3SK	314	ZL1BIL	309	YU2TW	301	VP9CP	292	KB8O	278
K9MM	314	W1NG	308	N4CRU	301	W8LKG	292	WB0UFL	277
YV5DFI	314	VK4VC	308	W8IMZ	301	XE1OW	292	W4PTT	277
K6JG	314	YV5AIP	308	N8BKF	301	K1VHS	292	KB0SY	277
CT1FL	314	N6AV	308	W4OHZ	300	W0ULU	292	I8XTX	277
OZ5EV	314	W2CC	308	I5EFO	300	VE3IPR	291	K2JF	277
W2SUA	314	AI8S	308	K9QVB	300	N5AWS	291	N7ASL	276
W0SFU	314	N4KG	308	KB9KD	300	WB6GFJ	291	WA6DTG	276
W0YDB	314	K8NA	308	K3UA	300	W4JFE	291	WA4OPW	276
OE3WWB	314	WA4WTG	308	VE4AT	300	W6MFC	291	AI9U	276
W9BW	314	VE4SK	307	I8KCI	300	KB0U	291	KC2RS	276
VE3XN	314	K8PYD	307	WZ4I	300	K2JLA	291	WA9IVU	276
VE1YX	314	I0MBX	307	I2ZGC	300	VE3CKP	290	K0HQW	276
N7RO	314	W0SR	307	WB4UBD	300	KD5ZM	290	I8INW	275
W3GG	314	WD9IIX	307	KZ2P	300	JA5PUL	289	WB3CQN	275
K9LKA	313	SM4CTT	307	W6BCQ	300	W9TA	289	WB1EAZ	275
ON5KL	313	KV2S	307	WA2MID	300	K8ZZU	289	VE7BSM	275
EA2IA	313	WD8MGQ	307	NW5K	300	K0GT	288	K8NWD	275
W8ILC	313	G4CHP	307	WA0TKJ	299	OK1AWZ	288	G3XTT	275
EA4LH	313	KB9OC	307	I6PLN	299	I8KCI	288	G4GED	275
OZ8BZ	313	KB8DB	307	JH1VRQ	299	AB9E	287	VE5FX	275
N6AW	313	KU9I	307	DJ7CX	298	W5LLU	287	KS0Z	275
K5OVC	313	N4KE	306	K9SM	298	N3ARK	286		
YU1DZ	313	WA0DCQ	306	I8LEL	298	K4LR	286		

CQ DX Awards Program

SSB

1472	G4TLZ	1475	G4VKV
1473	SM0JOQ	1476	VE7EIK
1474	IK8EPC		

CW

661	N9BMS	663	OK1SN
662	NY5L		

SSB Endorsements

310	YV1KZ/316	275	W4BQY/296
310	VE1YX/314	275	W5LLU/287
310	ZS6LW/315	200	PY2DBU/247
300	WB3DNA/303	150	IK8EPC/152
300	AI8M/302	3.5/7 MHz	N8BKF
300	N8BKF/301		

CW Endorsements

310	W4BQY/312	275	W0HZ/286
275	K3UA/298	275	K9BWO/275
275	K8LJG/291	150	PA3AAN/166

Total number of active countries is 315. The basic award fee for subscribers to CQ is $4. For non-subscribers, 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. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply. Please make all checks payable to the awards manager.

the National Airline of Trinidad and Tobago, BWIA, and retired for medical reasons last year. He returned to his native hometown of Vancouver in British Columbia about a year back when it was indicated that his illness was serious. During his years in the Caribbean, Nick served as President of the Trinidad and Tobago Amateur Radio Society for ten consecutive terms, during that time pioneering 2 meter radio communications in that area and at his passing was the immediate past-president of the club.

Earle Baccus, 9Y4EB, passes along the information and notes that Nick, 9Y4NP, will be greatly missed.

St. Kitts

Chuck Van Horn, KG9N, will be on St. Kitts this July. Look for him to be on the air about July 16th and operating until July 29th. He will be signing KG9N/V4.

Chuck will operate both CW and phone from 80 to where the bands fade out—even to 10 meters should that be open. Chuck is looking for contacts, the more the better, and intimates that his vacation will be less than joyous should there not be a steady and boisterous demand for his KG9N/V4 card, even from those few who might have worked St. Kitts previously. Also, with the bottom of the cycle the lower bands should be tilled for that top award, the 5BWAZ.

QSL directly to Chuck at Box 57, Goodfield, Illinois 61742, SASE or SAE/IRC needed.

Clipperton

A return to the island was scheduled for early May. If all went right, you might have already welcomed the crew home. Some who went out last time were among the operators. Also going was a new face from the support crew. The crew included Rusty Epps, W6OAT; Bob Vallio, W6RGG; Kip Edwards, W6SZN; Carl Cook, AI6V; and Wayne Mill, N7NG, all members of the Northern California DX Club. QSLs go to YASME.

Considering the long period when there was no Clipperton activity and the efforts of the last several years, those who are aware of the cost and difficulty of putting FO0XX and such calls on the air might be interested in a recent note in the "Pacific Islands Monthly."

There it is reported that the French government is considering establishing a shelter for fishing and sailing vessels at Clipperton, this to be done by reopening an old pass from the ocean on the northeast side of the island and dredging the lagoon sufficiently so as to provide mooring space. It might also include building a pier and reestablishing an old airstrip left from WW II.

But before this gets underway, there will be an exploration program by the Mining Syndicate of Clipperton, 25% owned by Geomarex of San Diego, which has been pushing the proposal of the harbor works with the French government. Back in 1975 phosphate resources were found during some earlier exploration, and there are prospects of some metals in the sulfurous lagoon. Some have speculated that the present claim on the island by the French government will be strengthened if there is a physical presence there, this to help in the claim for a 200 mile zone surrounding the island.

Recent DXpeditions have had to land over the beach, this at times a bit of a sticky problem when the surf is high. The island is often passed by fishing vessels and also by yachts heading south from California, these sometimes going direct to Polynesia, other times harbor-hopping down the coast to Mexico and then making the long haul south to the Marquesas.

This is Ezzat Sayed Ramadan, SU1ER, secretary of EARS, the Egyptian Amateur Radio Society. Ezzat works all bands mostly SSB from downtown Cairo, a city of more than 14 million, but not too many amateurs. (DK7PE photo)

Egypt

Rudolf Klos, DK7PE, passes along some information on the current activity in Egypt and possibly the route for a needed QSL.

Rudolf notes that there currently is no QSL bureau in Egypt, but QSLs for SU1ER, SU1MR, SU1RR, and SU1SR can be routed through the DARC Club in Baunatal, West Germany. There is also an unlisted direct route, this through P.O. Box 33, Cairo Airport Station, Cairo, Egypt. This is a private box held by an individual and definitely is not a QSL bureau.

In the photo is Ezzat Sayed Ramadan, the secretary of the Egypt Amateur Radio Society. Ezzat works SSB, 10 through 80, when conditions are right. In Cairo there is also 2 meter activity.

5 Band WAZ #53

Here is something rare among DXers, rare these days even among amateurs. Vaclav Vsetecka, OK1ADM, winner of the prestigious 5B WAZ award, has built all his receiving and transmitting gear. Actually, Vaclav admits to being only 99 and 44/100% pure. He does have a commerical SWR meter in the shack, but only a small one.

Vaclav has done this ever since he got started in amateur radio. The receiver, the transmitter, the linear, the antennas—everything. At this point some may start thinking that on the home turf Vaclav is an electronics engineer. He isn't!

Vaclav Vsetecka, OK1ADM, winner of 5B WAZ #53. Take a long look at the gear. It is all homebrew and Vaclav has built all his gear ever since he started in amateur radio. An Assistant Professor of Chemistry at the Charles University in Prague, OK1ADM is also found on the DXCC Honor Roll and hosts the OK DX Net on Sunday mornings. Even the antennas are homebrew.

OK1ADM lives in the Prague area and was first licensed in 1960. He holds the Czechoslovakia Class A License, the top one in their licensing system, and it allows an input of 500 watts. In his early forties, Vaclav is an Assistant Professor of Chemistry at Charles University in Prague. Married, there are two children in the family. He holds a PhD degree.

You can find OK1ADM right up there at the top of the DXCC Honor Roll for mixed modes, and he has been since 1979. He holds 5BDXCC #39, among other things. He says that he does work SSB a bit more than CW, but he does use both modes.

The antennas, also homebrew, consist of verticals, inverted vees and longwires on 80 and 40, and two-element beams on 20, 15, and 10 meters.

Finding Zone 1 for 80 meters was the difficult part of finishing off the 5B WAZ, he thinking it perhaps a bit more difficult to find that one from central Europe. Vaclav also conducts a DX information net, the OK DX Net, every Sunday morning on 3.7 MHz.

Somehow we find this 5B WAZ winner a bit different and a bit refreshing. To find a top DX operator these days who makes all his own gear and has always done just that must be something unusual. Certainly OK1ADM is not the usual run often encountered. It is a delight to congratulate this winner of amateur radio's most difficult major award.

Years back there were times when it was easier to work Egypt. That was when the British Military units were in the Suez Canal area and often found in contests. Sometimes it was even Canadian units. But times change and things get scarce. To someone looking for Egypt or Afghanistan or some of the others grown scarce with the years, however, it is not much of a consolation to hear someone tell how easy it used to be.

N7DF

Larry Strain was out to Tchad last year where he signed N7DF/TT8. While Larry has been home in Kansas for some months, he is not finished with DX operations. He operated from Bolivia back in 1973, from the Yukon in 1981, and from the Bahamas in 1984/85/86. Currently he is ticketed by the Pan-American Health Organization to go to the Caribbean for two years, but the project is still waiting for funding. He is scheduled to go to St. Vincents and will have a heavy schedule of travel throughout the islands in the Lesser Antilles chain, including time on Haiti. Larry is also working on plans for his own personal base in the Bahamas, where he owns property.

Those who remember the Tchad operation might be interested in his efforts to raise funds for the International Human Assistance Program. The group is working to finance materials and equipment for village health clinics in that country. Should more information be desired, drop a line to Larry Strain, Box 125, Holton, Kansas 66436.

Northwest DX Convention

If you have been noting the TV commercials on the exposition in Vancouver, British Columbia this year, you might make your plans carefully so that you will also be at the Northwest DX Convention at Renton, Washington, July 25–27th. The convention will be at the Sheraton Hotel in Renton, not too far from downtown Seattle and a short drive from Vancouver. Always a good convention, the technical expertise of the DX clubs in the northwest corner can be impressive. One picks up knowledge just by waiting for the main course at the Saturday night Grand Banquet. More details can be had by writing to the Western Washington DX Club, Box 224, Mercer Island, WA 98040. To check on room accommodations, call Jody Harwood at (206) 226-7700. In late July you can expect cool weather, magnificent scenery, and a lot of DX talk. Throw in the Vancouver Exposition and you'll heardly care—for awhile anyhow—if the sunspots ever return.

A Passel of DX Notes

From far Hungary, Balazs Magyar, HA7SU, advises that you can get a quick return on an HG5A QSL if you send it via him at P.O. Box 40, Nagykoros, H-2750 Hungary.

If you are interested in stamp collecting there is the International HAM Stamp Group which emphasizes those postage stamps connected with amateur radio. They have a catalog. You can get more information by dropping a line to Manfred Bussemer, DL4UE, Eckstrase 1, D-6792 Ramstein 2, West Germany. You could find it very interesting. Paul King, ZC4AK, would like the word passed that any contact since 1981 for ZC4AK should go via the ZC4 Bureau.

Marvin Moye, N6MXR, took off with the U.S. Navy for Diego Garcia in the Chagoes Island a couple of months back and was promising CW action once he gets organized. Marvin also will

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CIRCLE 3 ON READER SERVICE CARD

work phone, but wants to upgrade and thus the CW slant. VQ9QM, Dale, is often heard CW after 1400Z on 15/20/40 meters plus 80/160 meters at times.

You might think that the ARRL/FCC thing on amateur antennas is another matter in another room, that is until it comes right home. Cliff Wells, KA7TVC, put up a 2 meter antenna a couple of feet above the roof on the apartment house where he resides in downtown Kirkland, Washington.

A neighbor complained. Cliff inquired at City Hall and was nailed with a citation for breaking the local ordinance which requires engineering drawings, a public hearing, and a $350.00 fee for a hearing examiner to consider any application. Also, the antenna must ". . .not interfere with the rights of neighbors."

Cliff is appealing hoping that PRB-1 FCC ruling and sanity will prevail. This is the first time the ordinance has been enforced, though it has been on the books for three years. Here on the western edge, the local California municipal authorities are, even without a case to prompt them, leaning to the idea that the FCC may have preempted them.

In case you missed it along the way, the FCC changed parts of Section 97.67 of the regulations to make it quite clear that under the revised paragraphs (a) and (b), 47 U.S. Code, Section 324, amateur stations use the minimum amount of power necessary to carry out the communication desired. This all to eliminate any possible interpretation to the contrary.

HC1ATG is being heard out of Ecuador and will be in Quito for a number of years. Back home this is George Brumley, KØWTM, in lower Wichita. George at other times has been heard as ET3GB, way back in the fifties, and as OA6CV in the early seventies. Look for him mostly on 20 and 40 CW. Being an old timer, George says he has the gear to match. He'd like to hear from someone with a set of matched 10 6LB6 tubes for a Galaxy 2000B. Should you be curious, George is a missionary.

Back a couple of months the FCC acted on a petition and will allow telephony operation from 7075 kHz to 7100 kHz by General, Advanced, and Extra class licenses south of 20°N latitude. This went into effect on February 28th. The *Heard Island Odyssey*, by Kirsti Jenkins Smith, VK9NL, recounts the story of the 1983 Heard Island DXpedition led by Jim Smith, VK9NS/P29JS. In the U.S. Ron Pretekin, AB8K, is the source for the book and $12.25 to Ron will bring a quick return (AB8K, 6741 Oak Field Drive, Dayton, Ohio 45415).

Both 3A6E and 3A6F have been active from Monaco during the spring DX tests. They will be heard again in the IARU Radiosport test the 12th and 13th of July, in the European test/CW. The 9th and 10th of August, and in the SSB portion the 13th and 14th of September. They will also be heard in both the CW and SSB portions of the great *CQ* WW DX Test in October and November as well as the ARRL/10 meters in December 13/14. QSLs for 3A6E go to F9RN, while 3A6F goes either via the CBA or the bureau.

Keep in mind that since January 1986 the following are removed from the WPX Honor Roll and will no longer be accepted for credit: M1, VO3, VP3, VP4, VPØ, VS5, 1B9, 3B1, 3B2, 3C2, 3C3, 3C4, 3C5, 3C6, 3C7, 8Z, 9E, 9F. In another area, the DA4, DB, DC, DD, and DG are not acceptable, these being callsigns assigned to VHF stations only. The WPX program has always been and will continue to be HF oriented. This includes contacts via OSCAR.

With a final fling, here are some of the leaders in the leading DX clubs around the country, these volunteers stepping forward to carry the torch that will lead the way to brighter sunspots. In southern Arizona the Southern Arizona DX Assn. elected officers for 1986, and they are Roger Root, KC7LZ, president, Jeff Skinner, NN7C, vice president; and Karen Sasek, WAØNNC, secretary-treasurer. KC7LZ would like to hear from other clubs, possibly to promote mutual interests. In northern Arizona the Northern Arizona DX Assn. has Hugh Phillips, KR7Y, as president; Bill Schuchman, W7YS, as secretary-treasurer; and Art (no relation) Phillips, NN7A, for the program chairman. This club might be noted for having no dues structure. Recently we heard from one club whose bite is now $25.00 per year. Some say it's cheap; some say something else.

F6HJR, F6HMJ, F6HIZ, and F9ER were active from the Lerins Island (IOTA EU58) in late April signing F9ER/p on phone and F6HMJ/p on CW. QSL to the home calls CBA. A couple of weeks back there was a commemoration of the Allied landing in Normandy on June 6, 1944. TV6JUN was the callsign used and the QSL manager is F5AM. Send one IRC with QSL.

The Colvins made 50,500 QSOs on their last outing. What do they do with all the QSLs they receive? They file them. You have to see the files to believe. Be a believer, DX will rise again.

Frank Turek, DL7FT, refutes any reports that he was not at Mt. Athos in March. Frank says that he had all the proper written authorizations and was active from March 26th to April 1st. Frank says he has the entry certificate, the "Diamonitirion," and more. Frank again propounds the advice: "Work 'em first, worry later."

A final note. To straighten out some WAZ notes, CW 80 meter #1 belongs to Steve Orland, AA6AA. Steve also holds 10 meter phone WAZ #3, 40 meter CW WAZ #6, 80 meter phone WAZ #9, 15 meter phone WAZ #11, 10 meter CW WAZ #141, and 20 meter phone WAZ #190. If that is not enough, in April 1981 Steve was the first, perhaps only, to have all ten single-band WAZ as well as holding 5BWAZ#4. There!

73, Cass, WA6AUD

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Nelson Watts, KB4HAI, Rt. 4, Box 1052, Hickory, No. Carolina, 28602, stands forth, ready and able, to help a DX station with QSLing. Write Nelson direct if you need a good one.

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VR6BR to KA9W
VR6HI to ZL1AMO
VR6RW to ZL1AMO
VR6JB to ZL4DW
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YW7A to YV7QP, Box 411, Porlamar, Margarita Is., Venezuela
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3A6E to F9RN
3A6F to CBA or Bureau
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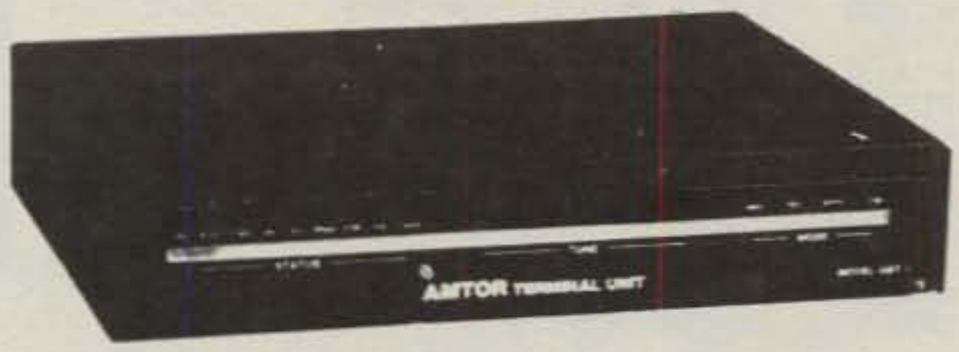

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C.W.

M/S	Score	Call	QSOs	Mult.
S	738,714	CT3BZ	734	106
M	557,520	GW3YDX	871	101
S	512,072	W1CF	1005	121
S	469,646	K5NA	947	127
S	453,321	G3SZA	649	99
S	440,520	KT3M	955	120
S	425,400	AA1K	1007	119
S	401,580	VE3BVD	889	90
S	383,150	W1BIH/PJ2	489	79
M	354,008	Y34K	806	76
S	331,535	VE6OU/VE3	730	89
M	322,575	YU1EXY	599	85
S	314,459	W3BGN	701	103
M	269,390	EA3VY	501	79
S	262,341	K3ZO	753	103
M	240,796	YT2R	533	74
M	235,790	W8JI	828	95
S	231,070	HK1AMW	335	70
S	230,230	VE1ZZ	277	110
M	229,292	GM3IGW	513	76
S	228,390	EA9EU	332	69
M	222,754	N9MM	846	98
M	218,463	K3ND	663	103
M	216,888	KH6RS	392	56
S	214,132	I2UBI	536	67
S	212,628	N5RZ	806	97
S	211,688	KM3T	683	94
S	209,700	N5DU	696	90
S	201,261	4X4NJ	295	72
M	201,178	W9RE	768	97
S	199,500	N4PN	716	100
M	196,280	UP1BWR	490	70
S	196,272	DF9ZP	501	72
S	194,124	W0ZV	755	84
S	189,266	YU3EF	418	50
M	188,852	UR1RWX	557	62
S	181,818	YU3EA	446	74
M	179,308	KS8S	705	92
S	178,020	K4VX/0	757	92
S	175,409	N4IN	490	103
M	171,738	N4SF	666	95
S	171,051	G4WQN	423	69
M	170,332	N4RJ	641	97
S	169,689	UG6GAW	318	57
S	166,252	W2FJ	539	89
M	165,319	W7XR	548	77
S	164,983	W3UM	571	91
S	164,073	WB3AVN	566	91
M	161,265	OK1KFQ	469	65
M	160,834	PA3DQW	510	58
M	157,368	K9RS	808	83
S	156,936	VO1MP	318	79
S	156,480	LA2GV	476	60
M	154,385	KY1H	650	77
M	153,085	W0AIH/9	779	85
M	146,916	ZL3GQ	248	63
M	146,586	OK3KFF	427	66
M	146,520	OK1KSO	400	72
S	143,299	VE3INQ	386	73
S	141,638	OK3CZM	431	67
S	140,140	VE3KP	439	52
M	138,374	W3GU	525	86
M	137,862	N8ET	693	81
M	135,564	WA0TKJ	730	79
S	135,316	UB5WF	400	56
S	134,456	RR2RU	434	56
M	133,083	KI0G	601	81
M	132,704	W3FV	503	88
S	131,192	VE3OME	430	62
S	130,815	W1KM	339	85
S	130,568	KV0Q	658	76
M	130,515	SP7KTE	450	55
S	129,856	DK6AS	364	64
M	129,352	K0UK	583	76
S	128,448	G3XTT	265	72
S	127,872	K5MM/7	594	72
M	127,800	AI7B	584	72
M	126,496	YU7JDE	388	59
S	126,469	N4WW	360	89
S	126,024	YT3T	394	59
S	125,118	UL7MAN	323	42
S	124,640	N4ZC	656	76
M	124,352	YT2B	394	58
M	121,451	DJ1BZ/A	354	61
S	121,420	OK1KPU	375	65
M	121,399	K6XV	482	73
M	121,044	W9AZ	646	77
S	119,460	UL7OB	302	44
S	119,196	EA6ET	340	63
S	118,422	UQ2PQ	433	51
S	118,252	N6ND	527	74
S	118,000	OA4ZV	202	78
M	117,900	UZ6LWZ	364	60
S	117,218	N1ACH	435	86
S	115,020	G4BYG	341	60
S	113,339	PA3DFT	355	60
S	112,672	OK2BCI	411	56
S	112,395	I4EAT	317	59
S	111,520	K7OX	591	68
S	110,121	UP2BCW	453	47
S	109,865	KC5DX	637	73
M	109,848	RL8PYL	271	46
S	109,760	VE5UF	356	64
S	109,099	KN4B	569	79
S	108,648	T77C	379	54
M	108,528	DL6RAI	385	56
S	108,518	UB5ZAL	346	58
M	104,938	K8AQM	630	71
M	104,208	N4XM	532	78
M	102,138	OK1DFP	384	58
S	165,282	K9UWA	914	78
M	163,030	W0CEM	1055	70
M	155,220	VP9AD	513	60
S	148,750	K0HA	948	70
S	145,350	WB3GCG	863	75
S	132,480	W0ZV	800	72
M	128,961	W8RA	827	69
S	109,364	AA1K	585	76
M	107,856	VE3KRP	400	56
M	104,676	N4FNB	794	61
S	98,528	VE3PN	423	48
M	96,837	LZ2KPD	451	39
M	89,311	NK7U	571	67
S	89,257	LZ1KOZ	410	41
M	88,608	K3ND	536	71
S	84,311	WB8SCD	670	59
S	82,398	NW5E	609	62
S	79,220	AA4NU	516	68
S	79,002	W4TMR	665	57
S	78,873	KY1H	565	60
S	77,805	KR7Y	523	65
S	76,760	AA4MM	339	76
M	75,010	N4NX	522	65
S	74,560	K6HNZ	485	64
S	74,340	YV2IF	126	63
M	74,220	KB5DN	612	60
M	73,602	KC3EK	612	54
S	73,160	W3TS	562	62
M	71,136	YU1AAO	252	52
M	70,058	YT2R	294	46
M	68,343	KA8POW	549	57
S	67,032	XE1VIC	231	57
S	65,691	KA7AUH	420	63
M	64,448	AK1L	524	53
S	64,400	W2FCR	503	56
S	63,630	WB9JKI	455	63
S	63,504	WI4K	552	54
S	60,690	I4ZNU	285	42
S	60,552	N4IN	342	72
M	60,192	KD0Z	495	57
S	58,080	KN4B	443	60
S	57,218	K7QQ	409	61
S	57,053	NJ8N	439	59
S	56,628	WA1UJU	516	52
M	56,007	K7IDX	350	63
S	53,970	UC2IDC	256	35
M	52,896	N2MM	400	57
S	51,015	W0GOR	407	57
S	50,388	K4DLI	338	57
S	50,266	4X4NJ	129	41
S	50,225	WB4OSS	482	49
S	49,973	K5WXZ	391	59
M	49,647	KE5BB	406	57
S	49,501	W3GU	367	59
S	48,152	N8ET	412	52
S	48,117	PA3DFT	217	43
M	48,052	OE3WQB	237	41
S	47,519	KM9L	367	61
S	47,466	WA5NFC	406	54
S	47,300	WA4VDE	374	55
M	47,152	W3FV	365	56
S	46,200	VP5Z	166	55
S	44,712	W3UM	368	54
S	43,450	W0HW	337	55
S	43,142	N1ACH	355	53
M	43,010	I8CZW	190	46
S	42,840	IV3PRK	182	45
S	42,340	KE7V	292	58
S	41,644	KR9G	320	58
M	40,748	N4RJ	278	61
M	40,150	K3UA	315	55
S	39,627	UA9AKO	205	21
S	38,836	OE1DH	210	38

SSB

M/S	Score	Call	QSOs	Mult.
S	279,441	LZ2CJ	838	61
S	215,499	K1ZM	1038	87
M	204,120	KC8MK	1060	81
S	203,948	VE3MFA	663	67
M	203,840	W3BGN	941	91
M	194,560	GW3YDX	570	64
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M	186,167	OK3KFO	804	47
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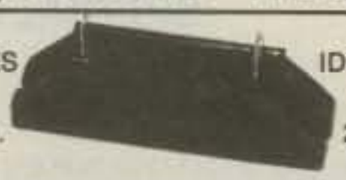

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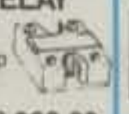

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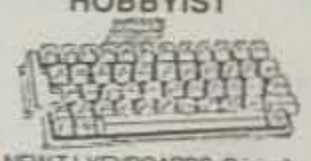

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