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Amateur Radio

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Including

HAM RADIO

Results Of The 1990 CQ World-Wide WPX SSB Contest . . . page 22

FCC Says "Yes" To No-Code! . . . page 11

On The Cover: W9XT and DeXter

THE RADIO AMATEUR'S JOURNAL

KENWOOD

TS-950SD

"DX-clusive" HF Transceiver

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

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Complete service manuals are available for all Kenwood transceivers and most accessories.
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Digital Signal Processing

Without DSP With DSP

• Digital Signal Processor. DSP is a state-of-the-art technique that maximizes your transmitted RF energy.

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Additional Features: • Built-in interface for computer control • Programmable tone encoder • Built-in heavy duty AC power supply and speaker •Adjustable VFO tuning torque • Multiple scanning functions • MC-43S hand microphone supplied

Optional Accessories
- DSP-10 Digital Signal Processor *
- SO-2 TCXO * • VS-2 Voice synthesizer
- YK-88C-1 500 Hz CW filter for 8.83 MHz IF *
- YG-455C-1 500 Hz CW filter for 455 kHz IF *
- YK-88CN-1 270 Hz CW filter for 8.83 MHz IF
- YG-455CN-1 250 Hz CW filter for 455 kHz IF *
- YK-88SN-1 1.8 kHz SSB filter for 8.83 MHz IF
- YG-455S-1 2.4 kHz SSB filter for 455 kHz IF *
- SP-950 External speaker w/AF filter
- SM-230 Station monitor w/pan display
- SW-2100 SWR/power meter
- TL-922A Linear amplifier (not for QSK)

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

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TM-731A/631A

144/450 and 144/220 MHz FM Dual Banders

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

Optional Accessories:

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

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"Dynamic Duals"

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

KENWOOD

Compact Champion!

TH-27A/47A

2 m and 70 cm Super Compact HTs

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

- **Large capacity NiCd battery pack supplied.** The standard battery pack is 7.2 volts, 700 mAh, providing extended transmit time with 2.5 watts. (TH-47A: 1.5 W.)
- **Extended receive coverage.** TH-27A: 118–165 MHz; TH-47A: 438-449,995 MHz. TX on Amateur bands only, (TH-27A modifiable for MARS/CAP. Permits required. Specifications guaranteed for Amateur bands only.)
- **Multi-function scanning.** Band and memory channels can be scanned, with time operated or carrier operated scan stop.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- **Built-in digital clock** with programmable timer.
- **Dual Tone Squelch System (DTSS).** Compatible with the TH-26AT Series and the TM-941A Triple bander, as well as other Kenwood series transceivers, this selective calling system uses standard DTMF to open squelch.
- **Five watts output** when operated with PB-14 battery pack or 13.8 volts.
- **T-Alert for quiet monitoring.** Tone Alert beeps when squelch is opened.
- **Auto battery saver, auto power off function, and economy power mode extends battery life.**
- **DTMF memory.** The DTMF memory function can be used as an auto-dialer. All characters from the 16-key pad can be stored, allowing repeater control codes to be stored!
- **41 memories.** All channels store receive and transmit separately for "odd split."
- **DC direct in operation.** Allows external DC to be used (7.2 – 16 volts). When external power is used, the batteries are being charged. (PB-13 only.)
- **Automatic offset selection (TH-27A).**
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **CTCSS encode/decode built-in.**
- **Supplied accessories:** Rubber flex antenna, battery pack, wall charger, belt hook, wrist strap, dust caps.

Optional accessories:
- **BC-14:** Wall charger for PB-13, 14
- **BC-15:** Rapid charger for PB-13, 14
- **BH-6:** Swivel mount • **BT-8:** Six cell AA Alkaline battery case • **HMC-2:** Headset with VOX and PTT • **PB-13:** 7.2 V, 700 mAh NiCd pack • **PB-14:** 12 V, 300 mAh NiCd pack • **PG-3F:** DC cable with filter and cigarette lighter plug • **PG-2W:** DC cable • **SC-30:** Soft case • **SMC-31:** Standard speaker mic • **SMC-32:** Compact speaker mic
- **SMC-33:** Compact speaker mic with controls
- **WR-2:** Water resistant bag.

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

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CQ The Radio Amateur's Journal

ON THE COVER: Gary Sutcliffe, W9XT of Slinger, Wisconsin, does his contesting and DXing under the watchful eyes of DeXter the cat (or should that be "DeXter the DXer"). (Photo by Larry Mulvehill, WB2ZPI)

MARCH 1991 **VOL. 47, NO. 3**

FEATURES

DEPARTMENTS

ZERO BIAS

EDITORIAL

This week war broke out in the Middle East. It's hard to come up with an amateur radio topic or concern that doesn't seem infantile or totally vapid in relation to the basic fact of war. Suddenly the relative merit or import of a no-code license, or to "hamspeak" or not to "hamspeak," fades rather quickly into obscurity.

After two or three days of CNN coverage I realized that the wonderfully complex amateur radio gear I own (or covet) is but a crystal set in comparison to the stuff being used to wage war. Clearly, the onset of this war was electronic and yet of a scale that few of us could imagine. We all can see and accept the fact that a rocket launched from 1,000 miles away can be guided almost effortlessly to a singular building and to a particular window before striking and wreaking havoc. Amazingly, we can even watch it hit and explode from half a world away. For a while anyway it is sort of disquieting and does tend to put a firm grasp on reality.

Someone I spoke to this week remarked that each time we begin the decent from a sunspot peak, some war breaks out. It's a curious "fact," one that stuck in my mind, but somehow in light of things I haven't checked it out. I'm sure that someone will be curious enough to look it up.

Some amateurs have found themselves on TV demonstrating to anxious reporters and their viewers how "traffic" is handled and messages are received and delivered to loved ones. Yes, it's good publicity in a sense for amateur radio, but I think that most people watching get caught up in the "messages," looking for some scrimpet of news not already covered on TV. The world is justifiably frightened and waiting for the other shoe to fall making this war even bigger and far costlier.

So, as I write this during the opening forays, I can only hope that it doesn't go on too long. I would like to believe that it all will be over by the time that you read this, rather than the world learning what the true meaning of ugly can be. In a lot of ways I'm still the same hawk I was during the early 60s when I saw military service, except these days I have fewer feathers on top and more white ones on the side. I didn't see combat, but served my time in the medical corps here in this country. I did get to see and smell the fruits of war after they were sanitized and brought home for recuperation. I still remember certain patients after almost 30 years. But there's a big difference between old hawks and young hawks. Old hawks don't have to fly anymore; they just head the young ones off hopefully in the right direction.

Enough pontificating. Let's get back to the issues facing amateur radio such as no-code and hamspeak. I say hamspeak because that seems to be the next big issue facing us—whether or not to keep it or opt for plain, simple language. No, people who are not amateurs don't readily understand it and it is a jargon of our "trade," if you will, but people do come to understand it, and use it routinely after a short while. Just think: It was only a few short weeks ago when most people thought that *scud* was something that floated on a pond during a hot summer day.

Closer To Home

I received a nice letter from Rey Marrero, CO2HQ, with regard to my editorial on the FRC and their Awards Department. Rey has just been appointed to take over the FRC Awards Department, and he wanted to assure me that my awards had been shipped last June and simply failed to arrive. He said that they were processing duplicates, and he wanted me to let him know when they arrived here. I'll let you and Rey know when they arrive. As I told Rey in my letter to him, sometimes I'm a ham first and an editor second. Hams do tend to take these things very personally and very seriously, although I suspect that most of you out there are much more mature about these matters.

With Deep Sorrow

It's always hard to write about the death of someone you knew and liked, especially if you felt that they died too young. George Buxton, N7EZJ, passed away on December 30, 1990 at his home in Everett, Washington at the age of 45. George succumbed after a long battle with cancer. George was one of the founders of AEA and its Vice President. We at *CQ* came to know George through AEA when it started and over the years maintained a friendship as the company grew. George truly was a nice, kind, considerate, and honest man. While his family and his friends and associates at AEA bear the brunt of this loss, his many other friends and acquaintances are also diminished by his death. We wish we had had more time with you, George.

Milestone Event

March 1951: A lot of us median-aged amateurs were 12 years old and just starting to think of amateur radio. That fact is really not worth commemorating, but in the March 1951 issue of *CQ* there was something which we proudly celebrate this month. Forty years ago George Jacobs, W3ASK, became the Propagation Editor for *CQ*. George has done an outstanding job these 40 years, not only on reporting propagation conditions, but in educating countless thousands of us in the whys and wherefores of the sunspot cycles and how to optimize our operating time. Thank you, George, for all of your efforts on behalf of amateur radio and *CQ*. Here's to the next 40.

This Month

This month we moved Fred Maia's "Washington Readout" column up front to be our lead article. In the event that you haven't heard or read the details of the new no-code licensing structure, I suggest that you read it. The FCC has remarkably and quite succinctly cut to the core of the issue and has opted for the most viable and economic solution. Obviously, not everyone will be pleased, and some will continue to seek ways of further convoluting our already complicated licensing structure.

We tend to react emotionally rather than logically. Hence the varied rationales. However, what we have achieved or received is now the norm as of February 14, 1991. This too will become an emotional tradition for the next generation of amateurs, and in the years to come it will seem as if it always was. Somewhere down the road as this too is changed or modified I can see countless arguments and proposals for protecting this by now sacrosanct tenet.

In the meantime, let's try to enjoy amateur radio and have some fun doing it. Let's also try to encourage others to give it a try. Nothing is as infectious as a group of people having a good time; others simply want to join in. Obviously, this is also a good time to start thinking of answers to questions posed by friends, neighbors, and relatives on traffic handling and information from the Middle East. In deference to the hobby, amateur radio is primarily defined as a service. So how many of us are actually prepared to provide that service?

73, Alan, K2EEK

116 Countries Worked

In Less Than 24 Hours

After several months of rigorous testing by hundreds of amateurs, the IsoLoop™ HF Antenna is proving to be a breakthrough in compact HF antenna design.

"I was very impressed with its apparent high efficiency. It was exciting to work European stations on 20 meters running 50 watts to the IsoLoop in my attic. A definite solution to (the) limited space antenna problem." George K7HBN

"The IsoLoop sure brought in the stations... It heard all the weak DX stations that my phased system heard!... I never missed hearing a weak DX station... This is not the compromised antenna I thought it would be... It really is a midget antenna that works like a big one!" Richard N5EV

"I have used (the IsoLoop) on 10, 15, 17 and 20 meters with great success... It 'talks' even better than I expected!" Mike KF7YB

"I'm a believer!... Yesterday I got on 21 MHz SSB during the CQM contest and made 20 contacts including EM2, Y34, SP, UW0, HA, UL8, UB5 and YL in less than one hour... a real solution for the ham with limited or restricted antenna capabilities." Lew K4VX

How is your IsoLoop performing for you? Drop us a line. We'd love to hear from you!

John KA7MCX works DX with his IsoLoop.

Our latest report is from John Pollock KA7MCX (pictured above) who worked 116 countries in 23.6 hours during the fall CQ World Wide SSB DX Contest. All 626 of his contacts made in the contest were with his IsoLoop mounted 15 feet above his flat roof (25 feet above ground). During that period he also worked all continents at least twice on each of the 10, 15 and 20 meter bands. Good things (and high-performance antennas) can come in small packages!

In another report from Bob Hatter K7RDH, we learn that he worked over 150 countries on SSB in less than 30 days. His antenna is also the IsoLoop, mounted above the peak of his roof.

Although we cannot guarantee results like these in every possible environment, chances are the compact IsoLoop will surprise you with its performance. This HF antenna goes where few others have gone before!

Where Engineering Makes the Difference!

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The Hercules II, Model 420

Model 253, Automatic Antenna Coupler

A 500 WATT OUTPUT STATION. Here is a full capability station that uses modern technology to simplify operation. The Hercules II amplifier and the new Model 253 automatic, 2 KW, "match anything" antenna coupler are both controlled by the Paragon (or Omni V) transceiver. All bands, 160 through 10 meters, all modes. A 500 watt output "transceiver" that works great with, or without, a world class antenna system. The really good news is that you can own this complete station for a price less than some competitive transceivers alone! Now, who offers the best value!

THE PARAGON is the choice of many of the most experienced operators on Earth. The fussiest phone folks, cw operators that are out-and-out snobs and many of the digital stations that lead the rtty DXCC list. General coverage receive from 100 kHz to 30 MHz. 100 watts of transmitter power from 1.7 to 29.999 MHz. All of the nifty features expected in a computer based design. Dual VFOs. TX and RX offset with display. 62 programmable memories that include frequency, mode and filter plus a 7 character alpha-numeric displayed tag feature. QSK cw with a changeover time of 30 ms. All digital modes with real FSK. Outstanding ssb with a standard speech processor that is a pleasure to hear. I-F filter selection, independent of mode. In short, a truly outstanding do-everything rig.

THE HERCULES II is a really classy solid state, all mode broadband amplifier that does not require any tuning. Remote band switching can be controlled by our Paragon or Omni V. Temperature controlled cooling system is whisper quiet on ssb, yet has adequate capacity to cool the internal heat sinks under key down conditions. Runs on 12-14 vdc for battery operation, mobile or base. (A heavy duty auto battery with a 10 amp charger makes a good, and inexpensive, base power supply.) Not shown is the Model 9420, 100 amp dc power supply that powers the Hercules II and the transceiver. A remote control system is available for mobile Hercules II installations. The Hercules II is fully metered and includes a 10 element LED peak power bar-graph display. Compact, good looking and a signal within one S-unit of the mighty TITAN!

THE MODEL 253, 2 KW AUTOMATIC ANTENNA COUPLER is the latest in our highly regarded line-up of tuners. Functions as an antenna management system with the front panel, four position, antenna switch. Positions 1 thru 3 are dedicated to coax fed antennas. Position 4 may be used for coax, single wire or balanced feeders through the built-in high power balun. Tuning is accomplished with a motor driven, roller inductor and fixed value capacitors selected with enclosed relays. The system is microprocessor controlled with one memory per antenna select position. Nine memories per antenna position are available when used with the Paragon or Omni V where band information is provided. The finishing touch for any station.

UNIVERSAL STATION ACCESSORIES

MODEL 240KW, DRY DUMMY LOAD. Forced air cooled. Designed to operate at 1500 watts "key down" for up to 2 minutes. 1.5 to 150 MHz. Alarm sounds if over-temperature reached. Rear panel connection for scope signal.

MODEL 254 200 WATT TUNER. "T" match design matches a broad range of impedances. Simple and fast to operate. Metered for power out and SWR. Small size and light weight makes this a favorite for mobile and portable operation.

MODEL 238, 2 KW ANTENNA TUNER. Time proven "L" network design will load virtually any antenna from 1.6 through 30 MHz. Metered for power and SWR. High power roller inductor with slide rule position indicator. High voltage variable capacitors are the same style as used in the Titan amplifier.

MODEL 5060 TV/FM HIGH PASS FILTER. Forty dB attenuation below 30 MHz. Insertion loss 2 dB or less. Extruded aluminum housing with a type F female input connector. Output is 4" of RG-59 cable with a type F male connector.

MODEL 5061, 2 KW TRANSMITTER LOW PASS FILTER. Ninth order Chebyshev circuit with less than .2 dB loss. 50 dB attenuation at 50 MHz with 70 dB ultimate attenuation. Unlimited operation at 1500 watts at 2:1 SWR. Rugged extruded aluminum housing with SO239 connectors.

MODEL 605 SINGLE PADDLE ELECTRONIC KEYER. Operation is just like a "bug" except the dashes are also keyed automatically. Adjustable paddle tension, speed and weighting. Also great for mobile use.

MODEL 604 ELECTRONIC IAMBIC KEYER. Unique torque driven paddles and adjustable magnetic tensioning system for the ultimate "touch" control. Front panel adjustment of speed and weighting. A cw operator's delight.

...TWO FOR THE SHOW"

THE OMNI V is unique in all the world. All of the great attributes of digital technology are combined with the demonstrable superiority of a crystal mixed oscillator. Phase noise is simply eliminated as a variable. All ham bands, 160 through 10 meters, in 500 kHz segments with 30 kHz overshoot at the band edges.

Large frequency display that you will appreciate. Selectable narrow filters are available for the 9 MHz I-F as well as the 6.3 MHz I-F. All are front panel selectable, independent of mode. Up to 24 poles of cascaded crystal filtering! Dual VFOs with an offset/split system that allows independent RX tuning throughout the 500 kHz segment. Momentary REVerse button lets you hear/set TX frequency. Fewer controls, fast operation and minimum operator-error opportunities.

QSK cw, real FSK and superb ssb performance. Standard features include speech processor, noise blanker, RS-232 interface, nonvolatile RAM for the 25 channel memory system, memory scratchpad and much more. Status register, clock and calendar are backed with a long life, easily replaced, "drug store" lithium battery. Options for FM and a remote frequency tuning encoder that can be positioned anywhere. The reasoned choice for the operator who places the first priority on optimized performance in the ham bands.

THE TITAN "LEGAL LIMIT" LINEAR AMPLIFIER is a workhorse of proven stamina. The heart of the Titan is a pair of Eimac® 3CX800A7 ceramic triodes. This tube is the popular choice among designers of high realiability commercial and military equipment in this power range. We consider the 3CX800 to be the 3-500Z of the 90s. 1500 watts continuous key-down output with ease. Super clean ssb. Unbelievably fast QSK cw using a Jennings® vacuum relay, rather than diodes. Assured reliability, even if you "pull the trigger" into high SWR. You older, really experienced operators never do that, right . . . .

Another Titan difference is the power supply. The power supply capacity required to maximize the performance of a pair of 3CX800 tubes, in our judgement, dictates a transformer size that will not fit into a RF deck of reasonable proportions. We also like the idea of not compromising the cooling of the tubes by adding the heat from the power supply. The Titan power supply is housed in a separate utility enclosure and remote controlled.

The TITAN has everything but the biggest price, including a limited three year warranty.

THE MODEL 961 POWER SUPPLY is a linear design that will operate at 22 amps and still deliver good clean dc and maintain regulation. A fast action circuit breaker is built-in to protect the transceiver power amplifier. Front panel speaker and styled to match the Paragon and Omni V.

The "FORCE 5" station. Compare in any pileup!

The Omni V, Model 562

The Titan, Model 425

Model 961, Power Supply

GSA CONTRACT NUMBER GSOOK91AGS0712

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HOW ABOUT OUR "CLOSET KILOWATT" CONCEPT!

The ultimate XYL pleaser. The entire station in a Ten-Tec cabinet measuring less than 19" high x 21" wide x 18" deep. 19" rack mount adaptors, with slide rails, are available for all major Ten-Tec equipment models.

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is one you may never use. Our service and product support are legendary. Proven, not just claimed! All of our products are designed for field service to the board level. When you call us with a service need, you typically talk to one of the techs who services the model you own. Many times service can be accomplished with a "painless" mail order board exchange. If factory service is required, the work is thorough, fast and at a fair charge.

Send for our free catalog. Full description and specifications on all Ten-Tec equipment and accessories. Our enclosure catalog also available upon request.

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Sevierville, TN 37862
Phone 615-453-7172
FAX 615-428-4483

MADE IN USA

10, 12, 15, 17 and 20 Meters

cushcraft

R5

Performance is always your top criterion, and when space is at a premium the R5 is your best choice. It needs no ground radials and stands 17 feet tall.

10, 12, 15, 17 and 20 meters are yours with fully automatic band selection and RFI supression. The only connection needed is the 50 Ohm coax from your transceiver.

The unique counterpoise has four 48" x 0.1" stainless steel rods for excellent ground independence. This allows the antenna to be mounted anywhere from ground level to roof top.

With the R5 you get quick assembly, easy installation and the highest "performance to size" ratio of any antenna available to the amateur today. Whether your space is large or small, the R5 will make ham radio more fun.

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SWR 1.2 : 1 Typical 2:1 Bandwidth	10m - 2 MHz 12m - 100 KHz 15m - 450 KHz 17m - 200 KHz 20m - 350 KHz
Power Rating, Watts PEP	1800
Radiation Angle, Degrees	16
Frequency selection	Automatic
Horizontal Radiation Pattern	360°
Height, ft (m)	17 (5.2)
Mast Size Range, in (cm)	1.5-1.75 (3.8-4.4)
Wind Load, ft² (m²)	1.4 (.13)
Weight, lb (kg)	8.7 (4)
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ANNOUNCEMENTS

• **Weekly Amateur Radio Show Premiers** -- The first weekly international amateur radio television series premiered on January 15 on Spacenet 3, Transponder 4. This weekly one hour series is devoted entirely to promoting and teaching amateur radio, with features such as spotlighting an amateur of the month, club and organization activities, product reviews, tech tips, special events, etc. The program is hosted by Jack Smith, WA2QYT, a well-known, active promoter of amateur radio in the northeastern United States. The promoters are expecting this series to be picked up by most of the major cable companies. It will take calls from active amateurs in each area requesting the show be put on your local cable. *CQ* is sponsoring a portion of these broadcasts. For more information, contact Jack Smith at 315-253-4301.

• **25th Central States VHF Society Conference** - This event will be held on July 25–28 at the Sheraton Inn in Cedar Rapids, Iowa. The conference is open to both members and nonmembers. They are looking for speakers and technical papers to be presented. Those interested should contact Ron Blocksome, K0DAS, 690 East View Drive, Robins, IA 52328 (319-393-8022).

• **Calling Vietnam-era MARS Operators** - MARS officials have asked Dr. Paul Scipione, AA2AV (MARS callsign AAA9PR), to write a book about the history of MARS operations during the Vietnam War. If you are a Vietnam era MARS op or know one, contact Dr. Scipione for a MARS Nam questionnaire. His book, to be published in 1992, will have a section with the names, current callsigns, and QTHs of MARS Nam ops to reunite old friends. Write to AA2AV, 5 Burr Drive, Metuchen, NJ 08840, or call 908-548-8096. The MARS Nam net meets each Sunday at 7 PM Eastern/4 PM Pacific (2400 UTC) at 14.330 +/– QRM.

• **Alamogordo, New Mexico ARC VE Testing Schedule** -The time of the following exams is always 12 noon, and the location is the Alamogordo Mid High School, south entrance. The dates are March 2, June 1, August 31 (at the club's hamfest, Otero County Fairgrounds, 12 noon Saturday, 9 AM Sunday), and December 7. For information contact Marilyn Redman, Alamogordo ARC, P.O. Box 1191, Alamogordo, NM 88310.

• **Dayton ARA Scholarship Applications** - The Dayton ARA is now accepting applications for their 1991 Scholarship Program. There will be eight $1500 scholarships available. The program is open to any FCC-licensed amateur operator graduating from high school in 1991. Information and application forms are available from DARA Scholarship Committee, 317 Ernst Avenue, Dayton, OH 45405.

• **WBOU/Voice of America Commemoration** - The Piscataway, New Jersey ARC will commemorate the Voice of America relay station WBOU, which operated from Piscataway from 1942 through 1964. PARC members will operate using their own callsigns /VOA from 0000Z March 16 to 2400Z March 17 in the lower General portion of 75, 40, 20, and 15 meters, and the Novice 10 meter band. For certificate send QSL and 9 × 12 SASE to PARC, Attn. KB2UV, P.O. Box 1233, Piscataway, NJ 08854.

• **KZ4S from Opp, Alabama** - The Covington ARS will operate KZ4S from 1400Z March 2 to 0200Z March 3 to commemorate the 32nd Annual Opp Jaycees Rattlesnake Rodeo. Operation 25 kHz up from the General 80, 40, 20, and 15 meter bands, and approximately 28.385 on Novice 10 meter band. For commemorative QSL send QSL and business-size SASE to CARS, c/o Kay B. Ezell, N4VJI, P.O. Box 244, Opp, AL 36467.

• **WA4THF from Virginia Beach, Virginia** - The Virginia Beach ARC will use club call WA4TGF from 1400Z March 23 to 2000Z March 24 to commemorate the 100th anniversary of the arrival of the *Norwegian Lady* to these shores. Approximate frequencies are 3.875, 7.275, 14.275, 21.275, and 28.363 MHz. For certificate send QSL and SASE to VBARC, P.O. Box 62003, Virginia Beach, VA 23462.

• **W4BKM from Macon, Georgia** - The Macon ARC will operate W4BKM in conjunction with the Cherry Blossom Festival as follows: March 22 and 23 from 1400Z to 2300Z on (+/–QRM) CW 7130, 14030, 21130, and 28130; SSB 7250, 14250, 21320, and 28320. For certificate send QSL and 9 × 12 SASE to Macon ARC, P.O. Box 4862, Macon, GA 31208.

• **5-Land Special Event** - The Nolan County, Texas ARC will operate a special event station from 1500–2400Z March 8–10 during the world's largest rattlesnake roundup. Operation will be in the 20 and 40 meter General phone bands plus 10 meter Novice. For certificate send QSL and large SASE to WR5B, P.O. Box 825, Sweetwater, TX 79556.

• **WA7APE from Scottsdale, Arizona** - The Scottsdale ARC will operate WA7APE from 1300–2300Z on March 16 on CW 21.045 and 28.110; SSB 21.350 and 28.320. Send QSL and SASE to Scottsdale ARC, P.O. Box 10878, Scottsdale, AZ 85271-0878.

• **WB8SMC/8 from St. Patrick (Shelby County), Ohio** - The Farout ARC will operate WB8SMC/8 from St. Patrick, Ohio from 1700Z March 16 to 1700Z March 17 in the lower halves of 80, 40, 15, 10 meter Novice CW and 10 meter Novice phone; and 80, 40, 20, 15 meter General phone. To QSL send business-size SASE and QSL to Farout ARC, P.O. Box 9181, Dayton, OH 45409-9181.

• **W9CAF Open House** - The Chicago ARC will sponsor an open house from 11 AM to 4 pm on March 10 at the DeVry Institute of Technology, Chicago, IL. Featured will be operating stations on SSB, CW, and packet, and exhibit of early radio and electronic equipment, and a videotape of amateur radio history. Free admission and parking. For more information, contact CARC, 5631 W. Irving Park Road, Chicago, IL 60634.

• **Special Event from Grand Island, Nebraska** - The Grand Island ARS will celebrate the return of the "Sandhills Cranes" on March 15–17 in the lower SSB and CW portions of General subbands 15–75 and Novice 10 meters. For certificate send SASE to P.O. Box 462, Grand Island, NE 68803. For more information, contact David Weitzel, KF0LZ, 308-381-1948.

(continued on p. 104)

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Communicator is out; code-free Technician is in! In this special installment of "Washington Readout," columnist W5YI gives the details of the FCC's no-code decision and how it affects the amateur service and prospective amateurs.

FCC Says "Yes" To No-Code!

BY FREDERICK O. MAIA*, W5YI

"The steps that we have taken . . . hold the potential of providing an even more vital, more dynamic service."
FCC Chairman Alfred Sikes

A year ago, February 8, 1990 to be exact, the Federal Communications Commission said they would be adopting a new class of amateur radio operator license that would not require applicants to prove that they can send and receive Morse code. It was to be called the "Communicator" Class and provided privileges in the relatively unused amateur spectrum above 222 MHz. The proposal was issued in response to twelve petitions for rule making from the amateur community calling for codeless license classes—one of which came from the American Radio Relay League. The ARRL historically has opposed code-free entry into amateur radio.

The FCC has had many requests over the years from persons who maintain that proficiency in telegraphy is an unreasonable barrier to obtaining an amateur operator license. When the FCC proposed codeless classes previously, however, the amateur community led by the ARRL strongly objected. The feeling seemed to be "I had to pass the code, so you should have to also" or "We don't want ham radio to become a disorganized CB service."

The sentiment of the amateur fraternity began changing a couple of years ago when it was learned that Morse code would no longer be used by ships sailing the high seas. Instead of depending upon shipboard operators and radio wave propagation, the Maritime Service would now use a more reliable satellite-based emergency plan.

Amateurs became especially concerned in 1988 when two megaHertz of prime spectrum was transferred from amateur to exclusive business use. No longer would the amateur community be able to communicate between 220-222 MHz. Our under-utilized frequencies have always been in big demand by the commercial sector. Now, acting in what they believed to be the public interest, the FCC was ressigning spectrum that we thought was ours. Amateur frequencies are by far the most valuable asset we have. Just the two megaHertz we lost represents billions in revenue to big business!

The international Radio Regulations to which the United States is treaty bound require amateur licensees to be knowledgeable in Morse code signalling. Although this requirement may be legally waived for an operator of a station transmitting exclusively on frequencies above 30 MHz, each of the five classes of operator licenses currently issued by the FCC requires the applicant to pass a telegraphy examination.

The FCC said they would be adding a new entry-level "Communicator Class" operator license which would replace the first two existing amateur classes. Their plan was to reprogram the resources used to issue Novice and Technician licenses to process the no-code Communicator Class. A six-month public comment period was adopted.

The Commission wanted the new code-free amateur ticket to offer an entry-level opportunity to otherwise qualified persons who find the telegraphy requirement a barrier to entering the amateur service. Another FCC code-free goal included prompt implementation without a negative impact on existing amateurs, or volunteer examiners and their workload.

The operator privileges proposed by the FCC included all authorized emission types, a maximum transmitter power of 200 watts peak power, and authorization to transmit on amateur service frequency bands above 30 MHz with the exception of the 2 meter and 6 meter bands. They generally followed the suggestions of the ARRL.

Comments From The Public

Approximately 70% of the more than 1,110 comments received from the public favored some sort of entry-level codeless class. Among those confirming the need for a codeless class is the Quarter Century Wireless Association.

The QCWA is an organization of nearly 11,000 amateur radio operators—"old timers"—who were first licensed 25 or more years ago. They said that ". . . many QCWA members have a lifetime history of operating with, and a sentimental attachment to, use of the Morse code. It is understandable that some may not be overly enthusiastic in endorsing changes in licensing procedures which would delete the requirement of proficiency in this traditional mode of communication. Nonetheless, after consideration of the facts associated with licensing trends, we have concluded that the blanket code proficiency requirement may be a major cause of decline in the entry of many people into the Amateur Radio Service. Given this conclusion and in recognition of our responsibility to the Public Interest, we are agreed that a blanket Morse code requirement for entry into the Amateur Radio Service can no longer be justified."

The American Radio Relay League agreed " . . . the FCC objectives in this proceeding are basically sound and are consistent with its own rationale for the creation of a codeless class. An ARRL study committee has concluded that the perception of the Morse telegraphy requirement filtered out too many desirable and technically qualified operators who have not recognized the value of manual telegraphy as a means of practical communication."

The National Conference of Volunteer Examiner Coordinators (NCVEC) stated that it ". . . found ample evidence that the Morse telegraphy requirement is no longer essential to an entry level amateur op-

*National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101

erator license." The Amateur Radio Industry Group (ARIG), another codeless class supporter, commented ". . . amateur radio has evolved from a hobby of tinkerers and telegraphers into a service of communicators. . . . The Morse code requirement at the entry level is a carryover from the origins of amateur radio which today may be preventing many interested and otherwise qualified persons from entering the Amateur Radio Service."

There were also opposing views. Some said that telegraphy skill is absolutely required for any participation in the amateur service, or claimed telegraphy as a superior communications medium, with telegraphers being model radio operators. They argued ". . . Morse code is the most effective means of communicating and the only one which can be used under the most adverse conditions." "All hams must be prepared to use code in an emergency situation." "We do not desire to have individuals join our ranks that would have us lower our standards." Another contention was based upon the need to maintain tradition. "I had to take the code when I got my ticket, so why should someone else pass the code up?" "I believe everyone should be blessed with the glory of learning code before operating in the amateur frequency spectrum."

The FCC acknowledged the responses clearly confirmed that the amateur community was undergoing a dramatic shift in sentiment concerning the value of Morse code as an entry-level license requirement. "Modern commercial and military electronic systems require engineers to design them, technicians to install and maintain them, and a technologically literate citizenry that can use them. The amateur service should as it has in the past, attract technically inclined persons, particularly the youth of our country, and encourage them to learn and to prepare themselves in the areas where the United States needs expertise." The FCC added, "We do not foresee that telegraphers will be in as great demand by future systems as will electronics and communications experts. . . . We conclude that telegraphy skill is not so essential to proper operation of a station that transmits exclusively above 30 MHz such as to justify turning away otherwise qualified persons who do not possess the skill."

"We do not concur with the comments alleging that the passing of a telegraphy examination is an indication of the examinee's good character, high intelligence, cooperative demeanor, or willingness to comply with our rules. These traits are also found in individuals who have not passed such a test. For regulatory purposes, passing a telegraphy examination is no more and no less than proof of the examinee's ability to send and receive texts in Morse code at some specified rate."

FCC Rules on Codeless Amateur License

Instead of enacting its controversial proposal for a Communicator license, the FCC on December 13, 1990 removed the 5 WPM Morse code requirement from the existing Technician class amateur operator license. Praising amateur radio for its achievements, the five Commissioners voted unanimously for the change. Implementation of the new rules takes place on February 14, 1991.

At the same time, the FCC voted to change the Part 97 Regulations to include the procedures for exempting handicapped Novice and Technician amateurs from the 13 and 20 WPM Morse tests required for upgrading to higher license classes. The 5 WPM Morse test will continue to be required of *all* amateurs who desire HF operation.

Current holders of Technician licenses will be "grandfathered," meaning that they will keep all of their current privileges (including HF privileges). After the new rules go into effect, new Technician licensees will receive all amateur privileges above 30 MHz. They may optionally pass a 5 WPM Morse test to obtain the

same privileges below 30 MHz enjoyed by Novices and current Technicians.

Technician licensees who pass the 5 WPM test will not receive any new call-sign, nor will they have to use a suffix or other special station ID. The new rules will not prescribe an official name for Technicians who have HF privileges. However, FCC staff told us they expect the name "Technician Plus" to be widely used in place of "Technician Plus 5 WPM Morse Code."

The Technician exam will consist of 55 questions from the current Novice and Technician elements 2 and 3A. The multiple-choice exam will not include five proposed special questions about Morse code's "utility and tradition" as requested by the ARRL. Element 2 (30 questions) and 3A (25 questions) need not be taken at the same time.

The Commission decided to retain the Novice license in order to provide an alternative entry-level opportunity to those who can pass a 5 WPM telegraphy requirement in place of the more comprehensive written exam for the Technician. The Novice examination will continue to be available under the current two VE system. Despite serious problems with fraudulent examinations, the Commission decided not to integrate Novice testing into the Volunteer Examining program at this time.

The Commissioners' Meeting

The following is a transcription of the FCC meeting of December 13, 1990, when the codeless Technician class was adopted. Ralph Haller, Johnny Johnston, and William Cross, officials in the FCC's Private Radio Bureau, are licensed amateurs.

Ralph Haller, Chief, FCC Private Radio Bureau: "Good morning, Mr. Chairman and Commissioners. The Amateur Radio Service has a long history of pioneering advancements in the radio art. I thought you might like to see what the state of the art is right now in the Amateur Radio Service. Through various networks that have been put together by the voluntary time and personal funds of radio hobbyists, it's possible to communicate around the world with a small radio (displays a small rig).

"We believe that the items before you will encourage growth in the amateur service. Three people deserve special credit. They reviewed over 1,100 comments in response to the two notices. I'd like to recognize John Johnston, Monty DePont, and Bill Cross, who will now present the items.

William Cross: "Modern consumer, commercial and military electronics systems require engineers to design them, technicians to install and maintain them, and a technologically literate citizenry to use them. Many of our engineers, scientists, astronauts, educators and technicians took their first steps toward their careers when they became amateur operators. We look to the amateur service to expand our country's resource of technicians and electronics experts.

"The advent of radio at the turn of the century brought the beginning of amateur radio. Eighty-nine years ago yesterday, at St. John's, Newfoundland, inventor and experimenter Guglielmo Marconi received the first message transmitted across the Atlantic Ocean by radio. The message consisted of three dots, Morse code for the letter 'S.'

"At that time, telegraphy was the only radio technology, whether amateur, commercial, or military. Telegraphy has remained an unbroken tradition in the amateur service. Every amateur operator ever licensed in this country has passed a Morse code test.

"Lately, however, there is concern within the amateur community that the current Morse code requirement is discouraging persons who could help the service more fully meet its purpose from participating in amateur radio. Now, as in the early 1900s, the amateur service is for technically inclined private citizens worldwide who engage in self-training, information exchange, and radio experimentation. It is for persons who are fascinated by radio, and who enjoy a personal satisfaction in understanding and using the technology.

"Society benefits from the experimental nature of this service. The concept of broadcasting, for instance, began when listeners overheard amateur stations exchanging weather reports and baseball scores. The first land mobile systems were built by amateurs (as were) the first hand-held radios. The first satellite system authorized by the Commission was an amateur station. Today, more than 30 amateur satellites have been launched. Amateur operators aboard the Space Shuttles communicate to other amateurs around the world. Amateurs pioneered communications by low-Earth orbiting satellites, a technology just now being explored commercially.

"This service discovered the forefront of communications technology. Single sideband, a narrowband voice emission, was adopted by our Air Force only after its capability was proven in the amateur service. Amateur operators moreover have always been at the cutting edge of digital communications technology.

"Society is well served by having amateur operators, with their transmitting apparatus, available in practically every area of the world. When a disaster strikes, such that normal communication systems are overloaded, damaged, or completely disrupted, amateur systems assist relief operations immediately. Often, it is from an amateur operator on the scene that the outside world first learns of a disaster and of the assistance that is needed. In a situation like this, nothing can surpass having persons there who are ready, willing, and most importantly, able to communicate. They temporarily bridge the gap until normal communications are restored.

"The amateur service should continue to attract technically-inclined persons, especially our young people, and encourage them to prepare themselves in the areas where the United States needs experts. The items before you, therefore, expand the access to the amateur service by amending the telegraphy requirements for amateur operator licenses.

"The first item, a Report and Order in PR Docket 90-356, exempts from the higher-speed code exams persons who, because of severe handicap, are incapable of passing those examinations. We would rely on a physician's certification of disability to determine eligibility of an applicant.

"The second item, a Report and Order in Docket 90-55, establishes a codeless amateur operator license class by eliminating the code requirement from the Technician Class operator license. These amendments will make it easier for today's technically-inclined persons to become involved in the world of radio communications. This, in turn, will help our country stay in the forefront of research and development. For these reasons, we recommend that these Reports and Orders be adopted. Thank you."

Commissioner James Quello: "The amateur service is self-regulating, self-disciplined, and it compares to some of the other services most favorably. I think this opens it up to one, the handicapped; and two, the young. And I know the same type of self-regulation will continue. I don't know how important code is today. Is it being used less and less?"

Ralph Haller: "Actually, Commissioner, there is still a fair amount of Morse code that is used by amateurs. But with the interest in computers it is probably being used less today, particularly by the people just now entering the service."

Quello: "Well, I think it's good to open it up to those who may not be able to master the code. Most of it is done by voice today anyway. Excellent items; I approve them both."

Commissioner Sherrie Marshall: "The amateur service has provided numerous contributions. This should open it up to attract more operators to the service while also preserving the traditional entry route for those who know Morse code. I also think it's appropriate for handicapped amateurs to take an even greater role in the service, and that's why these two items deserve our support."

Commissioner Andrew Barrett: "Mr. Chairman, I share what Commissioners

Quello and Marshall said. They're both good items, and certainly the one for handicapped is something we should have been doing some time ago, and you're to be complimented."

Commissioner Ervin Duggan: "Mr. Chairman, I also support these items. Mr. Cross, I'm impressed by all the insights you gave in your presentation, the reasons we should appreciate the amateur service in its relationship to commercial services like the new low-Earth orbit satellites. I was fascinated to hear those connections made. I think you deepen our appreciation of the amateur service.

"One comment about the handicapped item. There was some fear in my office when this whole process began that we might be leaning over too far backwards to relax our standards and that in the process of trying to seem compassionate and responsive to the special needs of handicapped people, that we would in fact go too far and rob handicapped people of the pride they might otherwise have at being able to meet tough standards.

"I think in the process of receiving comments and reviewing this item, you have succeeded in removing that concern. I'm impressed by the large number of comments that came in. It speaks of the vitality and the tremendous interest on the part of people who are involved in this activity. I know that it imposed some real burdens on you, but you've done a good job and I'm happy to support these items, Mr. Chairman."

Chairman Al Sikes: "I think that the team has done an excellent job; you've weighed carefully and come forward with a very balanced approach. This is clearly a vital service. The contributions in the service area, the equipment area, the emergency areas by amateurs have really been extraordinary. I would agree with Commissioner Duggan. Your report was helpful; it gave me some additional insights. I think that the steps that we have taken to broaden this now and invite more into it hold the potential of providing an even more vital, more dynamic service."

Press Conference Held

At the press conference following the FCC meeting, PRB chief Ralph Haller explained that to determine who may certify handicaps, the FCC would use the American Medical Association's definition of "physician." Only health professionals with full medical privileges—that is, doctors of osteopathy (DO) or doctors of medicine (MD—would be permitted to attest that an amateur has a handicap severe enough to prevent passage of a 13 or 20 WPM code exam. This part of the FCC's decision is not likely to be welcomed by other practitioners who may be competent to certify certain disabilities but who are not DOs or MDs.

"We will put out a guide of some type to explain to the physicians what's required in taking the Morse code test and this should be of some help in making that determination," he said. The FCC may redesign the Form 610 amateur license application to contain the doctor's certification, or it may rely on a separate sheet. In either case, the Title 18 warning against misrepresentation will apply. [U.S. Code Title 18, Section 1001 provides for fines and imprisonment when willful, false statements are made on government forms.]

Asked if the handicapped waiver system will be immune to abuses, Haller replied, "I don't think that any Commission process is completely free of abuse. . . . We have chosen to rely on certifications of people who have been certified in the medical profession, who are relied upon in many other areas to certify disabilities. For example, whether you are entitled to have a disability license tag on your car to park in the disabled spaces. We rely upon the integrity of those trained people. If there are abuses, and they come to our attention, we would fully anticipate enforcement action both against the applicant and against the physician."

Will dropping the Morse requirement from Technician bring poor-quality CB-type operators into amateur radio? "Morse code doesn't prove what kind of operator you're going to be. It proves that you can send and receive Morse code," Haller said. "We are still retaining a written test. There is a license that can be lost for willful violation of the rules. There is something of value in that license. In the Citizens Band service today there is not even a license. So we don't consider this in any way making this even close to a CB service. You have to work to get the license even though you don't have to pass Morse code."

Technicians who pass the 5 WPM test will receive the Certificate of Successful Completion of Examination by the Volunteer Examination Coordinator. This CSCE will be permanently valid, but there is otherwise no change in use of a CSCE to take exams. The VECs will also provide the FCC with a list of those who possess the CSCE.

Will no-code forestall stagnation in amateur radio? "The amateur service is not growing to the extent it probably should, based on all that it has to offer," Haller said. "One of the reasons we think that providing a non-code entry will be helpful is that it will get people, particularly young people who have a primary interest in digital communications and computers, interested in this service. Many times this is where the technical expertise comes from in this country. People become interested in amateur radio at a young age and become some of our brightest scientists and engineers.

"So we really do think that this is a step that is necessary, a step that will help the United States be competitive in international markets."

Other Questions Answered

Points not covered at the press conference were answered in the FCC's Report & Order (R&O) released December 27. An R&O is the last document issued before laws are changed and new procedures implemented. They are a summary of an entire proceeding and are required by the 1946 Administrative Procedures Act. They include the FCC's consideration of the public comments, their decisions and state any new regulations. The code-free amateur class R&O is rather long and we are covering key points in a question-and-answer format in the interest of brevity and clarity.

Basically what did the comments say? Approximately 70% were in favor of an entry-level codeless license, although many people suggested alternatives, some of which would have unacceptable effects upon the VEs and the Commission's workload. The remaining 30% of the comments object to any form of codeless amateur license class.

Why didn't the FCC adopt their proposed Communicator Class? The FCC ruled that ". . . the addition of a sixth (Communicator) class to an already intricate license structure is neither desirable nor achievable without unacceptable effects upon our workload." Furthermore, the FCC found that their present computer system will not support six classes of licenses without new and significant costs. "A new Communicator Class of license, consequently, is not a viable solution."

Why a codeless Technician? What about existing Techs? The FCC decided not to adopt a codeless Novice Class because it ". . . has very limited privileges above 30 MHz. The Technician Class, however, has a more difficult written examination and authorizes all privileges above 30 MHz. The conversion of the Technician Class to a codeless class, as allowed by the international Radio Regulations and as recommended by QCWA and others, therefore, is the logical choice." The FCC said Technicians licensed before February 14, 1991 and who have passed a telegraphy test would retain their HF privileges.

What are the requirements to become a Codeless Technician? Initially the FCC proposed a 60-question multiple-choice exam consisting of 30 questions from the Novice question pool, 25 from the Element 3A Technician pool plus 5 from a new pool. In effect, applicants for the new codeless class would be required to pass the same written examination as is required for the current Techni-

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UX-R91A Broadband receiver unit...	389.00	CALL
UX-19A 10w 10m unit.....	299.00	269.95
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EX-257 FM unit.....	49.00	
EX-310 Voice synthesizer.....	59.00	
CR-64 High stability oscillator xtal	79.00	
SP-3 External speaker	65.00	
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cian Class license plus five additional questions.

The ARRL supported the additional questions, but the VECs pointed out that the only purpose of testing is to assure that the licensees are qualified to operate amateur stations on the frequencies authorized. "The deletion of privileges below 30 MHz does not call for an increase in the number of questions posed in the written examination for a Technician Class license."

How does a Codeless Technician upgrade to the next higher license class? The Commission initially proposed a "Communicator plus CSCE" operator class which would recognize that Communicator Class licensees hold a Certificate of Successful Completion of Examination (CSCE) showing the licensee has passed an international Morse code test. A CSCE is a document certified by three examiners showing that an examinee has passed certain written and telegraphy tests. "To avoid an increased license processing burden, our proposal was that the documentation of the passing of the telegraphy examination be indefinitely evidenced by the CSCE rather than by the issuance of another license."

Even though the VECs and ARRL thought an upgraded license should be issued, the FCC disagreed stating that the testing community already performs the necessary work. VECs would merely advise the FCC monthly the names of new "Technician plus CSCE Class" operators.

Why didn't the FCC discontinue the present Novice and Technician as they initially proposed? The amateur community, while supporting the establishment of a codeless class, was uncomfortable with the prospect of discontinuation of the Novice Class. The comments indicated the Novice Class should be retained as an entry level for persons who do not have the knowledge to pass the written examination for the Technician Class license, but who can pass a telegraphy examination.

"The keystone of our proposal was to reprogram resources currently expended in processing new Novice Class licenses annually to processing the new codeless class license. Retention of the Novice Class, however, precludes reprogramming all of those processing resources for the new codeless Technician class. We estimate, however, that with our current resources we should be able to process the applications for new Novice and codeless Technician Class licensees. The Rules we are adopting, therefore, retain the Novice Class license."

What about callsign identifiers? The Commission said they were ". . . persuaded by the comments" not to require use of a two-letter (/AC) station identification indicator system to distinguish stations having Technician Plus privileges. "Shorter callsigns . . . generally are reserved for the more accomplished higher class operators."

Implementation of New Examination Rules

All volunteer examiner coordinators received a letter dated December 14th from the FCC's Personal Radio Branch providing preliminary instructions on handling handicapped applications and examination credit. We quote from that letter:

"Handicapped examinees. To implement the rules adopted on December 13, 1990, please instruct your administering VEs to implement the following procedure beginning on February 14, 1991.

"Examination credit: The administering VEs must give examination Element 1(C) [20 words-per-minute] credit to an examinee holding a current or expired (but within the grace period for renewal) operator license, including:

Novice,

Technician plus CSCE for passing element 1(A) [5 WPM] or 1(B) [13 WPM],

Technician issued before February 14, 1991, the effective date of the Report & Order (R&O),

General, or

Advanced Class operator license;

AND a Form 610 with the following attachments:

A physician's certification stating that because the person is an individual with a severe handicap, the person is unable to pass a 13 or 20 words per minute telegraphy examination, and

A release signed by the examinee permitting disclosure to the FCC of medical information pertaining to the examinee's handicap.

"Attaching the above information to the current Form 610 is a temporary measure until such time as a revised Form 610 is available. The administering VEs mark on the Form 610 in Item D of their report, under EXAMINATION ELEMENT 1(C), the letter 'H.'

"For the purpose of the above, a physician is a person who is licensed to practice in a place where the amateur service is regulated by the FCC, as either a Doctor of Medicine (MD) or a Doctor of Osteopathy (DO).

"Codeless Technician: In general, the answer to practically every question about how the VEC system will be affected by the codeless Technician is 'No change over present procedures.'

"Technician Plus: We need your input on how you can periodically provide us with the names and callsigns of codeless Technician Class licensees who pass a telegraphy examination. We will not have the capability to incorporate this information into our licensee data base in the

foreseeable future. Ideally, we would like you to maintain and supply to us and to others a complete masterfile containing the information in paper or magnetic form."

Four Technician Class Levels

It appears that this database will contain three types of new Technician Plus operators.

1. Current Novice licensees who upgrade by passing Element 3(A), the written element required for the Technician class,

2. Applicants who successfully pass the 5 WPM (element 1A) telegraphy requirement at the same time they pass Element 2 and 3(A) and;

3. Codeless Technicians who later pass element 1(A), which must be accomplished at a (3 examiner) VEC coordinated test session.

The four levels of Technician class operators that will be in existence after February 14, 1991 will be:

1. *Grandfathered Technician*—A Technician issued before March 21, 1987. They receive credit for Elements 1(A), 2, 3(A), and 3(B).

2. *Current Technician*—issued between March 21, 1987 and February 13, 1991. They have examination credit for Elements 1(A), 2, and 3(A).

3. *Codeless Technician*—issued on or after February 14, 1991. Credited with Elements 2 and 3(A).

4. *No-Code Technician Plus CSCE* for 5 WPM telegraphy. Tech Plus operators also include Novices who upgrade by passing 5 WPM code, and an applicant passing a telegraphy test plus 2 and 3(A) at one sitting.

It will be the applicant's responsibility to submit evidence as to which Technician level he or she qualifies for. This will normally be accomplished by the Certificate of Successful Completion of Examination (CSCE) issued at a VEC System test session or by the date appearing on their operator license.

The VECs (and FCC) are also looking for informal titles to the four Technician levels. Suggested are Grand Tech (or Granddaddy Tech, Grandpappy Tech, or Grandpa Tech), Classic Tech, Tech Lite (or Codeless Tech), and Tech Plus.

Becoming A Codeless Technician Operator

The codefree Technician Class amateur operator license is available to everyone now! You merely have to pass two multiple-choice examinations. Passing Element 2 requires answering 22 of 30 questions selected from a pool of possible questions. You also must correctly answer 19 of 25 Element 3(A) questions. All 698 questions in the question pools, their possible multiple-choice answers, and correct answers are all known and widely published.

You may be administered these two test elements at hundreds of examination locations around the country. There are even several testing points in foreign countries. The test session is conducted by senior-level amateur operators who have been accredited by their Coordinators and provided with testing material. The examinations consist of simply selecting a specified number of known questions from each of nine subelements. You can generally find the location of the nearest examination session by asking any amateur radio operator in your neighborhood.

We have put together a special "Codeless Technician" education package especially geared to unlicensed applicants who wish to join the amateur fraternity. This package consists of the two question pools (containing all 698 questions, multiple choices, and answers) two text books containing short, concise explanations to all questions, a copy of the Part 97 Amateur Service Rules and Regulations, and a computer program which allows you to study at an IBM-compatible PC. (Over 300 pages of information plus 5¼ inch computer programs.) The software allows you to review all questions and take sample Element 2 and 3A examinations right at your computer. You can even print out actual tests. Your PC will tell you when you are ready to pass! Cost is $21.95 from: The W5YI Group, P.O. Box 565101, Dallas, TX 75356; VISA/MasterCard orders call (toll free) 1-800-669-9594.

See you next month in the regular "Washington Readout" column. And happy hamming! CQ

No, it's not another NiCad® charger, but rather a NiCad® discharger. Why a discharger? Well, read W5PFG's article and then head on out to your local parts store.

The Care and Feeding of Nickel-Cadmium Batteries

BY W. MAX ADAMS*, W5PFG

Nickel-cadmium batteries, commonly known as NiCad® batteries, are so named because of the material used for their electrical anodes, or "plates." They are primary cells which can be recharged when their useful dischargeable energy is expended. Since they are constructed with a chemical "electrolyte" imbedded in their plate separating insulation material and sealed for normal applications, NiCad® batteries are widely used in portable (cordless) consumer appliances.

To help you better understand your NiCad® battery equipment, let's take a broad look at what makes them operate.

Notice in fig. 1 that the plates are separated by an electrolyte-soaked insulation material and wound in a tight spiral which is enclosed in a metal package. This assembly can be formed to a round, oval, or rectangular package. Notice that an insulating cap is installed with an electrical connection and a safety-vent plug.

The need for electrical connection is obvious. The safety-vent plug allows internal gas to escape should the battery be shorted accidentally or be connected in an abnormal manner, causing internal gas pressure to exceed a safe limit. Normally, internal gases are absorbed by the plate material (during charge periods) and not vented to the atmosphere. Because gases are not vented, moisture (electrolyte) is not lost in this manner, and therefore contributes to long battery life. Incidentally, internal corrosion of the cell's metal materials can contaminate the electrolyte, thereby reducing its function.

When a NiCad® battery powered appliance is purchased, it usually contains an internal charger, or in some cases, a separate dedicated charger. Some apparatus, such as radios and video "camcorders," have detachable NiCad® batteries which allow quick replacement and short intervals of appliance "down" time. The charger, either supplied with the equipment or recommended by the battery manufacturer, should always be used for charging a given battery. Never attempt to charge "extra" batteries at the same time, unless the charger is intended for such application.

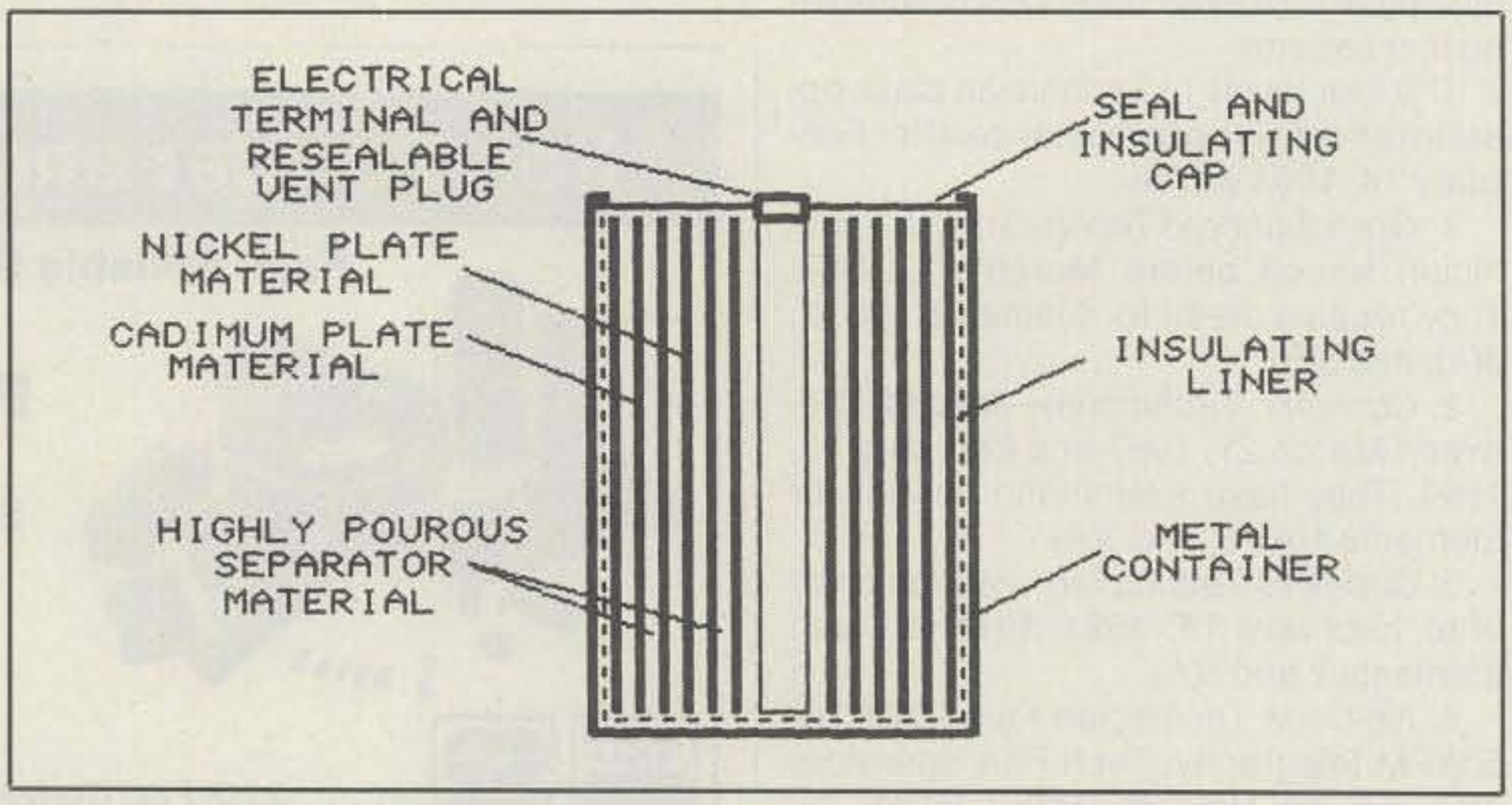

Fig. 1– Nickle-cadmium cell construction (typical).

NiCad® batteries are commonly believed to develop *memory*, which shortens their useful dischargeable energy. Actually, NiCad® batteries develop "voltage depression" because of incomplete discharge and extended overcharge cycles of operation. Notice in fig. 2 that a voltage depression "knee" occurs near the mid point of cell discharge. The depressed voltage knee progresses toward the start of discharge with each partial-discharge/extended-overcharge operational cycle. Notice also that a final "discharge knee" occurs later in the cell's discharge time.

"Then," you may ask, "why does my equipment fail to operate because of this so-called battery *memory*?"

Modern solid-state electronic equipment uses voltage-sensitive circuits and solid-state electronic devices. Included in many appliances are voltage regulators which demand what is commonly known as a "head voltage." Head voltage is an amount of power-source voltage greater than the regulator's output voltage. In some appliances there is a "low-voltage shutdown" circuit, which automatically turns the appliance off when battery-supply voltage is below a preset minimum level. Therefore, since the combined cell depressed voltage loss in a battery may total several volts, battery output voltage can fall below the input voltage required by the low-voltage shutdown circuit. Actually, there is an amount of useful energy remaining in the battery, but the appliance's *memory* turns your equipment off before the battery is discharged to the recommended level (see fig. 2).

The effects of NiCad® battery voltage

*P.O. Box 504, Fairfield, TX 75840

Note: NiCad is a registered trademark of SAFT America Inc.

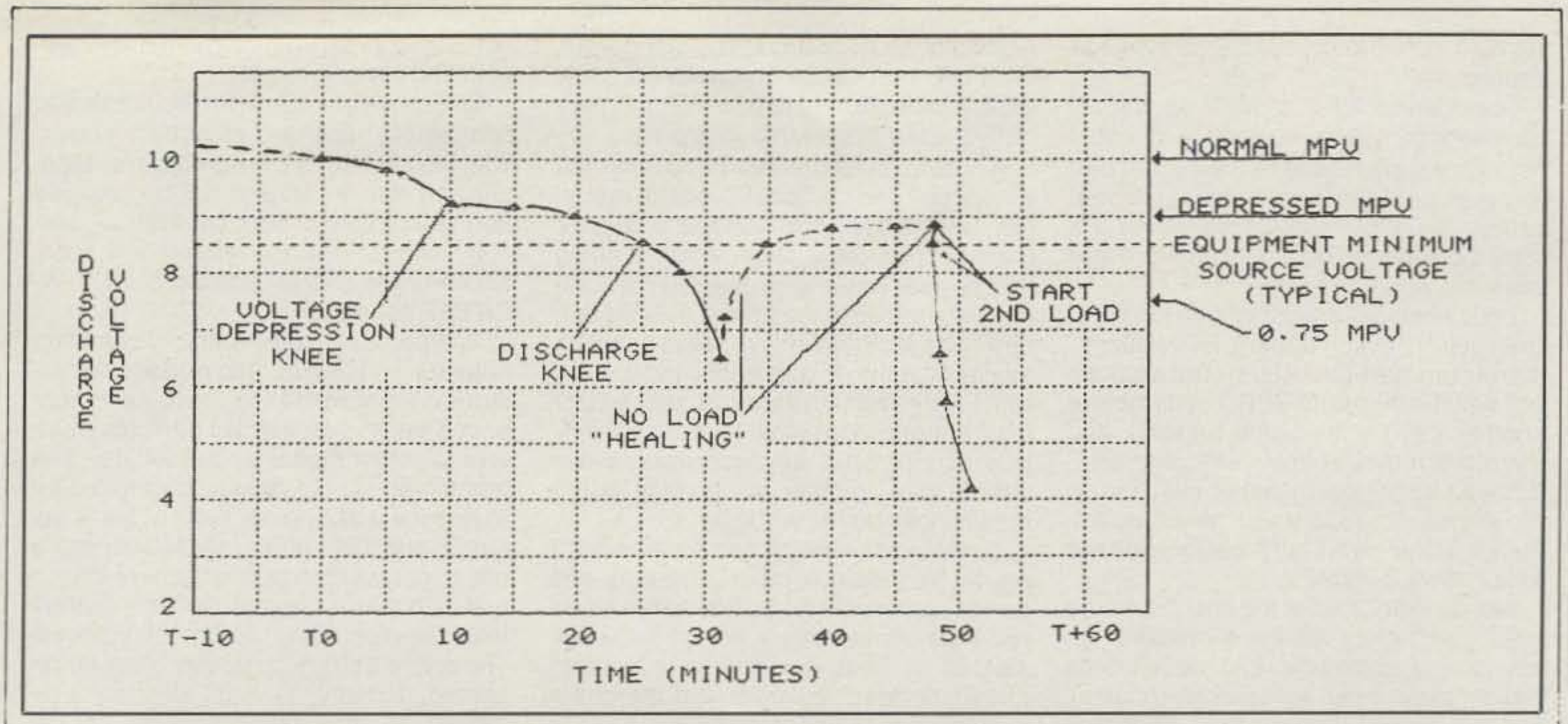

Fig. 2– NiCad® battery discharge time (typical). (See text.)

depression can normally be eliminated by first discharging the battery to the manufacturer's recommended level (not zero volts), then charging *it* at a *normal rate* to 100% of its capacity. When 100% charge is achieved, *disconnect* the Ni-Cad® battery from its charging source. *Disconnect* from the charging source should be interpreted to mean "normal charging source." An auxiliary "trickle" charge source may be connected to overcome long-term losses, thereby maintaining full charge, without harmful overcharge effects.

Metallic "whiskers" can develop in the separator material between a cell's plates. These whiskers are resistive in nature; when a number of them are "paralleled," they represent a shunt (voltage "IR") loss and prevent useful (full) cell charging.

Persons who wish to live dangerously often try to repair NiCad® batteries by "zapping out whiskers" with the application of a momentary, high-current, reverse voltage. Notice that I used the phrase "wish to live dangerously." This practice is not recommended, because at today's prices, a new battery is much cheaper than your doctor's new "town car" or his all-expense-paid vacation!

Recently, my camcorder battery lasted just long enough for me to get out of reach of its charger. I had heard, read, and said that you should discharge the cells to a recommended minimum voltage before charging to prevent voltage depression. I decided to practice what I had been preaching!

Digging in the good-junk box, I found two 33 ohm/10 watt wire-wound resistors with leads long enough for their connection in parallel and attachment of two small alligator clips. This made a simple 16.5 ohm, 20 watt dummy load. Later I found one of their cousins in another good-junk box. Now I had an 11 ohm, 30 watt (± 10%) dummy load. This allowed a 10.6 volt battery to be discharged at approximately 1 ampere (± 10%). Actually, the discharge current decreases, according to decreasing battery voltage (I = E/R according to Mr. Ohm).

My camcorder battery voltage display indicated near full-charge battery life remaining. I disconnected the battery from the camera and connected my 11 ohm (± 10%) dummy load. With my trusty Simpson 260 VOM, a new digital clock, and a fresh pot of coffee, the data shown graphically in fig. 2 were taken. Notice that the usual discharge curve is prescribed, except for shortened battery life, from start of discharge to about T plus 30 minutes. Since this particular battery is rated at 1500 ma (1.5 ampere) at a MPV (midpoint voltage) of 10.6 volts, normally full charge should support a 1.0 ampere drain for 1.5 hours! Such a short battery

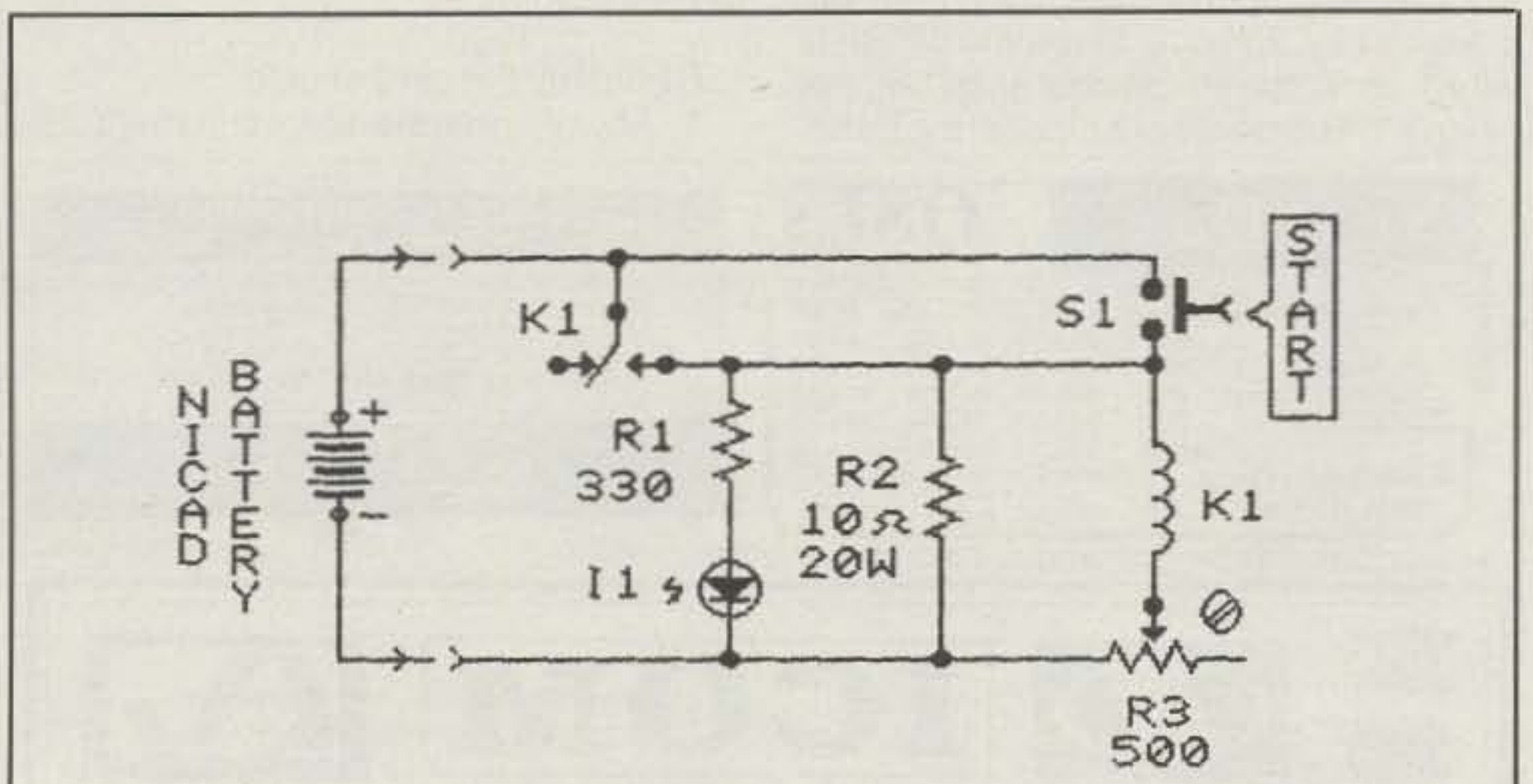

Fig. 3– A simple NiCad® battery conditioner. Photo optic IC stops battery discharge at preset level to prevent cell reversal (see text). (Note: The same can be accomplished using a separate LED and photo-sensitive diode or transistor, for a minimum parts count device. An NPN transistor with IC greater than 1 amp may be Darlington connected to a photo transistor for replacement of Relay K. Set R4 to turn off POC at 0.75 battery MPU—see text.)

life is an indication of cell/battery voltage depression.

Considering 75% of MPV as the recommended minimum voltage (I could not afford a phone call to the distant battery manufacturer's home town), normal battery shutdown should be about 7.2 volts. I decided to go a little bit more and see what would happen.

Let's consider a word of caution here. One cell in every battery is "weaker" than its brothers (or sisters). The weakest cell will discharge to ZERO volts before another cell (in the same battery), and therefore may develop "cell reversal," followed by the next weaker cell, and so on. In order to avoid this, it is not recommended to allow NiCad® battery voltage to fall below 0.75 MPV.

Notice in fig. 2, after the final discharge knee, that battery voltage decreases rapidly during discharge and accelerates rapidly toward cell reversal (zero volts). For this reason, dummy-load discharge should stop when the battery's dischargeable voltage reaches 0.75 MPV.

To be on the safe side of manual dummy-load battery discharging, it is recommended that all other distractions be turned off and the coffee pot brought near the discharge location. During such an operation it always seems that the battery takes its final dive. Just when you turn your head, some interesting "scanner gossip" is heard, or you leave the room!

During battery discharge, and between head scratching and pouring coffee in my face, the thinking process drew a mental picture later reproduced as shown in fig. 3.

Disconnect voltage potentiometer R2 is adjusted to cause K1 to drop out and I1 to extinguish when the source voltage decreases to 7.25 volts. Since the circuit is wired to stop all discharging, except when K1's contacts are closed, the battery will not be discharged to a dangerous level that can cause cell reversal. Likewise, it is necessary to press S1 momentarily to start the discharge process.

A note about DC relays. Each relay has a "pickup" and "dropout" voltage rating. Normally the pickup voltage is higher than the drop-out voltage. When building this device, make sure the relay will remain energized at the lowest desired battery voltage. Small relays, such as those available at the neighborhood parts store with the big red sign (Radio Shack), will remain energized to below 15 ma and therefore do not offer any appreciable discharge load. In other words, they let the dummy load do the work.

Speaking of work, remember Power (P) equals Voltage (E) times Current (I), and power represents heat. The dummy load resistors cause battery energy to be dissipated as heat, so leave a little room about the load resistors and adequate ventilation in their enclosure.

Indicator LED I1 lights when the dummy load is connected to the battery. Once the battery voltage fails to cause operation of POC1, I1 will extinguish and battery discharging stops. Just after the dummy load is disconnected, a chemical reaction within the battery cells will cause the voltage to "heal" ("get well"), as shown in fig. 2. Notice at T plus 49 (in fig. 2) that battery voltage healed to 8.9 volts, then dropped to 6.8 volts (less than 0.75 MPV) just one minute after the dummy load was again connected across the battery. This "healed" voltage may cause POC1 to operate for a short time, when S1 is pressed, but will disconnect the dummy load when the battery voltage does not supply enough current for operation of POC1 or K1.

Ordinarily the user should:

1. Always operate the equipment according to its instruction-manual procedures and specifications.

2. Periodically allow the equipment to completely "use up" its battery power. This may be done by allowing the appliance to remain on and not be charged during intervals of nonuse. After a "normal" charge interval remove the appliance from its charger and store in a POWER OFF condition.

3. When a so-called memory condition appears and Step 2 above does not restore normal operation, have an experienced service technician perform a battery discharge/charge procedure. The technician should repeat the procedure to ensure that original battery life is restored and that "other" faults are not the cause of less than normal battery life.

4. Should a sealed NiCad® battery leak, the electrolyte cannot be replaced. The entire battery assembly must be replaced, and any "spilled" electrolyte removed to prevent corrosion of the equipment.

Remember: Abnormal battery care and feeding can be hazardous. Sudden expenditure of energy is what makes atomic bombs so deadly, so be sure to beware!

Parts List

One each: 330 ohm, ¼ watt, 5% film resistors.
One each: 500 ohm ⅛ watt potentiometer PC type.
Four each: 10 ohm 10 watt, connected series/parallel to make a 10 ohm, 20 watt wirewound load, (2 pks) RS #271-132.
One each: relay 5 volts DC, 2 amp SPDT contacts, RS #275-243.
One each: LED RS #276-026.
One each: optocoupler, H111AA11 or equivalent, (part of) RS #276-139.
Two each: alligator clips to suit your needs.
One each: switch, momentary push type, RS #275-1556, or equivalent.
One each: perf board, approximately 1¾" × 2¼".
Misc.: hookup wire, clip leads, plastic or metal ventilated enclosure.

Calibration Procedure

1. Set voltmeter to suitable range for maximum battery voltage indication.
2. Connect voltmeter across alligator clips. Observe polarity.
3. Connect alligator clips to battery. Observe polarity.
4. Calculate 0.75 × battery voltage rating (i.e., 10 volt battery, 0.75 × 10 = 7.5 volts is the recommended discharge shutdown voltage for this battery).
5. Press S1. I1 should light.
6. Observe voltmeter. When battery is discharged to 0.75 volt battery, quickly adjust R4 to extinguish I1.

600 WATTS OUT . . . $599

Ameritron's new

AL-811 linear amplifier gives you plenty of power to bust thru QRM.

You get a quiet desktop linear that's so compact it'll slide right into your operating position -- you'll hardly know it's there . . . until QRM sets in. And you can conveniently plug it into your nearest 120 VAC outlet -- no special wiring needed.

You get three tough 811A transmitting tubes, extra heavy duty power supply, all HF band coverage, pressurized ventilation, tuned input, dual illuminated meters, adjustable ALC and much more . . . for an incredible $599 . . .

The first 600 watts makes the most difference

The AL-811 gives you 600 watts PEP output — that's nearly 2 full S-units over your barefoot rig.

That could mean the difference between hearing, "You're Q-5 armchair copy" and, "Sorry can't copy you, too much QRM."

Now you won't have to stand aside while the "big guns" steal your DX. You'll be able to log some of those stations first.

Going from 600 watts to the full legal limit gives you less than one S-unit increase. But is that fraction of an S-unit worth the 3 to 4 times more money it'll cost you?

The AL-811 gives you a powerful punch at a price that's easy on your wallet.

All band, all mode coverage

The AL-811 covers all HF bands (10/12 meters with easy user mod). There's no compromise on WARC and most MARS bands — you get a 100% rated output.

You can operate the AL-811 on all modes. You get 600 watts output PEP SSB and 500 watts output CW. You even get 400 watts on demanding continuous carrier modes like RTTY, SSTV, FM and AM.

How the low cost 811A tube resists premature failure - even when your amplifier is mistuned

811A tubes resist premature failure in two ways.

First, they're constructed with widely spaced elements that minimize the chance of elements touching and causing a short — even if the plate gets hot enough to melt.

Second, they use a directly heated thoriated tungsten filament cathode that prevents the electron emitting layer from instantly stripping off — even if mistuning causes a sudden, severe current overload.

Indirectly heated oxide cathode tubes (like the $400 3CX800A7) can be rendered instantly useless if their electron emitting layer is stripped off because of a severe current overload due to mistuning.

The Ameritron AL-811 is excellent for the newcomer because it's tough enough to withstand momentary mistuning. And the tubes are so inexpensive that you can replace one for mere pocket change.

The Ameritron advantage: extra heavy duty power supply that gives you peak performance year after year

The heart of the AL-811 power supply is its heavy duty power transformer with a high silicone steel core weighing a hefty 17 pounds.

A full wave bridge using 52.5 ufd of total capacitance (four 210 ufd, 470 volt capacitors) produces 1500 volts under full load and 1700 volts no load. That's excellent high voltage regulation!

Full height computer grade filter capacitors with screw terminals are used — not short stubby, light duty soldered-in "high technology" capacitors that can't dissipate the heat generated by high current.

The rectifier diodes are rated for a massive surge current of 200 amps. They won't blow even if you accidentally short the high voltage supply.

Wire wound, 7 watt, 50 K ohm equalizing resistors safely protect each filter capacitor — not 2 watt, 100 K ohm carbon composition resistors that can open and cause your filter capacitors to explode or fail.

The Ameritron AL-811 power supply is built tough so you get peak performance year after year.

Tuned input provides excellent load for any rig

A Pi-Network *tuned input* provides a 50 ohm load for your rig. Even fussy solid state rigs can deliver their full drive to AL-811.

Low loss slug tuned coils — tunable from the rear panel — let you optimize performance. High quality low drift silver mica capacitors maintain proper tuning.

Output tank: optimum Q on each band

The low loss pi-network output tank of the AL-811 has been carefully designed for optimum Q on each band and built with quality RF components.

The result is peak performance over each band, wide impedance matching range and exceptionally smooth tuning with efficiencies close to 70%. Even a 3:1 SWR load won't damage the tubes or tank components.

A ball bearing vernier reduction drive makes plate tuning precise and easy.

Quiet pressurized ventilation keeps your tubes safely cooled

A quiet fan pressurizes the cabinet with over 20 cubic feet per minute of cool air.

This large volume of air flow keeps the 811A tube temperature safely below the tube manufacturer's rating — even with a key down carrier at 500 watts output.

Two illuminated meters

Two illuminated meters give you a clear picture of your AL-811 operating conditions so you can tell right away if something is wrong.

The Grid Current meter continuously checks for improper loading. The other meter switches between high voltage and plate current to warn of abnormal conditions.

Ameritron exclusive Adapt-A-Volt™ power transformer

Too high line voltage stresses components and causes them to wear out and fail. Too low line voltage causes a "soft-tube" effect — low output and signal distortion.

Ameritron's exclusive Adapt-A-Volt™ power transformer has a special buck-boost winding that lets you compensate for stressful high line voltage and performance robbing low line voltage.

This makes your components last longer and gives you peak performance — regardless of your line voltage.

Plus more . . .

An Operate/Standby switch lets you run barefoot, but you can instantly switch to full power if you need it.

A transmit LED tells you when your rig is keying your AL-811.

A 12 VDC keying relay makes it compatible with all solid state and tube rigs. A built-in back-pulse cancelling diode protects your rig's keying circuit.

Shielded RF compartment. One year limited warranty. Compact 16" D x 13¾" W X 8" H. 30 pounds. UPS shippable. Shipped with transformer installed and wired for 120 VAC. Draws 8 amps at 120 VAC. Export model Al-811X wired for 240 VAC and includes 10 and 12 meters.

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Get 600 watts of real power and the most for your money. Call your favorite dealer for your best price and order your AL-811 today.

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CIRCLE 174 ON READER SERVICE CARD

Results of the 1990 CQ World-Wide WPX SSB Contest

BY STEVE BOLIA*, N8BJQ

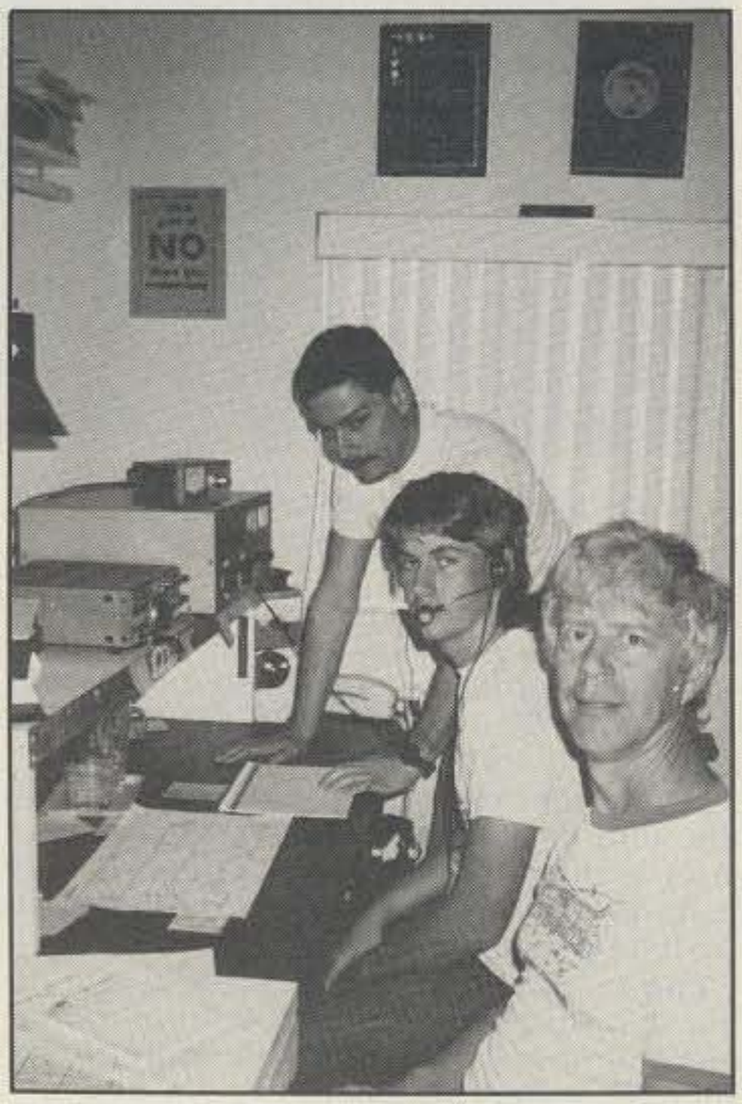
Extremely close competition, many new world and continental records, the return of Vietnam to contesting, along with better than average conditions highlighted the 34th annual CQ WPX SSB Contest. Scores keep climbing, but also we are seeing more competition for the top spots.

DX

Returning to the top of the all band category, 1988 champion P4ØV edged out K2SS at PJ4A by only 400K. Multipliers were the difference, with Carl having 60 more than Dave. Third in the world was 1989 champ KP2A (again operated by KW8N), with W7EJ at FG5R finishing fourth. The top four all broke KP2A's 1989 world record. ZW5B (PY5EG at the mic) finished at number five in his first attempt at real-time computer logging. 5HØT (5H3TW) was the top African station and sixth in the world. CT4NH was tops in Europe, K4YT/DU8 the top Oceania entry, and EX9S number one in Asia.

ZX5C (PY5CC) shattered ZPØY's 1989 record on his way to the 28 MHz title, followed by YW1A and LU9FDG. ZPØY (ZP5JCY) QSYed to 21 MHz and set another single band record with his all-time top single band score of 12,070,245. Luis and PT5T (N5FA) were close all weekend, with Luis making 300 more Qs while the multipliers were almost even. In another close finish, ID1V (I1ZEU) used his special prefix to edge out Joel, KG6DX, and Rolf, CE6EZ, for the top spot on 14 MHz and a new European record. Claudio, IO4VEQ, and Glenn, T32AF (KH6UR), were also close on 7 MHz, with Claudio coming out number one. Both Glenn and Claudio set new continental records. John, CF6OU/3, found 3.5 MHz to his liking and snagged a rare North American victory over 4N1A, who also established a new European standard. Less than 9K separated UL7ACI and LZ6A on top band. Both had surprisingly competitive scores for this point in the solar cycle.

VP2EXX was the "big" signal among the QRPers, followed by PQ2DX and 4X6IF. NP4CC was tops on 28 MHz, with SP3RBI, RV3E/JT1BY, K7UR, UM8MDX, and UB5ZND champions on 21, 14, 7, 3.5, and 1.8 MHz, respectively.



The ops at multi-single station WU7Q. From top to bottom are Mike, WU7Q, Bill, N6TIB, and Duane, W6REC.

USA

KQ2M's 5.6M points put him at the top of the USA all banders, followed by KC1F, N5RZ, K3ZO, and K7RI. In general, US scores were up from 1989. It took 3.2M just to make the top ten this year, up from 2 million in '89.

Single band categories were dominated by the 5th and 9th districts. WN4KKN/5 edged out NU6S and W5WMU for the top spot on 28 MHz. WB5VZL repeats as 21 MHz champ, followed by NX1H and AA5JF. KK9A captured the 14 MHz trophy, with WD5N and W5FO in pursuit. WB9Z was the clear winner on 7 MHz, KE5FI was tops on 3.7, and W2GD edged out AA4MM for top band honors.

KR2Q came up just a bit short in his attempt to break W8ILC's US QRP record. WA2UUK was first on 28, with N7NKG, KA1UJ, and K7UR the champs on 21, 14, and 7 MHz.

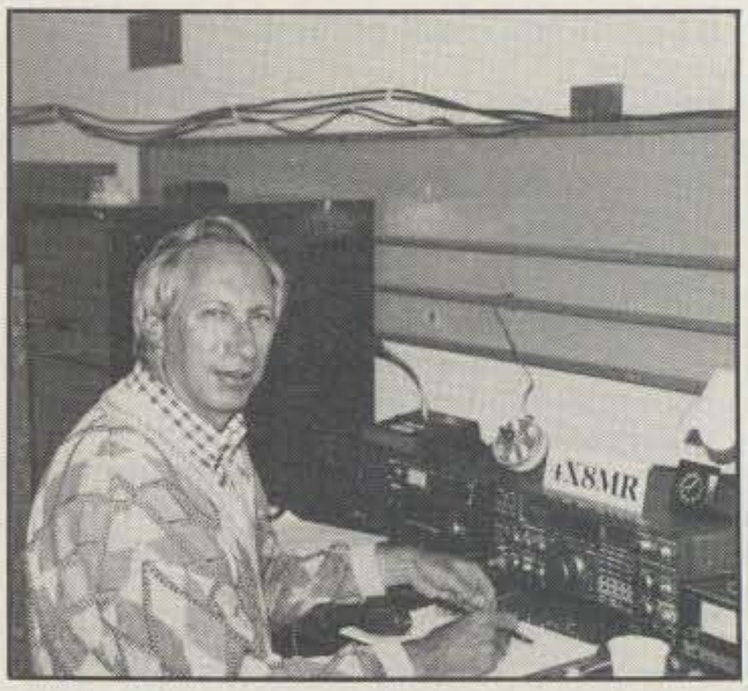
Multis

After several years of coming close, the gang at LZ9A has claimed a world title in the multi-single class with a less than 100K victory over 5H1HK. Only 300K behind was IZ4C, followed by expedition trophy winner SØ1EA. The multi-multi title goes to YT2A, followed by IU3A, T32T, and CZ7Z.

WC4E repeats as the USA multi-single champ, followed by N4WW, WU7Q, and AA7CM. WZ6Z is again the multi-multi champion, followed by WOØG and NB6L.

Other Stuff

Over 100 stations sent in some form of a log or dupe sheet on disk. A good portion of these were complete logs. In processing these disks, I believe we only had a problem with reading two disks, and these were quickly corrected by requesting a new disk. Submission of the entire log on disk would seem to be a reliable, easy, and cheap method, and we will continue to encourage and support it. All that we require with a log on disk is that you submit a printed summary sheet showing all the required scoring information along with the normal signed declaration, and a



Here is Martin, VE3MR, at 4X8MR. Martin really enjoyed his operation from Ben-Gurion University of the Negev in Beershiva and his rare 4X8 prefix.

*4121 Gardenview, Beavercreek, OH 45431

good address where we may contact you in the event that your disk can't be read.

As I sit here listening to my packet cluster beep, I must mention that the WPX Contest does not yet have a packet-assisted category. Those who entered as packet assisted will find themselves listed in the multi-single section. If enough of you see the need for a packet-assisted category in the WPX Contest, drop me a note and we will consider it for future contests. Negative comments are also welcomed.

Speaking of negative comments, a couple were received concerning abusing the rules (cheating) following the contest. Unfortunately, these were in an area that is nearly impossible to verify, so no action could be taken. I would hope that we as contesters would not have to resort to illegal methods to win a $45.00 plaque or a $1.00 certificate.

There are no rule changes for the 1991 contest. Remember, rule VII (A) has been changed so that you are only required to sign portable if you are outside of your DXCC country or if required by your country's regulations. The trophy list has been changed somewhat. Bill Johnson, KV0Q, has picked up sponsorship of the World 7 MHz SSB trophy and will also sponsor the World 7 MHz CW trophy. Roger Burt, N4ZC, has also picked up sponsorship of the World Multi-Multi trophy for the CW contest. Also, K6HNZ was inadvertently left out of the 1991 trophy list. Ken continues to sponsor the Single Op. Single Band trophy for Japan. Walt Smith, K1DWQ, will sponsor a USA 28 MHz trophy for the CW contest. Thanks guys. There are still lots of categories waiting for sponsors. If you are interested, please drop me a note. The cost is reasonable.

As we do every year, we again had a large number of stations using special prefixes. Among them were CF25A, J37DX, 6I7CQ, TR1G, 3W7A, AT0C & AT0T, EX8M, 4U5ITU, C39OF, CQ7A, CQ8D, TM6C, ID1V, IE8A, IY0A, SN5W, DX8I, HI9UD, HU1A, and a multitude of others who went out of their way to put on a new prefix. In addition, we had several expeditions for the contest. The Pacific was a popular place, with K0IJL doing a single op from ZK1XN and a multi-multi effort by T32T. W9VA (ZY0FX), VE3MR (4X8MR), AE6U (V32SW), K7BG (XX9TDM), KH6UR (T32AF), and OH3VV (PJ9V) were also on the expedition trail. The special calls and expeditions play a large part in the success of the contest, with new prefixes for the WPX award hunters and new DXCC and band countries for the DXers.

Again a big thanks goes to Scott, N9AG, who spends countless hours of his free time helping with the logs. Also thanks to the many thousands of stations who take part in the contest. Over 20,000 calls appeared in more than one log during the contest. These are the people who make the contests a success. Most don't send in a log, but they do add to the incredible QSO totals the top stations are amassing. Please try to send them a QSL if they request one. They are in the contest primarily to work new band countries or prefixes and need the cards for these awards.

The 1991 contest will be held 30 and 31 March, 0000 GMT Saturday to 2400 GMT Sunday. If you need forms or rules, you may request them from *CQ* for an SASE or SAE and postage. You may also get them from me via my Callbook address. To speed things up, put WPX FORMS on the outside of the envelope so your request does not get put in with the logs. You may also use forms of your own de-

This is Barbara, NL7KB, who finished first in Alaska on 21 MHz.

TROPHY WINNERS

SINGLE OPERATOR—ALL BAND

WORLD: Stanley Cohen, WD8QDQ Trophy. Won by: **Station P40V operated by Carl Cook, AI6V.**
U.S.A.: Atilano de Oms, PY5EG Trophy. Won by: **Robert Shohet, KQ2M.**
CARIB/C.A.: Auturo Gigante Jr., HI8GB Trophy. Won by: **Station KP2A operated by Bob Hayes, KW8N.**
EUROPE: Jim Hoffman, N5FA Trophy. Won by: **Luis Teixeira, CT4NH.**
SOUTH AMERICA: Ron Moorefield, W8ILC Trophy. Won by: **Station PJ4A operated by Dave Donelly, K2SS.**
***JAPAN:** The DX Family Foundation Trophy. Won by: **Station JA7YAA operated by Tetsuhiko Nagahara, JJ3CNL.**
ARABIAN GULF: Fred Greenbaum, WA2UDV Trophy. Won by: **Station A61AD operated by Don Greenbaum, WB2DND.**
WORLD QRP/p: Dayton Amateur Radio Assn. Trophy. Won by: **Paul Meacham, VP2EXX.**

SINGLE OPERATOR-SINGLE BAND

WORLD: John Reichert, N4RV Trophy. Won by: **Luis Kemper, ZP0Y (21 MHz).**
EUROPE: Myron Crofoot, WB4VQO Trophy. Won by: **Station CQ7A operated by Joao Almeida, CT1BOP (21 MHz).**
JAPAN: Ken Ruddock, K6HNZ Trophy. Won by: **Junji Fujiwara, JG4AKL (14 MHz).**
WORLD 7 MHz: *CQ* Magazine Trophy. Won by: **Claudio Veroli, IO4VEQ.**
***WORLD 21 MHz:** Lee Wical, KH6BZF Trophy. Won by: **Station PT5T operated by Jim Hoffman, N5FA.**
U.S.A. 3.7 MHz: Lance Johnson Engineering Trophy. Won by: **Charles Dietz, KE5FI.**
U.S.A. 7 MHz: *CQ* Magazine Trophy. Won by: **Jerry Rosalius, WB9Z.**
U.S.A. 14 MHz: Doug Zwiebel, KR2Q Trophy. Won by: **John Bayne, KK9A.**
U.S.A. 21 MHz: Bernie Welch, W8IMZ Memorial Trophy. Won by: **Paul Terwilliger, NX1H.**
U.S.A. 28 MHz (Novice/Techician): Jon Engelhardt, KA0ZFX Trophy. Won by: **Russell Miller, KC6IHT/T.**
***JAPAN 28 MHz:** Joe Arcure, W3HNK, and Toshi Kusano, JA1ELY (Terry Appleton, W4GSM, Memorial Trophy). Won by: **Akira Minagawa, JA0JHA.**

MULTI-OPERATOR, SINGLE TRANSMITTER

WORLD: Mike Badolato, W5MYA Trophy. Won by: **Station LZ9A operated by LZ2CC, LZ2DF, LZ2HE, LZ2ZO, LZ2TT, LZ2UA, LZ2WM, LZ2-E-Y1.**

MULTI-OPERATOR, MULTI-TRANSMITTER

WORLD: Henry Thel, VE7WJ Award. Won by: **Station YT2A operated by YU2's DQ, OH, MP, LJ, HO, OG, MY, IQ, NJ, YD, AJ, EU, RA, MM; YT2's AA, FI, GW, HN, MO and Marin.**
NORTH AMERICA: James P. Dixon, NL7HI (Burt Curwen, KL7IRT, Memorial Trophy). Won by: **Station CZ7Z operated by VE7's ARS, AV, CQD, EME, DLM, DRS, NNN, RBL, SK, SSS, VE6UX, VE5FN.**
U.S.A.: Glenn Tracey, KC3EK Trophy. Won by: **Station WO0G operated by WO0G, K4VX, K9ZO, KE9PM, AG9A, KD9Q, NS0Z.**

CONTEST EXPEDITION

WORLD: Kansas City DX Club Trophy. Won by: **Station S01EA operated by S01A, S01ML, S01MZ, EA5AD.**

**Trophy donor is responsible for this trophy.*

WORLD TOP SCORES

SINGLE OPERATOR ALL BAND

P40V	**17,440,680**
PJ4A	**17,001,774**
KP2A	**15,056,886**
FG5R	14,487,613
ZW5B	12,776,816
5H0T	10,615,880
HD1T	10,517,381
EA8AGD	8,519,499
CT4NH	**6,984,450**
ZY0FX	6,663,703
J37DX	6,546,537
EL2CX	6,278,250
OK1RI	5,985,144
F6CQU	5,760,594
YT3AA	5,755,667
KQ2M	**5,682,876**
K4YT/DU8	5,501,820
ZK1XN	5,154,520
OB4ZV	5,122,182
VP2MEZ	4,996,044
EX9S	4,757,275
ZS6AOO	4,652,648
6I7CQ	4,607,493
KC1F	4,480,683
EX9B	4,335,877

28 MHz

ZX5C	11,919,582
YW1A	7,870,500
LU9FDG	5,414,547
PJ9V	4,755,438
IK2DUU	2,830,441
DL8FBD	2,666,331
LP3F	2,173,914
LS6E	1,944,576
WN4KKN/5	1,880,112
VK4KRP	1,856,876

21 MHz

ZP0Y	**12,070,245**
PT5T	**11,304,975**
HU1A	7,004,374
TR1G	6,788,925
CQ7A	**5,329,680**
DL6FBL	4,750,125
HA8IE	4,190,202
ZZ5JR	3,952,950
8P6SH	3,527,929
G4CNY	3,281,607

14 MHz

ID1V	4,729,488
KG6DX	4,558,527
CE6EZ	4,386,380
YZ1E	3,896,723
GB8FX	3,870,435
IE8A	3,635,940
GW4BLE	3,487,605
4M5Y	2,796,244
OH2IW	2,711,423
KK9A	**2,436,904**

7 MHz

IO4VEQ	**3,878,928**
T32AF	3,345,864
PA3DWD	1,405,360
LU1IV	1,180,300
OE2XEL	1,156,480
YT4I	1,065,844
UT5UGR	1,042,296
K6GSS/WH6	961,048
OH2HE	902,055
GB0DX	881,832

3.5 MHz

CF6OU/3	1,741,368
4N1A	1,073,520
UF6VZ	835,584
DL8PC	778,928
YU2WV	566,341
ES5RY	378,120
UT5DK	330,624
UB4QYA	309,447
4M5E	260,236
SP9AHB	237,626

1.8 MHz

UL7ACI	147,368
LZ6A	138,474
LZ1KWZ	77,376
W2GD	38,860
AA4MM	32,928
IV3WMP	31,824
YU3QI	17,760
UP2BSD	15,996
LY2BSS	13,860
OK1DWJ	8,932

QRP/p

VP2EXX	**A**	**6,727,444**
PQ2DX	A	4,902,525
4X6IF	A	997,149
NP4CC	28	2,165,940
JR3RWB	28	400,788
SP3RBI	21	173,259
N7NKG	21	146,720
RV3E/JT1BY	14	675,990
SP4GFG	14	113,724
K7UR	7	26,784
UM8MDX	3.5	4.320
UB5ZND	1.8	10,988

MULTI-OPERATOR SINGLE TRANSMITTER

LZ9A	**14,066,376**
5H1HK	13,980,480
IZ4C	13,631,493
S01EA	**12,533,858**
HI500UD	12,341,385
HG5A	11,696,037
FV1O	11,676,864
PT7FX	10,859,940
LU4FM	10,842,788
HG1S	10,232,640
R6L	10,062,435
5Z4BI	9,523,155
3DA0DX	9,179,380
OL4A	9,160,840
HG0X	9,094,217
CE7ON	8,522,235
WC4E	8,117,160
PP5ZYZ	7,945,449
TM5A	7,737,641
P35S	7,714,323

MULTI-OPERATOR MULTI-TRANSMITTER

YT2A	**21,266,490**
IU3A	21,203,072
T32T	18,918,301
CZ7Z	**17,791,848**
WZ6Z	17,506,971
JE2YRD	13,618,840
WO0G	**10,682,362**
YT2B	10,072,257
4M9X	8,504,410
KL7RA	8,099,966

sign as long as they contain all the necessary information. Please put WPX SSB Contest on the outside of the envelope containing your log. Again, thanks to all for making the 1990 contest a huge success. Hope to see you in the '91 contest.

73, Steve, N8BJQ

Random Comments
Single Operator

A real thrill to stay on one frequency per band and have a consistent pile-up. What a difference a special call makes . . . *4X8MR*. I was transmitting from Cabo San Lucas; there were many walking bikinis in front of me! Can't do anything! . . . *6I7CQ*. W2HPF software worked like a dream in my T1000 laptop. From now on, no software, no contest . . . *8P6SH*. First contest DXpedition. Great fun, especially calling stateside with A61 call . . . *A61AD*. Being first to work 9L1US was thrill . . . *AA4MM*. I set a new world's record for weight lost in first day of a contest—11 pounds! Food poisoning . . . *AA5B*.

WOW! Great contest, my best attempt and score of any contest! . . . *AA5JF*. Almost fell out of my chair when A15AW called me . . . *AD1C*. I enjoy the WPX contest and think that it is the most "fun" contest that I participate in . . . *AG8W*. Good contest, but I had RFI and TVI problems which limited me. See you next year . . . *AG9S*. Once again poor solar condx. spoiled attempt for a competitive score. No EU on 10M . . . *AI7B*. The 1355 contest QSOs took our QSO total with the CF25A call to over 10000 in 193 countries . . . *CF25A*. Great fun! Picked up some new pxs, new countries, and was able to give out a different one myself (CF3) . . . *CF3PYA*.

This is KF0GV, who finished second in the Zero district.

Great 80M conditions for sunspot high year . . . *CF6OU/3*. Finally made it over the million hump . . . *CF7EIK*. Bad condx. Where are all the stateside stations on 75M! . . . *DL8PC*. QRM was so high over European countries and also my 7-month-old baby boy was crying during the peak of the contest! . . . *DU3WPX*. Is my first "WPX" contest and I found it really funny. Please note that my QSL manager is EA8RA . . . *ED8BVH*. My first WPX Contest! . . . *ES5RY*.

So many exotic prefixes! Will try to use one for the CW part instead of F2 prefix . . . *F2CW*. With all these prefixes about, G4 will soon be a rare one! . . . *G4CNY*. Looks like I missed YT3AA record narrowly! Condx not that good . . . *GB8FX*. Plenty of new ones around for WPX Honor Roll . . . *GM4OBK*. Terrible propagation. I could hear South American stations work stations I could barely hear. Lots of fun though . . . *HU1A*. Is the best contest, very good pile-up with my special call! . . . *ID1V*. QSL Manager—IK8DOI . . . *IE8A*. What emotion when ZS8MI answered to my calls! . . . *IK6FJV*.

Never work so many W6 and W7 on 40 meter. WPX is always a great contest. Tnx . . . *IO4VEQ*. Nice test on very poor propagation. Many interesting station like ZS8, ZY0, and OH0. See you next year . . . *IY0A*. Air condition not so good (I'm can't hear east coast and N. Eu) . . . *JA3BBQ*. I need "Big System" for low bands! . . . *JG2CLS/JD1*. For the first time, I used "digital voice memory," and it did good job for the test . . . *JH4NMT*. Band conditions in Colorado down from last year by about a million points! . . . *K0CS*. Great using nice software like W2HPF's. I always knew immediately whether I needed someone . . . *K1JUL*.

Computer is better than pencil and paper . . . *K1KJT*. Working WAC on one evening on 40 meters! . . . *K6GSS/WH6*. Heavy fog all weekend resulted in S-5 power line noise when pointing east. Very disappointing . . . *K6HNZ*. Best damn contest there is! . . . *K6JG*. Conditions were a BIG disappointment! . . . *K7RI*. Had 9J2FC call me but he wasn't in the contest! . . . *K9BQL/0*. My first CQ WPX contest entry. Won't be my last! . . . *KA1MXZ*. Ugh—no new ones this year . . . *KA6ING/T*. Eleven new countries in a few hours. First contest . . . *KB0FIR*.

It's embarrassing when QRP stations break the pile-up before I do! Tnx for a great first contest . . . *KB5LBU*. I wish stations would identify sometime within each contact. Wasted much time listening to stations who would not identify . . . *KB9UG*. What happened to Europe? Great experience with handling a pile-up.

MFJ TUNERS

Here is the finest 3 KW Tuner money can buy with roller inductor, dummy load, *new* peak reading meter, antenna switch, balun plus more ... $349.95

The MFJ-989C is not for everyone.

However, if you do make the investment you get the finest 3 KW PEP tuner money can buy - one that will give you a lifetime of use, one that takes the fear out of high power operation and one that lets you get your SWR down to absolute minimum.

The MFJ-989C is a compact 3 KW PEP roller inductor tuner with a new **peak** reading Cross-Needle SWR/Wattmeter. The roller inductor lets you get your SWR down to absolute minimum.

With **three continuously** variable components - two massive 6 KV capacitors and a high inductance roller inductor - you get precise control over SWR **and** the widest matching range possible from 1.8-30 MHz.

MFJ-989C **$349.95**

You get a **new** lighted **peak** and average reading Cross-Needle SWR/Wattmeter with a **new** more accurate directional coupler.

You get a giant two core balun wound with teflon wire for balanced lines and a 6-position antenna switch with extra heavy switch contacts.

Its compact 10¾x4½x15 inch cabinet fits right into your station.

You get a 50 ohm 300 watt dummy load for tuning your exciter, a tilt stand for easy viewing and a 3-digit turns counter plus a spinner knob for exact inductance control. Add $10 s/h.

2-knob *Differential-T*™ Tuner

MFJ-986 **$289.95**

The **new** MFJ-986 Differential-T™ 2-knob Tuner uses a differential capacitor to make tuning foolproof and easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only **one** best setting. Covers 1.8-30 MHz.

The roller inductor lets you tune your SWR down to absolute minimum. 3-digits turns counter lets you quickly return to your favorite frequency.

You get MFJ's **new** peak and average reading Cross-Needle SWR/Wattmeter with a **new** directional coupler for more accurate readings over a wider frequency range. It reads forward/reflected power in 200/50 and 2000/500 watt ranges. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

A **new** current balun for balanced lines reduces feedline radiation and forces equal currents into antenna halves that are not perfectly balanced for a more concentrated, stronger signal. Add $10 s/h.

MFJ's *Fastest Selling* Tuner

MFJ-941D **$109.95**

The MFJ-941D is MFJ's fastest selling 300 watt PEP antenna tuner. Why? Because it has more features than tuners costing much more and it matches everything continuously from 1.8-30 MHz.

It matches dipoles, vees, verticals, mobile whips, random wires, banlanced and coax lines.

SWR/Wattmeter reads foward/reflected power in 30 and 300 watt ranges. Antenna switch selects 2 coax lines, direct or through tuner, random wire, balanced line or tuner bypass. Efficient airwound inductor gives lower losses and more watts out. Has 4:1 balun. 1000 V capacitors. 10x3x7 inches.

MFJ's *Random Wire* Tuner

MFJ-16010 **$39.95**

You can operate all bands anywhere with any transceiver when you let the MFJ-16010 turn any random wire into a transmitting antenna. Great for apartment, motel, camping operation. Install a wire anywhere! Tunes 1.8-30 MHz. 200 watts PEP. Ultra small 2x3x4 in.

MFJ's *Deluxe* 300 Watt Tuner

MFJ-949D **$149.95**

The MFJ-949D gives you lower SWR than **any** tuner that uses two tapped inductors. Why? Because you get two **continuously** variable capacitors that give you infinitely more positions than the **limited** number on switched coils.

This gives you the precise control you need to get your SWR down to a minimum. After all, isn't that why you need a tuner? Covers 1.8-30 MHz.

You get MFJ's **new** lighted 2-color **peak** and average reading Cross-Needle SWR/Wattmeter, dummy load, antenna switch, and 4:1 balun - all in a compact 10x3x7 inch cabinet. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

With MFJ's **deluxe** 300 watt PEP tuner you get an MFJ tuner that has earned a reputation for being able to match just about anything - one that is highly perfected and has years of **proven** reliability.

MFJ's *Mobile* Tuner

MFJ-945C **$89.95**

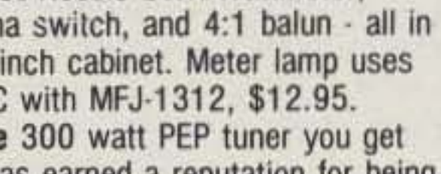
Don't leave home without this **mobile** tuner! Have an uninterrupted trip as the MFJ-945C **extends your antenna bandwidth** and eliminates the need to stop, go out and adjust your mobile whip.

You can **operate anywhere in a band and get low SWR.** You'll get maximum power out of your solid state or tube rig and it'll run cooler and last longer.

Small 8x2x6 inches uses little room. **SWR/ Wattmeter and convenient placement of controls make tuning fast and easy while in motion.** 300 watts PEP output, efficient airwound inductor, 1000 volt capacitors. Mobile mount, MFJ-20, $3.00.

144/220 MHz VHF Tuners

MFJ-921 **$69.95**



MFJ's new VHF tuners cover both 2 Meters and the 220 MHz bands. They handle 300 watts PEP and match a wide range of impedances for coax fed antennas. SWR/Wattmeter. 8x2½x3 in. **MFJ-920, $49.95.** No meter. 4½x2½x3 inches.

MFJ's *Artificial* RF Ground

$79.95 **MFJ-931**

You can create an artificial RF ground and eliminate RF "bites", feedback, TVI and RFI when you let the MFJ-931 resonate a random length of wire and turn it into a tuned counterpoise. The MFJ-931 also lets you electrically **place a far away RF ground directly at your rig** -- no matter how far away it is -- by tuning out the reactance of your ground connection wire.

Barefoot/1.5 KW Linear Tuner

MFJ-962C **$229.95**

For a **few** extra dollars, the MFJ-962C lets you use your barefoot rig now and have the capacity to add a 1.5 KW PEP linear amplifier later. Covers 1.8-30 MHz

You get two husky **continuously** variable capacitors for maximum power and minimum SWR. And lots of inductance gives you a wide matching range.

You get MFJ's **new** peak and average reading Cross-Needle SWR/Wattmeter with a **new** directional coupler for more accurate readings over a wider frequency range. It reads forward/reflected power in 200/50 and 2000/500 watt ranges. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

Has 6-position antenna switch and a teflon wound balun with ceramic feedthru insulators for balanced lines. 10¾x4½x14 7/8 inches. Add $10.00 s/h.

MFJ's *smallest* Versa Tuner

MFJ-901B **$59.95**

The MFJ-901B is our smallest -- 5x2x6 inches -- (and most affordable) 200 watt PEP tuner --when both space **and** your budget is limited. Good for matching solid state rigs to linears.

It matches whips, dipoles, vees, random wires, verticals, beams, balanced and coax lines from 1.8-30 MHz. Efficient airwound inductor. 4:1 balun.

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KC1F	4,480,683
N5RZ	4,317,060
K3ZO	4,243,994
K7RI	4,015,616
NW3B	3,864,250
AI7B	3,689,249
KA5W	3,579,296
NN7L	3,371,140
AD1C	3,205,378
KY2J	2,301,481
K6HNZ	2,282,516
W0CG	1,863,873
WX4G	1,828,843
WF5E	1,742,530
AA5B	1,726,494
KT4W	1,723,668
KR0B	1,559,025
KI3V/7	1,512,320
KF2O	1,502,026

28 MHz

WN4KKN/5	1,880,112
NU6S	1,650,420
W5WMU	1,561,506
KW6J	1,271,016
NB1H	1,264,809
K1ZM	1,187,595
N0BSH/9	945,615
KA1JJR/T	934,524
WX6M	846,954*
WA3LFY	816,202

21 MHz

WB5VZL	2,687,622
NX1H	**1,688,844**
AA5JF	1,146,829
N3GB	784,123
KG5VK	701,760
WA6FGV	614,380
WA4QMQ	260,756
K1DWQ	250,274
WD5DMD	237,336

14 MHz

KK9A	**2,436,904**
WD5N	2,005,291
W5FO	811,530
K1KJT	776,250
KS2M	319,631
AG9S	177,012

7 MHz

WB9Z	**594,176**
N3HHE	114,342
WQ2M	113,542
KJ0B	109,564
WD8PAQ	74,240

3.7 MHz

KE5FI	**215,800**
KQ3V	163,552
KE4BM	26,664
N2WK	12,688

1.8 MHz

W2GD	38,860
AA4MM	32,928

QRP/p

KR2Q	A	961,422
N1AFC	A	426,725
WA2UUK	28	144,000
N5US	28	130,810
N7NKG	21	146,720
WI8W	21	103,774
KA1UJ	14	61,686
K7UR	7	26,784

MULTI-OPERATOR SINGLE TRANSMITTER

WC4E	8,117,160
N4WW	5,982,160
WU7Q	4,328,352
AA7CM	4,319,343
W1FEA	4,147,091
WD1K	3,911,136
W9NQ	3,386,186
WR8W	3,329,354
NU1P	3,243,680
NM9H	3,213,361

MULTI-OPERATOR MULTI-TRANSMITTER

WZ6Z	17,506,971
WO0G	**10,682,362**
NB6L	3,228,855
N8BJQ	1,883,637

Highlight was having BY5TX answer my CQ! . . . *KC6IHT/T*. New QTH! No Beam! Working BY1PK biggest thrill! . . . *KC9EW*. Finally got S0! First time I logged on computer real time —Great! I will never hand write again . . . *KE5FI*. Bands disappeared on day 2! . . . *KF2O*.

The weather here was much too pleasant to be inside contesting, so I didn't . . . *KG6AO*. Where was EU? . . . *KH6DW/KS6*. Aloha and Mahalo to all and especially to my wife for letting me contest on our 39th wedding anniversary . . . *KH6FKG*. Finding out after contest where those prefixes were! Like XX9. First time in contest . . . *KI6CK*. Working Reunion Is. (FR4FD) for a new lifetime country made it all worthwhile . . . *KI6PG*. Tough band for this contest—working split and all those broadcast stations. Now I remember why I stay on CW here . . . *KJ0B*. The first contest I entered was the 1980 WPX SSB. I've been hooked on contesting ever since . . . *KK9A*.

Spent the time, but not the effort, and still had fun . . . *KM0L*. I can't figure out why I submit to this torture. Thank the Lord for K1EA! . . . *KM4YY*. First time in WPX. Where was 10 on Sunday? . . . *KR0B*. YMCA father/son car race cut into operating time, but at least we won that! . . . *KS2M*. Being told you are the only west coast station being heard in Europe . . . *KW6J*. Much time was wasted listening for identification of stns. just using QRZ and not their callsign. Why so secret? . . . *LA2AD*. With 50 watts and the clothes-line wire, I give out a non-common multiplier. See you next year . . . *LQ17DX*.

Special callsign for the first anniversary of the Argentine DX Group . . . *LQ24DX*. For QSL via LZ1RU . . . *LZ5M*. LZ5N—special contest call—normal LZ1KAZ . . . *LZ5N*. Thought condx couldn't get much worse than they were on Saturday, but then came Sunday! . . . *N0BSH/9*. Lousy conditions . . . *N0ZA*. Potomac Valley Radio Club . . . *N4MM*. Does this qualify for the "Worked Least Stations Award"? . . . *N5FHZ*. Five hour drive to site after work makes for tired operation. Fun getting several new countries. New if they will QSL . . . *N6IFW*. A 6 foot snake tried to climb my tower and caused the SWR to go up. He quickly retreated when I keyed down . . . *N7DF/NH2*.

Only operated a total of 13 hours; not the biggest score but got 15 new countries and had a good time! . . . *N7HZG*. Three new countries in first half hour . . . *N8LMB*. Gary, AA5OR, kicked my butt bad! From my old North Texas QTH with the tower and beam I only used 3 months. Wait til next yr . . . *NJ1V/5*. Shouldn't have gone out to breakfast Sunday morning! . . . *NL7DU*. I like being a YL! . . . *NL7KB*. A61AD answered my CQ! . . . *NN7L*. Lots of people wanted my prefix. K4VX/NS0Z must not have been on this time . . . *NS0B*.

The Alpha stopped working after 24 hrs. Had to limp through the last six hours . . . *NU6S*. Surprised how well I placed being only 14 years old . . . *NW3B*. Am I getting older or are contest hams getting politer? . . . *NY0R*. First international contest in all my life . . . *OC4BTE*. Poor condx and/or loss of stations . . . *OH2IW*. Bad conditions from Finland . . . *OH6MFN*. Poor condx on Saturday, so I used my rest periods, only to realize that the condx were even worse on Sunday . . . *OH6NIO*. I didn't really plan to contest this weekend, but I got caught up the second night and made 135 . . . *OZ1ADL*.

Missing the first 164 because I did not copy their report # . . . *P4/N4XCF*. During the whole contest it was possible to work long and short distance at the same time . . . *PA0COR*. I have work with my 5 element beam to a fixed position. A big storm have destroyed my antenna rotor . . . *PA0IJM*. No meters like 10 meters: great 10 meter conditions down here! . . . *PJ4A*. Only one QSO during contest . . . *PY5AG*. Broke my Oceania record! . . . *T32AF*. Poor conditions in northern part of Russia . . . *U1BA*. Small activity on 160 meter band! . . . *UP2BSD*.

Many thanks for the interesting contest! Lot of DX with rare prefixes such as K4YT/DU8, P40V, A61AD, HI500UD, etc. . . . *UT5UGR*. 2222 Q's using a clench-to-talk mobile mike and a channelized transceiver that only has "Up/Down" buttons. This is fun? . . . *V32SW*. Great contest. Condx so bad Sunday, I thought I was RX on the dummy load. Heard and worked only ZS6JR as DX on Sunday . . . *VE2WAT*. What happened to all the great propagation of late? . . . *VE3VET*. An S-9 noise level for the whole contest. Sorry if I didn't hear you . . . *VO3MP*. Best rates were on 20 meters in the middle of the night . . . *VS6WO*.

Tnx to K1EA for taking the bureaucracy out of contesting and leaving the radio fun in! . . . *W0CG*. Snaring S01EA after many tries was great! Also enjoyed finally working DX on 40 SSB . . . *W3FTG*. My amplifier went out before the contest, so I operated "barefoot" all of the contest. Still worked all I heard . . . *W4WJJ*. No Europeans worked. Nice to get back on 10 meters after a long absence . . . *W7FP*. Propagation to Europe disappointing. Not too good into other sections, but was able to work everything heard . . . *W7HS*. CQ WPX always lots of fun! . . . *WA4QMQ*. Hearing Europeans with good signals calling CQ with no takers on Saturday was like the "Twilight Zone"! . . . *WA6WPG*.

Had great fun even though band condx miserable . . . *WB4FOT*. Thought it was going to be good. Come Saturday morning and Sunday buzz and lousy prop . . . *WB4VQO*. This one was dedicated to Bernie, W8IMZ . . . *WB8TLI*. It's great to be called twice by ZS8MI on 40 . . . *WB9Z*. Whew! . . . *WD5N*. Doubled last year's score . . . *WD8EOL*. First time I used a computer program to log with. Boy does it make the contest more fun! . . . *WD8PAQ*. Very narrow European opening with excellent runs on Sunday . . . *WF5E*. Alas again too much aurora, not enough MUF . . . *WL7E*.

The bands were so bad Saturday morning I felt like I was doing a single band 50 MHz . . . *WN4KKN/5*. My mike went down 3 times! Finally got correct wire soldered . . . *WP4WD*. Was able to get higher single band score in less time than in 1989 . . . *WQ2M*. First contest. Next year I'm logging with a computer. I ran out of correction fluid preparing my results . . . *WS7V*. XX9JN and XX9KA are responsible for the excessive off time—too much partying Friday night! . . . *XX9TDM*. 88-89 score up 64%—still 28th in world. 89-90 score only up 8.4%. How far will I drop! . . . *YB3ASQ*.

New experiment, will learn more . . . *YC2HTD*. Pulled arm muscles previous weekend, then quad fell apart during the contest . . . *ZM1IM*. I used the K1EA software ON LINE and was not possible to have the usual speed, but was a very nice experience . . . *ZW5B*.

Revolutionary NEW . . .

MFJ SWR Analyzer

MFJ's innovative new SWR Analyzer gives you a *complete* picture of your antenna SWR over an entire band — *without* a transmitter, SWR meter or *any* other equipment!

All you do is plug your antenna into the coax connector, set your SWR Analyzer to the frequency you want and read your SWR.

Setting up and trimming your antenna: Super simple and super accurate

You can instantly find your antenna's true resonant frequency right at your feedline -- that's something a noise bridge just can't do.

You can monitor SWR changes as you adjust your beam or vertical — you'll know right away which way to adjust it.

You can shorten or lengthen your dipole and see the effect immediately.

The MFJ SWR Analyzer is battery operated and handheld size so you can take it right to your antenna. It makes it sooooo easy to work on your antenna until it's just the way you want it.

Create your perfect multi-band antenna

You can instantly check multi-band dipoles and trap verticals to see if the low SWR points are where you want them and adjust your antenna until they're right.

Mobile Antennas made easy

You'll find the perfect adjustment for your mobile whip in seconds by actually seeing the SWR as you pull the whip in and out without transmitting

You can easily find the ideal place on the car for your mobile antenna by checking different spots with the SWR Analyzer.

All kinds of uses

You can see how the SWR varies over your entire band and quickly find your usable 2:1 SWR bandwidth.

You can see your SWR change as you drive under an overpass and see how mobile whip flutter affects SWR.

You can see what happens as you swing your beam toward the power line or away from your tower.

You can see how rain or snow affects your beam.

You can tune up your antenna tuner without transmitting.

You can check the SWR of the input to your linear amplifier.

You'll find all kinds of uses for this totally self-contained handheld unit that'll revolutionize how SWR is measured.

MFJ-207 **$99.95**

Super Value: Several Instruments in One

You get a super value because several instruments are combined into a single portable handheld unit.

It has a low distortion RF generator that covers 10-160 meters, an SWR bridge that gives forward and reflected components and a computing circuit that automatically computes the SWR and displays it on the meter.

Everything is automatic. All you do is set the frequency and read SWR. It also has a frequency counter output so you can connect a frequency counter for precise digital readout.

Use 9 volt battery or 110 VAC with MFJ-1312, $12.95. 7½'' x 2½'' x2¼''.

The best way ever to measure SWR

Here's the best way ever to measure SWR . . . so get yours today!

MFJ VHF SWR Analyzer

MFJ-208

$89.95 NEW

If you operate 2 meters this new MFJ-208 VHF SWR Analyzer helps get your antennas in tip-top shape. Just plug in the coax to find the SWR of any antenna from 142-156 MHz. Use 9 volt battery (not included) or 110 VAC with MFJ-1312, $12.95.

MFJ Low Pass Filter

MFJ-704 Regular Price: ~~$39.95~~

LOW SALE PRICE!

$29.95

Now you can eliminate or minimize TVI problems caused by harmonics with this new MFJ Low Pass Filter that connects between your transceiver and antenna. It's the best way to ensure that your transceiver does not cause harmonic interference to your neighbors' TVs -- you can operate in peace while your TV watching neighbors completely miss out on the fun of ham radio.

Handles full legal power from 0 to 30 MHz. SWR below 1.15:1 to 30 MHz. High harmonic attenuation. Low insertion loss. One year unconditional guarantee.

W9INN Balun Box

NEW

MFJ-912

$39.95

Permits using coax from your wide range T-network tuner to the MFJ-912 W9INN Balun Box mounted outside the building. The MFJ-912 then converts the unbalanced coax to the balanced transmission line (ladder line). Provides the same function as the internal balun except it is located remotely from the tuner.

With an adequate tuner will permit feeding any balanced transmission line this way.

Retains flexibility and efficiency of the ladder line feed without bringing the ladder line into the shack. One year unconditional guarantee.

DC-650 MHz Dummy Load

MFJ-264 Regular Price: ~~$89.95~~

LOW SALE PRICE!

$59.95

One dummy load that covers 160 Meters through 650 MHz and QRP through 1500 watts!

SWR is below 1.1:1 to 30 MHz, below 1.3:1 to **650 MHz.** Run 1500 watts for 10 seconds, 100 watts for 10 minutes. 3'' x 3'' x 7''. Guarantee.

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The French DX Foundation operated GJ0LYP during the contest. They worked 120 countries and will QSL all contacts via the bureau. From left to right the ops are: Claudia, F1NYQ, Florence, F6FYP, Marcel, F6DOW, Sylvio, F6EEM, Denis, F6GKQ, and Fritz, F6IMS.

Random Comments QRP/p

I was mobile QRP at a hilltop. Best ones on 28: JA, CE, DU (12000 km) . . . *EA3DXD/M*. Formula for a long weekend: (A) Go on a diet; (B) QRP WPX on 40 meters! . . . *K7UR*. My sincere thanks to everyone who pulled my QRP signal out of the 20 meter QRM! . . . *KA1UJ*. Working ZY0 and S0 was a thrill, but otherwise condx were bad on 10 . . . *KF8DF*. Someone said to me, "Big Signal"—didn't have the heart to tell him I was QRP/p . . . *KN1M*. The best of competition. 183,516 points for 13 hours only. 73! . . . *LZ1OV*. Conditions not as good as last year but good openings to all continents. The East Coast was blacked out for me . . . *N5US*.

Simply the best band conditions on 15 meters I've ever heard! . . . *N7NKG*. The Sunday Boulder K-index was 6! Give us QRP guys a break . . . *N8AGU*. Amazing! 9J, A6, XT, XX9, FW, ZK1—all with 5 watts! . . . *VP2EXX*. Sure miss those 10 meter openings to Europe . . . *WB6JMS*.

Random Comments Multi-Single

My last contest from Zanzibar, maybe . . . *5H1HK*. First experience contesting from 5Z4. Conditions much different than from S.A. Over 50% of our contacts were with Europe! . . . *5Z4BI*. We are high school students. This is first contest for us . . . *BY8AC*. Having to close down due to TVI during a massive pile-up stateside with 6 hours to go . . . *G0CCH*. Usual four seasons in one weekend. Had to shut down due to static off hail storms 15 times. Great contest . . . *GM0AEE/P*. Whatever happened to 10 meters! We managed to run a few stateside 5's, 6's, and 7's on Sunday but no East Coast . . . *GM0ECO*.

Great signals, great participation, the best contest of the period. Thanks for the pile-up! . . . *IZ4C*. Multipliers don't come automatically. Where are they? . . . *JA1YFG*. We had hoped to make over 2000 QSOs on 28 MHz only, using a big antenna . . . *JA8YBY*. Wx was windy. My AFA40 was turned vertical . . . *JH1YDT*. "K1EA software makes all those weird prefixes a piece of cake." . . . *K3UA*. We didn't have enough time . . . *KB2SE*. Lately, whenever it's contest time, my little brother who's in the Army decides to visit! Murphy works in mysterious ways . . . *NC7K*.

Great propagation to USA. Condx to JA not too good . . . *PI4GV*. First time our club station was in a contest. It was great. See you in the next contest . . . *PT7FX*. First time we used K1EA software. WOW! How did we manage without it before?! . . . *SM5GMG*. We have more fun with special call in WPX. Almost everybody ask, "What is your country?" . . . *TM5A*. Poor condx Saturday. Worse on Sunday. Definitely a character building contest! . . . *VE3BXY*. I love this contest because you can make a lot of Q's with modest antennas and have fun . . . *WU7Q*. First time ever for XM5 prefix . . . *XM5FX*. Big power is still main factor to win the contest . . . *YB4ZBY*. Wish the pile-up would be also that big fun from home QTH . . . *ZB2/HB9FMD*.

Random Comments Multi-Multi

First Venezuelan 9th district call in any CQ WPX SSB contest. Seventeen years after the last YV9 in any *CQ* contest . . . *4M9X*. We had the callsign, the operators, the radio equipment, the computers, but we didn't have the propagation . . . *CZ7Z*. Bring back the bottom of the cycle. Condx like this are really disappointing at this time of the cycle. Very few JAs . . . *WO0G*.

Station Operators

Multi-Operator Single Transmitter

3DA0DX: ZS6BRZ & ZS6WPX. **5H1HK:** JE3MAS. **5Z4BI:** 5Z4BI & 5Z4FO. **AA7CM:** AA7CM & W7ZR. **BY1PK:** BZ1FB & VK4DO. **BY8AC:** Wang Tao, Huang Ruil, Yang Guang. **CE2AA:** Club Group. **CE7ON:** VE7ON, VE7SZ, VE7CC. **CF3CPA:** VE3CPA & VE3NJM. **CF6AO:** VE6's AMR, CJZ, EY, PY, COD, GLR, JX, KC, CIZ, TFM, CTY, ACW, ANL, NOW, YES, BLI, WA0ZVF. **CF6WP:** VE6's WP, BBP, BRE, EZ, LLL, BOS, MAA, VE5WI. **CI7U:** VE7's CMK, MT, GL, BV, CPX, HAN, HI8TGS. **DK2XX:** DK2XX & DL4ZBK.

ED3MM: EA3's FJM, CAC, FWE, FPR, GWR, FUM, EC3's CUS, CUP, CSK, CVD, CVP, CSG, CVK. **ED3QD:** EA3BOW, EA3BOX, EA3DGQ, EA3EIO, EA3DDU. **ED7WV:** EA7FTH, EA7DOJ, EA7GTG, EA7GTF. **ES1WQ:** Club Group. **FF1COM:** F6EPN, F6FNL, F6IQA, FD6ITD, F1JAD. **FF5KK:** FD1MWA, F6HHU, FC1GIE. **FF6KRC:** F6GLH, F6GLI, FD1LHA, F11LTF, F6GYT. **FO0XXL:** W6KG & W6QL. **FV10:** F6BBJ, F6CTT, F6EPY, F6HSV. **G0CCH:** G0CCH, G0CDO, G1YIU. **G6UW:** G3ZAY, G4DQW, G4JVG, G0HSD, G0KUB, G0MFO. **GB2SH:** G0AAF, G0IZM, G0KYM, G1NPY, G4GIK, G4JYE, G4SEA, G4WMH, G6WTM.

GJ0LYP: F6IMS, F6FYP, F1NYQ, F6EEM, F6DOW, F6GKQ. **GM0AEE/P:** GM4NNC, GM4TNJ, GM4RYZ, GM0EAS, GM6HWZ, GM1OXQ. **GM0ECO:** GM0ECO & W5ASP. **GM90CC:** GM0EFH, GM0HNV, GM0HSC, GM0FHJ, GM3CIX, GM3YOR, GM4TOQ, GM4CXM, GM7BPA. **HA3KNA:** HA3NS, HA3NU, HA3FO, HA3OV. **HA8KCK:** HA8's FW, KH, FM, FT, EK, DZ. **HG0X:** HA0's NNN, MK, VN, LC, DU, OB. **HG1S:** HA1's TD, AH, DAC, TW, DAE, TJ, SV. **HG5A:** HA5's ML, FM, AWH, MK, IW, LN, OM, BBC, GF, HG5BNL, HA6WX. **HI50UD:** HI3AMF, HI3LFE, HI3JH, HI3LRR, HI3HBD, HI3JMP, HI3HCE, JP1DMX.

HL0B: White, Checl, Sun, Ic, New. **HL8A:** HL1CG, HL1EJ, HL1IE, HL1XP, HL2IDJ, HL2KAT, HL1KFW. **HY0P:** F5JY, F6BFH, F6FVY, F9IE & Dany. **IK2ARI:** IK2'S EKY, FAD, FEO, GAU, IKT, MMF, MPV, NVU, OFR, OHG, OQB. **IZ2W:** IK2FYH, IK2GXK, IK2GSN, IK2GWH. **IZ4C:** I4UFH, I4YSS, I4USC, I4JMY, IK4IEE, I2VXJ. **JA1YDU:** JH0NZN, JH0LFE, JH0SPE, JS1DLT, JR8NMX, JA0VBJ, JE0AXZ. **JA1YFG:** JP1JFG, JQ1BRW, JJ3OLZ, JE7WBI. **JA1ZLO:** JI2GUT, JN3PYQ, JK1JEO, JR0JFM, JI3XNQ, JG3LLB, JI3BFG, JH7PKU.

JA3YCT: JL3HEY, JJ3WAM, JJ3WTY, JJ3LBO, JM3ETO, JL3ASH, JL3CLB, JO3EMC, JL3AXE, Ryusuke, Hidekozu. **JA6YBR:** JR6GKT, JF1DHS, JF6DEA, JP1LRT, JF6TMH, JG6GNR, JI6BRB, JI6ROX, JL6FIS. **JA8YBY:** JO1DFG, JH8PNE, JH8WBR, JR8DHA. **JH1YDT:** JO1IDL & JK1BWM. **JK1ZNB/JD1:** JS1GHA, JS1PJO, JI1VGY, JR7ISY. **JT1KAI:** S. Dorjpalami, B. Zajsanbator, Sh. Chulunbat, J. Sukhe. **K3UA:** K3UA & Packet Cluster. **KB2SE:** KB2SE & WT2J. **KD3JH:** KD3JH & W3GG. **KD5GD:** KD5GD & Packet. **KJ0G:** & K0GAS. **KS3F:** KS3F & NE3F.

LQ9DX: LU7DID, LU8EGO, LW1EXU, LU7DW. **LU4FM:** LU1FOW, LU1HOO, LU1JRL, LU2FID, LU2FN, LU2FYA, LU3FEU, LU4FDV, LU6FEC, LU6FN. **LY1BZR:** Dombrauskas, Gorbunov, Jodeika. **LY2WW:** LY1BA, LY2BIJ, LY2BKW, LU2BMW, LY2PX, LY-SWL-E.B. **LZ1KNP:** LZ1N-143, LZ1N-151, LZ1N-152. **LZ2KCO:** Janko, George, Dobri. **LZ9A:** LZ2CC, LZ2DF, LZ2HE, LZ2ZO, LZ2TT, LZ2UA, LZ2WM, LZ2-E-Y1, LZ2II. **N3CHL:** KA3VEL & N3CHL. **N4WW:** N4WW, NX4N, WA6DGX, K0LUZ. **N7TT:** N7TT & KA2KRA. **NC7K:** NC7K & Packet. **ND1X:** ND1X, K1WNT, K1CVF, KJ1D, KA1TGB, KA1USY, KA1SNQ, WA1PMA, KA1RFM.

NE8T: NE8T, N8CXX, N8BTU, K8JM, KE8OC. **NI7T:** NI7T & NK7U. **NM9H:** NM9H, NO9Z, N9HXG, KE9NL. **NU1P:** NU1P, NJ1F, KB1W, KY1H, Packet. **NV4G:** NV4G & NU4B. **NZ4K/8:** NZ4K & KU8E. **OH7AB:** OH7MA & OH7MOG. **OH7NTM:** OH7MS, OH7MHL, OH7WV. **OK1KCF:** Club Group. **OK1KNR:** Club Group. **OK1OFM:** OK1DDR & OK1DRQ. **OK1ONA:** OK1's JPH, JOE, DOY, JKR, 18081. **OK2KDS:** Club Group. **OK2KLI:** Club Group. **OK2KMR:** Club Group. **OK2KOD:** OK2BDI, OK2BGR, OK2BHM.

OK2KVI: Club Group. **OK2KYC:** Club Group. **OK3KFF:** OK3's TPW, TPG, TRG, TLU, TCW. **OK3KHU:** Club Group. **OK3KUN:** Club Group. **OK3KYH:** Club Group. **OL4A:** OK1AEZ, OK1WT, OK1CF, OK1JJB. **OQ7AR:** ON4AMT, ON6VK, ON4AFZ, ON6UL, ON4AAQ, ON4AMI, ON4ALT, ON6NL, ON4AEK, ON4AKL, VP8BPZ. **P35S:** 5B4's WN, WS, XF, XN, YN, ZX, A. Charalambides & S. Georgiou. **PB0AIU:** Club Group. **PI4GV:** PA3ERC, PA3BBP, PA3FMY. **PI4TTC:** PA0FVH, PA3AQE, PA3FMV, PA3DZP, PA2JMK, PB0AHX, PE1LSJ, PD0ODC, NL9877. **PI9IRC:** DA1KG, DA1AU, G3XHK, PA3EZL, PA3EWM, PA0HNB.

PP5ZYZ: PP5ZYZ, PP5JD, PP5WG. **PT7FX:** PT7's AQ, BL, BR, BZ, CQ, NK, NN, SY, VB, WA, WX, WZ, ZD. **R6L:** UA6LO, UA6LV, UB5ITW, UA6-150-1240, UA6-150-1103, UV6LPL, RA6LRT, UA6-150-1403. **RB4EXN:** Bojko, Vailo, Sheremet. **RB4LWV:** UB5-077-2145, UB5-077-2143, UB5-077-2214. **RL8DWW:** UL7DDJ, UL7-029-106, UL7-029-120, UL7-029-121. **RX9J:** UL7OB, RA9JX, RA9JR, RA9JN,

RA9JM. **RZ2F/UX9XWV:** UA9-090-1053, UA9-090-1058, UA9-090-1085. **RZ6AXO:** UA6YN, RA6AX, UV6AOW, UA6-102-15.

RZ9MYA: UA9-146-79, UA9MAA, UA9MRC. **S01EA:** S01A, S01ML, S01MZ, EA5AD, EA5CGU, EA5BQJ, EA5AEE, EA7BUD, EA7EL, EC7DMU. **SM5GMG:** SM5GMG & SM0NSJ. **SN9C:** Cracovia DX Club. **SP1PBW:** Club Group. **SP4KTO:** Club Group. **SP9ZHR:** Club Group. **TM5A:** F6IFR, F6GWV, F6HMQ, F6CWN, F6GDK. **UA3QYN:** RA3QI, UA3QNS, UA3-121-339, UA3QLC. **UB3IWA:** UB5IOK, UB5-073-1151, UB5-073-3175, UB5-073-3941, UB5IRZ, RB5IJ. **UB4LWC:** Club Group. **UB4QWW:** Club Group. **UB4TWL:** Club Group. **UB4WXE:** Club Group.

UB4WZA: UB5WBY, UB5WCX, UB5-068-995, UB5-068-996, UB5-068-997. **UB4XWK:** Club Group. **UC1IWW:** UC2IDC & UC2IO. **UH9HWB:** UH8ABV, UH8ABS, Serge. **UI9BWF:** Vlad, Paul, Poul. **UL8CWW:** UL7-028-291, UL7-028-283. **UL8LYA:** UL7LEZ, UL7LEG, RA6XA, UL7-026-177. **UM9TWA:** Club Group. **UZ0LWC:** Yuri, Vitaly, Eugeny. **UZ3AXX:** UA3-170-220, UA3-170-126. **UZ3QYN:** Club Group. **UZ4AXQ:** UA4-156-531, UA4-156-878. **UZ4AYT:** Oleg, Aleksej, Vladimir. **UZ4HWS:** Club Group. **UZ4WWQ:** Club Group.

UZ4WY: UA4YGM, UA4YGT, UA4-097-185, UA4-097-271. **UZ6AXS:** Al, Serge, Mike. **UZ6HXK:** UA6-108-1838, UA6-108-1870, UA6-108-1873. **UZ6LWM:** RA6LG, RA6LM, Serv. **UZ9JWJ:** UA9JAF, RA9JD, UA9WO/RW9J, RA9JAC, UA9-162-317. **UZ9UWN:** Club Group. **VE3BXY:** VE3BXY & VE3EPM. **VE3CPA:** Club Group. **VE3SWA:** Club Group. **VK6ANC:** VK6APK, VK6ATA, VK6JIP. **VK6LW:** VK6LW & VK6BB. **W1FEA:** W1FEA & K2BA. **W9NQ:** W9NQ, KI6VC, WB6RXE. **WA8LLY/6:** WA8LLY & Packet. **WB2YOF:** WB2YOF, WB2R, Packet.

WC4E: WC4E & K4XS. **WD1K:** WD1K, K8PO, K1RX. **WF2G/4:** WF2G & N4QWL. **WI8L:** Club Group. **WJ0L:** KA0JZV, KB0LC, KA0LAH, N0BNG, KF0FC, KA0YFN, WJ0L. **WR8W:** WR8W & K8CC. **WU7Q:** WU7Q, N6TIB, W6REC. **XM5FX:** VE5FX, VE5GHC, VE5ELJ, VE5MX, VE5SWR. **Y38I:** Y44ZI, DK9FE, Y44UI, Y24RK. **Y48CJ/P:** Y23RJ & Y55SC. **Y51CQ:** Y51TQ, Y510Q, Y51XQ, Y54NL. **YB4ZBY:** YB4FNN, YD4NCS, YG4GDZ, YG4HCL, YD4FUG. **YL1WW:** UQ2-037-83, UQ2-037-116, UQ2GDW, UQ2GUB, YL2AG. **YL1ZW:** UQ2GKL, UQ2GID, YL2GM, RQ2GN, YL2KA.

YO7KHJ: YO7NA & YO7LBU. **YT3T:** YU3BQ, YT3EW, YU3HP, YU3HR. **YT7A:** YU70A, YU7BJ. **YU3AI:** YU3AI, YU3BM, YU3EO. **YZ4Z:** 4N4AE, 4N4CX, 4N4MX, YU4AX, YU4CC, YU4EK, YU4KW, YU4MI, YU4TB & 10 operators. **ZB2/HB9FMD:** HB9FMD & HB9DCQ.

These are the ops of multi-multi entry T32T. From left to right are KH6VP, JH1LBR, CQ DX Editor VP2ML, N6HYK, NH6UY, WH6CDF, AH6IO, KH6XQ, KH6BM, and N6RZC.

Station Operators

Multi-Operator Multi-Transmitter

YT2A: YU2's DQ, OH, MP, LJ, HO, OG, MY, IQ, NJ, YD, AJ, EU, RA, MM. YT2's AA, FI, GW, HN, MO & Marin. **IU3A:** I3MAU, I3JSS, I3ON, I3KVW, I3QJZ, I3BYT, IK2BHX, IK2NBJ, JA3DLE, I3JUK, I3VJW. **T32T:** WH6CDF, JH1LBR, KH6BM, AH6IO, KH6VP, KH6XQ, N6HYK, N6RZC, NH6UY, VP2ML. **CZ7Z:** VE7's ARS, AV, CQD, EME, DLM, DRS, NNN, RBL, SK, SSS, VE6UX, VE5FN. **WZ6Z:** WZ6Z, K3EST, N6KT, N6RO, WA6AUE. **JE2YRD:** JA1LZR, JH1NBN, JO1RUR, JO1EMV, JF2EOC, JI3ERV, JK3GAD, JR7OMD, JR2SCJ. **WO0G:** WO0G, K4VX, K9ZO, KE9PM, AG9A, KD9Q, NS0Z. **YT2B:** YU2NK, YU2VR, YU2NY, YT2JA, YU2CCJ, Ica, Sale, Pero, Sasa, Denis, Igor, Andreja.

4M9X: YV5RW, YV5AJP, YV5EED, YV5IQJ, YV5LIX. **KL7RA:** KL7RA, KL7TC, KL7XD, KL7RN, AL7CQ, AL7HC, NL7PH, AL7AF. **ZZ4Y:** PY4BA, PY4BHB, PY4MI, PY4NL, PY4OY, PY4VD, PU4WHO. **RX0C:** UW0CA, UW0CN, UW0CW, UA0CDX, RW0CA, UW0CI, UW0CK, UW0CJ. **LY2ZO:** LYR346, LYR1751, LY2BCW, LY2BDW, LY2BFN, LY2BKZ, LY2BMX, LY2BOA, LY3BN. **ED4VPM:** EA4's DAE, BB, DYN, EJA, CMF, Lons, Jesus, Maurico, Marcelo, Juan Carlos, Javier, Borja, Jose Manuel. **SN60:** SP6's SNT, AOI, CIK, CYX, DVP, FJG, GCU, OJK, OUJ. **NB6L:** NB6L, K6ZM, WB6MZQ, WR6R, NP4IW/W6. **N8BJQ:** N8BJQ & N9AG. **ZS4WRC:** ZS4ABB, ZS4ABI, ZS4AE, ZS4CB, ZS4KK, ZS4NS, ZS4WD, ZS4Y.

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, and Prefixes. Certificate winners are listed in boldface.

QRP/p SECTION WORLDWIDE

VP2EXX	**A**	**6,727,444**	**3865**	**779**
PQ2DX	**A**	**4,902,525**	**2314**	**729**
4X6IF	**A**	**997,149**	**925**	**379**
KR2Q	**A**	**961,422**	**843**	**462**
YU2TY	**A**	**770,450**	**770**	**475**
TO1WPX	**A**	**571,680**	**707**	**397**
N1AFC	**A**	**426,725**	**517**	**325**
NH6T	**A**	**380,904**	**488**	**269**
KN1M	"	378,998	500	314
KB3TS	**A**	**308,160**	**414**	**288**
JA2JSF	**A**	**281,936**	**414**	**268**
SM0DJZ	**A**	**223,779**	**471**	**291**
WB6JMS	**A**	**214,760**	**387**	**260**
OK1DKS	**A**	**212,510**	**410**	**269**
LZ10V	**A**	**183,516**	**347**	**246**
IO0KHP	**A**	**173,376**	**366**	**252**
KE7V	**A**	**150,014**	**320**	**214**
JI1DQS	"	145,152	300	189
EA1GT	**A**	**113,120**	**346**	**224**
JE7DOT	"	111,159	255	179
Y25NA	**A**	**85,086**	**246**	**174**
PA0IA	**A**	**66,725**	**170**	**157**
UD6DFF	**A**	**54,483**	**150**	**127**
VK2HF	**A**	**50,694**	**152**	**119**
WA2TTI	"	35,520	133	111
KA1NDY	"	23,056	104	88
W6YVK	"	22,568	107	91
LA1XDA	**A**	**20,710**	**139**	**109**
UB5ZME	**A**	**18,183**	**109**	**87**
IS0LYN	**A**	**17,400**	**95**	**87**
AK5E	**A**	**14,484**	**80**	**71**
PA3EXJ	"	14,240	98	89
YO6ADW	**A**	**9,396**	**101**	**81**
N8AXA	**A**	**8,308**	**67**	**62**
LY2BB	**A**	**6,174**	**84**	**63**
OK2BAT	"	5,459	55	53
LA9VDA	"	5,130	63	54
YO2CJX	"	4,988	59	43
JG4SNR	"	4,223	51	41
EA1DVY	"	3,432	40	39
ON8WN	**A**	**3,072**	**32**	**32**
YO4CXD	"	2,442	56	22
Y23TL	"	1,488	34	31
NP4CC	**28**	**2,165,940**	**1764**	**540**
JR3RWB	**28**	**400,788**	**481**	**324**
LR2DW	**28**	**281,274**	**400**	**259**
ZL1AXB	**28**	**215,296**	**348**	**232**
JA6WJL	"	203,966	334	238
FB1MUX	**28**	**190,080**	**344**	**216**
WA2UUK	**28**	**144,000**	**305**	**225**
YO5BRZ	**28**	**135,585**	**270**	**207**
N5US	**28**	**130,810**	**252**	**206**
UA0QIU	**28**	**92,697**	**388**	**159**
EA4CRU	**28**	**89,356**	**238**	**178**
KF8DF	**28**	**88,725**	**281**	**195**
ED1EPB	**28**	**76,908**	**231**	**174**
W5VGX	"	64,680	147	70
EA3FHT	"	62,609	201	137
KJ6AW	**28**	**50,660**	**241**	**149**
EA3DXD/M	"	50,432	183	128
WA0VBW	**28**	**50,292**	**162**	**132**
VE3HX	**28**	**36,630**	**128**	**111**
EA4EEK	"	29,601	158	117
RA3DQP	**28**	**14,924**	**93**	**82**
N8AGU	"	13,612	94	82
XE2HWB	**28**	**9,826**	**69**	**63**
RB5FO	**28**	**8,646**	**81**	**66**
UV3AHM	"	5,757	60	57
VE7EKS	**28**	**2,403**	**33**	**27**
YO5OAG	"	738	21	18
UA1NDV	"	25	5	5
SP3RBI	**21**	**173,259**	**309**	**243**
N7NKG	**21**	**146,720**	**365**	**262**
WI8W	**21**	**103,774**	**216**	**178**
W6CN	**21**	**56,564**	**183**	**158**
JA8RJE	**21**	**49,848**	**150**	**134**
SP2UUU	"	43,596	140	126
SM5CCT	**21**	**9,052**	**87**	**73**
DU3MJJ	**21**	**7,245**	**62**	**45**
RV3E/JT1BY	**14**	**675,990**	**912**	**435**
SP4GFG	**14**	**113,724**	**318**	**234**
KA1UJ	**14**	**61,686**	**170**	**149**
UA0SNT	**14**	**13,632**	**77**	**71**
K7UR	**7**	**26,784**	**109**	**93**
KH6CP/WW1	**7**	**226**	**17**	**17**
UM8MDX	**3.5**	**4,320**	**30**	**27**
UB5ZND	**1.8**	**10,988**	**95**	**62**

SINGLE OPERATOR UNITED STATES

KC1F	**A**	**4,480,683**	**2236**	**757**
AD1C	**A**	**3,205,378**	**1736**	**734**
K1TO	**A**	**1,077,895**	**862**	**455**
W1BWS	"	825,816	747	456
W1KRS	"	499,495	510	353
K1JUL	"	411,621	520	357
WE6G/1	"	309,000	422	300
WA1DIO	"	262,476	414	276
WA1IML	"	235,008	373	256
KV1P	"	175,158	342	263
NF1J	"	130,854	264	193
KA1MXZ	"	54,488	175	139
W1BK	"	34,840	117	104
NB1H	**28**	**1,264,809**	**1236**	**533**
KA1JJR/T	**28**	**934,524**	**1033**	**459**
WB1HBB	"	201,760	376	260
AA1M	"	96,432	229	196
W9KDR/1	"	13,400	78	67
WA1VRD	"	9,882	63	54
NX1H	**21**	**1,688,844**	**1209**	**633**
K1DWQ	"	250,274	344	289
K1KJT	**14**	**776,250**	**771**	**450**
KQ2M	**A**	**5,682,876**	**2534**	**834**
KY2J	**A**	**2,301,481**	**1447**	**637**
KF2O	**A**	**1,502,026**	**1037**	**551**
K2PS	"	1,005,480	802	490
KD2YP	"	359,828	449	284
KD2BW	"	185,640	316	221
KT2D	"	168,276	300	222
W2FGY	"	153,912	278	212
WA2UDT	"	75,604	197	164
W2QKJ	"	66,066	174	154
W2FUI	"	27,180	106	90
KS2I	"	18,240	98	96
W2AOY	"	13,325	71	65
WV2B	"	12,672	83	72
N2JTW	"	12,282	77	69
WF2V	"	4,488	50	44
K1ZM	**28**	**1,187,595**	**1012**	**513**
WB2YQH	"	291,828	406	293
N2IZJ/T	"	89,908	233	182
W2KZE	"	66,214	170	142
KB2GCG	"	10,050	60	56
KA2JLA/N	"	3,564	72	27
KS2M	**14**	**319,631**	**420**	**299**
WB2ABD	"	117,195	227	195
WQ2M	**7**	**113,542**	**172**	**143**
N2WK	**3.5**	**12,688**	**64**	**61**
W2GD	**1.8**	**38,860**	**270**	**145**
K3ZO	**A**	**4,243,994**	**1998**	**746**
NW3B	**A**	**3,864,250**	**2022**	**754**
NM3E	**A**	**1,433,124**	**1035**	**564**
K5ZD/3	"	1,162,000	874	500
NM3U	"	1,152,699	951	519
NN3Q	"	575,166	608	373
NV3V	"	377,600	501	320
WB3JRU	"	301,550	452	326
WI2T/3	"	65,100	190	155
K3WW	"	53,704	157	137
N3GSC	"	41,311	126	109
KA3AVB	"	36,354	179	146
NW3H	"	34,100	145	124
N3GLK	"	27,930	118	98
KA3QER	"	6,215	62	55
W3FQE	"	1,575	32	32
W3FTG	"	912	17	16
WA3LFY	**28**	**816,202**	**832**	**457**
NT3F	"	60,900	180	10
WA3EEE	"	28,774	110	98
N3GB	**21**	**784,123**	**725**	**479**
NK3U	"	17,850	90	85
KA3PDY	**14**	**4,028**	**45**	**38**
N3HHE	**7**	**114,342**	**203**	**177**
KQ3V	**3.5**	**163,552**	**425**	**269**
WX4G	**A**	**1,828,843**	**1273**	**601**
KT4W	**A**	**1,723,668**	**1178**	**601**
AA4NU	"	872,460	634	393
WA5DTK	"	659,362	623	374
WB4FOT	"	567,456	602	368
W4WKQ	"	482,632	558	344
W4TMN	"	376,130	447	290
AA4XU	"	346,754	451	281
KJ4TI	"	346,512	450	293
WB4FTT	"	325,920	434	291
KM4YY	"	293,488	414	272
N4MM	"	260,608	354	256
N4XRH	"	173,119	285	233
WK4F	"	116,256	230	168
AF4O	"	107,882	232	167
W4WJJ	"	101,640	218	165
W4KMS	"	69,864	165	142
W4UYC	"	50,432	164	128
N4UH	"	44,428	135	116
W4CYC	**28**	**88,740**	**251**	**180**
WB4VQO	**28**	**60,192**	**162**	**144**
KC4GFW/N	**28**	**45,666**	**184**	**118**
N4UQD/T	"	40,754	169	142
N4PUV	"	30,000	113	100
WA4QMQ	**21**	**260,756**	**360**	**292**
W9HNI	**14**	**10,008**	**92**	**72**
KE4BM	**3.5**	**25,664**	**160**	**132**
AA4MM	**1.8**	**32,928**	**290**	**147**
N5RZ	**A**	**4,317,060**	**2229**	**844**
KA5W	**A**	**3,579,296**	**1962**	**812**
			(Op. K5IG)	
WF5E	**A**	**1,742,530**	**1459**	**643**
AA5B	"	1,726,494	1558	606
AA5OR	"	1,193,192	1239	572
K5TSQ	"	944,460	940	495
N3BB	"	883,535	841	415
NJ1V/5	"	747,097	1247	569
KI3L/5	"	329,943	502	327
N5IET	"	202,653	347	253
KC5NQ	"	195,951	428	301
AA5PA	"	105,848	257	202
KB5LBU	"	83,441	185	181
N5MBD	"	54,806	162	134
WK5K	"	54,315	190	153
K5DX	"	34,398	120	98
W5EIJ	"	21,331	99	83
WN4KKN/5	**28**	**1,880,112**	**1572**	**624**
W5WMU	**28**	**1,561,506**	**1587**	**582**
WU5Z	"	546,750	875	450
AA5LF	"	95,445	221	189
KB5KTY	"	4,888	47	47
K5FUV	"	1,232	32	28
N5FHZ	"	208	17	16
WB5VZL	**21**	**2,687,622**	**1733**	**719**
AA5JF	**21**	**1,146,829**	**1057**	**513**
KG5VK	"	701,760	954	516
WD5DMD	"	237,336	711	341
WD5N	**14**	**2,005,291**	**1441**	**719**
W5FO	"	811,530	884	512
WB5YLT	**7**	**15,688**	**80**	**74**
KE5FI	**3.5**	**215,800**	**571**	**325**
K6HNZ	**A**	**2,282,516**	**1698**	**604**

CONTINENTAL LEADERS

AFRICA

1.8	No Entrant	
3.7	No Entrant	
7.0	No Entrant	
14	No Entrant	
21	TR1G	6,826,621
28	9J2AL	797,368
A	5HØT	10,615,880

ASIA

1.8	UL7ACI	147,368
3.7	UF6VZ	835,584
7.0	JHØZHQ	250,260
14	**JG4AKL**	**1,839,365**
21	RW9UD	800,214
28	**JAØJHA**	**1,511,334**
A	EX9S	4,757,275

EUROPE

1.8	LZ6A	138,474
3.7	4N1A	1,073,520
7.0	**IO4VEQ**	**3,878,928**
14	ID1V	4,729,488
21	**CQ7A**	**5,329,680**
28	IK2DUU	2,830,441
A	**CT4NH**	**6,984,450**

NORTH AMERICA

1.8	W2GD	38,860
3.7	CF6OU/3	1,741,368
7.0	**WB9Z**	**594,176**
14	**KK9A**	**2,436,904**
21	HU1A	7,004,374
28	WN4KKN/5	1,180,112
A	**KP2A**	**15,056,886**

OCEANIA

1.8	No Entrant	
3.7	No Entrant	
7.0	T32AF	3,345,864
14	KH6FKG	2,244,000
21	DU3GDX	1,020,861
28	VK4KRP	1,856,876
A	K4YT/DU8	5,501,820

SOUTH AMERICA

1.8	No Entrant	
3.7	4M5E	260,236
7.0	LU1IV	1,180,300
14	CE6EZ	4,386,380
21	**ZPØY**	**12,070,245**
28	ZX5C	11,919,582
A	**P4ØV**	**17,440,680**

MULTI-SINGLE

AF	5H1HK	13,980,480
AS	P35S	7,714,323
EU	**LZ9A**	**14,066,376**
NA	HI5ØØUD	12,341,385
OC	VK6LW	5,671,110
SA	PT7FX	10,859,940

MULTI-MULTI

AF	ZS4WRC	1,629,954
AS	JE2YRD	13,618,840
EU	**YT2A**	**21,266,490**
NA	**CZ7Z**	**17,791,848**
OC	T32T	18,918,301
SA	4M9X	8,504,410

KJ6DL	**A**	**862,972**	**996**	**484**
N6CCL	**A**	**834,108**	**1015**	**426**
KI6ZH	''	834,054	869	481
NF6S	''	802,380	803	430
WW6O	''	677,108	765	436
KU6T	''	632,346	1573	402
WA6DBC	''	579,514	708	403
KT6V	''	572,042	770	458
K6JG	''	309,636	403	282
K6MA	''	104,742	240	198
KI6CK	''	74,571	205	159
KI6PG	''	39,904	140	116
W6ISQ	''	21,749	116	91
AA6EE	''	1,728	26	24
NU6S	**28**	**1,650,420**	**1680**	**519**
KW6J	**28**	**1,271,016**	**1895**	**508**
WX6M	''	846,954	1192	422
N6EE	''	546,915	769	361
KC6IHT/T	**28**	**488,538**	**996**	**327**
KI6EZ	''	471,870	790	294
KH6DW/KS6	''	399,750	801	325
W6UQF	''	383,131	819	343
KA6ING/T	''	20,196	110	99
N6IFW	''	7,076	66	58
N6MMM/T	''	6,080	78	76
KB6KTZ	''	4,860	52	45
N6NF	''	196	14	14
WA6FGV	**21**	**614,380**	**1097**	**442**
WA6WPG	''	66,581	182	139
KG6AO	**7**	**6,052**	**35**	**34**
K7RI	**A**	**4,015,616**	**2454**	**704**
AI7B	**A**	**3,689,249**	**2298**	**691**
NN7L	**A**	**3,371,140**	**2180**	**730**
KI3V/7	''	1,512,320	1302	556
NX7K	''	711,997	1054	383
N7MJZ	''	536,424	736	372
WR7E	''	465,658	638	382
WC7S	''	237,899	562	361
W7QB	''	188,368	308	244
K6XO/7	''	177,038	424	254
N7KRW	''	135,828	307	196
W7HS	''	124,160	288	194
WS7V	''	107,163	309	189
N7HZG	''	44,296	165	113
KB7M	''	43,407	134	117
WJ7R	''	36,360	143	90
WS7O	''	25,696	125	88
WA7IIM	''	23,736	103	86
KX7J	''	14,746	75	73
W7FP	**28**	**294,484**	**713**	**332**
W7AYY	**28**	**152,047**	**548**	**203**
WB7VUB/T	**28**	**30,140**	**136**	**110**
N7LOX	''	8,970	80	69
N7LTM	''	5,290	46	46
AA7DU	''	243	10	9
N7NKD	''	104	8	8
K7SDW/M	**21**	**1,944**	**30**	**27**
WØCG	**A**	**1,863,873**	**1305**	**603**
WD8EOL	**A**	**778,950**	**761**	**450**
NG8D	**A**	**718,656**	**734**	**456**
AG8W	''	569,250	661	414
WD8DSV	''	559,373	683	397
WB8TLI	''	540,904	611	364
K8CV	''	322,385	444	305
KA8D	''	278,690	415	290
W8UPH	''	255,760	387	278
KA8WAS	''	106,067	265	199
N8CQA	''	69,552	208	161
W8TN	''	28,030	104	98
N8LMB	''	20,384	95	91
K8MR	''	3,822	41	39
KA8OUT	''	350	12	10
N8FEH	**28**	**152,086**	**281**	**223**
N8DGV	''	127,508	491	254
KA8VPL	''	7,544	107	92
KA8ZHC/T	**28**	**6,954**	**65**	**61**
AC8W	**21**	**27,872**	**107**	**104**
WD8PAQ	**7**	**74,240**	**160**	**160**
NO9F	**A**	**1,248,051**	**1000**	**577**
WE9V	**A**	**634,032**	**669**	**408**
NG9L	''	432,464	516	358
KC9EW	''	239,088	370	272
WB9HRO	''	113,967	321	243
K9UQN	''	108,540	230	180
KB9UG	''	62,088	186	156
K9OSH	''	1,800	25	25
W9RZW	''	952	48	34
NØBSH/9	**28**	**945,615**	**969**	**521**
KB9CRY	''	11,175	77	75
N9IUA	''	7,242	71	71
KB9EEH	''	5,995	63	55
WB9CXY	**21**	**42,834**	**139**	**121**
KK9A	**14**	**2,436,904**	**1542**	**727**
AG9S	''	177,012	374	298
W9JOO	''	72,488	185	164
WB9Z	**7**	**594,176**	**524**	**352**
KRØB	**A**	**1,559,025**	**1061**	**585**
				(Op. AF9T)
KFØGV	**A**	**892,147**	**854**	**491**
KMØL	**A**	**859,299**	**801**	**493**
KØCS	''	672,364	704	407
NØZA	''	561,213	723	381
KBØC	''	387,092	439	284
WJØI	''	345,312	457	327
ACØS	''	338,625	468	301
NØAT	''	279,720	399	296
K9BQL/Ø	''	195,000	331	250
KEØUI	''	170,710	313	215
NSØB	''	164,680	308	230
KDØNB	''	132,800	283	200
NYØR	''	79,381	200	163
NNØM	''	51,660	140	123
KBØFIR	''	19,760	96	76
KDØWJ	''	16,458	83	78
KSØT	**28**	**115,560**	**326**	**214**
WBØYJT	''	84,728	220	178
NØILS	''	75,650	232	170
WBØGFV	''	26,329	114	113
KAØZPP	''	1,215	31	27
KAØZIA	''	324	12	12
WØACT	**21**	**99,129**	**234**	**191**
KJØB	**7**	**109,564**	**208**	**182**

NORTH AMERICA

BARBADOS

8P6SH	21	3,527,929	2125	733	

GUADELOUPE

FG5R	A	14,487,613	5358	959	(Op. W7EJ)

DOMINICAN REPUBLIC

HI9UD	A	56,515	188	127	

PANAMA

HP1COO	28	193,185	435	265	

GRENADA

J37DX	A	6,546,537	3758	773	(Op. W8KKF)

ALASKA

WL7E	A	3,953,425	2023	665	
NL7DU	''	1,108,467	1026	411	
AL7LR	28	24,840	151	69	
NL7KB	21	395,850	623	290	

U.S. VIRGIN IS.

KP2A	A	15,056,886	5241	1014	(Op. KW8N)

PUERTO RICO

WP4AKZ	A	2,278,030	1883	535	
WP4WD	28	822,779	834	431	

BELIZE

V32SW	A	2,525,820	2222	516	(Op. AE6U)

CANADA

VO3MP	A	3,662,956	1939	649	
CF25A	A	2,042,496	1355	576	(Op. VE3XN)
VE7XO	A	290,296	404	262	
VE4RP	A	140,693	255	199	
CF3PYA	''	127,036	229	182	
VE3VET	28	223,608	337	264	
VE2WAT	28	50,520	155	120	
VE2XL	''	30,700	114	100	
VE2EW	21	72,534	177	154	
VE3CRD	21	50,142	149	137	
CF7EIK	14	1,271,592	1102	504	
CF4CI	14	10,143	65	63	
CF6OU/3	3.5	1,741,368	976	444	
VE3UOW	''	62,712	144	117	(Op. VE3OIL)

MONTSERRAT

VP2MEZ	A	4,996,044	3329	642	(Op. JA2EZD)

MEXICO

6I7CQ	A	4,607,493	3347	731	(Op. XE2TCQ)
XF1C	A	1,883,904	1539	488	
XE1IPO	''	808,857	1149	333	
XE2KB	''	93,016	298	151	
XE1AVM	''	19,296	117	96	
XE2HWH	28	56,430	198	135	
XE2JGM	21	137,588	396	236	

NICARAGUA

HU1A	21	7,004,374	3413	901	(Op. YS1MAE)

AFRICA

TANZANIA

5HØT	A	10,615,880	3876	920	(Op. 5H3TW)

ZAMBIA

9J2AL	28	797,368	716	374	

MOROCCO

CN8GH	A	13,920	144	58	
CN8FC	28	49,140	130	130	

MADEIRA IS.

CT3BD	A	254,538	306	237	

CANARY IS.

EA8AGD	A	8,519,499	3507	807	(Op. OH6LK)
ED8BVH	A	2,965,290	1723	582	
EA8AKN	''	1,444,625	1065	455	
EA8BTY	''	111,979	317	119	
EA8BCN	''	222,600	370	210	
EA8BVR	21	328,318	399	278	
EC8ATF	''	7,990	32	30	

LIBERIA

EL2CX	A	6,278,250	2806	750	

CAMEROUN

TJ1BJ	A	9,735	60	59	

GABON

TR1G	21	6,788,925	2757	825	(Op. TR8JLD)

BURKINA-FASO

XT2BW	21	17,319	87	69	

SOUTH AFRICA

ZS6AOO	A	4,652,648	2103	728	
ZS6AXF	''	1,034,688	844	408	

ASIA

VIETNAM

3W7A	28	840,072	1590	348	(Op. 3W3RR)

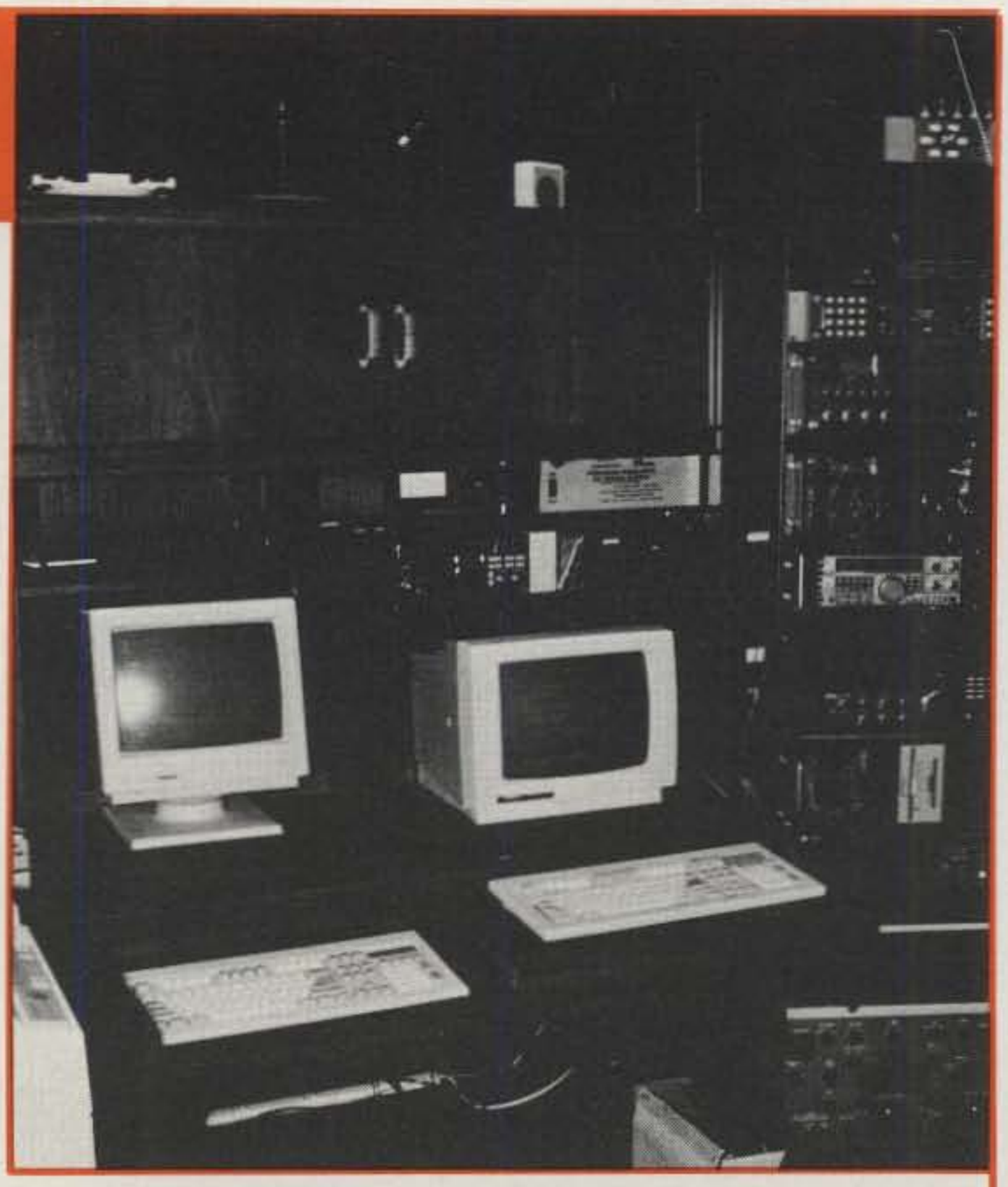
ISRAEL

4X8MR	A	2,637,362	1663	559	(Op. VE3MR)

UNITED ARAB EMIRATES

A61AD	A	3,105,648	2153	546	(Op. WB2DND)

COMPUTERIZE YOUR SHACK



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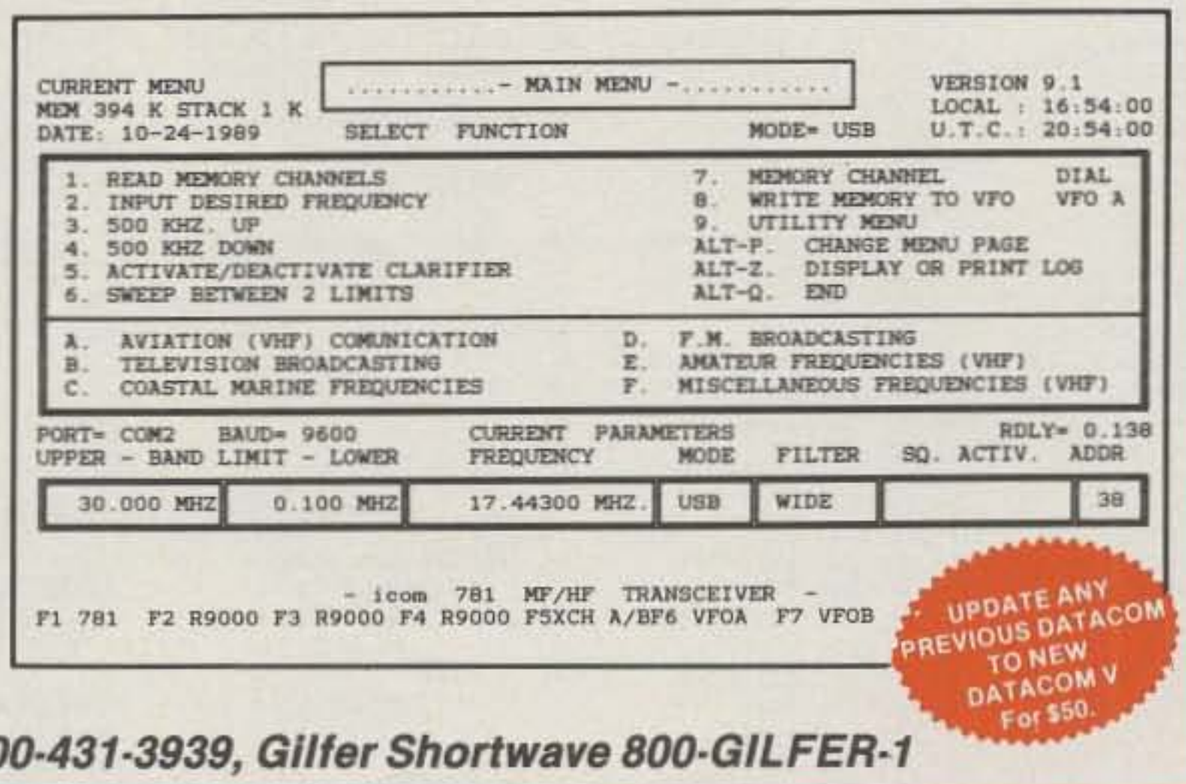

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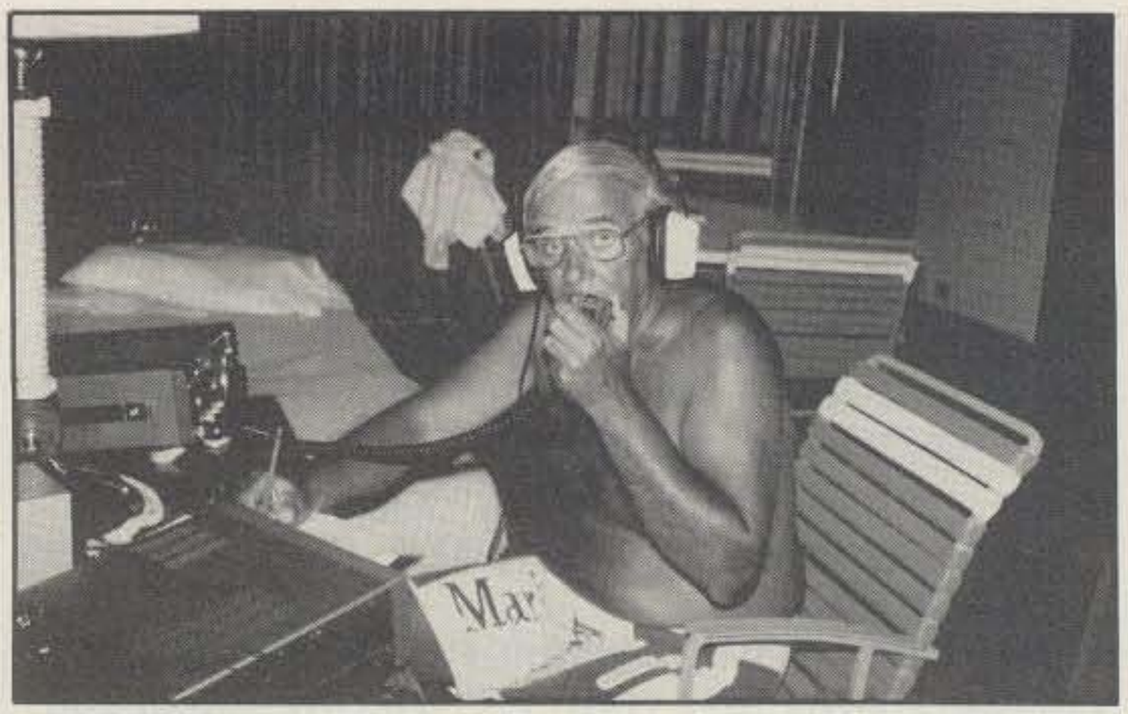

Willy, OV3VV, during his holiday in Curacao. Notice the hand mic. Willy made 2600 contacts on 10 meters.

KOREA

HL9KLN	**28**	**168,824**	**342**	**188**	

JAPAN

JA7YAA	**A**	**2,651,292**	**1615**	**567**	**(Op. JJ3CNL)**
JG3KIV	**A**	**1,945,944**	**1326**	**546**	
JF1SEK	**A**	**1,468,719**	**1034**	**513**	
JH4NMT	"	1,206,912	919	448	
JR1GSE	"	1,067,040	860	416	
JR3BOT	"	926,544	848	398	
JA3LDH	"	604,023	647	343	
JA5CDL	"	518,580	594	335	
JI1HHX/2	"	296,225	412	289	
JA2ESR	"	245,514	393	249	
JA1BUI	"	234,324	356	276	
JA5IP	"	217,440	359	240	
JH1UUT	"	180,544	324	208	
JA3UWB	"	174,052	344	212	
JR1DTN	"	81,396	226	153	
JE1UFF	"	75,651	204	151	
JA6BWH	"	72,520	209	140	
JP1SRG	"	70,420	189	140	
JE1SLP	"	62,505	178	135	
JA5EO	"	57,720	166	130	
JR1MRG	"	56,644	196	119	
JF6JQM	"	56,576	161	128	
JH9EIT/1	"	49,385	151	119	
JR1TFR	"	46,767	155	119	
JA6QDU	"	45,738	147	126	
JH2WHS	"	44,522	160	113	
JL1MWI	"	25,276	100	89	
JJ2TQO	"	22,704	101	88	
JL1UMX	"	20,496	91	84	
JA1HWF	"	17,712	100	82	
JH9AMJ/1	"	16,492	90	71	
JH1RMH	"	13,200	75	66	
JR1GGB	"	12,685	74	59	
JR1CCL	"	6,273	52	51	
JI4ARB	"	5,850	59	50	
JA3VOV	"	3,024	43	36	
JA7AXP	"	2,640	34	33	
JA1BNW	"	2,635	31	31	
JN2JXT	"	2,090	48	38	
JE4HIH	"	1,800	28	25	
JP1NQM/0	"	1,100	28	25	
JA1WYQ	"	615	17	15	
JA0JHA	**28**	**1,511,334**	**1216**	**449**	
JH2UVL	**28**	**1,275,868**	**1156**	**428**	
JA6BIF	"	889,448	809	392	
JR1EEG/7	"	869,385	860	363	
JE2IFM	"	210,438	316	243	
JA1QZC	"	185,891	314	211	
JG2TSL	"	171,600	306	200	
JA6EFT	"	164,688	284	219	
JH9CAV	"	131,125	288	175	
JH8QJ	"	74,560	193	160	
JA2OJ	"	58,624	171	128	
JA4ETH	"	46,125	141	123	
JF2GYH	"	45,220	141	119	
JA3GLU	"	43,524	137	117	
JM1NKT	"	34,900	134	100	
JA4DWZ/2	"	30,576	117	98	
JA3BBQ	"	23,577	99	87	
JE0BTL	"	22,013	104	91	
JA7HNV	"	16,480	90	80	
JA1BBA	"	14,839	79	71	
JR1OYL	"	14,484	75	68	
JR8FLY	"	11,590	68	61	
JH3AKD	"	11,092	72	59	
JA3FZI	"	4,968	46	46	
JF2KUU	"	4,960	152	124	
JA2JEG	"	2,613	58	39	
JA1AAT	"	442	14	13	
JN3QVM	"	420	13	12	
JO1MCC	"	200	9	8	
JE8PHS	"	0	0	0	
JA1BBA	"	0	0	0	
JA7BEW	**21**	**424,620**	**504**	**337**	
JA2BNN	**21**	**387,537**	**496**	**303**	
JA7NVF	"	296,036	390	253	
JR5FHC	"	180,804	319	228	
JR8FWE/1	"	136,822	267	203	
JA8UJY	"	104,760	227	180	
JH7KTI	"	77,588	190	163	
JE7SLC	"	75,123	192	153	
JA1HDI	"	59,732	170	137	
JL1KUH	"	31,536	128	108	
JA7FKF	"	28,078	113	101	
JR9GQP	"	24,840	105	92	
JA2ONH	"	24,570	100	91	
JI1QBY	"	20,592	112	88	
JA5CPO	"	18,300	152	122	
JA1QE	"	18,176	102	71	
JA1JLP	"	17,319	84	69	
JR7LVK	"	17,143	87	79	
JH2WGI	"	12,663	83	67	
JK1OEO	"	9,794	70	59	
JR2IGV	"	8,215	63	53	
JG4DDN	"	5,580	57	45	
JF2PXB	"	4,173	48	39	
JR3KAH	"	3,534	44	38	
JL6BMJ	"	1,728	33	27	
JA0JEZ	"	1,020	34	30	
JG3EHD	"	987	21	21	
JM2BHI	"	377	16	13	
JR7MZC/1	"	312	16	12	
JG7LBN	"	136	11	8	
JL2RTW	"	112	7	7	
JG1KOE	"	90	11	9	
JI1LNR	"	3	1	1	
JA1JLP	"	0	0	0	
JG4AKL	**14**	**1,839,365**	**1148**	**583**	
JH7QXJ	"	607,600	628	350	
JE1GZB	"	7,089	55	51	
JA1GO	"	3,800	40	40	
JI2DYK	"	1,272	24	24	
JH0ZHQ	**7**	**250,260**	**307**	**215**	
					(Op. JH1BBT)
JH7WKQ	**3.5**	**18,120**	**73**	**60**	
JA5FBZ	"	4,080	35	30	

OGASAWARA IS.

JG2CLS/JD1	**A**	**112,477**	**673**	**137**
JL3UIX/JD1	**21**	**256,284**	**800**	**226**

BRUNEI

V85NR	**A**	**838,529**	**1061**	**283**

INDIA

AT0T	**A**	**749,248**	**838**	**368**
				(Op. VU2TTC)
VU2NBT	**28**	**1,409,360**	**1367**	**395**
				(Op. AA4U)
AT0C	**14**	**7,776**	**63**	**54**
				(Op. VU2CC)

MACAO

XX9TDM	**A**	**3,804,423**	**3566**	**609**
				(Op. KB7G)

U.S.S.R.

ASIATIC

EX9S	**A**	**4,757,275**	**2365**	**695**
EX9B	**A**	**4,335,877**	**2315**	**689**
				(Op. UA9AM)
UA9OS	"	309,324	406	298
UW9CM	"	169,168	297	194
UA9CUA	"	85,280	206	164
UA9YNC	"	2,675	29	25
RA9LFI	**28**	**58,819**	**181**	**131**
RW9UD	**21**	**800,214**	**1195**	**394**
RW9AB	"	457,542	510	333
UA9YJO	"	27,674	120	101
UV9CP	**14**	**1,208,532**	**898**	**508**
UA9XEN	**7**	**5,376**	**44**	**42**
UA0ZDD	**A**	**916,560**	**1062**	**380**
UA0SR	"	458,645	604	341
UW0CM	"	29,832	149	113
UA0TO	**28**	**1,188,980**	**1333**	**442**
EX0S	"	906,376	1600	356
UA0KBO	**21**	**768,360**	**965**	**380**
UA0XAK	"	375,744	707	304

GEORGIA

UF6QR	**A**	**151,008**	**284**	**176**
UF6FFH	"	42,016	150	104
UF7FWM	**14**	**1,121**	**23**	**19**
UF6VZ	**3.5**	**835,584**	**569**	**256**
RF6FM	**1.8**	**7,056**	**46**	**28**

ARMENIA

UG5G /RZ3AM	**A**	**62,988**	**348**	**181**
UG6JJ	**28**	**878,430**	**917**	**329**

UZBEK

UI8CAJ	**28**	**1,240,420**	**1124**	**436**
UI8ZAA	**3.5**	**72,812**	**137**	**98**

TADZHIK

UJ8KA	**A**	**804,186**	**808**	**387**
UJ8XA	**14**	**48,884**	**121**	**114**

KAZAKH

RL7RL	**A**	**9,918**	**93**	**85**
UL7CQ	"	8,684	65	52
UL8LWF	**14**	**921,855**	**756**	**453**
RL7AC	**3.5**	**222,832**	**266**	**152**
UL7ACI	**1.8**	**147,368**	**264**	**109**

KIRGHIZ

EX8M	**A**	**3,511,090**	**2292**	**590**
				(Op. UM8MQ)
UM0MO	"	369,288	557	276
UM5ML	"	327,860	492	260
UM8MGO	**28**	**30,591**	**123**	**103**
UM8TBE	**1.8**	**620**	**11**	**10**

EUROPE

ITU GENEVA

4U5ITU	**A**	**3,613,064**	**2422**	**709**
				(Op. OH0XX)

ANDORRA

C39OF	**21**	**184,269**	**440**	**239**
				(Op. C31OF)

PORTUGAL

CT4NH	**A**	**6,984,450**	**2532**	**825**
CQ8D	**28**	**878,157**	**1201**	**477**
				(Op. CT1DIZ)
CT1BBJ	"	276,159	502	291
CQ7A	**21**	**5,329,680**	**2870**	**848**
				(Op. CT1BOP)
CT1QF	"	95,188	232	212
CT4HA	"	74,654	361	229
CT1BWW	**14**	**192,560**	**330**	**290**
CT1BNW	"	16,074	103	94
CT1CQK	**7**	**359,985**	**334**	**233**

GERMANY (FRG)

DL1DAS	**A**	**2,946,944**	**1717**	**644**
DJ8UV	**A**	**1,762,101**	**1274**	**561**
DK7ZT	"	305,844	500	308
DA1KM	"	258,040	527	292
DF3IS	"	172,074	366	238
DL6ZBN	"	71,200	227	160
DA2QX	"	63,882	233	183
DL4GBR	"	40,273	184	103
DL5ZBA	"	39,984	169	136
DL2OBF	"	24,521	147	113
DK5KJ	"	23,436	130	108
DK6BT	"	19,170	90	90
DL4YBP	"	9,010	57	53
DL8FBD	**28**	**2,666,331**	**1675**	**629**
				(Op. DF9ZP)
DK0RD	"	218,707	350	257
				(Op. DL3YED)
DF5BM	"	98,306	225	199
DL6FBL	**21**	**4,750,125**	**2324**	**793**
DJ0BX	"	109,011	273	203
DL8AAE	"	37,638	140	123
DL1YAW	**14**	**1,533,984**	**1194**	**608**
DL2SDQ	"	85,696	271	208
DL3YDY	"	6,600	84	75
DL8BCM	"	33,456	148	136
DJ2YE	**7**	**24,552**	**100**	**99**
DL8PC	**3.5**	**778,928**	**752**	**356**

SPAIN

ED4WPX	**A**	**1,068,359**	**1123**	**499**
				(Op. EA4KK)
EA5DCL	**A**	**838,580**	**874**	**460**
EA7FUR	**A**	**466,830**	**593**	**399**
EA1CVY	"	430,445	522	437
EA3GCJ	"	415,638	624	358
EA1EVY	"	267,764	472	292
EA5AOJ	"	214,385	419	265
EA5CHT	"	191,808	378	222
EA5GEO	"	183,040	398	256
EA4EER	"	182,336	424	259
EA1BQR	"	131,120	283	220
EA3FQV	"	117,820	307	215
EA5AN	"	106,575	262	203
EA1EVW	"	95,200	313	200
EA5AEN	"	78,831	203	171
EA1DFH	"	72,580	237	191
EA7DXR	"	68,382	218	174
EA5FYJ	"	54,600	183	156
EA3DVJ	"	54,418	221	161
EA1BFZ	"	53,654	171	139
EA7EBL	"	35,685	140	117
EA3EXW	"	28,520	146	113
EA3CZR	"	26,983	150	121
EA5WA	"	22,736	126	98
EA7CA	"	22,601	116	97
EA5WX	"	9,956	81	76
EA7CP	"	5,700	52	50
EA4DDE	"	646	21	19
EA7FTR	**28**	**602,736**	**862**	**348**
EA1CON	**28**	**505,280**	**683**	**320**
ED4DMB	"	487,168	627	346
EA3EJI	"	130,820	274	211
EA2BFM	"	85,305	246	165
EA3GCN	"	72,542	202	166
EA7BYM	"	35,032	134	116
EA4EP	"	21,945	99	95
EA5ETP	"	18,601	98	89
EA3FHP	"	1,740	40	29
EC3CUI	**21**	**345,384**	**630**	**312**
EC1CTH	"	59,512	272	173
EC1CWU	"	8,378	88	71
EA1AHA	"	4,732	55	52
EA1AK	**7**	**198,398**	**311**	**227**
EA5CIX	"	5,700	33	30

BALEARIC IS.

EA6ZS	**A**	**34,304**	**158**	**128**
EA6ZZ	**28**	**367,232**	**471**	**302**

FRANCE

F6CQU	**A**	**5,760,594**	**3066**	**786**
F2CW	**A**	**3,519,456**	**1910**	**732**
F8WE	**A**	**1,664,445**	**999**	**426**
TM6C	"	1,113,248	1150	608
				(Op. F6IGF)
FE6DRP	"	370,755	513	385
F6EXQ	"	245,665	375	144
F2RO	"	228,874	371	317
FE6CYT	"	136	25	13
FF1MKK	**28**	**1,268,695**	**1125**	**445**
				(Op. N2HMS/F)
F1JDG	"	157,500	336	225
F1CJB	"	17,040	100	80
FB1OMN	"	12,450	80	75
F6CXJ	"	5,824	52	52
F2EE	**14**	**2,224,400**	**1716**	**670**
F6EZV	**7**	**849,648**	**656**	**372**
F1HWB	"	2,310	40	33

ENGLAND

GB8DX	**28**	**291,460**	**444**	**260**
				(Op. G4PEO)
G4CNY	**21**	**3,281,607**	**1859**	**679**
GB8FX	**14**	**3,870,435**	**2086**	**815**
				(Op. G3FXB)
G4ZME	"	45,360	200	144
GB0DX	**7**	**881,832**	**870**	**362**
				(Op. G4BUE)
G4LRP	**3.5**	**35,880**	**146**	**115**

SCOTLAND

GM4OBK	**A**	**113,092**	**228**	**196**
GM3BCL	"	81,366	272	191

WALES

GW4BLE	**14**	**3,483,010**	**2044**	**758**

HUNGARY

HA8XX	**A**	**1,862,102**	**1207**	**586**
HA0IT	**A**	**1,844,340**	**1459**	**590**
HA0MM	"	1,733,403	1253	591
HA4XX	"	408,915	635	351
HA3NU	"	219,123	426	251
HA5AND	"	62,625	201	167
HA3NS	"	24,645	108	93
HA1XR	**28**	**1,588,410**	**1180**	**530**
HG8QB	"	128,952	296	199
HG3FMZ	"	11,277	76	63
HA8IE	**21**	**4,190,202**	**2063**	**813**
HA1AD/7	"	824,229	830	441
HA8CQ	"	57,986	206	158
HA3MU	**14**	**231,378**	**463**	**294**
HA7MI	"	13,400	110	100

SWITZERLAND

HB9ADD	**A**	**1,329,280**	**1037**	**496**

ITALY

IK6CNM	**A**	**898,596**	**918**	**436**
IK2HTW	**A**	**368,532**	**464**	**348**
IK2LOL	"	189,875	253	217
IK0NWE	"	173,116	423	226
				(Op. W9LT)
IO1GPG	"	139,944	323	196
IK2LCY	"	90,896	246	184
IK2IKW	"	70,392	202	168
IK7NXU	"	56,601	200	171
I7PXV	"	41,866	135	121
IK4DSP	"	12,390	73	70
IK2DUU	**28**	**2,830,441**	**1822**	**607**
IY0A	**28**	**1,550,224**	**1417**	**514**
				(Op. IK0IXM)
IK6FJV	"	1,249,440	1090	480
I2EOW	"	960,531	916	429
IN3QBR	"	927,884	903	421

IK2AEQ	"	839,270	855	410
I4RHP	"	748,266	784	401
IV3YYK	"	720,800	804	400
I8BYG	"	573,040	802	377
IV3BMV	"	273,132	384	281
I1QBI	"	22,320	109	93
ID1V	**14**	**4,729,488**	**2560**	**888**
			(Op. I1ZEU)	
IE8A	**14**	**3,635,940**	**2406**	**787**
			(Op. I8QLS)	
IK8OHU	"	200,554	590	298
IK6NHT	"	39,368	179	152
IK8ADY	"	5,848	79	68
IO4VEQ	**7**	**3,878,928**	**1519**	**648**
IN3ZNR	"	505,600	567	316
IK4JOJ	"	3,354	43	39
IK8DWN	**3.5**	**149,984**	**325**	**218**
IV3WMP	**1.8**	**31,824**	**162**	**104**

SARDINIA

IS0LLJ	**A**	**49,742**	**180**	**133**

SICILY

IT9LPN	**A**	**73,325**	**251**	**175**
IO9W	**28**	**1,776,476**	**1537**	**508**
			(Op. IT9BLB)	
IT9RYJ	"	776,058	965	422
IT9NTT	**14**	**709,068**	**1016**	**444**

NORWAY

LA9DI	**A**	**215,710**	**412**	**265**
LA2LV	**A**	**213,160**	**412**	**292**
LA4GY	"	152,460	352	252
LA2AD	"	53,760	225	160
LA3WEA	"	3,854	52	47
LA2AFA	**21**	**7,738**	**100**	**73**
LA6WEA	**7**	**137,160**	**245**	**180**

LUXEMBOURG

LX1SG	**A**	**147,586**	**345**	**218**

BULGARIA

LZ3YY	**A**	**402,864**	**705**	**327**
LZ1OJ	"	88,128	250	192
LZ5N	**28**	**1,461,215**	**1357**	**503**
			(Op. Nikolay)	
LZ5W	"	862,400	938	448
LZ5M	**21**	**572,773**	**850**	**419**
			(Op. LZ1PM)	
LZ6Z	**14**	**215,730**	**527**	**282**
LZ6A	**1.8**	**138,474**	**347**	**147**
			(Op. LZ2SC)	
LZ1KWZ	"	77,376	248	124
			(Op. LZ1DM)	

AUSTRIA

OE6WIG	**A**	**783,660**	**837**	**444**
OE1WEU	"	246,246	443	273
OE3NPW	**21**	**1,106,784**	**1001**	**488**
OE2XEL	**7**	**1,156,480**	**868**	**416**

FINLAND

OH1AF	**A**	**2,857,268**	**1777**	**692**
			(Op. OH1NOA)	
OH6YF	**A**	**2,274,375**	**1551**	**625**
OH1BV	**A**	**1,337,448**	**1141**	**532**
OH2BYS	"	563,528	784	406
OH3UU	"	517,500	592	345
OH6NJM	"	304,236	733	313
OH6SO	"	127,452	446	228
OH3AD	"	119,790	252	165
OH7NW	"	93,258	311	198
OH1MDR	"	56,730	217	155
OH6YLS	"	35,496	202	136
			(Op. OH6CD)	
OH6ZJ	"	17,444	128	98
OH5AD	"	15,990	82	78
OH2VZ	"	11,966	69	62
OH1AK	**28**	**102,960**	**300**	**198**
OH2BLV	"	77,809	200	199
OH6MFN	"	45,903	220	143
OH5MMG	"	45,617	164	143
OH4MCV	"	32,875	142	125
OH7MFO	"	29,736	171	118
OH6RC	"	11,753	80	73
OH6MIL	"	1,026	27	27
OH2BXT	"	105	7	7
OH5BM	**21**	**2,831,620**	**1772**	**671**
OH6NIO	**21**	**1,286,376**	**1047**	**546**
OH3NLP	"	35,306	162	139
OH7TO	"	26,257	147	121
OH2IW	**14**	**2,711,423**	**1621**	**737**
OH3OJ	**14**	**1,097,256**	**1091**	**524**
OH2PM	"	1,074,823	1026	521
OH3HM	"	7,208	58	53
OH2HE	**7**	**902,055**	**753**	**385**
			(Op. OH2JA)	

AALAND IS.

OH6XY/OH0	**7**	**553,632**	**747**	**292**
OH0BCI	**3.5**	**13,680**	**72**	**57**
			(Op. OH2BCI)	

CZECHOSLOVAKIA

OK1RI	**A**	**5,985,144**	**2760**	**792**
OK1FUA	**A**	**2,879,253**	**1765**	**631**
OK2PAY	**A**	**1,817,856**	**1363**	**526**
OK8AHE	"	406,337	532	347
OK1KZ	"	405,350	628	335
OK1EP	"	342,703	422	323
OK3YCA	"	331,780	469	313
OK1TD	"	296,514	478	306
OK3RRC	"	240,402	563	309
OK2HI	"	226,380	369	308
OK3CDZ	"	160,425	399	225
OK1BB	"	118,146	249	203
OK3CXS	"	108,112	304	233
OK2PGT	"	107,759	285	197
OK3PA	"	104,253	310	177
OK1MNV	"	97,709	238	199
OK1DXW	"	83,125	225	175
OK2BHQ	"	8,442	74	63
OK2BDH	"	7,442	76	61
OK2ON	"	5,687	53	47
OK1ADS	**28**	**962,024**	**869**	**419**
OK3CFA	**28**	**937,125**	**891**	**425**
OK3CLD	"	99,264	231	188
OK3TCL	"	19,440	95	80
OK2BMU	"	3,240	36	36
OK3KAG	**21**	**2,675,946**	**1825**	**609**
			(Op. OK3WDX)	
OK1AJN	"	416,532	618	337
OK2SWD	"	884	31	24
OK3YK	**14**	**157,140**	**370**	**270**
OK3CAB	"	48,960	236	160
OK1PFJ	**7**	**92,316**	**236**	**157**
OK3YCL	**3.5**	**98,020**	**295**	**169**
OK3CTT	"	39,312	150	126
OK1DWJ	**1.8**	**8,932**	**75**	**58**

BELGIUM

ON4XG	**A**	**387,940**	**549**	**340**
ON5EU	"	37,125	189	125
ON5CZ	"	12,859	89	77

DENMARK

OZ5EV	**A**	**551,691**	**553**	**417**
OZ7AX	**A**	**154,037**	**432**	**221**
OZ1DYI	"	124,890	320	230
OZ3ABE	"	100,224	336	174
OZ1KQP	"	41,040	187	144
OZ4ABH	"	31,320	137	116
OZ1FMO	"	29,250	152	117
OZ6PI	"	26,964	200	126
OZ1BUR	"	18,648	95	84
OZ3ACZ	"	16,544	99	94
OZ1ACB	**28**	**46,845**	**148**	**135**
OZ1INN	"	22,320	113	80
OZ4NA	**21**	**8,160**	**70**	**68**
OZ1LRT	**14**	**66,045**	**226**	**185**
OZ2ACL	**3.5**	**37,296**	**336**	**111**
OZ1ADL	"	28,016	135	103
OZ7DX	**1.8**	**1,000**	**21**	**20**

THE NETHERLANDS

PA0IJM	**A**	**1,947,059**	**1737**	**541**
PA3DMH	**A**	**290,160**	**454**	**310**
PA3FDO	"	277,104	473	276
PA0KDM	"	67,646	203	149
PA3EWP	"	24,038	133	101
PA0DOM	"	5,126	42	41
PA0DJ	"	3,956	48	43
PA2NJN	"	3,520	50	36
PA0COR	**28**	**1,786,895**	**1372**	**583**
PA3FNE	"	569,116	669	316
PA0KHS	"	129,560	271	205
PA2SWL	"	103,761	233	183
PA2REH	**21**	**393,808**	**524**	**326**
PA3BNH	**14**	**2,000**	**50**	**40**
PA3DWD	**7**	**1,405,360**	**1050**	**440**

SWEDEN

SK3AH	**A**	**107,184**	**252**	**174**
			(Op. SM3COL)	
SK5SE	"	56,606	187	166
			(Op. SM5PAX)	
SM7ABL	"	22,278	97	94
SM0HBV	"	20,661	120	97
SM0HTO	**28**	**816,024**	**650**	**484**
SM4BTF	"	18,612	97	94
SM3TLG	"	14,652	84	74
SM0HTO	"	0	0	0
SM0OHI	**14**	**237,632**	**545**	**316**
SM7TV	"	52,374	227	174

POLAND

SP7LZD	**A**	**308,160**	**550**	**320**
SP9MAT	**A**	**176,280**	**352**	**226**
SP9HWN	**A**	**170,433**	**282**	**261**
SP6TPM	"	114,036	322	204
SP7FQI	"	103,488	291	192
SP4LXE	"	65,758	233	154
SP6FBD	"	45,024	165	134
SP6AUI	"	32,431	160	127
SP4CJA	"	24,832	140	97
SP3BVI	"	23,296	95	91
SP6RYB	"	23,180	99	95
SP9JBX	"	14,322	77	66
SP6DWB	"	12,540	110	95
SP7OGK	"	6,700	77	50
SP3IBM	"	6,604	62	52
SP9DGO	"	645	15	15
SN5W	**28**	**570,752**	**618**	**364**
			(Op. SM5JTF)	
SP9PT	"	38,744	124	116
SP9EML	"	9,315	69	45
SP6JKH	"	5,310	45	45
SP5GIQ/7	**21**	**886,298**	**950**	**406**
SP4EEZ	"	669,292	755	422
SP9BRP	"	28,072	145	116
SP1AEN	**14**	**96,750**	**281**	**215**
SP5DHH	"	43,400	217	155
SP6CXH	"	33,360	186	139
SP8BBK	"	13,013	79	77
SP7CMR	"	7,524	87	76
SP9EMQ	**7**	**55,744**	**173**	**134**
SP7LHX	"	1,080	30	15
SP9AHB	**3.5**	**237,626**	**463**	**241**
SP9HZF	"	66,816	220	144
SP6LUV/A	"	64,260	335	189
SP6HBX	"	16,362	96	81
SP3DFB	"	11,036	85	62

GREECE

SV3AQR	**28**	**267,441**	**641**	**239**

CRETE

SV9AKI	**14**	**634,480**	**938**	**412**

GERMANY (GDR)

Y33UJ	**A**	**492,404**	**624**	**361**
Y23LG	**A**	**447,070**	**595**	**362**
Y25KA	"	416,415	614	345
Y24AM/A	"	285,988	525	284
Y32WF	"	269,180	373	313
Y41SN	"	241,902	449	267
Y67RL	"	132,696	326	228
Y61ZA	"	126,800	325	200
Y22XF/P	"	107,952	237	208
Y67UL	"	99,190	302	182
Y22AN/A	"	43,848	160	126
Y31NJ	"	38,625	153	125
Y52GE	"	24,288	136	91
Y41YM	"	21,489	100	87
Y23CM	"	19,170	101	90
Y21OE/P	"	18,810	120	95
Y25ML	"	13,870	98	73
Y42VN/P	"	13,202	94	82
Y21WI	"	10,624	65	64
Y51XB	"	8,710	70	65
Y66YF/P	"	6,384	60	57
Y46ZC	"	6,000	51	48
Y51TO	"	208	9	8
Y54TN	**28**	**6,016**	**59**	**47**
Y26DM	**14**	**29,008**	**160**	**112**
Y67PN	"	403	30	13
Y24RG	**7**	**242**	**11**	**11**

ROMANIA

YO2DFA	**A**	**399,714**	**646**	**307**
YO9DIA	**A**	**241,878**	**436**	**273**
YO2LEA	"	121,260	411	141
YO9BFP	"	111,600	360	200
YO4CIS	"	100,920	426	116
YO9BPX	"	79,990	301	190
YO2LBN	"	74,210	193	181
YO9FEH	"	51,592	192	164
YO8ROO	"	35,568	157	114
YO2BLP	"	15,785	102	77
YO9IAB	"	15,194	97	71
YO6BTY	"	5,424	58	48
YO5CYH	**28**	**80,070**	**210**	**157**
YO6OBH	"	7,140	53	51
YO4BEX	"	6,100	52	50
YO4BQV	"	2,432	32	32
YO4DIH	"	270	12	9
YO2LAU	**14**	**85,244**	**307**	**202**
YO5BQ	"	59,136	233	176
YO8CRU	"	11,104	105	69
YO8GF	"	4,092	49	44
YO3ZR	"	3,240	45	40
YO6VZ	**3.5**	**5,424**	**54**	**42**

YUGOSLAVIA

YT3AA	**A**	**5,755,667**	**2505**	**811**
YU7BW	**A**	**1,545,984**	**1254**	**528**
YT2IJ	"	897,558	948	454
YT2SC	"	432,064	548	344
YU7AW	**28**	**1,204,560**	**976**	**504**
YT3SK	**28**	**1,143,822**	**1266**	**503**
YU7AV	"	1,077,120	943	440
YU7RU	"	941,920	842	464
YU2QU	"	157,472	298	224
YU7SF	"	37,640	118	113
YU1PJ	"	29,590	111	110
YU5GX	"	11,880	50	30
YU7KM	**21**	**34,580**	**160**	**130**
YU1ADO	"	11,340	100	81
YZ1E	**14**	**3,896,723**	**2118**	**799**
			(Op. YU6AR)	
YU1KQ	"	1,971,952	1498	592
YU1JW	"	827,750	920	473
YT4I	**7**	**1,065,844**	**826**	**398**
			(Op. YU4EBL)	
YT5G	"	378,752	492	269
			(Op. YZ5GDX)	
4N1A	**3.5**	**1,073,520**	**2520**	**426**
YU2WV	"	566,341	626	331
YU3QI	**1.8**	**17,760**	**111**	**80**

U.S.S.R.

EUROPEAN

EX3A	**A**	**3,110,320**	**2286**	**680**
			(Op. UW3AA)	
EX1A	**A**	**2,041,977**	**1609**	**609**
UA4FDS	**A**	**1,248,168**	**1126**	**524**
RA3WA	"	991,728	1096	426
RW3DW	"	756,196	807	452
UV3DN	"	481,712	521	374
UA4HBM	"	419,446	607	401
UA3DRB	"	397,937	507	383
RA3VV	"	239,136	414	318
UA6YJA /UA8T	"	157,784	519	242
UA4AHA	"	139,284	380	219
UW1AE	"	135,898	311	238
UA4NC	"	131,220	210	180
RV6AF	"	92,191	235	182
UA6LIG	"	86,190	348	195
UA6LAY	"	35,836	160	124
UA3TGO	"	24,495	119	115
UA3RNI	"	2,970	50	45
UZ6LWW	"	312	12	12
RA3QR	**28**	**402,636**	**750**	**356**
UA3XAL	"	47,040	203	147
UA3TJW	"	35,483	195	137
RV6AGG	**21**	**894,381**	**996**	**489**
UA4WHW	**21**	**866,063**	**880**	**461**
RA3QOC	"	95,130	274	210
UA3RGG	"	79,356	285	204
UA4CKC	"	49,728	209	148
UA3DPX	"	44,064	180	153
U1BA	"	20,272	132	112
UA4WEV	"	19,188	158	156
UA1ANA	**14**	**293,776**	**526**	**344**
UA4CZ	"	94,786	260	213
4K4QQ	"	44,042	156	127
UZ6LZL	**7**	**523,446**	**503**	**309**
UV3AFB	**3.5**	**211,935**	**350**	**199**
UA3ICB	**1.8**	**4,284**	**54**	**42**

FRANZ JOSEF LAND

4K2OT	**A**	**29,016**	**122**	**104**
4K2OIL	**14**	**252,879**	**368**	**291**

KALININGRADSK

RW2F /UA9XC	**A**	**2,065**	**39**	**35**
RV2F /UA9XLN	28	84	6	6
UA2EC	**21**	**113,742**	**262**	**213**
UA2FAG	**1.8**	**100**	**10**	**10**

UKRAINE

RB4IRO	**A**	**1,284,560**	**1301**	**522**
UB4CQ	**A**	**725,214**	**886**	**434**
UB5PAN	"	713,595	730	421
UY5TE	"	337,239	642	303
UB5CQM	"	185,856	362	242
UT3UZ	"	160,952	392	236
RB5ICY	"	155,178	434	222
RB5QW	"	93,933	254	189
UB5MLP	"	89,822	235	463
UB5CCP	"	89,534	232	178
UB5IBV	"	66,668	192	176
RB5IOV	"	37,642	176	118
UT5HP	"	15,169	80	77
RB5IM	**28**	**1,139,468**	**1211**	**517**
RB4JF	"	225,615	500	267
UB5RCW	"	66,830	211	410
UB3IAA	"	31,242	169	123
UB5VDA	"	27,610	137	110
UB5VAP	"	27,552	155	112
UB5TEX	"	19,376	161	56
UB5IJG	**21**	**2,123,125**	**1500**	**625**
UB5XBC	"	212,072	412	284
UB5VEF	"	131,688	336	236
UB4JJY	"	42,185	212	143
UB3MW	"	10,412	85	76
UB5AFI	"	8,176	80	73
UB5IAL	**14**	**722,612**	**911**	**484**
RB4LJ	"	244,065	483	307
UT4UZ	"	95,642	255	194
UB5IPN	"	28,119	111	103
UB3MP	"	18,216	109	88
UT5UGR	**7**	**1,042,296**	**871**	**411**
UB5ZHQ	"	62,304	170	132
UT5DK	**3.5**	**330,624**	**573**	**252**
UB4QYA	"	309,447	458	219
UB4JKA	**1.8**	**2,623**	**67**	**43**

BYELORUSSIA

RC2AZ	**A**	**2,320,526**	**1527**	**599**
UC2OL	**28**	**15,394**	**88**	**86**
UC2OBB	**21**	**54,631**	**196**	**153**
UC2IO	"	3,198	42	41
UC2OG	**14**	**230,100**	**527**	**300**
UC2ABC	**7**	**431,648**	**575**	**287**

MOLDAVIA

RO4OW	**A**	**145,600**	**345**	**280**
UO5OED	**28**	**24,010**	**125**	**98**
UO5GR	**3.5**	**4,968**	**52**	**46**

LITHUANIA

LY3BH	**A**	**2,393,750**	**1587**	**625**
LY3PB	**A**	**1,916,392**	**1296**	**569**
LY2CY	"	1,850,940	1446	585
LY3BU	"	500,192	775	406
LY2BIM	"	434,192	634	313
LY3BA	"	405,544	822	326
LY2BNC	"	317,696	572	292
LY2BKM	"	139,320	397	216
LY2OU	**28**	**267,160**	**544**	**274**
LY2ND	**21**	**124,752**	**300**	**226**
LY2BI	"	17,195	111	95
LY3BX	**14**	**1,716,596**	**1424**	**607**
LY2BTD	**7**	**106,640**	**262**	**172**
LY2BRP	"	9,918	73	57
UP2BSD	**1.8**	**15,996**	**124**	**62**
LY2BSS	"	13,860	102	66

LATVIA

YL2IP	**28**	**43,524**	**160**	**124**
YL2IIN	"	4,788	41	38
YL2HB	**21**	**88,157**	**253**	**199**

ESTONIA

ES4NG	**A**	**461,262**	**718**	**354**
ES1RRM	"	66,732	175	166
UR2RER	"	37,007	160	123
ES6WV	"	23,739	175	123
UQ2GN	**21**	**477,312**	**734**	**384**
ES5RY	**3.5**	**378,120**	**611**	**274**

OCEANIA

PHILIPPINES

K4YT/DU8	**A**	**5,501,820**	**2321**	**705**
DX8I	**A**	**1,100,486**	**977**	**386**
			(Op. Ariel)	
N2HEU/DU3	"	768,768	1421	384
DU3WPX	**28**	**545,342**	**754**	**248**
DU3GDX	**21**	**1,020,861**	**1237**	**279**

GUAM

KH2D	**28**	**110,780**	**273**	**145**
KG6DX	**14**	**4,558,527**	**2142**	**733**
N7DF/NH2	**3.5**	**54,348**	**145**	**84**

HAWAII

KH6DLW	**A**	**891,644**	**914**	**338**
KH6FKG	**14**	**2,244,000**	**1453**	**528**
K6GSS/WH6	**7**	**961,048**	**606**	**268**

CHRISTMAS IS.

T32AF	**7**	**3,345,864**	**1321**	**436**
			(Op. KH6UR)	

AUSTRALIA

VK3VR	**A**	**3,561,090**	**2001**	**598**
VK2AYK	**A**	**540,432**	**540**	**324**
VK3ALZ	"	175,644	298	204
VK5GN/P	**A**	**58,056**	**172**	**118**
VK4KRP	**28**	**1,856,876**	**1334**	**476**
VK3TZ	**28**	**267,900**	**392**	**235**
VK3PJB	"	33,354	109	109
VK3SM	"	28,116	106	99

HONG KONG

VS6WO	**A**	**718,092**	**1073**	**366**

INDONESIA

YB3ASQ	**A**	**3,422,400**	**1855**	**620**
			(Op. W7TSQ)	
YB0IKI	**A**	**1,929,208**	**1383**	**478**
YC8VTN	"	692,809	606	389
YC5OBQ	"	160,994	797	202
YC3OSE	**28**	**810,579**	**713**	**363**
YC2BKJ	**21**	**245,280**	**370**	**224**
YC2HTD	"	142,104	279	191
YC7BVY	"	106,978	211	178
YC2JWB	"	25,899	103	89

SOUTH COOK

ZK1XN	**A**	**5,154,520**	**3003**	**574**
			(Op. K0IJL)	

NEW ZEALAND

ZM1IM	**A**	**350,406**	**499**	**243**
ZL3QD	**28**	**412,910**	**569**	**263**

SOUTH AMERICA

TRINIDAD

9Y4BU	**A**	**1,422,960**	**1008**	**484**

CHILE

CE4MWK	**A**	**657,882**	**611**	**393**
CE5BPE	**28**	**9,735**	**66**	**59**
CE6EZ	**14**	**4,386,380**	**2090**	**710**

BOLIVIA

CP1BA	**A**	**562,128**	**586**	**336**
CP1DM	"	133,548	261	186

URUGUAY

CX8CG	**28**	**439,095**	**40**	**219**

ECUADOR

HD1T	**A**	**10,517,381**	**3776**	**863**
			(Op. HC1OT)	
HK7MQC	**14**	**185,166**	**256**	**254**
HK3JJH	**3.5**	**85,314**	**130**	**118**

ARGENTINA

L1Y	**A**	**852,600**	**914**	**435**
			(Op. LU1YU/D)	
LQ8DX	**A**	**298,000**	**427**	**250**
			(Op. LU5UL)	
LV1D	"	187,434	327	267
			(Op. LU6DTS)	

5Z4BI on the left and 5Z4FO operated as 5Z4BI in the multi-single class. Bill, 5Z4BI, is a newcomer to contesting, while 5Z4FO may be better known as OA8V. In their first shot at multi-single, the guys made 3600 Qs.

LQ17DX	"	119,028	236	182	
					(Op. LU7DW)
LU2FRX	"	9,000	94	75	
LU9FDG	**28**	**5,414,547**	**2535**	**723**	
LP3F	**28**	**2,173,914**	**1433**	**531**	
					(Op. LU6FAZ)
LS6E	"	1,944,576	1301	512	
					(Op. LU6EJP)
LW1DIO	"	1,613,656	1147	484	
LU5ER	"	1,301,625	1002	445	
LQ24DX	"	1,170,532	987	407	
					(Op. LU1VK)
LU5ER	"	948,295	1002	445	
AY9F	**21**	**2,300,160**	**1328**	**599**	
					(Op. LU7FJD)
LQ21DX	**21**	**2,168,040**	**1289**	**580**	
					(Op. LU1JCX)
LU1DF	"	456,000	526	300	
LU1FVD	"	28,244	102	92	
LU1IV	**7**	**1,180,300**	**560**	**370**	

PERU

OB4ZV	**A**	**5,122,182**	**2550**	**677**	
					(Op. OA4ZV)
OC4BTE	"	119,515	231	205	
					(Op. OA4BTE)
OA4ANR	**28**	**610,740**	**736**	**405**	
4T4DX	**14**	**1,480,832**	**1012**	**503**	
					(Op. OA4OS)

ARUBA

P4ØV	**A**	**17,440,680**	**5486**	**1010**	
					(Op. AI6V)
P4/N4XCF	**28**	**1,033,200**	**1018**	**336**	

CURACAO

PJ4A	**A**	**17,001,774**	**5830**	**948**	
					(Op. K2SS)
PJ2MN	**A**	**3,587,373**	**2060**	**597**	
PJ9JT	"	21,242	90	86	
					(Op. W1BIH)
PJ9V	**28**	**4,755,438**	**2600**	**639**	
					(Op. OH3VV)

BRAZIL

ZW5B	**A**	**12,776,816**	**4407**	**988**	
					(Op. PY5EG)
ZY5BVL	**A**	**628,794**	**607**	**362**	
ZY5AKW	"	466,375	542	325	
PT2ACC	"	282,795	410	255	
PP2YY	"	74,358	188	162	
ZX5C	**28**	**11,919,582**	**4390**	**921**	
					(Op. PY5CC)
PQ4OD	**28**	**1,600,500**	**1139**	**485**	
ZZ1NEZ	"	1,147,475	938	415	
PP5AJ	"	193,596	310	219	
PT2TF	"	55,125	202	125	
PT5T	**21**	**11,304,975**	**3961**	**965**	
					(Op. N5FA)
ZZ5JR	**21**	**3,952,950**	**1870**	**722**	
PY5PS	"	381,477	442	303	
PY2APQ	**14**	**211,925**	**321**	**245**	
PY5AG	3.5	0	1	1	

FERNANDO DE NORONHA

ZYØFX	**A**	**6,663,703**	**3065**	**733**	
					(Op. W9VA)

VENEZUELA

4M1G	**A**	**573,504**	**484**	**412**	
					(Op. YV1ELM)
YW1A	**28**	**7,870,500**	**3524**	**795**	
					(Op. YV1AVO)
4M5Y	**14**	**2,796,244**	**1527**	**617**	
					(Op. YV5LAS)
4M5E	**3.5**	**260,236**	**253**	**178**	
					(Op. YV5MBX)
YY1C	"	174,324	213	146	
					(Op. YV1CP)

PARAGUAY

ZPØY	**21**	**12,070,245**	**4277**	**955**	
					(Op. ZP5JCY)

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

WC4E	**8,117,160**	**3300**	**1020**
N4WW	5,982,160	2601	940
WU7Q	**4,328,352**	**2679**	**798**
AA7CM	4,319,343	2561	777
W1FEA	**4,147,091**	**2491**	**689**
WD1K	**3,911,136**	**2099**	**786**
W9NQ	3,386,186	2274	678
WR8W	**3,329,354**	**1969**	**742**
NU1P	3,243,680	1842	776
NM9H	**3,213,361**	**1788**	**773**
NZ4K/8	3,037,216	1776	728
NE8T	3,025,800	1725	738
KS3F	**3,005,856**	**1800**	**756**
N7TT	2,617,764	1760	681
NI7T	2,474,940	1631	669
ND1X	2,262,832	1330	598
WJØL	**1,745,920**	**1292**	**640**
KD3JH	1,638,888	1128	552
WI8L	1,158,246	977	534
WB2YOF	**986,261**	**789**	**479**
NV4G	905,080	879	484
KJØG	853,281	858	429
WF2G/4	626,164	660	418
KB2SE	286,426	397	287
NC7K	282,051	497	333
N3CHL	252,525	389	273
K3UA	248,832	370	256
KD5GD	**228,960**	**366**	**265**
WA8LLY/6	36,720	121	102

NORTH AMERICA

HI5ØØUD	**12,341,385**	**4781**	**965**
CE7ON	**8,522,235**	**3741**	**827**
CI7U	6,726,599	3141	737
CF3CPA	**6,133,314**	**2434**	**803**
VE3CPA	5,997,189	2434	789
CF6WP	**3,223,065**	**2077**	**645**
XM5FX	**2,257,956**	**1560**	**606**
CF6AO	1,425,291	1176	469
VE3BXY	1,071,125	779	451
VE3SWA	171,696	304	219

AFRICA

5H1HK	**13,980,480**	**4873**	**960**
SØ1EA	**12,533,858**	**4528**	**899**
5Z4BI	**9,523,155**	**3623**	**883**
3DAØDX	**9,179,380**	**3566**	**865**

ASIA

P35S	**7,714,323**	**3894**	**687**
JA8YBY	**4,950,456**	**2366**	**746**
HL8A	**4,844,780**	**2760**	**740**
JA1YFG	3,908,520	1994	693
JA1YDU	3,638,856	1928	642
JA1ZLO	3,469,473	1928	633
BY1PK	**2,935,026**	**2368**	**582**
JA6YBR	2,408,760	1459	580
JH1YDT	1,923,305	1235	545
JT1KAI	**1,772,544**	**2026**	**512**
BY8AC	**1,706,111**	**1739**	**473**
HLØB	471,523	991	299
JK1ZNB/JD1	**159,210**	**968**	**145**
JA3YCT	32,670	129	99

EUROPE

LZ9A	**14,066,376**	**4593**	**1101**
IZ4C	**13,631,493**	**4387**	**1137**
HG5A	**11,696,037**	**4593**	**1047**
FV1O	**11,676,864**	**4461**	**976**
HG1S	10,232,640	4284	990
OL4A	**9,160,840**	**3903**	**892**
HGØX	9,094,217	4086	1007
TM5A	7,737,641	3738	929
ED3MM	**7,190,256**	**3347**	**919**
FF6KRC	6,714,120	2895	840
GJØLYP	**6,425,280**	**3281**	**873**
Y38I	**6,308,691**	**3003**	**817**
OQ7AR	**5,869,353**	**2815**	**831**
YZ4Z	**5,863,086**	**2802**	**921**
YT3T	5,769,492	2744	843
HYØP	4,418,325	2519	807
GMØECO	**4,412,655**	**2544**	**741**
DK2XX	**4,407,088**	**2352**	**763**
IZ2W	4,364,737	2563	779
OK3KFF	3,771,714	2213	678
G6UW	**3,749,130**	**2184**	**770**
SM5GMG	**3,527,404**	**2065**	**727**
ED7WV	3,408,312	2476	708
FF1COM	3,323,510	2151	710
ZB2/H89FMD	**3,298,568**	**2597**	**644**
GB2SH	3,160,365	1893	741
ED3QD	2,978,978	2069	697
YT7A	2,931,312	1807	692
OH7AB	**2,866,266**	**1742**	**702**
YU3AI	2,605,109	1958	689
GM9ØCC	2,498,125	1926	625
OK1ONA	2,330,508	1685	628
PI9IRC	**2,085,440**	**1665**	**608**
IK2ARI	2,058,240	1799	649
HA8KCK	1,925,536	1477	613
HA3KNA	1,853,552	1511	592
Y51CQ	1,454,024	1303	533
GØCCH	1,271,592	1229	522
PI4GV	1,115,322	1061	474
SP1PBW	**1,011,520**	**961**	**464**
YO7KHJ	**837,713**	**1076**	**443**
OK2KOD	826,708	844	452
OK2KDS	773,080	862	440
LZ1KNP	703,684	951	394
OH7NTM	585,900	838	420
Y48CJ/P	571,283	750	397
SN9C	477,962	711	353
OK2KYC	402,597	576	333
GMØAEE/P	394,060	628	340
OK2KLI	375,174	567	342
FF5KK	251,045	400	295
SP9ZHR	198,360	341	290
OK1OFM	155,844	345	234
OK3KUN	152,958	414	222
PI4TTC	102,663	289	187
OK3KHU	96,960	257	202
OK1KNR	79,730	240	170
LZ2KCO	61,560	160	152
OK2KMR	25,220	113	97
SP4KTO	19,044	115	92
OK2KVI	13,200	103	80
OK3KYH	11,760	106	89
OK1KCF	7,812	74	62

OCEANIA

VK6LW	**5,671,110**	**2809**	**690**
YB4ZBY	**4,616,700**	**2336**	**660**
FOØXXL	**2,170,977**	**1420**	**519**
VK6ANC	729,047	721	347

SOUTH AMERICA

PT7FX	**10,859,940**	**3816**	**884**
LU4FM	**10,842,788**	**4071**	**913**
PP5ZYZ	7,945,449	3306	813
LQ9DX	3,728,100	1961	669
CE2AA	**2,783,904**	**1455**	**617**

U.S.S.R.

CLUB STATIONS

ASIATIC

UL8LYA	**7,214,429**	**2833**	**837**
RX9J	**4,572,348**	**2523**	**726**
UZØLWC	**2,597,028**	**1772**	**602**
RZ9MYA	2,292,003	1700	543
UI9BWF	**1,750,845**	**1327**	**453**
UZ9JWJ	1,554,102	1086	501
UH9HWB	**875,425**	**709**	**475**
UZ9UWN	246,272	391	296
RL8DWW	67,072	202	128
UL8CWW	64,680	166	140
UM9TWA	**24,788**	**100**	**86**

EUROPEAN

R6L	**10,062,435**	**4656**	**995**
YL1WW	**7,691,684**	**3547**	**884**
YL1ZW	5,575,411	2830	821
UB3IWA	**4,322,501**	**2657**	**733**
LY2WW	**3,899,910**	**2168**	**758**
UB4QWW	2,910,725	2087	673
UB4WZA	2,475,969	1640	669
UA3QYN	1,984,320	1439	636
UZ3QYN	1,925,808	1439	636
UZ6AXS	1,648,288	1522	608
UZ6HXK	1,523,376	1593	568
RZ6AXO	1,031,550	1160	575
UZ4WY	785,158	986	401
UZ3AXX	540,985	701	421
UB4XWK	402,747	640	363
UC1IWW	**382,755**	**630**	**285**
UZ6LWM	378,088	624	334
UB4WXE	326,462	589	302
LY1BZR	313,651	541	299
RB4EXN	299,026	486	403
UB4TWL	282,663	417	361
ES1WQ	**266,110**	**636**	**299**
UZ4AXQ	220,176	519	278
UZ4HWS	178,890	355	201
UZ4AYT	146,148	411	228
UB4LWC	133,632	312	256
UZ4WWQ	67,158	306	182
RB4LWV	17,686	173	74
RZ2F			
/UX9XWV	**6,328**	**71**	**56**

MULTI-OPERATOR MULTI-TRANSMITTER

WORLDWIDE

YT2A	**21,266,490**	**6918**	**1190**
IU3A	**21,203,072**	**6847**	**1184**
T32T	**18,918,301**	**7172**	**823**
CZ7Z	**17,791,848**	**6617**	**1044**
WZ6Z	**17,506,971**	**6698**	**1179**
JE2YRD	**13,618,840**	**4468**	**1010**
WØØG	**10,682,362**	**4357**	**1126**
YT2B	10,072,257	4393	953
4M9X	**8,504,410**	**3091**	**853**
KL7RA	**8,099,966**	**3757**	**823**
ZZ4Y	**7,853,111**	**3073**	**873**
RXØC	**6,087,075**	**3027**	**831**
LY2ZO	**5,710,800**	**3107**	**823**
ED4VPM	**4,222,789**	**2324**	**761**
SN6O	**3,477,867**	**2701**	**681**
NB6L	3,228,855	1996	735
N8BJQ	**1,883,637**	**1241**	**609**
ZS4WRC	**1,629,954**	**1168**	**498**

CHECK LOGS: The following logs were used for cross-checking. Check logs and SWL logs are always appreciated. Thank you.

4K4BAE, CE5NCX, CF1ACK, CSØCDP, CSØDJE, CT1AHC, CT1TM, DF5PK, DK1YU, DU3CWM, EA1AW, EA1CNL, EA2BOT, EA3EDU, EA3GBU, EA5DVL, EA5EFQ, EA5EFV, EA5JC, EA7GBD, EC1CTH, EC5CNG, ED2NCE, ES5MC, ES6EA, F6GQS, F9OO, G4YSD/PA, HA8CO, HK3MAH, I2HWI, IKØJMS, IK2GPQ, IK7BPV, IK7NYD, JF2GYH, JRØMVH, K6SMG, KB4GYZ, KC7UP, LAØEW, LA1FW, LA1PHA, LA2IZ, LA2PGA, LA3KY, LA3RHA, LA4KGA, LA4NL, LA4OGA, LA6DM, LA6VJ, LA9DAA, LA9FFA, LA9ML, LY2BAG, LZ1DM, LZ1ZD, LZ2CT, LZ2ES, LZ2LE, N6RUV, N8LBI, OG2AI, OH1RY, OH1YM, OH2HR, OH3GZ, OH3MIG, OH6SU, OH6UC, OH8HCE, OK1DQT, OK1DQW, OK2BQL, OK2ZU, OK3KJF, ON5FV, OX3ZM, OZ8DX, PBØAIU, RAØCBS, RAØSK, RA3AGF, RA3ALA, RA3DDA, RA3DDU, RA3DPD, RA3VA, RA3VR, RA4PKI, RA4PKL, RA4SA, RA6ECP, RA9JB, RB5DX, RO4OA, RO5OO, RV6AB, RV9CFP, RW6LZ, SMØBDS, SMØCSL, SMØMC, SM2NTU, SM3CVM, SM4JUW, SM4SET, SM5CVC, SM5EMR, SM6BWQ, SM6CDN, SM6HRR, SM6KMD, SM6LIF, SM7DUR, SO3MAQ, SP1DMD, SP2EP, SP2ERZ, SP2GOW, SP2GUV, SP3CDQ, SP3GRQ, SP4DMF, SP4GDC, SP5AUB, SP5ENA, SP5ILO, SP6TGA, SP7IVW, SP8BWR, SP8GEY, SP8JMA, SP8JUX, SP8KO, SP9AGS, UAØQCA, UAØSOM, UA1AUU, UA3DUA, UA3EDH, UA3LAR, UA3PB, UA3RJ, UA3SDT, UA3TAM, UA3TEG, UA4HRZ, UA4NBD, UA4NCI, UA4PKN, UA4PKZ, UA4PMX, UA6EA, UA6HPK, UA6HSN, UA6LQZ, UA9AKW, UA9CQS, UA9JFR, UA9MEK, UA9MHC, UA9TS, UA9XKU, UB4CO, UB4CWA, UB4JJR, UB5-066-376, UB5ITD, UB5QFJ, UB5QFJ, UB5QMD, UB5UCH, UB5XAN, UB5XEG, UC1WWY, UC2SDD, UL7EFF/UL6G, UM8DX, UM8MAU, UM8MGM, UT4UH, UT5UNR, UV3DF, UV3DLB, UV6AGF, UV6HLC, UWØCW, UW3RN, UW3RR, UW9CL, UW9JC, UW9SG, UW9UE, UZØWWL, UZ1NWA, UZ2FWG, UZ3DWZ, UZ3DXS, UZ3DYU, UZ6LZZ, UZ9AWH, UZ9CWW, UZ9SWR, UZ9YXL, VK3DD, W7EYR, WA4HIW, WB8GNX, XE2KAK, XF1C, Y22TO, Y23HJ, Y24WJ/A, Y25XJ, Y31EM, Y32ZF, Y34SF, Y34XF, Y44WA, Y45RJ, Y49RF, Y87PL, YL1WJ, YO4US, YO8AII, YV4ABR, YV6DNP, ZL2AH, ZZ5SZ.

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- SSB, CW, AM, FM
- 10 Memories

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  35W Output/440 MHz
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- Satellite Operation Made Easy

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WA6IPD presents some interesting information of which we may not be aware. Meeting code requirements in this case has nothing at all to do with Mr. Morse.

Amateur Radio And The National Electrical Code (NEC)

BY ART RIDEOUT*, WA6IPD

The National Electrical Code (NEC) specifically refers to amateur radio, but amateur radio publications generally give little exposure to the NEC.

There are probably only two occasions when an amateur might be concerned with the NEC: (1) If the local building inspector inspects your antenna tower or that new ham shack you just constructed; and (2) When the insurance adjuster refuses to pay your fire claim because the fire started in your ham shack and your installation did not meet the NEC.

As might be expected, the NEC is generally concerned with good grounding and good antenna construction/installation practices. Let's review them in that order.

Grounding

Metal towers and radio equipment must be grounded. The grounding conductor must be continuous and unspliced. It cannot be smaller than #10 copper or #8 aluminum stranded or solid. If possible, it must run in a straight line; it must be securely fastened; it must be protected where exposed to damage; and it must be connected to an approved electrode system by an approved connector. Approved connectors may be obtained from electrical supply houses.

An approved electrode system consists of one or all of the following, if available at the site:

1. A metal underground water pipe in direct contact with the earth and at least 10 feet in length. Never attach to a gas pipe.

2. The metal frame of a building where the building is connected to a low-impedance ground.

3. A ground ring consisting of at least 20 feet of bare #2 copper encircling the building or structure and in direct contact with the earth at a depth of 2½ feet.

Each of the above electrode systems, if available, must be interconnected with #6 bare copper to make up the electrode grounding system.

Where any of the above are not available, a ⅝" × 8′ copper rod or a ¾" × 10′ galvanized pipe may be used as the ground electrode. However, the objective is to have a ground system of 25 ohms or less.

Whatever electrode system is selected, it must also be interconnected with the electrical service ground by a #6 copper conductor.

Antenna Construction And Installation

Antenna wire must be size #14 for spans of 150 feet and #10 for longer spans. Note that all antenna wire must be solid hard-drawn copper or copper-clad steel insulated or uninsulated. No stranded wire or invisible antennas are permitted by the NEC.

Antennas and feeders must not be supported by utility-owned power poles or any electrical service mast entering the home. They also must be kept well away from power lines to avoid the possibility of accidental contact. They must not

(continued on p. 104)

**Author's address:*
2235 Gum Tree Lane, Fallbrook, CA 92028-0901

CQ REVIEWS:

The Kenwood TH-27A and TH-47A UHF Handheld Transceivers

BY DAVE INGRAM*, K4TWJ

Like all red-blooded radio amateurs I am crazy about handheld FM transceivers and cannot visualize going anywhere without one by my side. Also like most amateurs I prefer the new shirt-pocket-size handhelds. These little gems are a combination amateur rig with touch-tone® pad and autodialing memories for telephone autopatching, public service and marine band scanner, NOAA weather radio and aircraft band monitor, plus 24-hour clock with travel alarm in one small package. Modern technology is amazing!

Naturally I was interested when Kenwood sent two of their latest miniature handhelds for review—the TH-27A 2 meter and TH-47A 70 cm talkies. After using the radios for a couple of weeks, a little voice reminded me to share the good news with others. The story follows.

Kenwood's new TH-27A and TH-47A handhelds are identical in appearance and features and differ only in frequency coverage and power output. Let's begin by explaining those differences, then discuss both units combined.

First, the TH-27A 2 meter handheld transmits and receives 144 to 148 MHz (plus MARS/CAP with a simple modification) with up to 2.5 watts output when using its supplied PB-13 rechargeable battery pack. It also receives 138 to 165 MHz with an FM detector and 118 to 138 MHz with an AM detector (for the aircraft band). Activating the latter function on a new TH-27A requires two to four keystrokes and will be described later.

The TH-47A 70 cm handheld transmits and receives 438 to 450 MHz with up to 1.5 watts output when using its supplied 7.2 volt/700 MAH PB-13 battery pack. I understand this radio can also be modified to receive the popular 800 to 900 MHz band, but Kenwood did not have details on that mod. Additional specs are shown in fig. 1.

Both the TH-27A and TH-47A will produce 5 watts output when powered from their optional 12 volt/300 MAH PB-14 battery pack or via an external 13 volt source such as the cigarette-lighter socket in a car. In the latter case you can simultaneously recharge the rig's PB-13 while powering the talkie via a car's battery.

An Overview

Kenwood's TH-27A/TH-47A is dark gray in color, measures 5"H × 2"W × 1⅜"D and weighs only 13.5 ounces. The case also has a very slight tilt, or angle, to have the unit resemble a miniature telephone. Top-mounted controls include volume, squelch, frequency selection, plus a TX LED, mic, earphone, and DC/charge sockets. The front display has a backlight for night use, and includes more functions than we could possibly list. This talkie is loaded with bells, tweets, and jingles!

Battery packs for the TH-27A/TH-47A slide into the talkie's bottom like a cartridge clip slides into an automatic pistol. The transmitter draws 1000 MA on (PB-13) high power, 500 MA on low power, and 60 MA on receive, so battery life between rechargings is surprisingly good. Additionally, an "economy low" power level is selectable for reducing transmitter output to 20 milliwatts for line-of-sight activities such as hamfest communications, coordinating public events, and so on.

The TH-27A/TH-47A has 40 memories that store any frequency and repeater offset, PL tone, DTSS paging code, etc. The talkie also has ten 15-digit autodialing memories for single-button autopatching, a built-in clock with on/off timer, a "bell" function that rings like a telephone when a carrier comes on frequency, and an "auto shut-off" mode for forgetful owners.

The previously mentioned DTSS tone paging system is great, and it works with any DTMF-equipped talkie. Let's say, for example, you wish to receive calls from only Danny, Chet, or Sandy via a wide-coverage (busy) repeater without close monitoring or listening to other conversations. You program your 3-digit DTMF number (such as 111) into the TH-27A/TH-47A and tell your three friends your number. You then dial the repeater and press your rig's **F** and **DTSS/PAG** key. The speaker mutes, but the LCD's S meter shows the repeater is active. Chet "comes on" the repeater and punches

Kenwood's TH-27A and TH-47A handhelds pack a lot of electronics into a small and easy-to-carry package.

4941 Scenic View Drive, Birmingham, AL 35210

GENERAL		TH-27A/E	TH-47A/E
FREQUENCY RANGE (MHz)	U.S.A. Version	144 to 148	438 to 450
	U.K.and Europe	144 to 146	430 to 440
	Other market	144 to 148	430 to 440 or 438 to 450
MODE		F3E (FM)	
ANTENNA IMPEDANCE		50 Ω	
OPERATING TEMPERATURE		–20°C ~ +60°C (–4°F~140°F)	
POWER REQUIREMENTS	DC IN(nominal)	7.2 V ~ 16 VDC (13.8 VDC)	
	BATTERY PACK	6.3 V ~ 16 VDC (7.2VDC)	
CURRENT DRAIN			
13.8VDC (Ext.Power Supply)	H	Approx. 1.5A	Approx. 1.5A
7.2VDC (Battery)	H	Approx. 1A	Approx. 1A
Transmit mode	L	Approx. 0.5A	Approx. 0.8A
Transmit mode	EL	Approx. 0.12A	Approx. 0.15A
Receive mode with no signal		Approx. 60mA	Approx. 65mA
Battery Save mode		Approx. 17mA	Approx. 17mA
GROUND		Negative	
DIMENSION(W x H x D)		49.5 x 124.7 x 38.0mm	
DIMENSION(Projection Included)		57 x 138.7 x 39.7mm	
WEIGHT		360g	
MICROPHONE INPEDANCE		2kΩ	
TRANSMITTER			
OUTPUT POWER	H (13.8VDC)	more than 5W	
	H (7.2VDC)	Approx. 2.5W	Approx. 1.5W
	L	Approx. 0.5W	
	EL	Approx. 20mW	

	TH-27A/E	TH-47A/E
MODULATION	Reactance	
MAXIMUM FREQUENCY DEVIATION	±5kHz	
SPURIOUS RADIATION	less than –60dB	
RECEIVER		
CIRCUITRY	double conversion super-heterodyne	
INTERMEDIATE FREQUENCY 1 st IF	45.05 MHz	58.525 MHz
INTERMEDIATE FREQUENCY 2 nd IF	455 kHz	
SENSITIVITY (12dB SINAD)	less than –16dBμ (0.16μV)	less than –15dBμ (0.18μV)
SQUELCH SENSITIVITY	less than –20dBμ(0.1μV)	
SELECTIVITY –6dB	more than 12kHz	
SELECTIVITY –60dB	less than 28kHz	
AUDIO OUTPUT POWER (10% distortion)	more than 200 mW (across 8Ω load)	

Fig. 1– Technical specifications of the TH-27A/TH-47A handhelds.

111 and you hear his melodious voice saying, "Wake up, Dave. This call's for you."

Want to go more formal? After pressing the previously mentioned **F** and **DTSS/PAG** keys, also press the **F** and **3/T.ALT** keys. Instead of hearing Chet's voice, your talkie will ring like an electronic telephone. Try explaining that while wearing a coat with a wireless phone in one pocket and a talkie in the other pocket and talking to a neighbor, and both units begin ringing! It's like being a teenager again!

Say you missed hearing the talkie ring? No problem: the display changes to show the time of your missed call. So who called? Ah . . . that's another 3-digit story. Simply tell Danny to add 222 and Chet to add 333 and Sandy to add 444 after your 111 code (and remember who is which number). Your missed-call TH-27A/TH-47A will then display the caller's code. This feature is fantastic if all your friends also have DTSS paging. Everyone can call individually or set up a code for group calling. Better get an extra battery pack for these rigs, as they quickly become personal companions with unlimited capabilities!

You might think the TH-27A/TH-47A is too feature-packed for simple and easy operation, but this is not the case. Each button or key has a normal function (marked in white) and a secondary function (marked in blue). Calling secondary functions into use merely involves pressing the **F/A** key before pressing the second button. Pressing the **ENT/C** key places the rig in VFO mode, for example. Then you punch in a desired frequency on the keypad (such as 46760 for 46.760 MHz, 62550 for 162.550 MHz NOAA weather, etc.). You can also press the **ENT/C** key again and dial frequencies via the rig's top knob.

Press the **F/A** and **MHz/STEP** key and you can select tuning steps of 5, 10, 15, 20, or 25 MHz. Still too slow? Press only the **MHz** key, and a few clicks of the top knob whisk tuning from 138 to 170 MHz. Press **MHz** again to select final frequency digits. Recalling memories is even easier: Initially press the **M** key for memory mode, and then punch in a desired number on the keypad or step through memories via the top knob.

We obviously could continue this tale indefinitely, but I will simply say, "Whatta radio!" I love it!

More Frills!

It is difficult to say whether the TH-27A/TH-47A is a pocket radio with built-in clock or a pocket watch with built-in radio. Either way, the rig is really handy for vacationing and/or hamfest attending. You can preset the radio to a NOAA weather channel and program an auto-on time for a 6 AM wake-up call and an auto-off time of 6:30 AM. If you do not wake during that 30 minutes of weather forecasting, forget the morning and enjoy snoozing!

Maybe you prefer listening to the local airport's control tower for wake-up entertainment. Just retune your TH-27A to the 119–120 MHz range rather than a NOAA channel. Say your TH-27A will not tune below 138 MHz? Activate its extended coverage reception and AM detector as follows.

This information is not in the TH-27A's manual, so please copy it for future reference. I also advise making this "keystroke mod" when you first get a TH-27A, because it may require resetting the rig's microprocessor, which will erase data you programmed in memories. First, press the **ENT** key once or twice so the rig is in VFO mode and a 2 meter frequen-

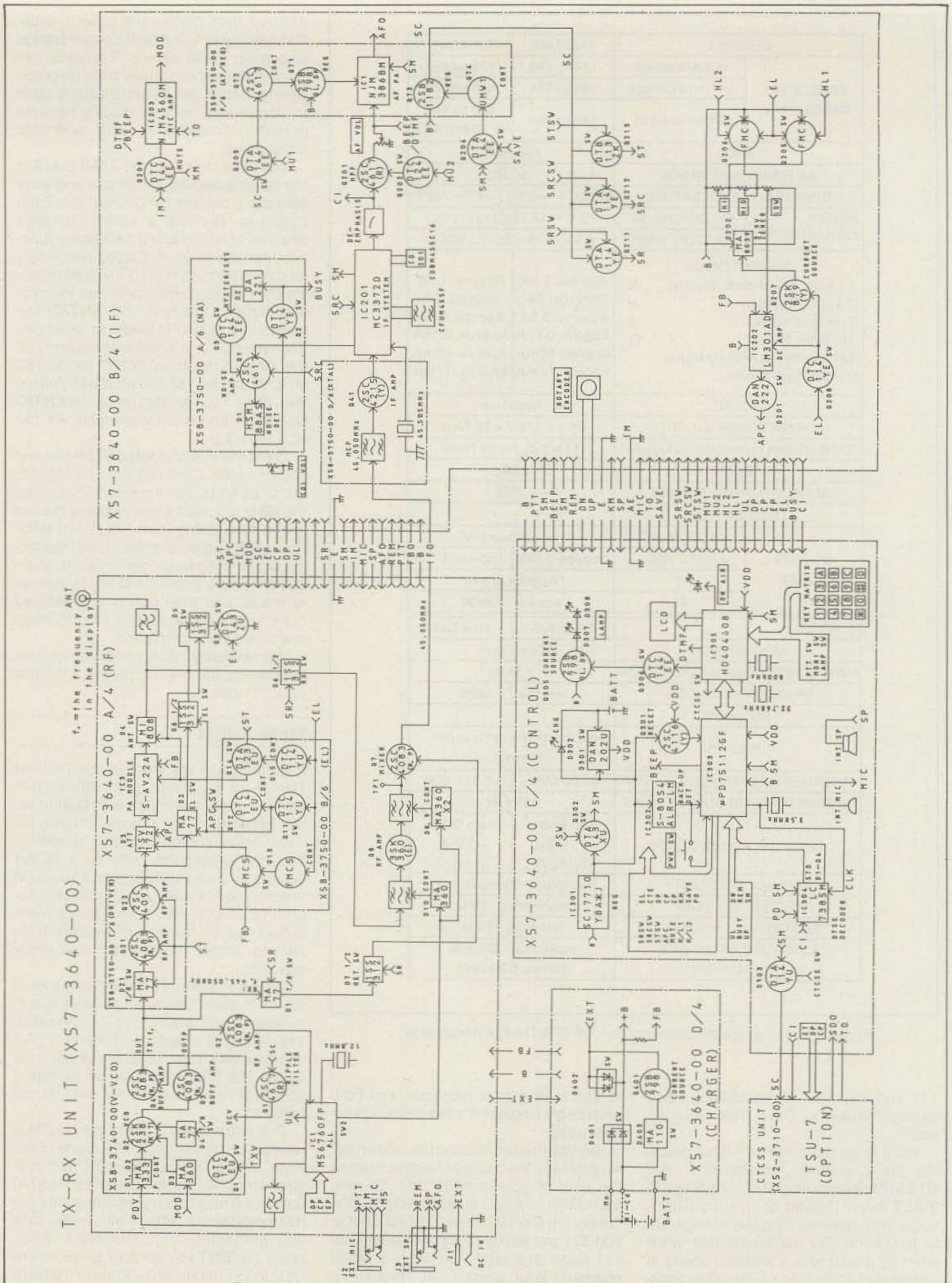

Fig. 2– Block diagram of Kenwood's TH-27A. (See discussion in text.)

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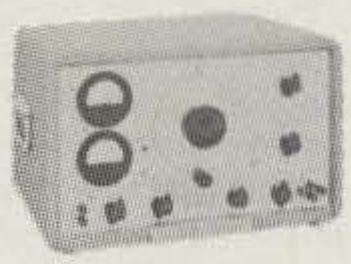

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cy shows on the display. Next depress the **F** key for 2 seconds (note flashing **F** in display's lower right area), and then release the **F** key and press the **MHz** key. The display (and rig) will shift down into the 119 to 138 MHz range. AFter locating and storing active local frequencies in memories, simply repeat the previous **F** plus **MHz** keystrokes and the TH-27A shifts back into the 138 to 170 MHz range.

If your TH-27A does not shift ranges, do a microprocessor reset. Press and hold the **M** key, and press the power switch "on." The display will glitz and then "come up" on 144.00 MHz. You can then use the **F** plus **MHz** keystrokes to change ranges. Future microprocessor resetting should not be necessary. If you experience a problem, call Kenwood and they can talk you through the steps.

Kenwood's TH-27A and TH-47A also sparkle in the scanning department. You can select full-band/VFO scanning, programmable band scanning, memory scanning, alternate VFO and memory or call channel and memory scanning, or scan any single MHz range. You can also program them to **SEEK** (scanning stops on a busy channel and scan is cancelled), **CAR**rier-scan (scanning stops on a busy channel and resumes 2 seconds after a carrier drops), or **TIME** scan (scanning pauses on a busy channel for 5 seconds, then continues).

Circuitry

You are probably curious about the TH-27A/TH-47A's "innards" but are hesitant to ask due to apparent complexity. Relax. I will explain it in plain language using the block diagram as a guide. Please refer to fig. 2 as we continue.

First notice the transceiver is comprised of three main circuit boards enclosed in solid lines. They are the TX/RX UNIT (upper left), IF UNIT (right side), and CONTROL (left side). Disregard the charger and optional TSU-7 until later. Now look at the block diagram's middle top and let's follow the receive path.

Incoming signals from the antenna go down, through the bandpass filter (classy symbol, eh?), down, through RX SW D6, another filter, RF amp Q8, and into mixer Q7. The Local Oscillator's signal (coming in the bottom of Q7) is heterodyned with the incoming signal at this point to produce a 45.050 MHz IF (bottom IFO pin between TX/RX and IF boards).

Hold your place at Q7 a minute, and let's trace the Local Oscillator/PLL signal. Spot IC1: the PLL chip in the left middle of the TX/RX board. Note its input comes from the keypad (DP) top knob (CP) or speaker/mic. PLL output goes up; through switch Q1, D4, VCO Q2; through buffer amps Q3 and Q4; out to the right; and down. It then goes through T/R switch D1, D7, and into mixer Q7.

Let's now continue from Q7's output, into the IF board, through IF amp/system Q41/IC201, and into Q201. Detected audio then goes through the volume control, amplifier IC1, and to AFO--the speaker. That is a neat receiver, eh?

Let's now move to the TX/RX board's left side and trace the transmit path. Audio from the microphone enters modulator diode D3 via connector MOD. It goes to VCO Q2, through buffers Q3 and Q4, "straight ahead" through RF amp and driver Q21 and Q22, on to the PA module, and to the antenna. You can now review signal paths and "fill in" spaces such as squelch (top left of IF board, etc.). After a few minutes of study I think you will agree the TH-27A/TH-47A is sophisticated but fairly easy to understand.

On The Air

Are Kenwood's TH-27A and TH-47A fun to use? You bet! I have used almost every handheld made. They only get better with each new model, and Kenwood's new "minis" are tops. These little rigs are easy to carry anywhere, and they work great. Transmit and receive audio is outstanding, and 2 watts is plenty of power for operation with modern repeaters in most cities. There is some speaker rattle at high-volume levels, but that should be expected.

The handhelds'inclusion of 10 DTMF autodialing memories and 24-hour clock is really grand, and the TH-27A's NOAA weather coverage plus aircraft-band reception makes it a pocket entertainment center. The DTMF paging is also great. The MHz scanning feature is perfect when visiting new areas or vacationing with last year's repeater directory as your only guide.

On the down side, some functions such as autodialer programming require close study of the rig's manual to master. The manual is also somewhat difficult to understand unless you already know how to use the rig. In other words, read it closely and go exactly step-by-step for best results. On my own "down side," I probably did not describe all the TH-27A/TH-47A's treats. You can use these radios for months and still find new and exciting features!

Conclusion

All aspects considered, I think Kenwood has a pair of winners in the TH-27A and TH-47A. They are fantastic little pocket transceivers, especially for amateurs traveling via airplanes and rental cars. They are also perfect purse units for YLs, particularly those working overtime after dark. Nothing beats instant communications during an unexpected emergency. I feel quite confident recommending Kenwood's new minis.

The TH-27A/TH-47A are also complemented by a full line of mating accessories. They include the new SMC-33 lapel speaker/mic with remote control ($49.95), BT-8 alkaline battery case ($19.95), HMC-2 headset with VOX ($57.95), SC-30 vinyl case ($19.95), and BC-15 rapid charger ($89.95) for the PB-13 ($54.95) and PB-14 ($79.95).

List price of the TH-27A is $419.95; TH-47A $429.95. For more information, contact Kenwood USA Corp., Communications and Test Group, P.O. Box 22745, 2201 East Dominguez St., Long Beach, CA 90801-5745.

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Here's a handy little project that's fun to build and comes in very handy for your beacon or to ID your repeater.

A Microcontroller CW IDer

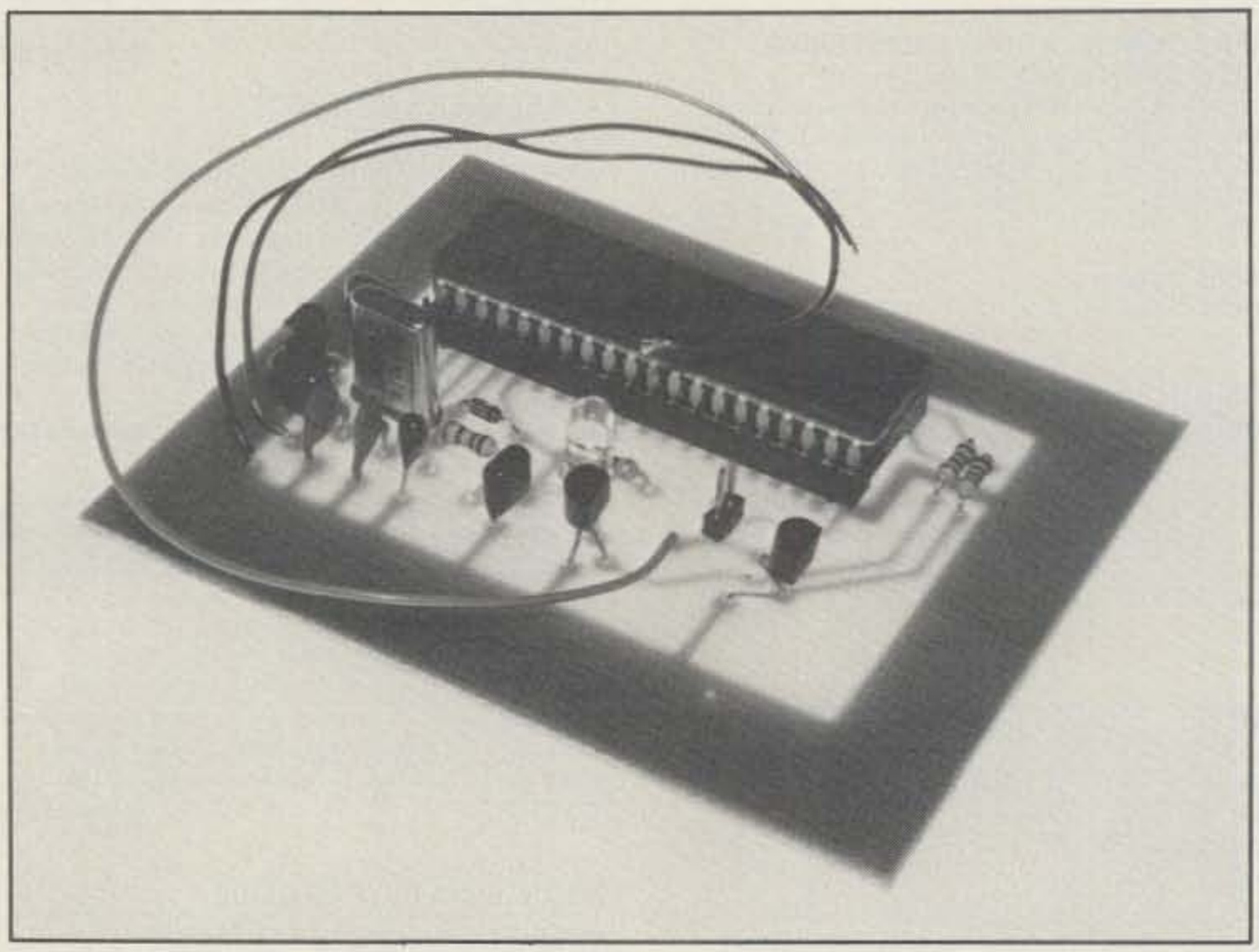
BY HUGH P. BUNN II*, N4LTA

I've seen many designs for Morse code generators that use various configurations of PROMs and diode matrices. Although most of these devices work well, they usually have complex circuit hardware and are only capable of sending short messages. As a result of the microcomputer explosion of the last decade, many software CW generators have appeared which are designed to run on small home computers. Unfortunately, few of us can afford the luxury of dedicating a home computer to run a beacon or ID our repeaters. It occurred to me that the perfect solution would be to use a single-chip microcontroller running a CW program similar to those used on my home computer.

When I put the 6 meter N4LTA beacon on the air several years ago, it used a microprocessor-based keyer. I had several surplus 8035 processor-based controller units with 2716 EPROMs on hand. I wrote a simple assembly language program to run the beacon and to sequence a step attenuator to control output power. The beacon has operated without problems for over two years. In fact, seven of these units are in beacon operation in various locations.

As I exhausted my supply of these controllers, I needed a design for a small compact keyer to replace them. Rather than use the 8035, 2716, and assorted support chips, I opted to use a single-chip microcontroller from the 8035 family. The 8748 microcontroller uses the same processor as the 8035, but has the 2-K EPROM on chip. These chips have been rather expensive, but are now available for less than $10.

The 8748 includes 27 I/O lines and an internal counter/timer. It uses the same software that I developed for the 8035. I decided to use the bare minimum I/O required for a simple one-sided PC board. If you want to use them, there are another 25 I/O points available. For this project, I chose to keep the design as simple as possible. Fig. 1 is the schematic diagram.



The finished project. Light shining from below the board shows the foil lines of the circuit board. (Photo by Robert S. Le Blanc)

The keyer is built on a single-sided PC board. The prototype unit show in the photo was designed using a PC-based printed-circuit layout program and produced using Kepro's DF process. This process produces high-quality prototype circuit boards; I recommend it highly. The board was exposed to bright sunlight for one minute using a line film negative of the PC board layout shown in fig. 2. For developing, I used a sodium-carbonate solution included with presensitized boards. Sodium carbonate is much easier to handle than solvent-based developers. I etched the board with standard etchant solution and cleaned it with steel wool. I used a drill press with a No. 60 bit to drill the circuit board.

To build the keyer, just place the components on the board and solder them in place (see fig. 3). Use a socket for the 8748. I used a standard single row header for my output connector, but wire connections are fine. I've specified a standard TV color-burst crystal, but any crystal in the 2.0 to 6.0 MHz range will work. If you change the crystal frequency radically, the timing bytes in the software will require some adjustment.

Install all parts on the circuit board and solder them with a low-wattage soldering iron. Check for solder bridges and check to make sure all semiconductors are oriented properly. If everything looks okay, install the programmed 8748. Be careful to orient the 8748 properly in the socket.

Connect an 8 to 16 volt power supply capable of 150 mA; the keyer LED should begin flashing your programmed CW message. If your unit doesn't start up, carefully recheck all of your work. Look for solder bridges or misplaced parts. If you put the 8748 in the socket upside down, it probably will be destroyed. If your hardware troubleshooting reveals

*Route 11, Spring Lake Drive, Spartanburg, SC 29302

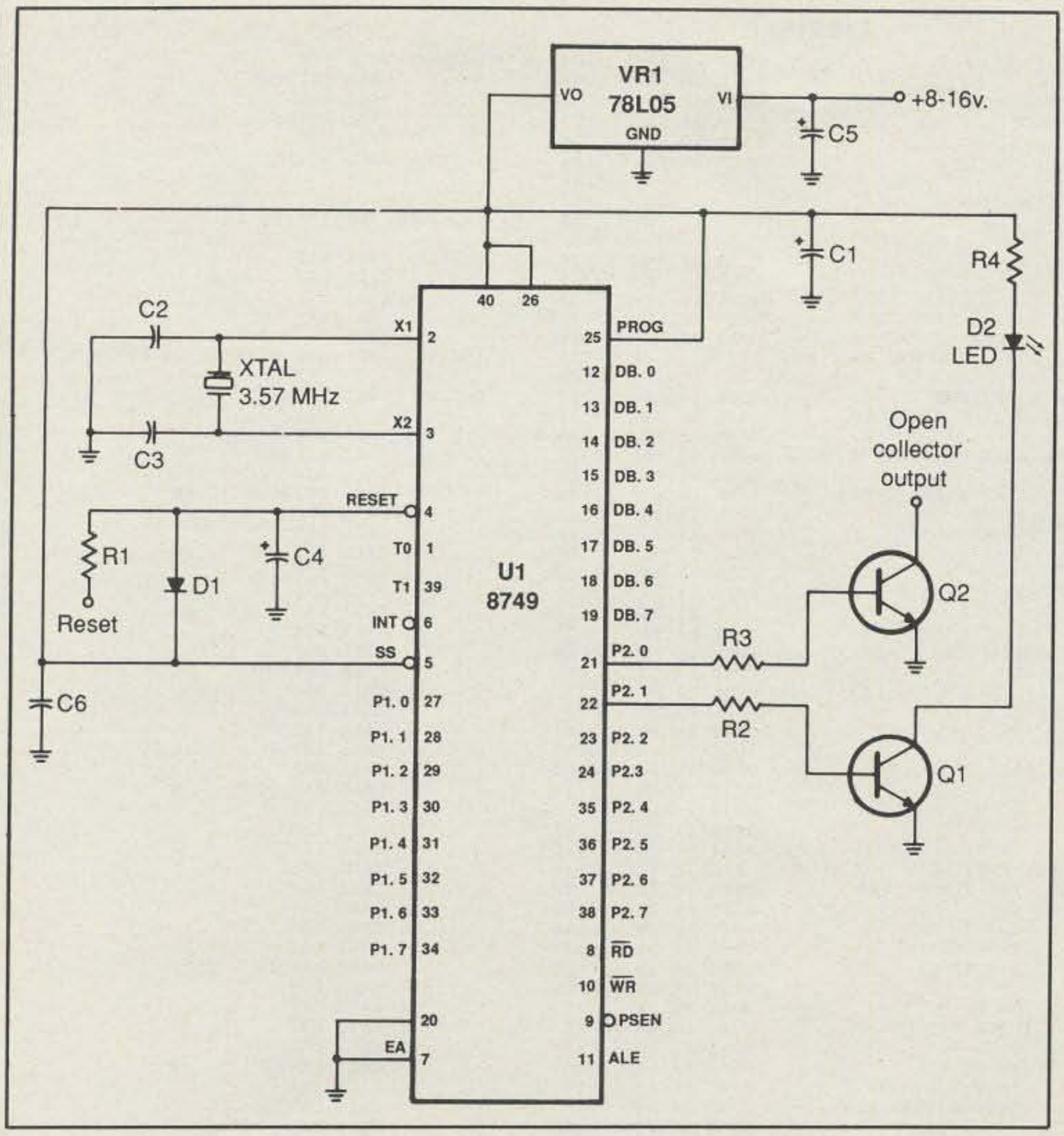


Fig. 1– Schematic diagram of the microcontroller CW ID.

Parts List

C1, C6—0.1 uF, 25 volt monolythic ceramic capacitor
C2,C3—10 pF, 25 volt or greater ceramic capacitor
C4—10 uF, 15 volt electrolytic capacitor
C5—1 uF, 25 volt electrolytic capacitor
D1—1N4148 switching diode
D2—LED (any standard LED will work)
Q1—2N2222A transistor (or other NPN switch)
Q2—2N2222A transistor (or NPN transistor with Vce to handle application, high voltage for vacuum tube keying)
R1—2.2 k, ¼ watt carbon film resistor
R2, R3—1.0 k, ¼ watt carbon film resistor
R4—330 ohm, ¼ watt carbon film resistor
U1—programmed 8748 microcontroller IC
VR1—78L05 100 mA voltage regulator
XTAL—3.5 MHz TV color burst crystal
Output plug—Berg Electronics

no problems, suspect your software. Microprocessors allow for no program errors, especially with assembly language. Make sure your code is addressed exactly as shown in the software listing.

The assembly language used to drive this controller is of the "cheap and dirty" variety. I've made no attempt to optimize the code. The core program shown in Listing I is the code used for a simple repeating beacon. The main program is nothing more than a long series of "calls" to "dit" and "dah" routines that make up the required message. I've never calculated the maximum available message length. It's probably longer than most situations require.

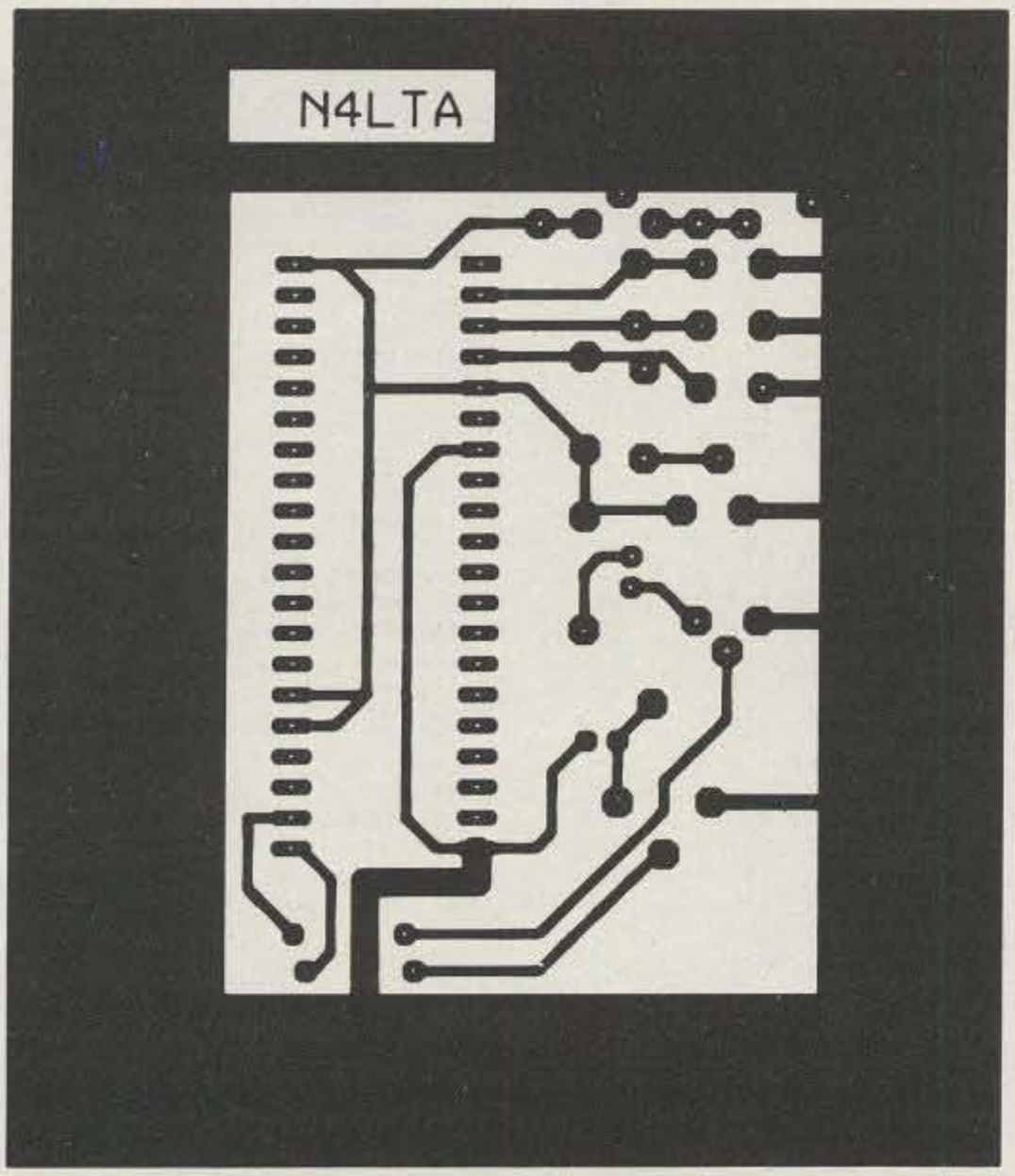


Fig. 2– Full-size layout of foil side of the PC board.

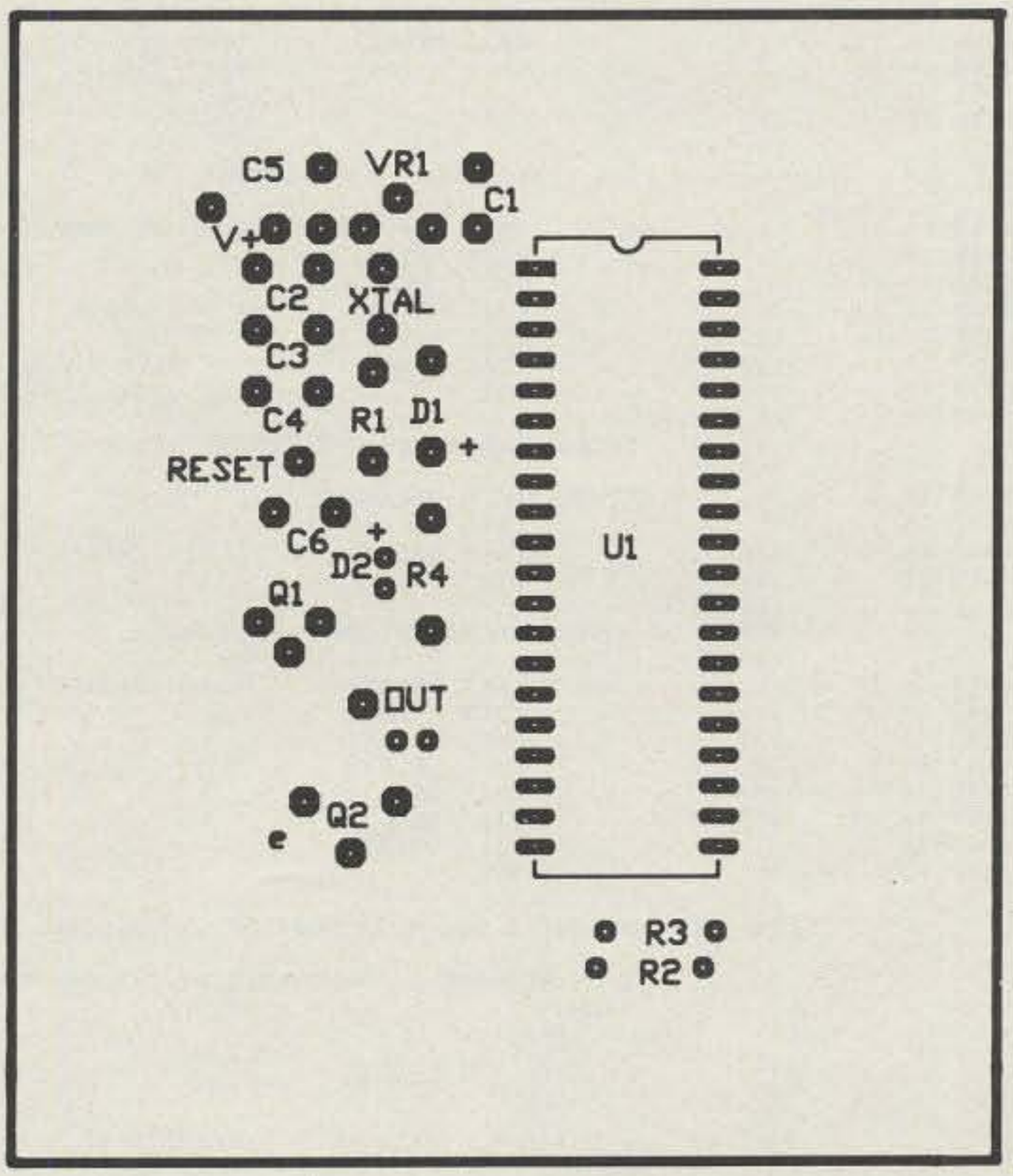


Fig. 3– Parts placement on the PC board for the CW IDer.

Listing I

```
                        1
                        2
                        3       ;THIS IS THE 8048 CODE TO DRIVE
                        4       ;THE 8748 IDer FOR A BEACON
                        5       ;SYSTEM
                        6
                        7
                        8               DEFSEG  absseg , ABSOLUTE
                        9
                       10               SEG     absseg
                       11
=0000                  12               ORG     0000H
                       13
                       14
0000 23 FF             15       BEGIN:  MOV A,#0FFH     ;A=FFH
0002 3A                16               OUTL P2,A      ;SET UP PORT2 FO
                       17
                       18       ;THIS IS THE MAIN MESSAGE ROUTINE
                       19       ;IT CALLS THREE V'SS TWICE, THE N4LTA ID
                                AGE,
                       20       ;2 WORD SPACES AND LOOPS BACK TO START O
                       21
0003 14 50             22       START:  CALL THREEV     ;SEND THREE V'S
0005 14 50             23               CALL THREEV     ;AGAIN
0007 14 66             24               CALL N4LTA      ;ID MESSAGE
0009 14 41             25               CALL WDSPC      ;SPACE
000B 14 41             26               CALL WDSPC
000D 04 03             27               JMP START       ;DO IT AGAIN
                       28
                       29
                       30       ;THIS TURNS ON AND OFF PORT2 BITS 0 AND
                       31       ;
000F 23 FC             32       PORTON: MOV A,#0FCH     ;TURN ON P20, P2
0011 3A                33               OUTL P2,A
0012 83                34               RET
                       35
0013 23 FF             36       PTOFF:  MOV A,#0FFH
0015 3A                37               OUTL P2,A
0016 83                38               RET
                       39
                       40
                       41       ;BELOW IS A ONE DIT DELAY ROUTINE
                       42       ;THE BYTE IN R6 CONTROLS THE WPM OF THE
                       43       ;IDer
                       44
0017 BF 00             45       DELAY1: MOV R7,#0       ;ZERO R7
0019 BE 15             46               MOV R6,#15H     ;15H TO R6
001B CF                47       WAIT1:  DEC R7
001C FF                48               MOV A,R7       ;R7 TO A
001D 96 1B             49               JNZ WAIT1      ;LOOP TIL DONE
001F CE                50               DEC R6         ;DECR R6
0020 FE                51               MOV A,R6       ;R6 TO A
0021 96 1B             52               JNZ WAIT1      ;LOOP TIL DONE
0023 83                53               RET            ;RETURN WHEN'DON
                       54
                       55
                       56
                       57       ;DIT SENDS A DIT  AND A LETTER SPACE
                       58       ;WHEN CALLED
                       59
0024 14 0F             60       DIT:    CALL PORTON     ;TURN ON PORT
0026 14 17             61               CALL DELAY1     ;WAIT ONE DIT TI
0028 14 13             62               CALL PTOFF      ;TURN OFF PORT
002A 14 17             63               CALL DELAY1     ;WAIT ONE LETTER
                                E
002C 83                64               RET
                       65
                       66       ;DAH SEND A DAH AND A LETTER SPACE
                       67
002D 14 0F             68       DAH:    CALL PORTON     ;TURN ON PORT
002F 14 17             69               CALL DELAY1
0031 14 17             70               CALL DELAY1
0033 14 17             71               CALL DELAY1     ;3 DIT TIMES
0035 14 13             72               CALL PTOFF      ;TURN OFF
0037 14 17             73               CALL DELAY1     ;ONE ELEM SPACE
0039 83                74               RET             ;AND QUIT
                       75
                       76       ;LETSPC GENERATES ONE LETTER SPACE
                       77
003A 14 17             78       LETSPC: CALL DELAY1
003C 14 17             79               CALL DELAY1
003E 14 17             80               CALL DELAY1     ;3 DIT SPACES
0040 83                81               RET
                       82
                       83       ;WDSPC GENERATES ONE WORD SPACE
                       84
0041 14 17             85       WDSPC   CALL DELAY1     ;WORD SPACING
0043 14 17             86               CALL DELAY1
0045 14 17             87               CALL DELAY1
0047 14 17             88               CALL DELAY1
0049 14 17             89               CALL DELAY1
004B 14 17             90               CALL DELAY1
004D 14 17             91               CALL DELAY1
004F 83                92               RET
                       93
                       94       ;BELOW IS THE MAIN BODY OF THE MESSAGE P
                                M
                       95       ;A CW MESSAGE IS GENERATED BY CALLING TH
                                LOWING
                       96       ;ROUTINES:
                       97
                       98       ;DIT , DAH , LETSPC , WDSPC
                       99
                      100       ;MESSAGE ROUTINES MUST TERMINATE WITH A
                                RETURN)
                      101
                      102       ;THREEV SEND THREE LETTER V'S
                      103
0050 14 5D            104       THREEV: CALL VEE
0052 14 3A            105               CALL LETSPC
0054 14 5D            106               CALL VEE
0056 14 3A            107               CALL LETSPC
0058 14 5D            108               CALL VEE
005A 14 41            109               CALL WDSPC
005C 83               110               RET
                      111
                      112       ;V SENDS THE LETTER V
                      113
005D 14 24            114       VEE:    CALL DIT
005F 14 24            115               CALL DIT
0061 14 24            116               CALL DIT
0063 14 2D            117               CALL DAH
0065 83               118               RET
                      119       ;N4LTA SENDS THE MESSAGE DE N4LTA/BCN
                      120
0066 14 2D            121       N4LTA:  CALL DAH
0068 14 24            122               CALL DIT
006A 14 24            123               CALL DIT
006C 14 3A            124               CALL LETSPC     ;D
006E 14 24            125               CALL DIT
0070 14 41            126               CALL WDSPC      ;E
0072 14 2D            127               CALL DAH
0074 14 24            128               CALL DIT
0076 14 3A            129               CALL LETSPC     ;N
0078 14 24            130               CALL DIT
007A 14 24            131               CALL DIT
007C 14 24            132               CALL DIT
007E 14 24            133               CALL DIT
0080 14 2D            134               CALL DAH
0082 14 3A            135               CALL LETSPC     ;4
0084 14 2D            136               CALL DAH
0086 14 24            137               CALL DIT
0088 14 24            138               CALL DIT
008A 14 3A            139               CALL LETSPC     ;L
008C 14 2D            140               CALL DAH
008E 14 3A            141               CALL LETSPC     ;T
0090 14 24            142               CALL DIT
0092 14 2D            143               CALL DAH
0094 14 3A            144               CALL LETSPC     ;A
0096 14 2D            145               CALL DAH
0098 14 24            146               CALL DIT
009A 14 24            147               CALL DIT
009C 14 2D            148               CALL DAH
009E 14 24            149               CALL DIT
00A0 14 3A            150               CALL LETSPC     ;/
00A2 14 2D            151               CALL DAH
00A4 14 24            152               CALL DIT
00A6 14 24            153               CALL DIT
00A8 14 24            154               CALL DIT
00AA 14 3A            155               CALL LETSPC     ;B
00AC 14 2D            156               CALL DAH
00AE 14 24            157               CALL DIT
00B0 14 2D            158               CALL DAH
00B2 14 24            159               CALL DIT
00B4 14 3A            160               CALL LETSPC     ;C
00B6 14 2D            161               CALL DAH
00B8 14 24            162               CALL DIT
00BA 14 41            163               CALL WDSPC      ;N
                      164
                      165       ;EM94 SEND THE MESSAGE EM94 SC AR
                      166
00BC 14 24            167       EM94:   CALL DIT
00BE 14 3A            168               CALL LETSPC     ;E
00C0 14 2D            169               CALL DAH
00C2 14 2D            170               CALL DAH
00C4 14 3A            171               CALL LETSPC     ;M
00C6 14 3A            172               CALL LETSPC
00C8 14 2D            173               CALL DAH
00CA 14 2D            174               CALL DAH
00CC 14 2D            175               CALL DAH
00CE 14 2D            176               CALL DAH
00D0 14 24            177               CALL DIT
00D2 14 3A            178               CALL LETSPC     ;9
00D4 14 24            179               CALL DIT
00D6 14 24            180               CALL DIT
00D8 14 24            181               CALL DIT
00DA 14 24            182               CALL DIT
00DC 14 2D            183               CALL DAH
00DE 14 3A            184               CALL LETSPC     ;4
                      185
00E0 14 41            186               CALL WDSPC      ;4
00E2 14 24            187       SC:     CALL DIT
00E4 14 24            188               CALL DIT
00E6 14 24            189               CALL DIT
00E8 14 3A            190               CALL LETSPC     ;S
00EA 14 2D            191               CALL DAH
00EC 14 24            192               CALL DIT
00EE 14 2D            193               CALL DAH
00F0 14 24            194               CALL DIT
00F2 14 41            195               CALL WDSPC      ;C
00F4 14 24            196       AR:     CALL DIT
00F6 14 2D            197               CALL DAH
00F8 14 24            198               CALL DIT
00FA 14 2D            199               CALL DAH
00FC 14 24            200               CALL DIT
00FE 83               201               RET
                      202
                      203
                      204
                      205               END
```

Listing I– This core program is the code used for a simple repeating beacon.

To use the IDer as a beacon, set the unit to "loop" to run a continuous message. The keyer is connected to the beacon transmitter, and repeats the message as long as power is supplied. If you use an older vacuum tube transmitter, use a high-voltage output transistor in place of the 2N2222A at Q2. An ECG 287 will work well up to several hundred volts. The 1988 edition of *The ARRL Handbook* has several articles on keying unusual transmitters with open collector outputs (see "CW on a Chip," Chapter 29, fig. 3). A quick look at the handbook should answer any questions you may have on interfacing an older tube-type transmitter.

If you intend to use the key as a repeater IDer or for some other "one-shot" message, you can use the reset input to initiate the message. The software is written to send the message once and stop. Resetting the processor restarts the software, sending the message once again. To use the reset input, ground the reset terminal. The keyer will reset and begin running when the reset terminal is released from ground. You can also write a simple timer to generate a repeater ID clock by looping with the timing routine in the software, but that's beyond the scope of this article.

This keyer is compact, inexpensive, and versatile. It's actually a small computer and can be programmed for many uses. If you are not into programming assembly language, a programming service and parts kit are available. If you like to tinker, the 8748 is available with 25 more I/O points and a built-in timer and interrupt port. You can build the entire keyer for less than $34—including the price of a programmed 8748 and an etched and drilled PC board. I plan to use one of the prototype units in conjunction with a homebrew, 1 watt FM transmitter as a "Fox transmitter." The entire unit, including a rechargeable nickel-cadmium battery pack, will fit into a small die-cast aluminum box.

So, the next time you need an automatic Morse code generator, use a computer. It's cheaper, more versatile, and "high tech."

Notes

The 8748 microcontroller is available (as are most parts used in this article) from Jameco Electronics, 1355 Shoreway Road, Belmont, CA 94002 (415-592-8097); and JDR Microdevices, 110 Knowles Drive, Los Gatos, CA 95030 (800-538-5000).

A complete kit of parts, including an etched and drilled circuit board, but excluding the programmed 8748, is available from the author for $15.95 (including shipping and handling). The author will also provide the 8748, custom programmed for ID or beacon use, for $19.

There's more to creating a new amateur than just passing out license manuals or mentioning a course. An old friend, VY2CM, shows us (and teaches us) how it ideally can be done as he did it. VY2DB is a new, young amateur of whom we all can be proud.

Getting Started in Amateur Radio In The 1990s—Part I

BY DANIEL BASILETTI, VY2DB, AND COP MACDONALD*, VY2CM

A few weeks ago I received a phone call from Cop Macdonald concerning an article he wanted to write. My mind immediately leaped to the conclusion that some new technological breakthrough was about to be published from the same man who created SSTV while still in college. However, what Cop had in mind was not exactly advancing the state-of-the-science or the state-of-the-art of amateur radio, but was advancing the state of the scientist to be or the new amateur.

A short digression is in order for those of you who may not be familiar with either Cop or his work. I first met Cop in the early part of 1972, when as WA2FLJ he began his Slow Scan TV column in CQ. To quote his biography in the July 1972 issue: "In 1957, while a student at the University of Kentucky, he became aware that it was technically possible for hams to transmit pictures all over the world with standard HF gear. That year he designed the first amateur slow-scan TV system, and the next year was awarded national first prize by the AIEE (now IEEE) for a paper describing the system. During the next ten years he designed equipment, wrote articles, conducted tests, and fought for an FCC rule change to permit SSTV in the HF bands. In 1968 the efforts of Cop and a handful of other pioneers were rewarded when the FCC changed the rules to permit SSTV in segments of all bands from 3.5 MHz on up."

Over the years Cop's call has changed from WA2FLJ to W1GNQ to W0ORX and now to VY2CM. In more recent years his writing has dealt with the environment and judicious use of our resources. What could be more fitting in context than preserving the amateur radio environment for future generations. The potential is there, as Cop shows, for those who care and want to get involved. —K2EEK

Cop: They say that amateur radio no longer attracts young people. We say, "Phooey!" While the thought of sending Morse code with a hand key no longer thrills the teenage imagination, the thought of extending their own keyboard communications beyond the local BBS to the other side of the world definitely does. All over North America technically aware youngsters are checking into computer bulletin-board systems. These young people are already turned on to computers and computer communication, and if told about *today's* amateur radio and helped to get on the air *with the new modes*, plenty of them would become hams. To make our case, Daniel (age 14) and Cop (age 54) share with you here the tale of our recent experience.

Dan: During the summer of 1989 Cop asked me if I wanted to go to Summerside, Prince Edward Island to meet Burt Amero, an amateur radio operator with a funny other name—VE1AMA. I knew nothing about amateur radio, and Cop explained the basics as he drove. We arrived at Burt's place, exchanged friendly greetings, and walked into a room *filled* with equipment of all sorts. Noisy chatter was coming from one black box, and there were lights, dials, and wires everywhere. We spent the afternoon boggled by what we were experiencing. Among the things that stick out in my mind are on-the-air demonstrations of color slow scan television, packet radio, and, of course, good old voice. Being the happy user of an IBM clone, I was also glad to see that computers could be used on the air.

All good things eventually come to an end. We said our goodbyes, and as I climbed back into Cop's van, Burt said, "Well, Dan, good luck on getting your ticket." It was then I realized that I too could become an amateur radio operator.

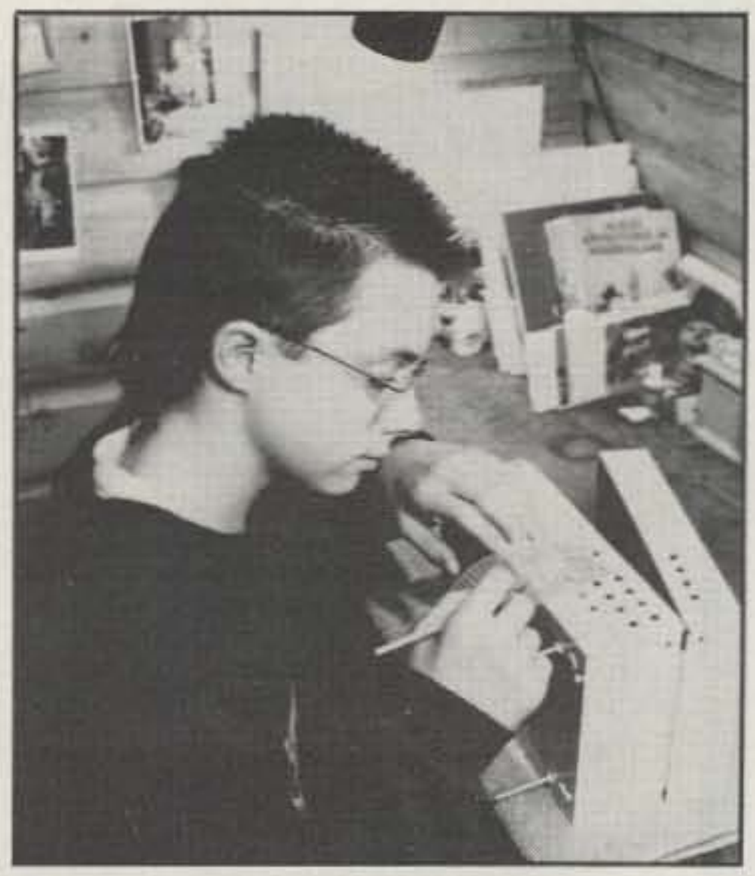
Seeing my beginning interest in all this, Cop offered to loan me his spare rig, a Heathkit HW-8. I was delighted, and listened to what was happening on the air with great interest. Cop also lent me several Morse code practice tapes, which I listened to. I began to learn the international code, but lacked the patience to really buckle down and master it. Cop bought me a code-teaching computer disc, and that helped quite a bit. I soon knew almost all the characters.

I became really serious about getting my ticket when I heard that the Charlottetown amateur radio club was giving a license preparation course two nights a week. It was a bit of trouble to get there. I live a half hour's drive from the college where it was held, but with the help of a fellow junior ham-to-be and his parents, I managed. The course was fun, and after four months I took the 10 word-per-minute code test and passed. Then after another few weeks I felt ready to pass the written part.

It was a Saturday afternoon and I was feeling mighty nervous as I walked into the testing room. All my friends from the course were there, and from the way they were talking, I could tell that they were also nervous. The tests were laid down in front of us and away we went. I zipped through the regulations with the greatest of ease, knowing I had passed that part of the test.

**P.O. Box 2941, Charlottetown, P.E.I., Canada C1A 8C5*

Dan, VY2DB (left), and Cop, VY2CM, in Dan's shack looking more than a little pleased at the success of their project.



Dan applies rear-panel markings to the 4 × 6 file box "chassis" of the transceive unit with rub-on lettering.

"This is easy," I thought, and relaxed until I saw the first question in the theory section. At that moment every single bit of theory slipped from my mind. I did the easiest questions first, and then got into the mind-numbing stuff. I ended up guessing more than I would have liked. Finally, I turned in the paper. Everyone else had already turned in theirs, but only one person had passed. This bit of information did not help my nervousness. The inspector checked my test, and looked up. "I'm afraid your mark is . . . 58%."

I told Cop the bad news, and he had a suggestion. He spoke about his university days, and the way he had studied for big tests. "Write the question on one side of a file card," he said, "and the answer on the other. That way you can't fool yourself into thinking you know the answer when you don't." I took Cop's suggestion and it worked like a charm. I went in again, took the test, and passed . . . with a 96%!

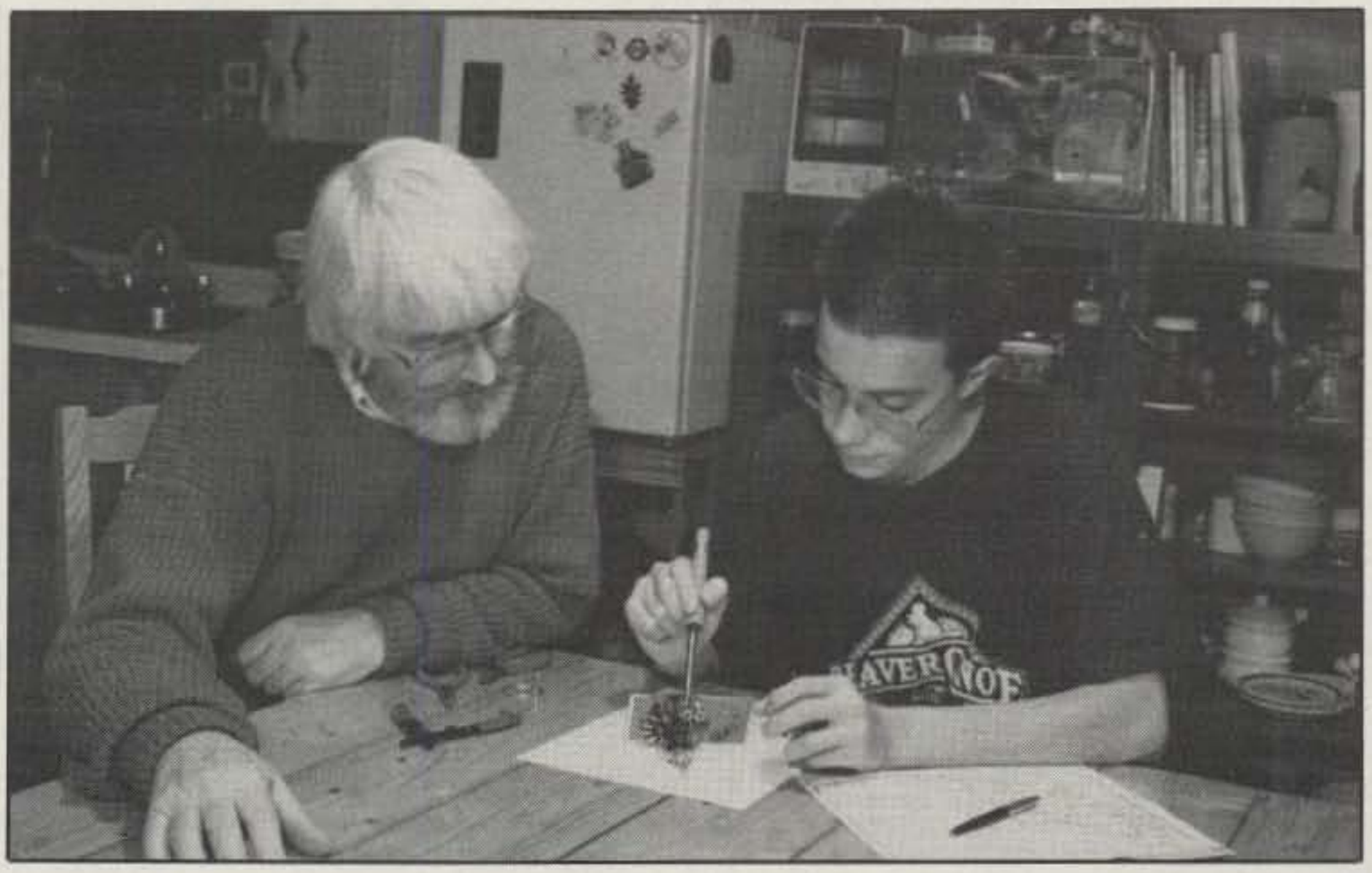
Cop: I had built a 30 watt power amplifier into the HW-8 I loaned Dan, so CW contacts were possible without the QRP frustration that sometimes arises when running only a watt or two.

Dan: It took me a while to get enough courage to actually go on the air, but eventually I did, and my first contact was with W4LRD in Connecticut. I was copying him solidly, and I talked (or rather coded) with him for about 20 minutes. That was the contact that broke the barrier of fright; my next few contacts were a lot easier. All of them were with stations in the United States.

Cop: After those first QSOs I asked Dan about his amateur radio interests. Was he enjoying CW a lot? Did he want to get on voice? No, it was the digital modes that really interested him. Of course! Dan had already been using far more sophisticated communication tools than I could have imagined when I got started in amateur radio. CW and phone were magic for me; keyboard communications were magic for Dan.

I thought about the various pieces of equipment that were tucked away around my place, stuff I had saved because I might want it "some day" but probably never would. I knew that Dan's birthday was coming up, so I got together several kit-built and homebrew things that I thought would be useful to him, and wrote up instructions on how to connect and use them.

Dan is shown here working on the HF crystal oscillator board.



Cop watches while Dan works on the HF crystal oscillator board.

Dan: My birthday came, and with it a spectacular gift from Cop. I received an RTTY/CW keyboard, a modem/interface unit, and a TV that Cop had converted into a monitor. Cop had had all this stuff for quite some time, and it was only new to me, but receiving it was an incredible experience. It was on that day, using the keyboard on CW, that I made my first real DX contact—a station in Chile.

Cop: Dan could now use the keyboard to transmit CW with the souped-up HW-8, but he could only receive RTTY—and not very effectively on the direct conversion receiver of that little rig. His need for appropriate RF gear had not yet been met.

Dan: One day our family visited some friends on the eastern end of Prince Edward Island. They had recently moved to a large farm with lots of old buildings and sheds. After lunch we were given a tour of the whole place. One building at the back of their spread was full of old things left by the person who used to live there. In the attic, an object caught my eye. The front panel had many dials on it, all of them a sort of faded green color and coated with dust. There was no top on this piece of machinery, and I could see lots of metal cylinders and grates, also coated in dust and rust. Nothing struck me as odd about it—I mean everything in this house was old and mysterious. Then I read some small lettering on the front panel. It was hard to see, but after some straining I read the words "Heathkit DX-60B." A real radio transmitter! I picked it up and said, "It's a ham radio!" "You can keep it if you like," said our hosts.

"What are you going to do with it?" asked my parents.

"Oh, I dunno, maybe use it for parts," I replied.

There was also a Hallicrafters tube-type CB, and I was given that, too.

We went home, and I wiped some of the dust off the DX-60B and took off the bottom plate. All the circuitry seemed to be there. I naturally assumed that it wouldn't work, being 30 years old. I plugged it in just to make sure, and as I expected, there was no response. Then I noticed the knob on the front that turned it on. I kicked myself for being so stupid, turned the switch to the right position and plugged it back in. Bingo! The transformer buzzed, the lights lit, and the meter measured.

Cop: When Daniel told me about the DX-60B, I said great, but I wasn't really too excited. I saw it as an old crystal-controlled CW rig—something fun to play with, perhaps, but not a serious part of Dan's equipment solution. My hope was that the upcoming amateur radio flea-market would yield some useful bargain.

Dan: I decided to get a job for the summer, and after some difficulty found one riding around on a bicycle selling ice cream. The purpose of this was to get money for the fleamarket. I looked forward to it all summer, with lots of big hopes. When it finally did come in August, almost all my expectations were fulfilled. There was every type of equipment there, dating from 1930 to the latest technology. Cop and I walked around and around, making small purchases. I had been hoping all this time to find a callbook, and maybe some computer programs. I bought a 1987 *Callbook* set for $4.00, a 1990 P.E.I. callbook for $2.50, a crystal for the DX-60B, and an information sheet on a logging program that hadn't quite come out yet. My only disappointment was not finding a suitable transceiver for sending RTTY.

Cop: My sole fleamarket purchase was a $.50 built-like-a-tank variable capacitor with worm gear drive and shaft coupling attached. I bought it for the coupling, which we needed to fix up the DX-60B.

Our failure to find RF gear at the fleamarket bothered me—perhaps more than Dan. Neither he, his parents, nor I had a kilobuck to put out on a new transceiver. What was the answer? I thought again about the various parts and equipment that I had been squirreling away over the years, and about what Dan now had. The breakthrough came when I began to see the DX-60B not as an obsolete CW transmitter, but as a high-gain all-band RF amplifier capable of handling 90 watts DC input. Perhaps Daniel and I could collaborate on some sort of building project. Perhaps we could bring together some bits and pieces that we each had and turn them into a useful rig.

I saw two options. The simpler option was to build a frequency-shifted VFO to drive the DX-60B (using the newly acquired variable capacitor of course), and to convert my aging SONY ICF-2001 digital receiver into a ham receiver by adding a preselector, a Collins mechanical sideband filter (from my junk box), and a product detector.

The second option was more complex. It involved "linearizing" the DX-60B, and building, to go with it, what amounted to a low-power, all-band, multi-mode transceiver. I had on hand, in addition to that VFO capacitor and 455 kHz mechanical filter, a receiver front-end board from a Heathkit SB-104A. It was a low-noise, wide-dynamic-range unit that used diode mixers. I figured that the VFO could be built in a large mini-box, and I had a steel 4 × 6 file-card box that was just the right size to hold the front-end board in its lid. Its bottom section looked roomy enough to hold all the additional circuitry we'd have to build. Dan even had a push-to-talk mic; it came attached to the Hallicrafters CB unit. Our most expensive purchase would be the ten crystals needed—six for band selection, two for sideband selection, one for CW, and one at 455 kHz. This

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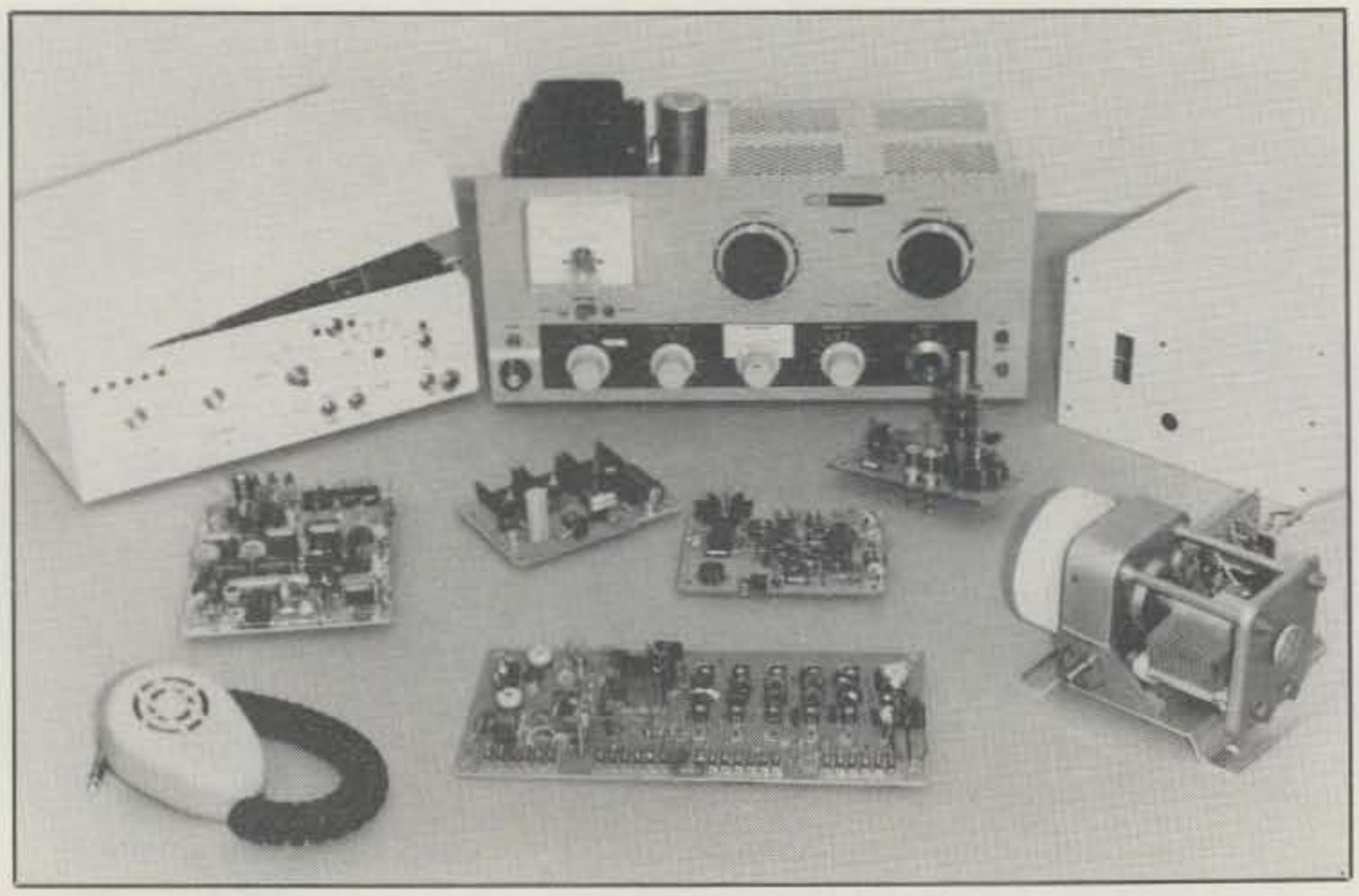

All the bits and pieces gathered together just before final assembly. All five circuit boards go into the file-box case (left); the variable capacitor assembly goes into the VFO case (right). A description of the gear and its construction will appear in Part II.

second approach would be a lot of work, but the finished product would be a respectable rig capable of operating SSB voice as well as the digital modes.

Dan: Cop presented the options, and I chose option two, mainly because with option one the receiver and transmitter would have to be tuned separately. It was then that the next stage of our adventure began.

Cop: We agreed on a schedule and a rough division of labor. It was now September first. We'd give ourselves three months, and try to complete the project by December first. I would do most of the circuit design, Dan would do the design layout of the front and back panels, and we would share the construction work—Dan doing as much of it as he could fit in with jazz band, homework, chores, and the other demands on his time.

Dan: The DX-60B was still not in the best of shape. Cop had looked at it more carefully and figured out that the man who owned it before had half-converted it to a rig for 160 meters only. Thus, we had to cut off some of the coil and add new taps. Also, because this rig used negative "grid block" keying, and because the Morse keyboard could key only positive voltages, we had to install a polarity-flipping interface circuit. All of this was done in an efficient way, with Cop drawing the schematic diagrams and coaching me while I did all the soldering. We also installed an antenna change-over relay at this time. Later, Cop changed the biasing of the final amplifier and driver stages to Class AB, and improved the regulation of the 6146B screen grid supply.

Cop: I felt fairly comfortable as I approached the circuit-design task. I had had good results in the past with LM1496N double-balanced mixers, and chose them for all frequency-conversion tasks except the receiver front end. I had never used the LM373N before, but it sounded too good not to use. In one 14-pin DIP package there were two IF amplifiers (one AGC controlled), an SSB product detector, and the peak detector needed to develop the AGC voltage. I also took a chance on another interesting IC—the LM2931CT voltage regulator. These devices featured adjustable output voltage and would work with a supply voltage just slightly higher than the output voltage. Another feature, important for our purpose, was an on/off terminal that allowed the output voltage to be turned on and off with external logic.

Dan: Another amazing little IC that we used is the LM3914 LED driver, and the logarithmic version of this same chip, the LM3915. We decided that it would be nice to have an LED display that would, on receive, show the strength of incoming signals, sort of like an S-meter. On transmit, the number of lighted LEDs would indicate the relative output of the transceive unit. This would help me avoid overdriving the modified DX-60B when I used SSB.

Cop was doing all the circuit-design work, having the knowledge that he did. I understood a little about how things got put together and how they worked, but now Cop asked me if I'd like to design the LED driver circuit. I said I would. Cop showed me a diagram of the LM3914 and explained how the different parts inside worked. The LM373 was supposed to produce an AGC voltage that varied between a minimum of 3.8 volts and a maximum of 4.1 volts. Cop showed me the LM3914 pins where the maximum and minimum reference voltages had to appear, and the pin to which the AGC voltage was fed. My job was to figure out the values of the resistors in a voltage divider that would produce the 3.8 and 4.1 volt reference voltages.

I brought all this information back to my home and got to work. Knowing you need resistances was one thing; figuring out their values was another. At one point I thought I had figured it all out, but then I realized that I hadn't included the resistance inside the chip. After that had been corrected, Cop suggested that we find resistors having slightly less resistance than the right value, and add 20K trimmer potentiometers in series so we could adjust to the exact resistance.

Cop: In Part II of this article we will discuss some of the devices and circuits that Dan and I just mentioned, as well as other technical aspects of the project that we think other amateurs would find interesting and useful. There seems no point in passing along all the circuitry, however, because no one would ever duplicate what we did exactly. Here, in Part I, we are concentrating on the *process* that Dan and I went through. It's not the technical details that are important here as much as the process of an older ham and a new ham working together to get that new ham going.

Dan: When we were assigning the tasks of this project, Cop asked me if I would like to do the layout for the front panel of the main transceiver unit, since I would be the one using it. I said sure, and shortly afterwards, Cop gave me the file box. I made a 1:1 scale drawing of it on some graph paper. I had to consider many things when thinking about where to place each knob, switch, and LED. There were space limitations inside and outside the case, but everything also had to be arranged so that I could use the unit properly. The switches had to be reachable from my seat at the front of the desk, and so forth. It was almost as though there was a perfect place for each thing, and my job was to find it. When I finished, I showed the design to Cop, expecting some suggestions and criticism, but all I got was a smile and lots of encouragement. He liked the layout!

In the days that followed I helped turn my design into a real cabinet, with real holes where I said they should be, paint on the metal, and lettering on the paint. I learned a lot during this whole process, and will share some of it with you in Part II.

Cop: In addition to circuit designing I also took on the parts-procurement role. We have no source of electronic parts on P.E.I. except Radio Shack, so I ordered the crystals, some ICs and transistors, and a few other parts by mail from suppliers in the U.S. I knew that one key to keep-

ing the project on schedule was my coming up with the next circuit board schematic and Ziplock bag of parts by the time Dan finished the board on which he was currently working.

It was also up to me to give Dan adequate instructions on how to build those boards. Heathkit puts much effort into creating crystal-clear instructions for performing each step in the process of building one of their kits. This was impractical in our case; so was being at Dan's side as he built each board. What I did was to discuss the tricky parts with Dan, make brief notes about some of them on the schematic, and in certain cases mount key parts on the board before I gave it to him. I assumed that the layout would flow organically out from those mounted parts. In all, this system worked pretty well.

Dan: The instructions, schematic diagrams, and parts were easy to understand, although I had never done this sort of building before. This is probably because of Cop's careful preparation and hard work. There were only a few glitches, and even these were easily fixable. Still, with school and everything else in which I was involved, it seemed like the only time I had to work on building the circuit boards was during the weekend—and not all my weekends were free.

Cop: When the first of November arrived, it was clear that we were behind schedule. This was a problem because I was going to be away from the island for half of December and much of the rest of the winter. If Dan was to have his rig before year's end, instead of next April or May, the pace would have to pick up. There wasn't much more that Dan could fit into his busy life, and normally it would have been the same for me. Fortunately for the project (unfortunately for my bank account) there was a lull in my paying work during November, and I had time to build and test the two most densely-packed boards myself.

Dan: The final assembly of the transceive unit began at Cop's place on a Friday. Although each board had already been wired, and many parts had been mounted in those file-box holes, there was still more to be done. Final assembly work is best done when there are two people involved to lessen the chance of mistakes. We had sort of a production line going: Cop got the boards in and the wires ready as I soldered those wires in place and checked them off on the schematic diagram. The last wire was soldered in place the next afternoon, and with great hopes I turned the power switch ON. The lights lit! It worked!

Well, not quite. It went on, yes, but there were a few problems. Cop did some tests and discovered that the unit was acting like it was always in the transmit mode. That was probably one of the lowest moments during the whole project, but it didn't last long. Cop found out that all that was wrong was a shorted wire. I immediately felt enthusiastic again. He fixed that problem, and the sound of ham radio conversations came out of the speaker. All that was needed now was more amplification for the microphone, some adjustments to a few variable resistors, and we would be all set!

Cop: I spent the next couple of days correcting small problems, and ran tests into a dummy load to determine how to set up the DX-60B on each band for most linear operation.

Dan: Tuesday, November 27 was the big day. Cop brought the VFO, the transceive unit, and the DX-60B to my house and quickly got them all set up, thanks to yet another of Cop's schematic diagrams. We turned it on, tuned it up on 20 meters, and I called a CQ on CW. It was like making my first contact all over again.

I only needed to call once; KN4RL in Florida came back. I was a bit rusty at copying by ear, not having made a contact for three months, but together with Cop—who was doing his rusty best—we managed to get it all. The station reported that we had no ripple, drift, or other side effects, and out of the corner of my eye I saw Cop smile.

Cop: Looking back at the project I feel wonderful about it. It was a lot of work, but I got as big a thrill out of Dan's first QSO with the new setup as I did out of my own first QSO almost 40 years ago. The most fun times were when we were working together, but only so much of that was possible. If we had it to do over again, I wouldn't change much.

Dan: For me, the project was definitely a wonderful experience. It was educational, fun, and useful. Cop's planning made it all go smoothly, and that made things more enjoyable, too. The putting together of the boards, the layout of the transceiver, and the relatively low cost made this project one that I'll never forget. I really think that without all this, I might never have bought myself a new rig.

Cop: We older hams tend to bemoan the fact that fewer young people are becoming hams. My experience with Dan made three things clear to me:

1. We older hams need to take the responsibility for introducing young people to amateur radio. It's unrealistic to simply expect them to drop into amateur radio club meetings. We need to take the message to them where *they* hang out—school, the local BBS, the computer club—and tell (or better yet, show) what's going on in the amateur radio of the '90s. Today it is the exotic modes—RTTY, AMTOR, Packet, SSTV, and satellite communications—that have power to stir young imaginations in the same way that CW and AM phone stirred ours. It is these modes that have the appeal needed to bring young blood into our hobby.

2. Clubs need to continue to offer license preparation courses; the courses are vital.

3. Our involvement with would-be amateurs must go beyond just giving a course. Most new amateurs today need a collaborator, helper, friend, mentor, or guide to help them begin hamming in a meaningful way. Things are not as simple as they once were. Of course, something as elaborate as the Dan/Cop project would rarely be called for, but it does indicate the extent of what can be done if a common will exists. Perhaps clubs might start a buddy system. In any event, many new hams—particularly younger ones—would benefit greatly if an experienced ham was there for them in a helpful and ongoing way.

(To Be Continued)

CQ Teenage Hams

Daniel would like to get on the air with other teen amateur radio operators. He has antennas up for 80, 40, 20, 15, and 10 meters and can operate CW, SSB, or RTTY. If enough interest develops, perhaps one-on-one chats could eventually expand into a net. If you'd like to set up an on-air sked with Dan, write or call him: Daniel Basiletti, VY2DB, RR #2, Cornwall, Prince Edward Island, Canada C0A 1H0 (telephone 902-675-3810.

CQ World-Wide WPX SSB Contest All-Time Records

BY STEVE BOLIA, N8BJQ, DIRECTOR, CQ WPX CONTEST

The contest is held each year on the last full weekend of March. The All-Time Records will be updated and published annually. Data following the calls are year of operation, total score, and number of prefix multipliers.

WORLD RECORD HOLDERS

Single Operator

1.8	CG3MFA('85) 319,140	162
3.5	OH1RY/CT3('85) . . . 2,816,754	453
7.0	NP4A('86) 6,668,184	654
14	ZZ5EG('88) 8,219,627	871
21	ZP0Y('90) 12,070,245	955
28	ZX5C('90) 11,919,582	921
AB	P40V('90) 17,440,680	1010
QRP/p	VP2EXX('90) 6,727,444	779

Multi-Operator Single Xmtr.

	ZX5C('89) 22,400,980	1060

Multi-Operator Multi-Xmtr.

	ZZ5EG('87) 38,096,250	1250

U.S.A. RECORD HOLDERS

Single Operator

1.8	K5UR('85) 122,664	228
3.5	KQ2M('85) 1,247,906	433
7.0	KM6B('87) 1,164,800	320
14	K2VV('87) 3,546,294	687
21	AI7B('82) 4,151,232	576
28	WM5G('89) 4,213,127	799
AB	KM1H('89) 6,669,171	817
QRPp	W8ILC('82) 1,044,012	459

Multi-Operator Single Xmtr.

	WC4E('89) 10,748,673	1017

Multi-Operator Multi-Xmtr.

	WZ6Z('89) 18,737,170	1138

CLUB RECORD

North Texas Contest Club('84) 53,012,561

QRPp RECORD

VP2EXX('90) 6,727,444

WPX (Prefix) RECORD

ZZ5EG('87) 1,250

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	OH1RY/CT3('87) 290,140	163
3.5	OH1RY/CT3('85) . . . 2,816,754	453
7.0	OH2KI/CT3('87) 3,729,834	409
14	TU4BR('86) 3,483,480	637
21	TR1G('90) 6,788,925	825
28	CN8CY('82) 2,947,811	487
AB	EA9AM('87) 12,712,460	838

ASIA

1.8	UL7ACI('90) 147,368	109
3.5	UF6VZ('90) 835,584	256
7.0	H24LP('87) 5,348,975	503
14	4X5L('89) 3,564,912	624
21	UA0TO('89) 3,563,520	696
28	JH1AJT('89) 4,848,480	740
AB	JA0JHA('89) 5,830,359	699

EUROPE

1.8	LZ2BE('84) 261,504	144
3.5	4N1A('90) 1,073,520	426
7.0	IO4VEQ('90) 3,878,928	648
14	ID1V('90) 4,729,488	888
21	CQ7A('90) 5,329,680	848
28	9H1EL('89) 5,882,825	787
AB	GB8FX('89) 7,049,694	824

Multi-Operator Single Xmtr.

AF	5H1HK('90) 13,980,480	960
AS	UL8LYA('89) 11,480,422	911
EU	LZ9A('89) 14,399,625	1075
NA	VP2EC('83) 15,238,880	820
OC	KD7P/NH4('85) . . . 10,484,712	568
SA	PJ2FR('87) 18,493,730	907

NORTH AMERICA

1.8	CG3MFA('85) 319,140	162
3.5	VE3BMV('86) 1,928,720	388
7.0	NP4A('86) 6,668,184	654
14	TI2CC('87) 5,491,290	790
21	FG5R('89) 9,936,240	912
28	WM5G('89) 4,213,127	799
AB	KP2A('90) 15,056,886	1014

OCEANIA

1.8	T32AF('83) 16,872	37
3.5	AH6AZ('88) 492,030	231
7.0	T32AF('90) 3,345,864	436
14	KG6DX('90) 4,558,527	733
21	NY6M/KH2('89) 6,122,620	707
28	KB7IJ/KH2('82) 4,743,144	504
AB	KG6DX('89) 7,018,200	700

SOUTH AMERICA

1.8	YV5JEA('84) 40,320	63
3.5	4M3AZC('84) 1,158,132	309
7.0	YV6CAX('86) 2,062,800	382
14	ZZ5EG('88) 8,219,627	871
21	ZP0Y('90) 12,070,245	955
28	ZX5C('90) 11,919,582	921
AB	P40V('90) 17,440,680	1010

Multi-Operator Multi-Xmtr.

AF	S79T('89) 15,479,240	937
AS	JA9YBA('89) 13,579,072	988
EU	YT2R('89) 22,324,200	1160
NA	VP2EC('87) 37,446,109	1147
OC	FK0AW('89) 26,538,972	1002
SA	ZZ5EG('87) 38,096,250	1250

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IF:	561.225, 58.075, 455KHz or 10.7MHz
Increments:	5 to 955KHz selectable/ 5 or 12.5 steps.
Audio:	.4 Watts
Power:	Input 9 - 13.8 V. DC
Antenna:	BNC
Display:	LCD
Dimensions:	6 7/8H x 1 3/4D x 2 1/2W. 12oz wt.

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IF:	21.4MHz, 455KHz
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Extended Warranty. 2/3 yrs.		$65/75
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Specifications:

Coverage:	1 MHz - 1500MHz
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Speed:	38 ch/sec. scan. 38 ch/sec. search
IF:	750.00, 45.0275, 5.5MHz 455KHz
Increments:	5,12,5,25 KHz
Audio:	1.2 Watts at 4 ohms
Power:	Input 13.8 V. DC 300mA
Antenna:	BNC
Display:	LCD, backlighted.
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External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs.		$65/75
Mobile Mounting Bracket.	MM1	$14.90
RS232 Control Package (software & cable) offers spectrum display and database.	SCS3	$295.00

Specifications:

Coverage:	100KHz - 2036MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM/SSB/CW
Speed:	20 ch/sec. scan. 20ch/sec. search
IF:	736.23, (352.23) (198.63) 45.0275, 455KHz
Increments:	50Hz and greater
Selectivity:	2.4Khz/-6db (SSB) 12KHz/-6db (NFM/AM)
Audio:	1.2 Watts at 4 ohms
Power:	Input 13.8 V. DC 500mA
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BILL'S BASICS

BY BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Getting Ready To Operate After 10 Meters Dies

It may be news to some new amateurs, but the 10 meter band does die during a long portion of the 11-year sunspot cycle, and we have almost reached that point. When the 10 meter band dies, the maximum communications range quickly drops down to about 20 miles. If you are among the many Novices and Technicians who spend most of their operating time using SSB/voice in the 28.3 to 28.5 megaHertz subband, you would do well to start preparing for the time when 10 meters is dead. The intelligent switch appears to be a change from the microphone to the telegraph key.

Code Aids Available. If you have neglected code while enjoying your voice privileges, you will need to expend time and effort to again develop enough code proficiency to operate on the air. The amateur radio magazines list an assortment of useful code practice systems. In addition, I have a set of 15 cassettes ($35, total cost) which can be used to take one from no knowledge of the International Morse code to a receiving proficiency of about 13 words per minute, which is the code-speed reception requirement for the General and Advanced licenses. My code training tapes have been used with good results by thousands of ex-students who are now licensed amateurs. If you have not been using your code operating privileges, I advise you to quickly develop sufficient proficiency to participate in Novice code segment operation. All you need is the ability to receive code at about three words per minute, plus the ability to send understandable code at any speed. No one should expect you to start in as an expert, and many of us get a lot of enjoyment from contacts with beginners. I have several reprints of code articles which are available to readers at no cost, other than the cost of a self-addressed, large (at least 10 by 12 inches) envelope and postage. These printed aids include Code (6 pages), Code is Not CW (2 pages), Novice Band Code Nets (2 pages), Telegraph Hill (1 page), Telegraph Symbols Printing System (1 page), The Demise of Marine Radiotelegraphy (1 page), Worldwide Codes (3 pages), and Worldwide Sources of Code Practice (7 pages).

**45527 Third Street East, Lancaster, CA 93535-1802*

This is Bob Nixon, KB6IXQ, of Valencia, California. Bob is one of those operators who spend a lot of time in the Novice bands. He and I search the Novice bands listening for amateurs who obviously need code practice. Bob has worked more than 4300 code contacts. He is always good for a QSO and a QSL.

Operating Aids. Before you try operating the code segments, you should read several articles about correct operating procedures. I have more than 30 such articles available at no charge to readers. If you want a list of these items, send an SASE with your request, using my California address. Operating information is advertised in all amateur radio magazines.

Quick Tips. The following lists of "do's" and "don'ts" are intended to help you avoid the most common mistakes encountered in the Novice bands.

Do's:

•Do use the best station your finances will allow you to assemble.

•Do use as many different antennas and transceivers as possible. This will help you select what you want in your own initial or updated station. It is okay to request the opinions of other amateurs, but nothing beats hands-on evaluations. Select accessories, antennas, and equipment you know are best for your station.

•Do keep CQ calls brief, and listen for answers without being distracted.

•Do use a good (narrow) code filter (250 to 500 Hertz) to minimize interference (QRM and QRN) on adjacent frequencies.

•Do practice your code sending before you go on the air. It is a good idea to tape your sending and listen to it for off-the-air practice.

•Do be willing to chat. Lengthy two-way on-the-air conversations provide inexperienced amateurs with excellent code practice. Exchanging just RST, QTH, and name information does not provide enough practice to enable quick improvement of a new operator's code skills.

•Do work the contests to whatever extent possible. Contests provide maximum good code practice in minimum time. Every Novice and Technician should work the ARRL's Annual Novice Roundup Contest, even if they don't work any other contest during the year.

•Do get an adequate supply of QSL cards (500 to 1000) in your initial order. You will contact amateurs who want a QSL from your state or country. There is nothing wrong with marking a QSL to show a different callsign after you upgrade. I have a 17-page reprint of an article I wrote about QSL cards. A copy of this article is available free to anyone who requests it and sends an SASE (10 by 12 inches) with quadruple first-class postage attached to it.

•Do operate as much as possible until you at least pass the 13 wpm code test.

•Do learn correct use of the RST sys-

These youngsters enjoyed practicing code sending during the 1990 Middletown Grange Fair in suburban Philadelphia (Wrightstown). The Warminster Amateur Radio Club ran a booth to introduce many of the 30,000 fair attendees to amateur radio. Thirty-five of the 200 club members manned the booth, and 316 messages were handled from the station.

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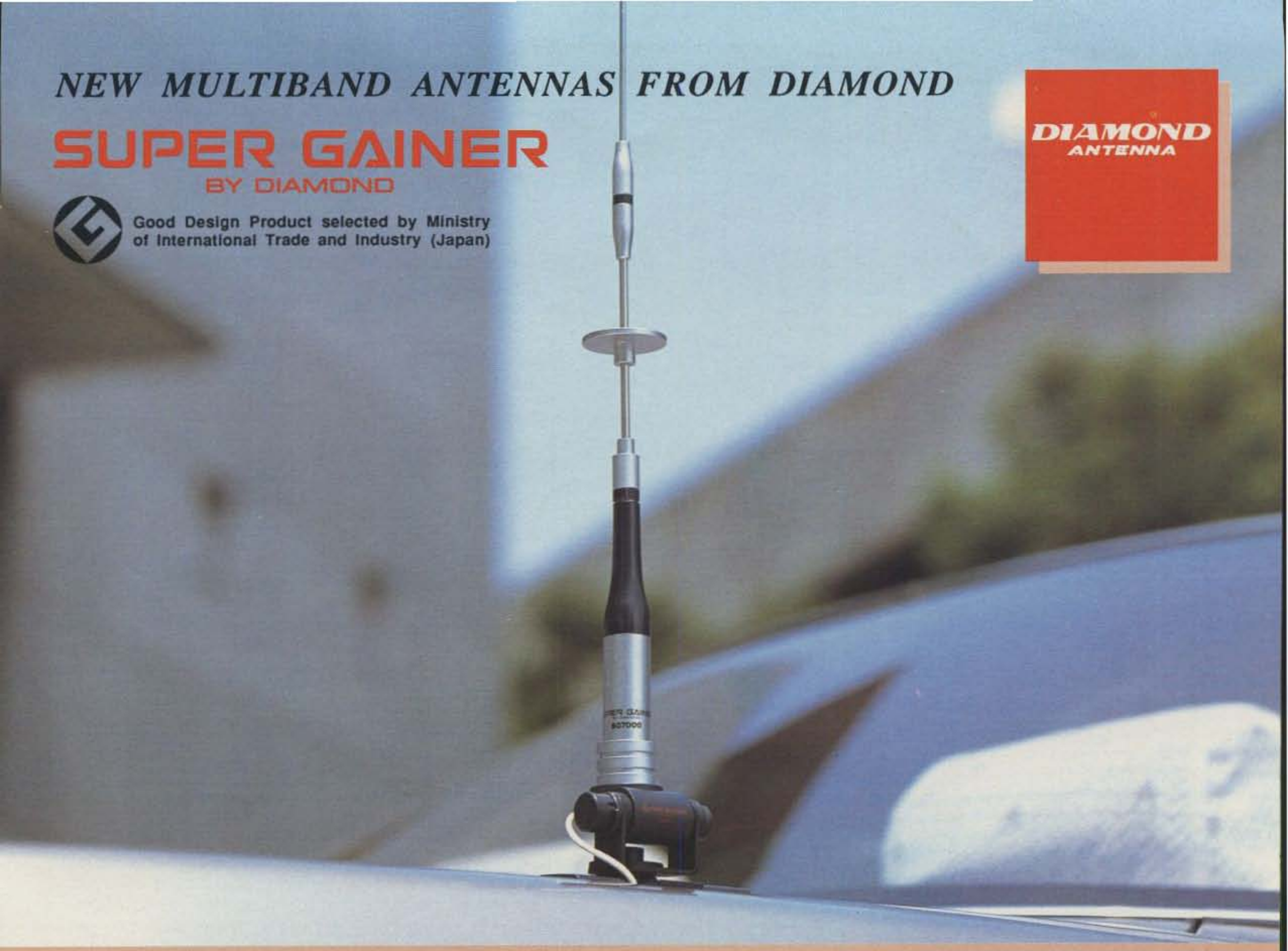

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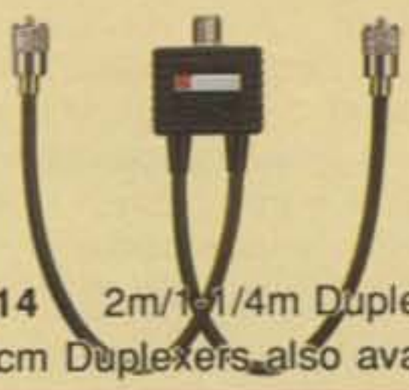

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CIRCLE 166 ON READER SERVICE CARD

These Boy Scouts (and their leaders) of Troop 73 (Springfield, New Jersey) and Troop 94 (Hillside, New Jersey) participated in the 33rd annual Jamboree on the Air. JOTA was held 20–21 October 1990.

tem. Readability, Strength, and Tone are three distinctly different parts of this signal reporting system. If a signal is perfectly readable, it is R-5, regardless of the strength or tone of that signal. The "S" and "T" reports are also separate from the "R" report.

Don'ts:

•Don't forget to zero (or turn off) the RIT/OFFSET control before answering a CQ call. This assures that both stations will be on (or very close to) the same frequency, minimizing the possibility of unintentional interference occurring on a frequency while it is not in use.

•Don't hesitate to ask an operator to QRS (slow down) if her/his sending is too fast for you to copy.

•Don't tune up (or call CQ) on top of a contact already in progress.

•Don't hesitate to give your name (first and last), plus your complete mailing address to any amateur who expresses an interest in sending a QSL to you. Contrary to popular opinion, you do not always have to send a QSL to get one. A QSL is usually far more important to a new amateur than it is to a long licensed one.

•Don't run a preset routine of programmed data. Those of us who spend time in the Novice code segments are usually there to provide new amateurs with code practice; we are not there to exercise your computers.

•Don't waste time telling a DX station that you need her/his card. DX amateurs are in U.S.A. Novice bands to work you and to send cards to you. No matter what is said on the air, your DX card will most likely be routed through the ARRL Incoming DX QSL Bureau. If you work DX, get your self-addressed stamped envelopes into your area's sorting group. You do not have to be an ARRL member to receive DX cards via the Bureau (BURO).

•Don't just listen on the air. If you have a license, operate. Shortwave listening is interesting, but I have never found it to be a true substitute for hamming.

•Don't stay on one band. Operate 10 meters when (if) it is open. When 10 meters fades out, switch to 15 meters. When 15 dies, move to 40 or 80 for your evening and night operation. Each band has advantages and disadvantages.

•Don't be overly concerned with sending errors and/or incorrect spelling. Neither of these things is likely to cause another amateur to leave you. Just keep trying.

•Don't be awed by anyone on the air. Remember that you are an equally important half of each two-way, two-operator contact. Get on the air with confidence!

Conclusion. I hope you start operating the Novice code segments before the 10 meter band cycles out. Many excellent 10 meter Novice band contacts are available to you every day. I operate in the 10 meter Novice segment several times each week. I have more DX sta-

Left to right are 11-year-old Bryn Bitzer, WL7BXQ, 10-year-old Elizabeth Bitzer, WL7BXR, and 11-year-old Sarah Janin, WL7BXS, of Ketchikan, Alaska with their father (Jack Bitzer, NL7SX). They received their Novice licenses during April 1990. Bryn's first contact was with QRP (low power); he worked Gene (AL7KH), in whose shack this picture was taken. The first contact for Elizabeth was with KA5LXA in Baton Rouge, Louisiana. Sarah's first contact was with Trevor, VK4AFL, in Brisbane, Australia.

tions answer my CQ calls than Novices and Technicians. I use a Ten-Tec Omni V Transceiver with a Carolina Windom/2, 40–10 meter antenna. You do not need high power nor a beam to work the world. Many of us work DX regularly with low to medium power and a wire antenna.

Amateur Radio Activities Calendar

John David, KB1T, puts out a 46-page wall calendar that is full of information useful to amateur radio operators. It is 11 by 18 inches and is spiral bound. The 1991 propagation forecast is included, plus an excellent 14-page reference section. Dates and starting times of more than 100 contests and events are listed on the monthly calendar pages, plus milestone events in the history of radio. This sixth edition calendar contains twelve color pictures of top amateurs and DXpedition groups. The cost per calendar is $13.95 to domestic (U.S.A.) addresses, which includes shipping charges. The cost per calendar to DX locations is $16 each, including airmail shipping costs. The address is KB1T Radio Specialties, Box 1015-YC, Amherst, NH 03031.

Ben Orwin, Clint Mundinger, and Brian Harrison (left to right) are members of the Omak Wireless League. I recently enjoyed a nice 15 meter Novice code band contact with Bob Gregory, KD7H, who promotes amateur radio at the Omak Middle School of Omak, Washington. He expected these students to be licensed amateurs by the time this picture appears in CQ. I hope they made it.

Printed Aids

My previous columns contain information that is useful to new and aspiring amateurs. Many of these items have been reprinted for distribution to students of licensing courses I instruct. For ease of use, these printed aids have been separated into six categories. These categories are introduction, code, theory, station, operating, and miscellaneous. Outdated items are continually replaced with newer material. Fifteen dollars brings a complete set of current printed aids, including shipping costs. A list of these printed aids will be sent to anyone who requests it and sends a business size (#10) self-addressed and stamped envelope to my California address. Any single item is available at no charge to anyone who supplies an SASE. It is advisable to supply a large (at least 9 by 12 inch) envelope and to include a couple of extra stamps (loose in your envelope) in case extra postage is required. Some items are long. Licensing-course instructors are welcome to revise and/or duplicate these items to suit their requirements.

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CONTEST CALENDAR

BY JOHN DORR, K1AR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

The Grand 'Ole Contest Clubs

Contest clubs have been with us as long as the sport of contesting itself. They are not only germane to North America, but exist worldwide (e.g., 33 DX contest organizations submitted club scores in the 1989 CQ WW). During my 20-plus years of contesting I have had the pleasure of belonging to some winning groups, including the Potomac Valley Radio Club, Murphy's Marauders, and the Yankee Clipper Contest Club. Each has its own personality and history, and each has stood out as a major contributor to the growth of contesting.

There are literally dozens of contest clubs in existence today. Although their benefits are numerous, in general they provide a focus for our specific amateur interest. Contest clubs also provide a valuable method of attracting new contesters to our membership rolls. And perhaps most notable are the contributions to the hobby as a whole that can come from the collective efforts of a group of highly competitive and technically proficient people.

In reviewing the history of contest organizations, there were two groups that stood out as premier examples of clubs that are rich in tradition and experience—the Frankford and Potomac Valley Radio Clubs. For this reason I chose to focus on their history as an illustration of this month's topic. Not only has contesting changed in recent years, but so have the makeup and style of today's contest club. Admittedly, some feel that contest clubs provide nothing more than an opportunity for an arithmetic exercise as individual contest scores are tallied together. I think after reading the profiles of the FRC and PVRC, however, you will realize how much more the contest club concept can offer.

Calendar of Events

Feb.	23-24	UBA CW Contest
Mar.	2-3	ARRL DX SSB Contest
Mar.	8-10	Japan Int'l CW DX Contest
Mar.	9-10	YL-ISSB SSB QSO Party
Mar.	9-10	Wisconsin QSO Party
Mar.	16-17	Union of Clubs Contest
Mar.	16-17	Bermuda Contest
Mar.	17-18	Virginia QSO Party
Mar.	**30-31**	**CQ WW WPX SSB Contest**
Apr.	6	Worked All Winnepeg Award Day
Apr.	20-21	Alabama-Georgia QSO Party
Apr.	27-28	Swiss Helvetia Contest
May	4-5	MARAC County Hunters CW
May	18-19	Michigan QSO Party
May	**25-26**	**CQ WW WPX CW Contest**
Jun.	8-10	ARRL June VHF QSO Party
Jun.	15-16	All Asian SSB Contest
Jun.	22-23	ARRL Field Day
July	1	Canada Day Contest
July	13-14	IARU Championship Contest

The Frankford Radio Club

The Frankford Radio Club originated at Frankford High School in Philadelphia, Pennsylvania around 1927. Maurice Cox, W3AHB, was largely responsible for the club's inception, with its first president being Lester Biederman, W3AVI. The original organization had only four other members, and as they graduated the club continued, becoming affiliated with the ARRL in 1930. Ian Nutting, W3BVX, became the next president as the club grew beyond its original high-school group. W3BVX was a private investigator who's profession examined the validity of large insurance settlements. With Ian's leverage, the FRC was able to secure a meeting location at an abandoned one room school house. Mysteriously, the school had its flag pole replaced and inside surroundings totally revamped, including a 12 foot square heated room for the shack. At that time the station consisted of a National SW3 receiver and a 50 watt CW transmitter. SWLs were accepted as members but were only allowed to view the amateur station through a plate-glass window!

The club achieved most of its financial needs through prize drawings and donations. In its early years club activities included field trips to radio stations, RCA, AT&T, etc. There was even one meeting at which Nescafe demonstrated their new instant coffee product.

In 1934 the FRC meeting location was taken over by the Works Progress Administration, at which point the club became inactive until 1936. In 1936 the FRC reorganized under the leadership of Gerry Mathias, W3BES (now W3GM), and others. During this period the club held a contest (it just seems to be in their nature to contest) to design a "club QSL" that is still in use by many FRC members to this day. The FRC at this time was mostly a social organization that met at various homes and places of business. Activities during this period included Field Day, Civil Defense, the American Red Cross, traffic handling, and individual participation in the ARRL SS.

The ARRL began awarding gavels in 1936, and the FRC won the first one. They were well on their way to becoming a contest club. The FRC was a "CW FOREVER" organization and paid the price in DX contests, where they placed second in the club standings for several years. In 1938, for example, the only phone entries were W3HFP with 100 points and W3CHH with 6 points.

In June 1939 *QST* reported that club member Jim Hodgman, W3FRY, had been bitten by the contest bug. The club once again reorganized along the lines of a contesting focus, inviting contest operators to be members and eliminating SWL participation. During this period W3FRY was the activities manager, and attendance averaged around 20 members per meeting. By 1941 FRC had already won its fifth Sweepstakes gavel before amateur radio activity was suspended by the events of WW II.

FRC members became heavily engaged in defense projects during the war. For example, many members volunteered to participate as Sky Watch observers to report aircraft sightings to the Army. Another group of FRCers took part in the National Bureau of Standards monitoring system to predict weather. W3FRY and others were instrumental in upgrading the radio communication systems used by the First Fighter Command Unit in the Atlantic Fleet. FRC involvement with wartime communications could fill a book indeed. Sadly, in 1945 W3FRY became a silent key.

After the war the FRC became active again with officers including W3BES, President and W3KT, Activities Manager (remember the manager of the W3 QSL bureau and former ARRL Director?). The ARRL QSL bureau was run by the FRC with cards sorted at W3FUF's hotel. QSL sorting was a social event for the club, with dinner preceding an evening of sorting QSL cards.

In 1948 the FRC initiated a DX spotting network on 53.5 MHz. In addition, the club won its first VHF SS gavel and decided at that point to try to win as many

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- **Microphone:** Backlit DTMF display for night operation.
- **Accessories/Options:** FRC-4 (Pager Unit), DVS-3 (Voice Memory Unit), YSK-1L (6m Trunk Mounting), FTS-22 (CTCSS Decoder), SP-7 (External Speaker).

Specifications:

Frequency Range: FT-5200: 2m, 144–148MHz; 70cm, 430–450MHz and FT-6200: 70cm, 430–450MHz; 23cm, 1240–1300MHz

RF Output Power: 2m, 50/5 W (high/low); 70cm, 35/5 W (high/low); 23cm, 10/1 W (high/low)

Dimensions (WHD): 5⅛ x 1½ x 5¹¹/₁₆ in. (w/o knob)

Weight (approx.): 2 lbs. 3 oz.

(Shown Actual Size)

YAESU

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gavels as possible. During that year FRC won the 14th ARRL DX Contest, which included the first recorded challenge to the illegal use of spotting by single operators. After much debate the FRC prevailed, but it has since become an eery precursor to the extraordinary log-checking efforts in today's competitive contest climate.

In 1950 the first joint PVRC (Potomac Valley Radio Club)/FRC meeting took place, and it was in the '50s that the battle for Sweepstakes gavels ensued with their friends to the south. A definite shift in the operating preferences of FRCers was underway as the PVRC won 8 of 10 SS competitions and the FRC achieved 6 of 10 DX contest victories. During this period K3CY provided access to the Philadelphia College of Pharmacy, where the club still meets. The 1960s produced similar results, although the PVRC began to equal the FRC victories in the ARRL DX contest as the decade faded. Super multi-multi stations were organized by the PVRC and it was at this time that FRC dropped its focus on SS and chose the CQ WW to be its primary competitive target.

By the end of the 1960s the FRC was quite competitive in the DX Contest field. K3BNS (W3BE), John Johnston, who is now Chief of the Personal Radio Branch of the FCC, served as president in 1967 and 1968. In 1969 W3WPG discovered that 90% of the FRC's club score was coming from 10% of its members. A less than popular quota system was tried but was quickly abandoned.

The 1970s provided even higher levels of competition. By now the boundaries of FRC-land had spread. The era of the local Frankford neighborhood club was but a faint memory. Numerous multi-multi stations began to appear, including K3HTZ (K3WW) and W3GPE (W3MM). Although the PVRC first discovered the strategic advantages of DXpeditions in club competitions, the FRC quickly followed their lead and began to organize contest expeditions to bolster their club aggregate.

Success continued to abound in the FRC during the 1980s as nine consecutive victories in the ARRL DX Contest and numerous CQ WW competitions were won. The traditional meeting notice was expanded into the widely read Frankford Radio Club newsletter. Strategic tactics changed once again with single-op/multi-single stations generating the bulk of the club's scores. W3GM, the club's first multi-multi station, still remains, although the bulk of others have faded into more competitive smaller stations.

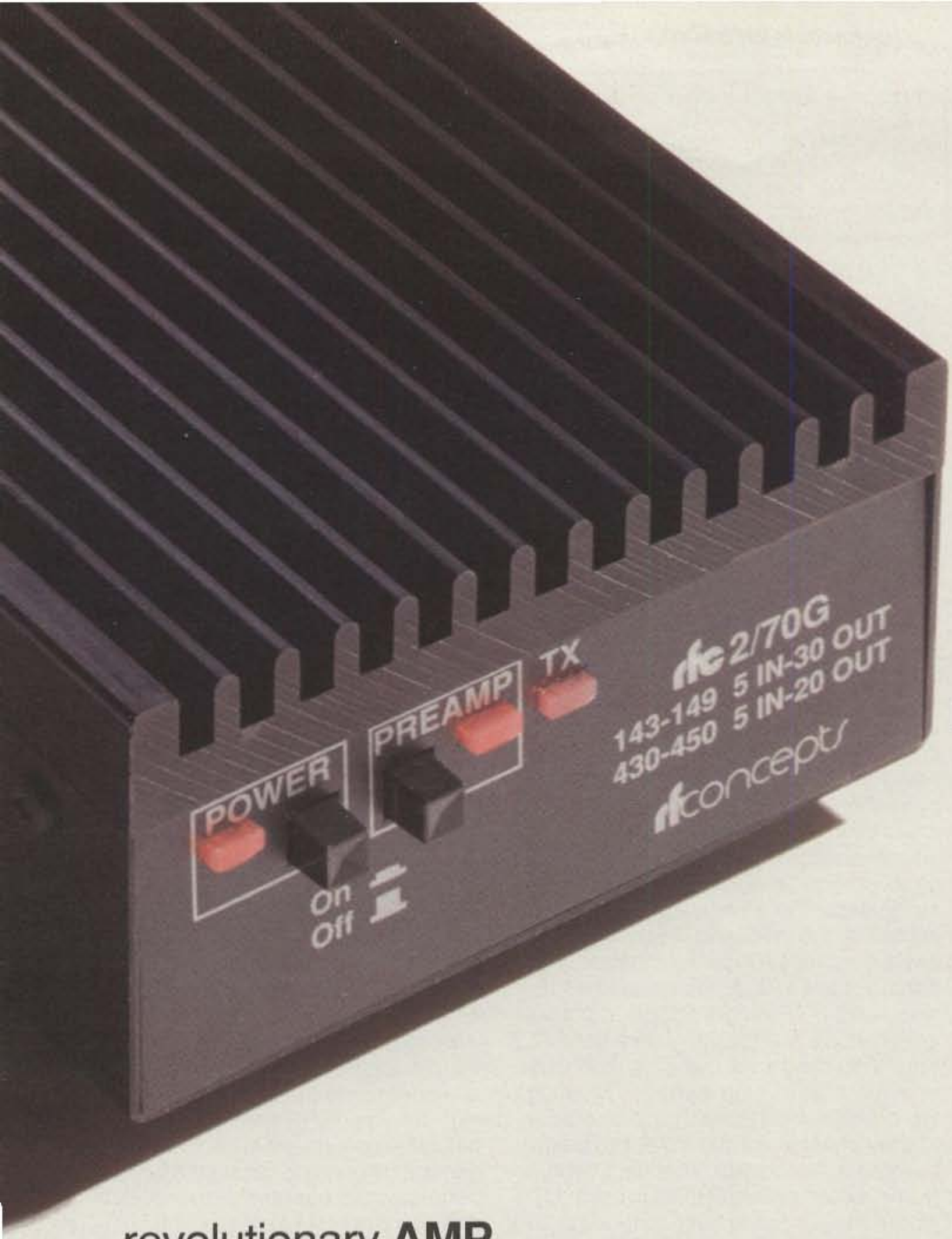
Recent years have brought to the FRC the implementation of packet radio spotting, which now supplements the venerable 2 meter VHF service. With the inception of spotting categories for single operators in the CQ WW and ARRL DX, more and more members are becoming active users of this exciting technology.

The Frankford Radio Club has an impressive and lasting legacy of which its members should be proud. Their club motto is one to which we all can subscribe: "Proficiency Through Competition."

The Potomac Valley Radio Club

The Potomac Valley Radio Club, although emerging nearly two decades after the FRC, is equally rich with tradition and heritage. The concept of a radio club to specialize in contest and operating activities in the Washington, D.C. area was first discussed among amateurs at the Pentagon's Army Signal Center following resumption of amateur radio at the close of the Second World War. This small group of amateurs sought to create a new type of club—one which would be dedicated to excellence in operating technique and winning contests. The evolution of this idea to reality is the saga of the PVRC.

The first organizational meetings were held during the summer of 1947 at the home of W4KFT in the Aurora Hills section of Arlington, Virginia. The original objectives of the club were to promote interest in amateur radio communications and experimentation, the maintenance of fraternalism and high standards of con-



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Band	QSOs	Zones	Countries
40	474	19	35
20	321	20	33
15	435	24	30
10	669	22	50
Total	1899	85	148

Fig. 1- BV/K1RX breakdown CQ WW CW 1990.

duct amongst its members, and to foster the participation in amateur activities. The club was first called the Aurora Hills Radio Club but was quickly changed to the Potomac Valley Radio Club, a name that is known to amateurs around the world today.

The original slate of officers included W4KFT, W4KFC, W3GRF, W4LRI, and KH6DD/4. An intensive membership drive unfolded from this initial core of leadership to obtain members who had an interest in contest operating. With a competitive organization in place, the new PVRC showed its determined spirit by challenging the larger Washington Radio Club in the 1947 ARRL SS. The challenge was accepted, and the PVRC won by over one million points. Under the agreement, the gavel was formally presented by the WRC and is still used at today's meetings. Despite not winning nationally, the PVRC established in its first two years a winning tradition in contest activities for the future. Unlike the FRC, the PVRC has never owned a clubhouse or even held a club callsign. Meetings were initially held in members' homes until they changed to the WAR transmitter building in Alexandria, Virginia. Eventually, the location shifted to its present QTH where meetings are held on the first and third Mondays of each month in addition to special summer gatherings.

Over the years the PVRC has held to a pattern of informal meetings. Meetings tend to focus on the important issues of the day such as equipment, operating, special projects, or visitors from outside the area. A brief scan of old minutes shows DX visitors from over 30 countries! A special PVRC custom has been their involvement with special projects. These have included a Novice night where over 50 Washington area Novices attended a PVRC meeting to learn about contesting. In addition, there have been numerous banquets, joint meetings, and other social affairs. And as you might imagine, the close proximity to Washington, D.C. has afforded numerous opportunities to become involved in legislative matters of interest to contesting.

Today the average PVRC member is neither typical nor contrary to the ordinary amateur. PVRC members range from teenagers to those in their 80s. The majority are married and work for Uncle Sam. All types of occupations exist, ranging from engineers to doctors and military officers. The common element is that each member has an uncommon zeal for competition and strives for bigger and better achievements.

In the early years of the PVRC it was not uncommon to have a completely homebrew station. Today many members still build a good portion of their equipment (e.g., amplifiers, antennas, etc.).

The PVRC story recalls the many individuals who have helped to build the club into what it is today. Over the years the PVRC has accumulated an impressive collection of winning club efforts. As the membership has grown and in some cases moved to new locations, the PVRC continues to renew friendships through the annual Reunion Activity Contest in the spring of every year. This year, in fact, the PVRC celebrates its 44th anniversary. Their enthusiasm and contribution to contesting remains unabated. For the PVRC, amateur radio truly is "The Greatest Hobby in the World!"

Perspective from Taiwan CQ WW CW 1990

By Mark Pride, K1RX

The 1990 CQ WW CW Contest offered me a rare opportunity to combine a Far East business trip with a radio-stopover in Taiwan (BV) as BV/K1RX. Admittedly, there was some preplanning involved, including discussions with operators of previous operations (e.g., I2MQP) and obtaining Tim Chen's (BV2A) telephone number. However, my main concern was simple: Is it possible to obtain the necessary permission to operate? Fortunately, I received a positive response with some restrictions. They included no operating on 160/80 meters, no QSOs with BY or USSR stations, and the requirement to be monitored in-person by another BV-licensee at all times.

After arriving in Taipei on Friday afternoon and spending dinner with my business colleagues, Tim Chen arrived at my hotel to discuss the various operating options. As it turned out, I eventually operated from several BV station locations as the need for a new host operator became necessary. Not surprisingly, this added a new ingredient to my contest strategy.

While operating, I took the time to make several notes to myself which you may find interesting:

1. The biggest signal on 40 meters was N6RO (louder than most JAs!).

2. Observed the 70 foot high tribander at W1PH to be 10 dB louder than W3LPL at one point on 20 meters.

3. The best East Coast signal on 20 meters was K1ST (at the QTH of K1MNS).

4. At 1459Z, 3W4VL was 30 dB over S9 on 40 meters.

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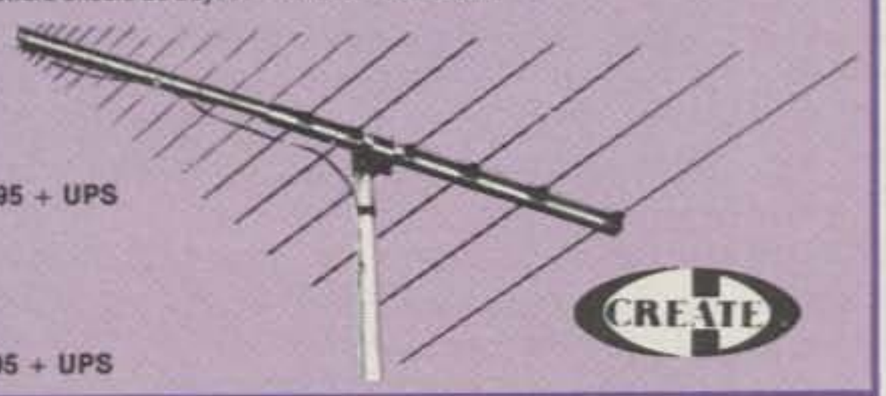

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5. K1ZM was the only signal I heard over the long path on 40 meters.

6. I heard several East Coast signals on 10 meter long path around 1600Z on the first day. None of them answered my call and I never did work Zone 5 on that band.

7. Even though I operated from downtown Taipei, there was virtually no QRN!

8. All of my host monitoring stations admitted that they could not copy my CW speed.

9. BV2VA (William) stayed up all night with me (Saturday) while his XYL spent a quiet birthday at home by herself.

10. Discovered some new contest food—peanut soup (peanuts and sugar water that comes in an easy-to-open can).

11. OH-land is the big signal into Taiwan from Europe on all bands. It's similar to JA for W6 and Europe for W1/2.

12. I had to program a keyer memory with "no-USSR sri," which had to be used once every 5 QSOs or so due to government restrictions. My apologies to USSR amateurs.

13. My work requirements began at 0000Z (Monday 8AM BV time). It was a tough day at work that morning.

14. I began checking the time it took for packet pile-ups to begin once a well-known packet user would spot me on a given band. The average time was 2 minutes and 15 seconds. The most efficient club will remain a secret!

Although I didn't set any new records, my final claimed score was 1899 QSOs, 85 Zones, and 148 Countries for 900K in 35 hours of operating (not including driving time). I want to extend very special thanks to Tim, BV2A, Wu, BV2AP, William, BV2VA, and Tony, BV2TA for their support and tolerance of this "driven" contester. QSLs can be sent via 52 Warner Hill Rd., Derry, NH 03038.

Closing Remarks

This month features one of *CQ*'s finest operating events—the CQ WW SSB WPX Contest. As you may have noticed in recent years, activity has increased substantially, with a growing number of rare countries joining in the fun. I hope to see you in the pile-ups!

Remember, the deadline for the June 1991 contest calendar is April 1st.

73, John, K1AR

Wisconsin QSO Party

1800Z Sun. to 0100Z Mon., March 10–11

This one is a shorty, only 7 hours, and it is again sponsored by the West Allis Radio Amateur Club.

The same station may be worked on each band and mode, and mobiles in each county change. Wisconsin stations may contact other in-state stations for QSO and multiplier credit. Only one transmitter on the air at the same time.

Classes: Single operator and multi-operator and transmitter, both fixed and mobile. And Novice/Tech, both single and multi-operator.

Exchange: QTH only. County for Wisc.; state or province for others.

Scoring: Phone QSOs count 1 point, 2 points if on CW.

Wisc. stations multiply total QSO points by (U.S. states + VE provinces + Wisc. counties) worked for their final score. DX contacts count for QSO points only.

Others use total Wisc. QSO points by the number of Wisc. counties worked (maximum of 72).

Wisc. mobiles can add a bonus of 500 points to their final score for each county outside their own from which they operate (minimum of 15 QSOs from each county).

Frequencies: CW—3550, 3725, 7050, 7125, 14050, 21150. SSB—3890, 7290, 14290, 28400. Other bands may be used.

Awards: To highest scoring single operator in each class in each state and province.

Wisconsin: To 10 top single operator scorers in each class. Highest multi-operator in each class. Highest aggregate club score. Plaque to the highest scoring single operator in the Party.

Logs with more than 100 QSOs must include a separate dupe sheet for each mode with their entry.

Complete rules and entry forms are available from address below. Include a large SASE.

Mailing deadline for logs is April 15th to: West Allis RAC, P.O. Box 1072, Milwaukee, WI 53201.

Bermuda Contest

0001Z Sat. to 2400Z Sun., March 16–17

This is the 33rd year for this popular contest open to amateurs in the United States, Canada, the United Kingdom, West Germany, and Bermuda.

Stations in the U.S. and Canada may work the U.K., Germany, and Bermuda. The U.K. and Germany may work the U.S., Canada, and Bermuda. Activity will be on the 3.5, 7, 14, 21, and 28 MHz bands. Cross-band or cross-mode contacts are not permitted. The same station may be worked on each band, phone and again on CW, providing there is a 60-minute separation between contacts on the same band.

You are limited to 36 hours out of the 48-hour contest period. Off times of no less than three consecutive hours must be clearly indicated on the log. Participation is for single operator stations only and must be from their own residence.

Exchange: RS(T) and QTH. Parish for VP9, state for the U.S., province for Canada, county for the U.K., and DOK number for Germany.

Scoring: Five points for each QSO. Multiply total by number of different VP9 stations worked on all bands. (Note: It's each VP9 station, not each parish.) Counted once per QSO (e.g., QSOs on 20M SSB and CW count as 2 multipliers). VP9 Novices count as double multipliers.

Awards: Certificates to top scoring stations in each U.S. state, VE province, U.K. county, and DL DOK (minimum of 100 QSOs). The overall winner in the US/Canada and UK/Germany will each receive something more substantial—a trophy to be presented at the Society's Annual Dinner in Bermuda in October. Round-trip transportation and hotel accommodations will be provided for the winners. (Note: Winners in '86, '87, '88, '89 and in '90 are not eligible.)

Use a separate log sheet for each band and a dupe sheet for logs with 200 or more contacts. A penalty of three contacts will be deducted for each duplicate contact for which points are claimed. An excessive number of claimed duplicates means disqualification. The usual signed declaration is also required.

Entries must be received no later than June 1st by the Radio Society of Bermuda, Box HM275, Hamilton HM AX, Bermuda. Enclose 4 IRCs for acknowledgments.

Union of Clubs Contest

1600Z Sat. to 1600Z Sun., Mar. 16–17

Sponsored by the Karelian DX Club, Kivach, this is a new contest designed to encourage operation from club stations. Contest operation is permitted on SSB and CW with operating frequencies on 160–10 meters (no WARC bands). Stations worldwide may be only worked once per band.

Classes: Single Operator, All Bands (SSB, CW, SSB/CW); Single Operator, Single Band (SSB/CW); Multi-Operator, Single Transmitter (SSB/CW); Union of Club member stations; QRP; and SWL.

Exchange: RST plus serial number (599001). Additionally, member club stations must include the three-letter designation of their organization. The possible codes are: KDX, AREL, CWAS, QRP, HCC, MDX, EDX, GRU, and UAR.

Scoring: Count 1 point in your own country, 3 points in the same continent, and 5 points in another continent. Contacts with UC club stations are worth twice as many QSO points (e.g., 2, 6, 10 points, respectively). In addition, multiply credited QSOs points on 1.8 and 3.5 MHz by 2. Final score is total QSO points times the sum of DXCC countries worked per band.

An impressive list of awards is available to the top winners in each category.

Entries are to be postmarked no later than April 16, 1991 and should be sent to: Dimo V. Frolov, UA1NDY, P.O. Box, Petrozavodsk-14, 185014, Karelia, USSR. Include 2 IRCs or $1 for final results.

BARTG Spring RTTY Contest

0200Z Sat. to 0200Z Mon., March 16–18

This contest is sponsored by the British Amateur Radio Teleprinter Group and is being administrated by Peter Adams, G6LZB. The contest is open to all amateurs in three classes—single operator, multi-operator, and SWL.

Activity will be on all bands 3.5–28 MHz, but no 10 MHz. Operation is limited to 30 hours out of the 48-hour contest period. The 18 hours off may be taken at any time, but not less than 3-hour periods.

Exchange: RST plus a three-figure contact number and time in GMT (full four figures).

Points: Contacts with stations within own country 2 points. With stations in other countries 10 points. And a bonus of 200 points for each country worked on each band including your own. The same station may be worked on each band for QSO and multiplier credit.

Multiplier: Total number of countries worked on each band and number of continents worked (continents are counted once only). W/K, VE/VO, and VK call areas will be counted as separate multipliers.

Final Score: (a) Total QSO points × country multiplier. (b) Country multiplier × bonus points × continents worked. Add sum of (a) and (b) for your final score.

Shortwave listeners must show call of station being heard, report of message being sent, and call of station being worked.

Awards: Certificates to the top-scoring stations in each class and to the continental leaders. Also in each W/K, VE/VO, and VK call area.

Use a separate log sheet for each band and a summary sheet showing the scoring, etc. Log forms are available from G6LZB; include 6 IRCs to cover postage.

Logs must be received by May 27th and go to: Peter Adams, G6LZB, 464 Whippendell Road, Watford, Herts. England WD1 7PT.

Virginia QSO Party

1800Z Sat. to 0200Z Mon., March 17–18

This is the 16th year the Sterling Park ARC has sponsored this party. The same station may be worked on each band and each mode for QSO credit. VA stations may work other in-state stations for QSO and multiplier credit. And VA mobiles in each county change.

Exchange: QSO number starting with 001 and QTH. County for VA; state, province, or DX country for others.

Scoring: One point for each contact.

VA stations multiply total QSO points by sum of US states, VE provinces, DX countries, and VA counties.

Others multiply total VA QSO points by the number of VA counties worked (maximum of 95).

Mobiles receive special 100 bonus points for each different VA county.

Frequencies: CW—40 kHz up from low end of 10, 15, 20, 40, and 80 meter bands. SSB—3930, 7230, 14285, 21375, 28375, 28575. Also Novice bands, and both modes on 160.

Awards: Certificates to top scorers in each state, province, DX country, and VA county. There are five plaques as follows: top VA multi-mode, VA CW only, VA mobile, VA Novice/Tech, and top out-of-state station.

Logs: Indicate each new multiplier in a separate column as it is worked. Include a summary sheet showing the scoring and other pertinent information.

Mailing deadline for all entries is April 25th to: Virginia QSO Party, c/o Forrest B. Snyder, Jr., N4UTY, 805 S. Hoga St., Sterling, VA 22170.

CQ World-Wide WPX Contest

SSB: March 30–31 CW: May 25–26
Starts: 0000Z Sat. Ends: 2400Z Sun.

Complete rules were published in the January issue. Following are a few points to keep in mind.

Only 30 hours out of the 48-hour contest period may be used by single operator stations. Off times can be taken in up to five periods, but off periods must be a minimum of 60 minutes in length. Multi stations can operate the full 48 hours.

The definition of the prefix multiplier is spelled out in detail and is now also being used for the *CQ* WPX Award program.

A prefix is the letter/number combination which forms the first part of a call.

The multiplier is determined by the number of different prefixes worked and is counted *once* only, regardless of how many times it is worked on other bands.

Another point to keep in mind is that in the multi-operator, single transmitter category only one transmitter and only one band may be used during the same 10-minute period. Picking up a new multiplier on another band during the same time period is prohibited.

An alphabetical/numerical check list of claimed prefixes is a requirement and must be included with your log. Note that contest logs may be submitted on disk (MS-DOS compatible) in standard ASCII or .bin, .res, .dfb, .wks formats.

An updated trophy and plaque awards list now shows over 40 awards. Be sure to check the awards that are available.

Deadline for submitting your SSB entry is May 10th, and July 10th for the CW section. Be sure to indicate SSB or CW on the envelope.

All logs go to: *CQ* Magazine, WPX Contest, 76 North Broadway, Hicksville, NY 11801 U.S.A.

Questions pertaining to the WPX Contest can be sent to the WPX Contest Director, Steve Bolia, N8BJQ, 4121 Gardenview Dr., Beavercreek, OH 45431 U.S.A. or via packet to the following: N8BJQ @W8BI.OH.USA.NA.

ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

BY KARL T. THURBER, JR., W8FX

More This and That

The last time we got together, we played "catch up" with a variety of topics. Touching on the highlights, we covered a new tower concept from Rotating Tower Systems, took a look at the Hy-Gain DX88 vertical, and discussed the Radio Shack Discone antenna. Turning to software, we reviewed the WA7RAI Antenna Designer and several other new hamshack programs, including the K1VUT 10 Meter Contest Program and the TRS Event Manager. We examined the popular graphics screen capture and print utility, Pizazz Plus 2.0. We also told of the many gremlins our electronic and computer equipment lived with when we experienced a close-by lightning strike.

This month we'll keep things in the same vein. Let's start with the "antennas side" of the column.

From the Antenna Notebook

Max-Gain Quagi. Allen Bond, WB4GNT, and Ed Tanton, N4XY, at Max-Gain Systems have been making quite a splash with their high-quality "Black Max" 2 meter, 5-element N6NB-based Quagi, the MAXI-5.

Quagis haven't received quite the recognition they deserve. Nonetheless, they are popular at higher VHF and UHF frequencies, especially since Yagis using dipole-driven elements become increasingly difficult to feed. On the other hand, Quad loops are not as convenient to assemble and tune as are straight elements. The N6NB-style Quagi makes use of a full-wave, loop driven element and reflector, and straight rod directors.

Quagi aficionados consider that this hybrid design combines the best features of the Quad and the Yagi to obtain outstanding performance. Quagi proponents suggest that the Quagi uses Yagi-type directors to yield somewhat more gain per director than Quad directors, and that they're desirable because of their lighter weight and lesser wind load. However, the Quagi uses a Quad-type driven element and reflector because of the reportedly superior front-to-side and front-to-back ratios over the straight Yagi, better matching and bandwidth characteristics, and lesser sensitivity to the effects of surrounding objects.

The MAXI-5's physical characteristics make it an extremely durable, light weight, low wind load, and low visibility package. The antenna, which is painted flat black for protection against environmental exposure, has an 8 foot noninductive fiberglass boom to prevent the pattern degradation a metal beam could cause. The directors are made of 6061-T6 aluminum alloy, while the spreaders are made of solid, one-piece fiberglass rods with no holes or slots to split or break. The element retaining clips are permanently attached to the spreaders for added strength and ease of assembly.

317 Poplar Drive, Millbrook, AL 36054

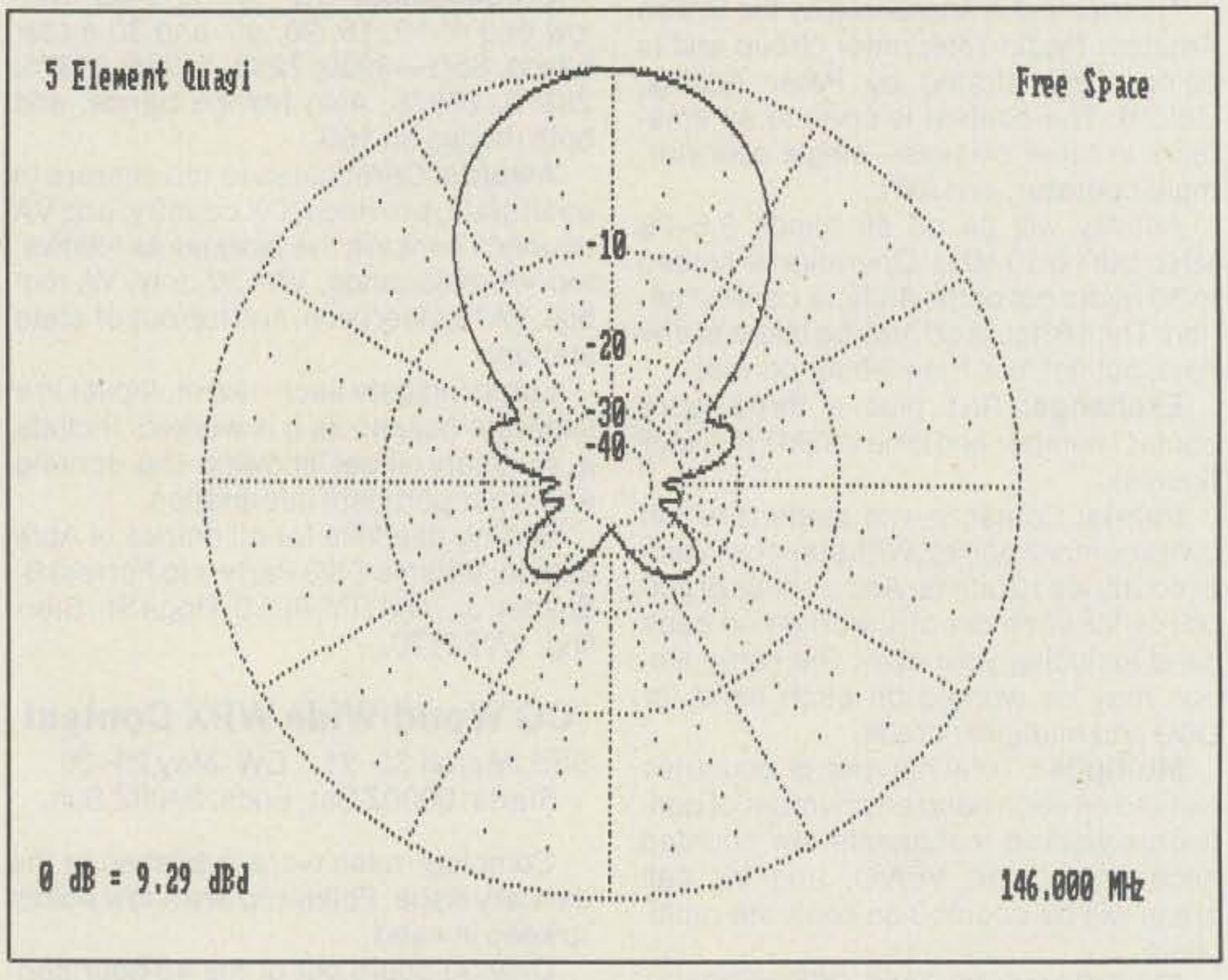


Fig. 1– Shown here is the horizontal antenna pattern for the 5-element Maxi-5 2 meter Quagi offered by Max-Gain Systems. The antenna is based on the N6NB design and boasts "the best of both worlds" in combining the advantages of the Quad and Yagi. Claimed forward gain is 9.29 dBd. (Photo courtesy Max-Gain Systems, Inc.)

The ⅜ inch thick aluminum boom-to-mast plate design allows end mounting of the antenna. End mounting can eliminate or minimize the degrading effects to the antenna pattern that are inherent when the mast intersects the plane of the antenna, as it does in center-mount designs.

The MAXI-5 for 2 meters (Model QG-5-2) is priced at $69.95. By the time this column appears in print, other models for higher bands should be available. For more information contact Max-Gain Systems, Inc., P.O. Box 70816, Marietta, GA 30007-0816.

Fig. 1 shows the MAXI-5's horizontal antenna pattern.

MAX System Antennas. Not to be confused with the Quagi folks at Max-Gain Systems, the Cellular Security Group recently began offering the MAX series of amateur VHF/UHF groundplane verticals.

According to Thomas Bernie, KØTB/1, the firm is primarily a telecommunications consulting firm that has had excellent results in marketing the MAX-800, a specialized 800–900 MHz groundplane designed especially for scanner monitoring of the 800–900 MHz range. The MAX-800 was favorably reviewed by Tom Kneitel, K2AES, in the September 1990 issue of *CQ*'s sister publication *Popular Communications.*

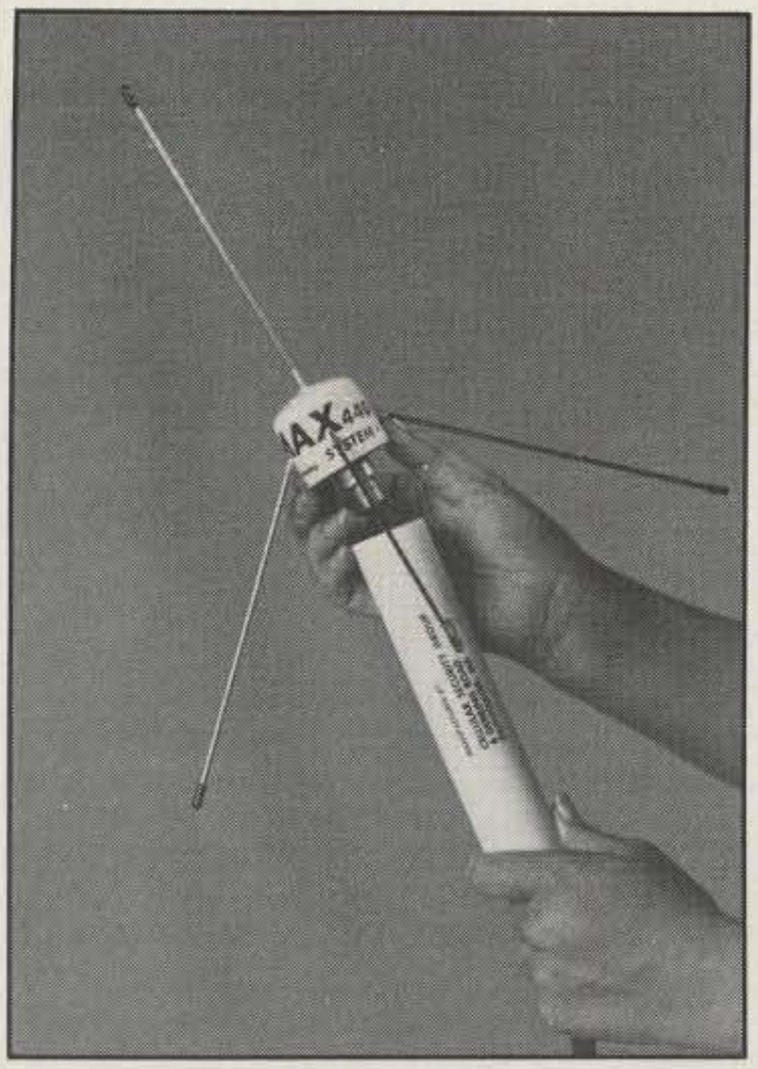
The idea behind the MAX antenna series is to capitalize on the advantages of the groundplane in terms of efficiency, low angle of radiation, good SWR characteristics, and easy 50 ohm feedpoint impedance. However, the groundplane can be a mechanical disaster, since water can get into the feedline, the antenna can be difficult to support, and the elements tend to break off in the wind.

The MAX System antennas are adapted from *Handbook* designs. By soldering stainless steel elements directly to the coaxial connector while inside a precision drilled 1 inch PVC cap, the elements are supported, no additional hardware is required, and the resulting antenna is rugged and weatherproof.

The MAX antenna is available in three amateur models: the MAX 146, MAX 220, and MAX 440. Each antenna is fully assembled and includes a 6 inch mounting mast. Each covers the complete band and handles 1500 watts, making the antennas suitable for repeaters and packet operation. Price is $29.95 each.

For more information contact Cellular Security Group, 4 Gerring Rd., Gloucester, MA 01930.

TENNADYNE Eagle. The Log-Periodic Dipole Array (LPDA) is a very broadband, frequency-independent antenna system. It is usually designed for multiband HF operation (al-



The MAX 440 ground plane is shown here. A spinoff of an 800 MHz application, the sturdy verticals are available in models covering 2 meters, 1¼ meters, and 70 cm. Options include Type N connectors and 38 inch mast sections. (Photo via Cellular Security Group)

though there are LPDAs for VHF and UHF) and consists of a system of driven elements in which not all of the elements are active on a given operating frequency. The result is a characteristically broadband antenna covering a range of frequencies having a ratio of 2 to 1 or more. The good news is that the antenna's gain, feedpoint impedance, F/B ratio, and the like, remain essentially constant over the full operating range. The typical LPDA exhibits an SWR of less than 2:1, with a typical directivity of 9.5 dBi (7.4 dBd), over its operating range.

The LPDA can offer good multiband performance without being costly, unwieldly, or heavy. However, the LPDA can be mechanically difficult to construct, especially due to the phase-shifting feeder system it uses. TENNADYNE is trying to ease the pain with its lightweight EAGLE, which covers all of the amateur bands from 14–30 MHz, including the so-called WARC bands, and all other frequencies included in this range. Consequently, the antenna boasts five-band operation with one feedline and boom, and with no traps, baluns, or tuning.

The EAGLE LPDA uses the dual-boom or through-boom type of feedline which does away with the need to use a balun while avoiding multi-resonant points common in the criss-crossed wire feed system. The antenna is lightweight, checking in at 55 lbs., and uses 6061-T6 aluminum alloy and stainless steel hardware. The wind area is 9 sq. ft. and the wind load at 80 MPH is 144 lbs.; the antenna is designed to handle 100 MPH winds. Claimed gain is 7.9 dBi with a FB ratio of 17 dB minimum. SWR is stated to be 1.6:1 maximum over the operating range.

The EAGLE is priced at $539.95 plus $25 handling and shipping from TENNADYNE, 1361 Kennedy Drive, Denver, CO 80234.

ICE Products. Several months ago I received an interesting illustrated catalog from Tom Carroll, N9AZD, of Industrial Communication Engineers, Ltd. The ICE catalog shows a wide range of low-cost antenna accessory products for amateur, commercial, and government applications.

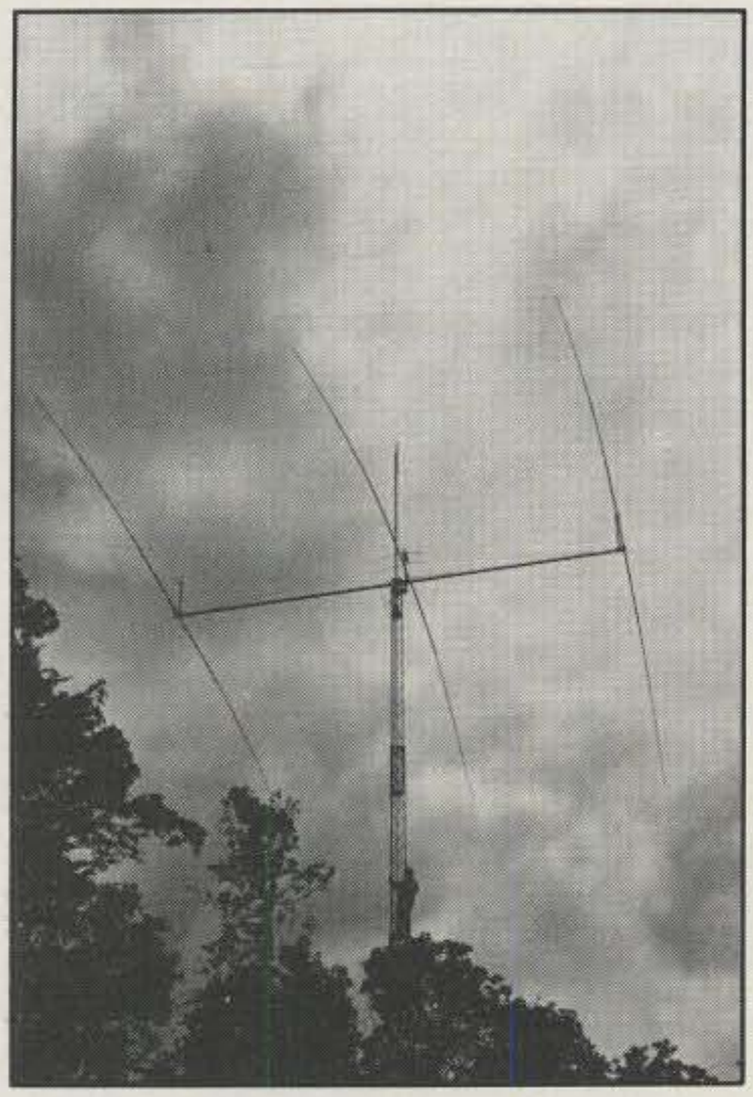
Some of the items ICE markets include low-pass, highpass, bandpass, and telephone interference filters; receiving preamplifiers for 500 kHz to as high as 1300 MHz; receive signal splitters; RF-tight circuit enclosures; coax lightning and EMP suppressors; coaxial cable grounding blocks; ground rod mounting fixtures; tower leg mounting fixture kits; rotor cable transient voltage suppressors; guy wire compression grounding kits; and ready-made coaxial cable assemblies.

Especially interesting to me were the coaxial grounding blocks that provide a direct, low-inductance ground for coaxial line shields without cutting the cable or disturbing the line impedance. Available in several different models to handle most popular cable sizes, including even ½ inch hardline, the units are machined from ½ inch thick extruded aluminum in two bolt-together sections. Installation requires only removal of one inch of the coax line's outer covering, application of a supplied conductive paste compound to the shield and mating surfaces, and placement of the attachment hardware. Also available are frames that mate with popular tower sizes that can handle two to four grounding blocks. The coaxial grounding blocks are priced at $14.95.

For a catalog write to Industrial Communications Engineers, Ltd., P.O. Box 18495, Indianapolis, IN 46218-0495.

US Towers. A new tower catalog from US Towers shows a variety of crank-up tubular towers, self-supporting crank-ups, and a broad range of accessories for both.

One of the firm's mainstays is the MA Series crank-up tubular tower. The tower's slim design offers a flagpole-like appearance while allowing for antennas up to 10 sq. ft. in 50 MPH winds. Towers are available in heights from 40 ft. to 85 ft., ranging in weight from 242 to 1128 lbs. Various accessories are available, including a raising fixture, freestanding bases, coax standoff arms, motor drives, and remote-control devices.



Here's one of the heavy-duty DX Engineering monobanders, a full-size 40DX-3 40 meter Yagi on a 42 ft. boom, as installed at N7AVK's QTH. The antenna has a wind load of 13 sq. ft., and the boom is double-trussed to provide both vertical support and horizontal stability. (Photo via Bill Sattler, NØXX/7)

US Towers also offers three series of self-supporting crank-up towers. The latest design is the compact TMM Series designed especially for amateurs living in restricted areas. TMM Series towers have a minimum retracted height of 11 ft. 4 in. and a maximum height of 47 ft. including mast. At the towers' retracted height, visual impact is reduced to a minimum and antenna servicing is aided. Typically, the tower and antenna are below the roof line of your home when the tower is fully retracted.

The freestanding TX Series is the mid-range product offering high strength using 21 ft. sections with 4 ft. overlaps to help prevent binding while lowering the tower in wind conditions. These towers come complete with rotor plate and base hardware. TX towers are available in maximum heights from 38 ft. to 89 ft.

The HDX Series are heavy-duty crank-up towers with high wind-loading capacity. Their high strength allows for large stacked arrays. HDX towers are available in the same height range as the TX Series, and they come complete with rotor plate, anchor bolts, and heavy-duty base. Various crank-up tower accessories are available, including raising fixtures, remote control, motor drives, service platforms, coaxial arm sets, thrust bearings, and masts.

For a catalog and pricing information contact US Tower Corporation, 8975 West Goshen Avenue, Visalia, CA 93291.

DX Engineering Update. In last July's column we covered some of the high-quality monoband Yagis and accessories offered by Dick Ewing, KO7N, and Bill Sattler, NØXX/7.

In a letter from Bill, he notes that the antenna manufacturing business "is a bit maddening because of all the hype and misrepresentation a few manufacturers put forth, resulting in a general disbelief of anything by those hams who've been around for a while." He and Dick quip that they should set up a 1–900 telephone line for antenna confessionals and gripes! They find that many customers complain on the phone about the bad experiences they have had with several manufacturers' antennas.

Anyway, Bill says that expanding business has warranted broadening the product line to include products at both ends of the spectrum, 40 meters and 6 meters. He notes that he's furnishing a lot of 3-element, full-size 40s, and is amazed at the demand for the antenna. He notes that many amateurs who put up shortened 40s are interested in going with full-size designs for improved performance. The new antenna, he indicates, has at least a 30 dB F/B ratio, 30–35 dB front-to-side ratio, and an "honest" 7 dBd gain.

On 6 meters the 6- and 8-element Yagis are quite popular. The popular 8-element model has a narrow bandwidth of 200–250 kHz, centered on 50.100 MHz, and it offers 12 dB free space gain, which probably translates to 18 dB over real ground at low-wave angles. The increase in activity on 12 and 17 meters has prompted Bill and Dick to add a full line of Yagis for these bands as well.

For a catalog contact DX Engineering, Inc.,

Shown in this photo is DX Engineering's new 6DX-8, an 8-element Yagi on a 2 inch diameter, 36 ft. boom for 6 meters that offers 12 dB free-space gain. We first covered DX Engineering's product line in last July's column; increasing acceptance of the antennas has prompted expansion of the product line to cover both 40 and 6 meters. (Photo via Bill Sattler, NØXX/7)

87296 Chinquapin Loop, Veneta, OR 97487.

New from Van Gorden Engineering. Several months ago Ed Rozic of Van Gorden sent me some samples and literature on his new ribbed Hi-Q antenna end insulators, his firm having recently acquired the patent and mold to manufacture the insulator.

The novel multipurpose insulators are 6⅜ inches in length and 1 inch in diameter, and are sold in pairs. They may be used as guy-wire strain insulators, as antenna end or center insulators, to construct antenna loading coils and traps, and even for building rotary inductors in tank circuits. Ribs are used to increase physical length to create a greater distance to minimize arc-overs, for dispersion of ice or moisture, and to lower wind resistance.

The ribs are constructed in a "spiral unending manner" that permits continuous winding of loading coils or partial winding for tuned traps. Small holes are placed strategically along the longitudinal grooves for "stopping off" traps or loading coils at various lengths. The insulators accommodate a coil length of 102.5 inches with a coil spacing of 6 turns per inch; there are a total of 32 coil winding turns on each insulator.

For more information contact Van Gorden Engineering, P.O. Box 21305, S. Euclid, OH 44121.

Mirage/KLM Catalog. Not long ago I received a new catalog from Mirage/KLM which covers the firm's amplifiers, preamplifiers, and antennas.

Several new antenna products are offered, including broadband 10- and 14-element 6 meter beams that boast high gain and 50 ohm feed using baluns. The new catalog also announces several new preamps for 6 meters through 23 centimeters. Each preamp is available in mast-mount or in-shack models, boasts gain in excess of 20 dB, and has a claimed noise figure of less than 0.6 dB.

The catalog also details Mirage/KLM's line of HF tribanders, monobanders for 80 meters through 1.2 GHz, J-pole verticals, satellite communications antennas, log periodics, HF verticals, commercial antennas, and accessories.

For a free catalog contact Mirage/KLM, P.O. Box 1000, Morgan Hill, CA 95037.

Software News and Views

LOG-EQF Update. We've mentioned Tom Dandrea, N3EQF's LOG-EQF shareware logbook software for the IBM PC twice before in the column, in December 1989 and in March 1990.

Tom told us that mention of the program in the column caused his mailbox to be flooded with requests for the program, as he offered it free for a formatted floppy disk and SASE disk mailer. He notes that although the shareware concept hasn't been particularly rewarding to him from a financial standpoint, it has been technically fulfilling nevertheless. He's received many constructive criticisms and helpful suggestions for program improvement from users and potential users. One of these improvements is the correction of some problems with the radio interface routine in earlier versions.

To recall, LOG-EQF is a full-featured electronic logbook when used as a stand-alone program. If you connect a Kenwood radio and appropriate interface to the computer, the program provides a variety of additional features to further automate logging and control radio functions. Stand-alone features include full-screen entry of logbook information in any order, quick reports of DXCC zone and continent information from callsign prefix, sophisticated search and sorting, QSL label printing, and more. The program also features a contest mode with fast dupe checking and production of dupe sheets.

Tom says he has released copies of the program to various shareware software distributors in hopes of relieving the strain on his overstuffed mailbox. If you can't find LOG-EQF elsewhere, you can still obtain the software free by sending a formatted floppy in an SASE mailer to Thomas Dandrea, N3EQF, 396 Sautter Drive, Coraopolis, PA 15108. The shareware user registration fee is still $10.

Fig. 2 shows the LOG-EQF Main Menu.

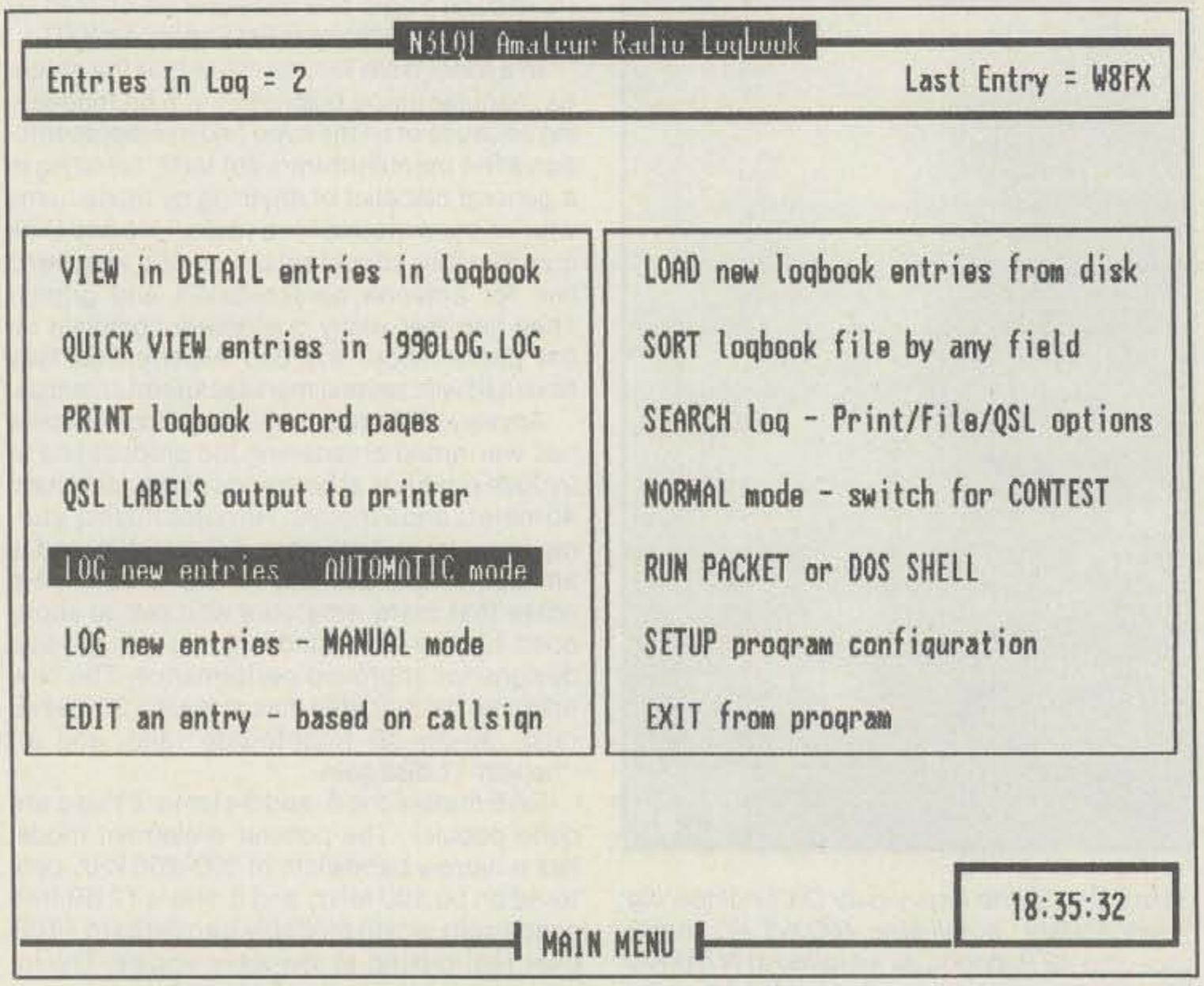


Fig. 2– LOG-EQF amateur radio logbook main menu. Here is the main menu from Tom Dandrea, N3EQF's full-featured logger for the IBM PC. Tom's highly capable logger is a veteran shareware program, now into Version 3. The program registration fee is $10.

KD7P Amateur Radio Logbook Management System. Several months back we received a note from Rod Linkous, W7OM,

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CIRCLE 173 ON READER SERVICE CARD

whose name is familiar to many as a former editor of *CQ*'s DX column. He mentioned a comprehensive and user-friendly IBM PC logging program he personally favors, the KD7P Amateur Radio Logbook Management System offered by Bob Winters, KD7P/KH2. A note to Bob brought a copy of Version 1.5b of the program along with documentation. Shortly thereafter, V1.6 and its docs arrived.

I agree that KD7P's software is a cut above most loggers, having just about everything from real-time contest entry to the tracking five-band awards. A glance at the Main Menu in fig. 3 hints at the considerable range of features offered by the program. These features include real-time logging with instant depiction of DXCC status, country, CQ and ITU zone, continent, long and short paths, and distance, upon callsign entry. You're immediately alerted if you work a new DXCC country, and the real-time logging feature displays the last 14 QSOs in an easy-to-read format. All previous QSOs are displayed when calls are entered.

Other features include DXCC, WAZ, WAS, and oblast award tracking; automatic 10-band DXCC updating; selectable date format; GMT offsets; included conversion programs for several loggers (WB2DND, K8CC, K1EA, KT5X, W2GGE, 2nd Op, and DXLOG); log browsing in chronological or alphanumeric order; five styles of QSL label printing; automatic band and mode tracking; beam and heading update; SWL card update; and a great deal more.

Bob tells us that the program is available to USA amateurs for $35, or for $40 for overseas DXers (U.S. funds only). Documentation is provided on disk but also is available in hardcopy form for $15. Upgrades are $5 and a demo disk is available for $5 ($7 overseas). The software is customized with your callsign and registration number. A 6 meter grid tracking program used in conjunction with the logger also is available for $15.

For more details write to Robert A. Winters, P.O. Box 8265, NCWP, MOU 3 Guam, Dededo, Guam 96912-8265. (Bob is in the Coast Guard and subject to reassignment, so refer to the latest Callbook before sending any orders, or refer to the W6GO/K6HHD QSL Managers List for possible updates.)

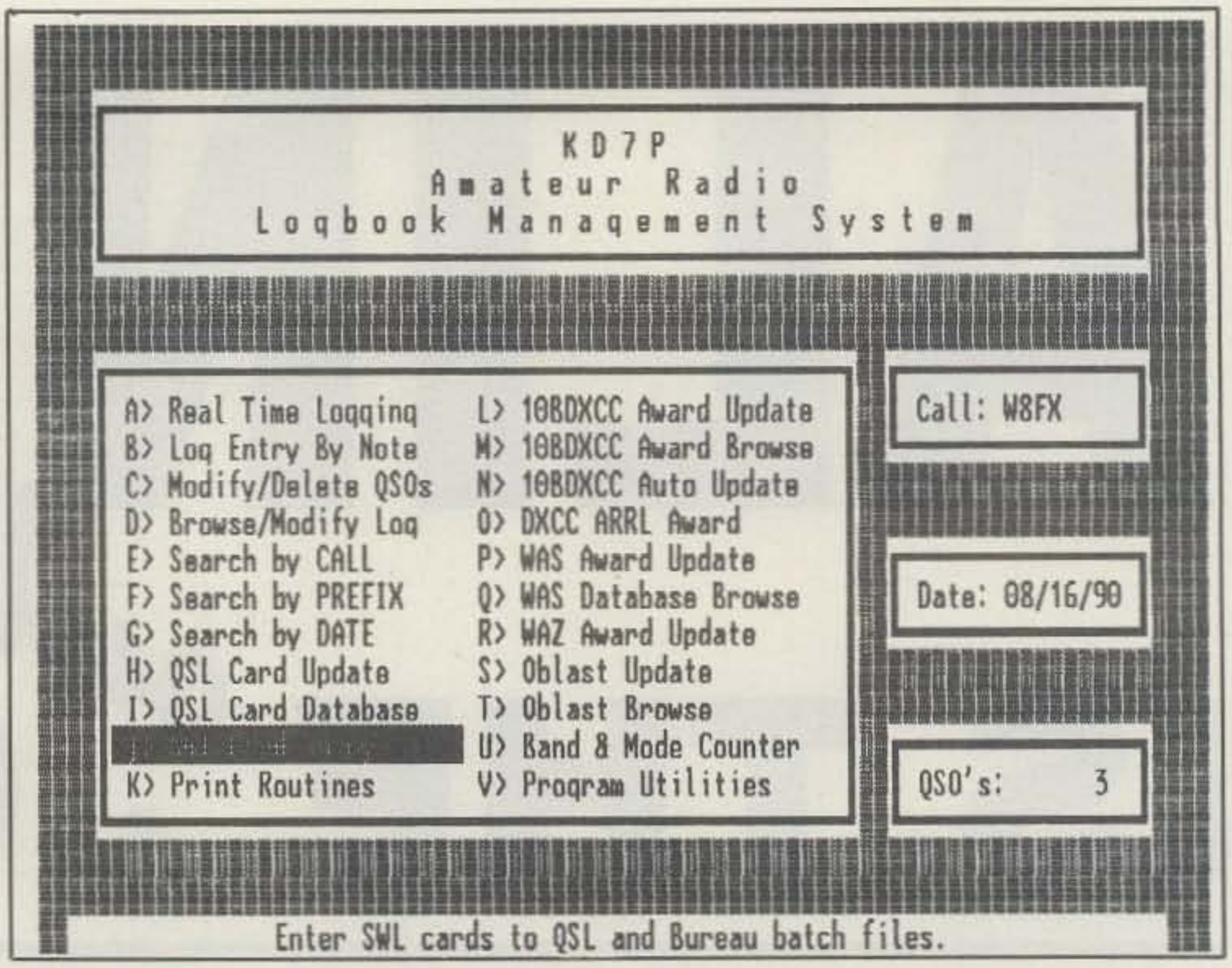


Fig. 3– Bob Winters, KD7P's logger, Version 1.6, is shown here at the Main Menu. This highly professional program features a wealth of DX operator oriented features including real-time logging with instant DXCC status, country, zone, continent, long and short paths, and distance, upon callsign entry. The program also includes conversion utilities for many other popular IBM PC loggers. (Menu selection "J" is shown blacked out on this screen dump; selection "J" is "SWL Card Entry.") As this issue went to press, Bob announced a new version of his logger which includes many new and exciting features. About a dozen changes and enhancements are involved, many of which are associated with the Real Time and Entry by Note modules.

KB0ZP Contest Log. Larry Kebel, KB0ZP, has fielded this specialized contest logger for the IBM PC. According to Larry, the current MS-DOS compatible program was started in 1983 on a Commodore Vic-20, progressed to a PC Junior, and is now programmed on a Leading Edge. The 15 or so contests envisioned by the program include ARRL Field Day, VHF/UHF Spring Sprints, CQ Word-Wide WPX Contest, IARU HF World Championship, ARRL UHF Contest, and ARRL RTTY Roundup. Also covered are the CQ World-Wide RTTY Contest, Sweepstakes, VHF QSO Parties, Novice Roundup, ARRL International DX Contest, and the ARRL 10 and 160 Meter Contests.

The program sports most of the features that serious contesters hold dear, including optional duping with dupe rate shown, on-screen display of section abbreviations, multiplier listings, help screens, automatic RST entry, unlimited band/mode combinations, and a timer alarm. A utilities program is provided to help the contestant edit and print our their log and dupe sheets.

The shareware version of the KB0ZP Contest Log may be ordered from Larry Kebel, P.O. Box 2010E, Sparks, NV 89432. Either enclose $5 or send Larry a disk, mailer, and postage. The registered version costs $25.

FDLog! for the Mac. This month we have a Macintosh contest logger and dupechecker to describe, thanks to Bill Gausman, WW0J. His FDLog! is a stand-alone application, written in Pascal and compiled for fast running. The Mac's graphical user interface is taken advantage of, so the program is said to be as easy to use as is most Mac software. Bill says that while the program was written with Field Day in mind, it works well for many other contests, including CQ WW, CQ WPX, ARRL DX, ARRL 10 and 160 Meters, the Sprints, QSO Parties, and others with a "two-part" exchange. FDLog! also has been used to log special-event station activity.

In addition to handling logging functions, FDLog! has a built-in, on-screen 10-memory keyer to handle many of the CW aspects of the contests. The keyer automatically (but optionally) inserts the other station's callsign and/or serial number into the exchange; a new program version adds the same features in a digitized voice keyer. Other major program features include an on-screen statistics display that depicts QSO rates; virtually unlimited logging of QSOs; fast dupechecking; and printout during and after the contest.

The keyers appear to be unique. The CW keyer memories are shown on the screen for easy reference. There are 10 memories having up to 255 characters each. They are fully editable and are accessible either from the mouse or from the keyboard. Speed is adjustable from roughly 5 to 60 WPM. The voice keyer also has 10 memories. If you have access to an audio digitizer, you can create the memories from your own voice. (Bill suggests that since the audio samples are stored within your program, you can borrow a digitizer for an evening well before the contest, saving the samples to disk. He also points out that information about building a simple and inexpensive radio interface was published in the October 1989 *QST*.)

FDLog! is priced at $49.95, plus $2 shipping. It requires a Mac 512KE and System 6.02 or newer; 1 MB memory is recommended for full voice keyer use. A hard disk is handy but not required. The program is available from System One Control, Inc., 6301 Zane Ave., Brooklyn Park, MN 55429.

PC Librarian Version 2. I believe we've covered enough logging programs so far this month! For a change of pace, let's turn to a commercial "archive management and file utility" program, PC Librarian™, which I had the pleasure to check out in 1989 and report on in the November 1989 column. I also had the opportunity to participate in the beta test of Version 2 of PC Librarian, and recently received the final version we'll discuss here. The new version of PC Librarian has a number of added features, including the ability to rename, copy, delete, and move files; faster file reporting; and the ability to run the program directly or in a batch file from the DOS command line. It is also available in a LAN version.

The program is designed to help you manage the program and file content of your hard disk, which (as most of us know) tends to rapidly fill up to capacity, whatever that may be—whether you have a 10 MB (megabyte) or 120 MB hard disk or something in between. PC Librarian is designed to automatically archive, catalog, and retrieve inactive hard-disk files. It provides an easy-to-use system to "unclutter"

your hard disk by means of an archiving process while maintaining online information about the data you archived.

Different in nature from backup software, you specify which infrequently used files or directories you want to archive to an alternative medium, such as floppies. The program then removes the files you've selected while retaining information about them in a catalog that remains on the hard disk. During retrieval, the files you select are transferred back to the hard disk. This clean and simple procedure is especially attractive if you remove a big, complex set of programs from your hard disk, since you can archive the whole directory in which the program resides. Thus it will stay safely tucked away for future use in its fully installed version. The few seconds it takes to retrieve the archived program is much simpler than completely reinstalling and setting up the program from the original manufacturer's disks.

Before moving the inactive files, the program records important information about them for future referral and retrieval. Once the inactive files are moved, hard-disk space is freed up for new files. To begin the process, the program creates a tree representation of your hard-disk files and directory structure; you can select files for archiving either individually or by using "wildcard" features. You also can attach a 59-character note to each file to identify its contents and search for during retrieval (see fig. 4). This feature, for example, can be useful to properly identify old log files or saved messages that you wish to remove and archive. You can archive the files to floppies, optical or Bernoulli disks, or space on a LAN file server.

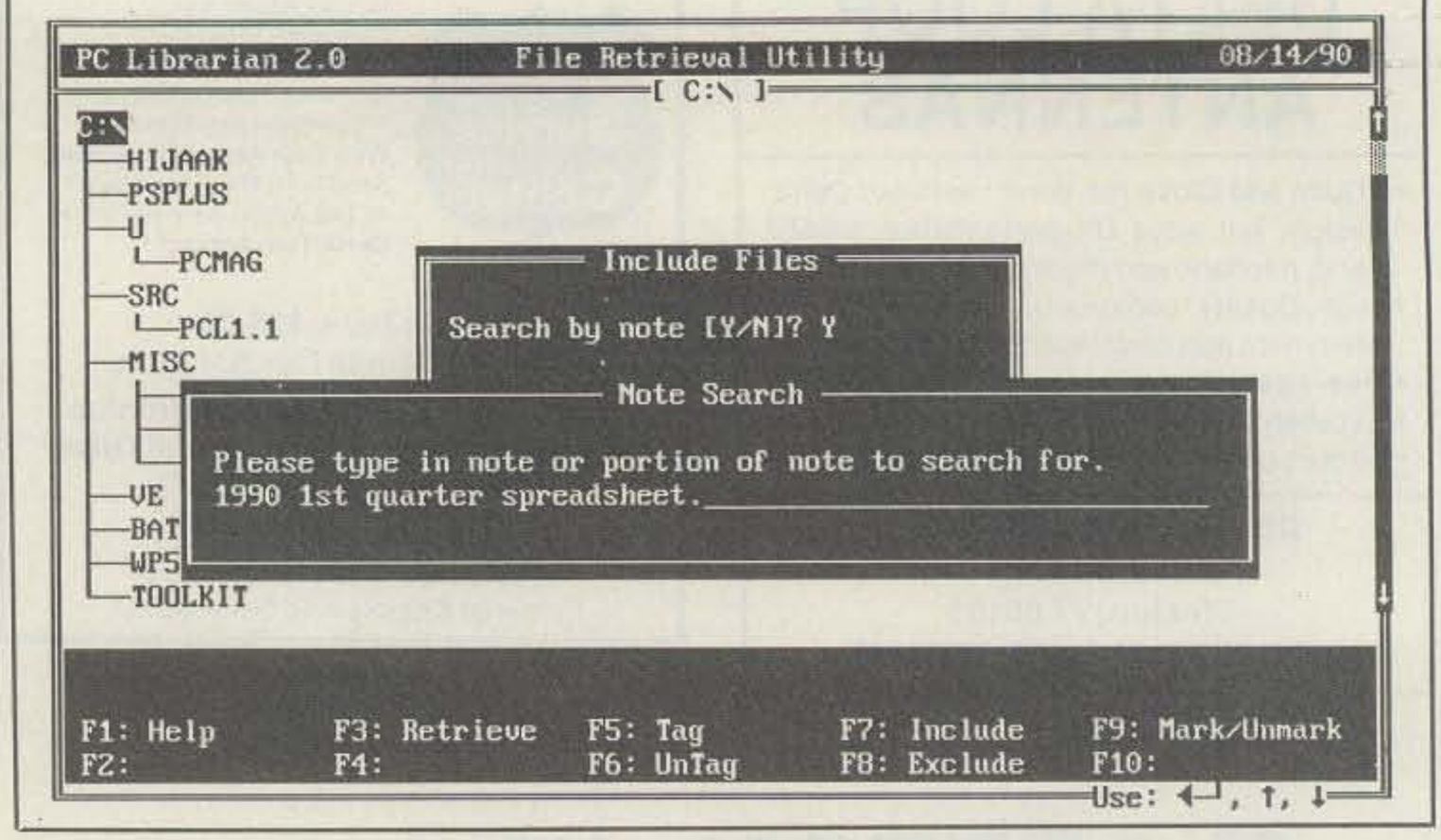
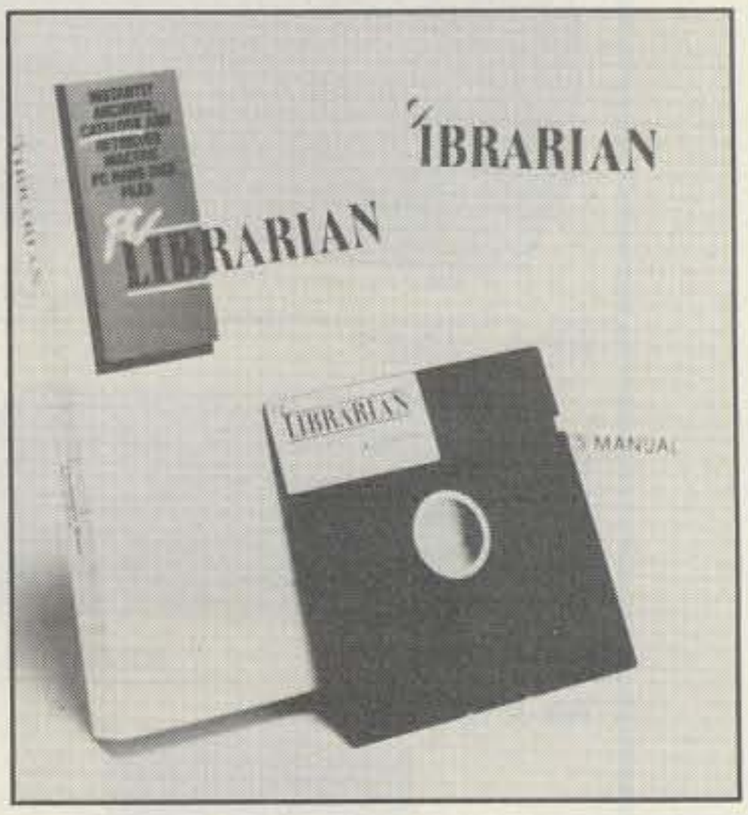


Fig. 4– PC Librarian file retrieval utility function. As shown on this screen, archived files can be searched by notes you optionally attach to them when you remove them from your hard disk and archive them to other media—without knowing the actual eight-character DOS file name. The program offers a variety of sophisticated file and archive management features.

Once you've archived the files, the resident catalog facilitates retrieval. Using the file notes created when files were initially archived, you can search for a file without knowing its true eight-character DOS file name. Once files for retrieval are indicated, the program will restore them into the directory in which they originally resided, or into a new directory if you so choose.

PC Librarian is priced at $69 (a LAN version is $299). For more information contact United Software Security, Inc., 8133 Leesburg Pike, Vienna, VA 22182.

Incidentally, several shareware disk cataloging and file archiving programs, as well as the commercial utility XTreePro Gold™, have the capability to archive or back up files to other media, so you might want to check out some of these programs. However, I'm not aware that any of them offer quite the specialized and sophisticated archiving and file management features that PC Librarian offers.



Turning to commercial software, we find PC-Librarian Version 2 to be an excellent upgrade of the original version we reviewed in the November 1989 column. The program is a "file and archive manager" that removes and archives inactive PC files while retaining on the hard disk a descriptive catalog of the archived files along with their location. (Photo courtesy United Software Security, Inc.)

Short Bursts

Help! We enjoy checking out new hamshack software for the column, and hope that readers will continue to submit their shareware and freeware programs to us for possible mention in the column.

Recently, the volume of amateur radio shareware programs we receive for evaluation has increased to the point where it's difficult to properly handle them all. In the future it will be hard to give the author personal feedback; we'll necessarily limit our feedback to that which we can provide through the published column. In many cases space limitations mean we won't be able to fully evaluate the software. We may have to just briefly alert you to the "high points" of the software.

If you send us software for evaluation, please limit it to an IBM PC compatible version; that's what we're presently set up to handle. Include *complete printed documentation*; please don't expect me print out the documentation. Also include ordering and registration details, price, and other necessary information the reader might need. You'd be surprised at how many disk mailers arrive without so much as a note or letter attached, or even a label on the disk! Naturally, my impression of the software starts when I open it. An unprofessional submission makes me wonder just how serious the author is, and how well the software will work. 'Nuff said.

Wrapping It Up

That's all the space I can wrestle from Alan this month, gang. Next time, more Antennas & Accessories topics of current interest. See you then.

Overheard: In amateur radio as in most other aspects of life, necessity is indeed the mother of invention.

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	IC-A20/U16

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MAXON, MOTOROLA,
YAESU: FTH 2008/7008
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MARINE ICOM: M5, M56, M700
AVIATION ICOM: A20 H.T., TAD

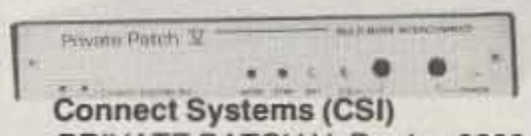
IC-32AT

IC-H16/U16

MOTOROLA RADIUS COMMERCIAL RADIOS

TH-77A

FT-470



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BY CHOD HARRIS, VP2ML

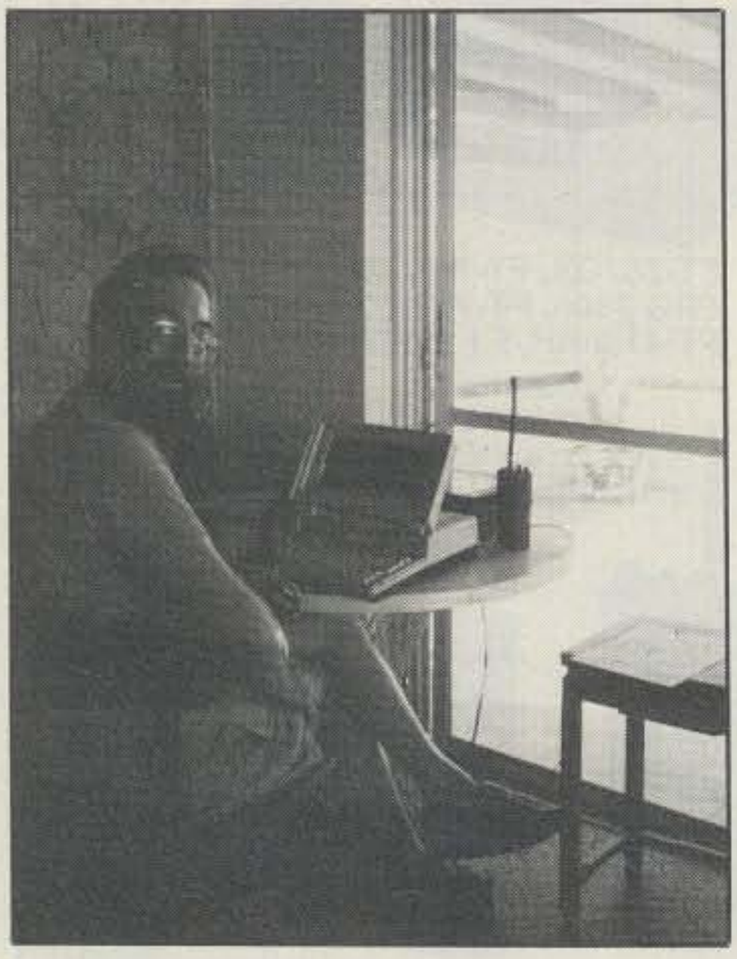
NEWS OF COMMUNICATION AROUND THE WORLD

The Two-Letter Identification

Why two letters? While I was back in my adopted home of Montserrat, I spent most of my radio time in the 10 meter Novice SSB band segment. Besides the usual problems of lack of proper phonetics (or phonetics at all, in some cases), the most disturbing problem noted at that time was the almost universal use of calling with only a part of a callsign. In more that 70% of my contacts, the operator sent only two or three letters of his or her call, not the complete call. Even when I asked specifically for complete calls, I seldom heard such.

Why do beginners send only part of their callsign? It is never to their advantage. They can't possibly have found that this is a useful way to work DX. While in Montserrat, I operated "contest style." This means I worked stations as fast as possible to give as many DXers as possible a chance to get a Montserrat QSL. Thus, I gave only the calling station's callsign and a (often bogus) 59 signal report. Anyone listening could immediately tell that I was not rag-chewing, and I was trying to work as many stations as possible. But that same listener, by sending only a few letters of his or her callsign, would only slow the QSO rate.

Here's why: The DX station must first come back to the partial callsign—"KG, go ahead"—and then come back to the complete callsign, at a loss of a QSO or two. Or I might even give a (bogus) signal report: "KG, you're 59." In either case the calling station must provide a complete callsign and receive an acknowledgement before being certain that he or she was "in the log." "KJ7HKG, QSL, QRZ." The use of a partial callsign forces a double exchange: the DX station acknowledges the partial call and asks for the complete call, or sends a report and hopes that the calling station provides a complete call. The latter arrangement leaves open the possibility that the calling station does not give his or her complete call, or gives it in other than unambiguous phonetics. Under the less-than-ideal conditions of most DX contacts, any of the letters BCDGPTVZ can be difficult to distinguish on SSB. Without proper use of phonetics, a station may not be correctly logged, with subsequent "not in log" response on the QSL request. And in too many instances the calling station would respond with "I QSL. You're also 59." I would try to restrain my sarcasm, as I was now forced to go back to the same station again: "Is that your complete call, KG?"



Your DX Editor, VP2ML, is shown here in Montserrat, logging with the WB2DND computer program.

Is there any advantage in sending only part of your callsign? In my opinion there is none. It can't possibly provide a contact in a marginal situation, and it may increase the chance that your callsign will be improperly logged, and thus that you will not get the desired QSL card.

The practice of sending partial callsigns may be related to the use of SSB DX nets and list operations. Partial calls are the most common way to "get on the list." The list manager asks for the last two letters of the call, and then comes back to each in turn. But the purpose of this practice is to prevent the list manager from knowing your callsign. This is the exact opposite purpose of calling a DX station "freelance." In the DX net or list operation, the list or net manager (if he or she is an honorable individual) will not relay the complete callsign of the calling station to the desired DX station. KA6V might say, "KG, make your call." Joanie is not saying, "7P8QL, do you copy K6KG?" Instead, the DX station must copy some piece of QSO information other than a (usually bogus) signal report. By forcing the DX station to copy the complete callsign of the calling station, something has been exchanged between the two stations—the definition of a valid contact.

But the points of "getting on the list" and making a contact "freelance" are diametrically opposed. In the case of the net, the point is to *conceal* the complete call so that there is a valid exchange of information during the previously arranged, orchestrated contact. In the case of a freelance QSO, the point is an immediate exchange of the vital information—i.e., the callsign.

So why do DXers continue this practice? Possibly they have forgotten two of the most important tenets of learning the DX game. The first is to listen to the DX station and follow any instructions. If the DX station says, "Listening 500–510," or "W4s only," then the DXer will have the best chance of making the desired contact by following these instructions. If a DX station asks for "Complete calls only, please," then responding with a partial callsign significantly reduces the chances of a QSO.

The second important tenet of mastering DX is to observe the techniques of successful DXers. To whom is the DX station coming back, the stations that send partial calls or those which send their complete calls? Listening for successful techniques and then emulating them is one of the most basic skills in DXing.

So the next time you hear VP2ML on the air, send your complete callsign, once only. And use this same technique with *any* other freelance DX station, unless that station specifically requests otherwise. (It is a very rare DX station that actually prefers partial calls.) And spend a moment determining the DX station's style. To whom is he coming back? What kinds of calls are breaking through the pileup? On what frequency is he listening? Once you have this information, making the contact is a simple matter of transmitting on the right frequency, at the right time, with your complete callsign. Good DXing!

P.O. Box 50, Fulton, CA 95439

DX Notes From All Over

The International DX Association (INDEXA) shares DX news and QSL information on 14236 kHz at 2330Z. They don't

The WPX Program

Mixed

1478	N1WR	1481	IK2JEX
1479	AC3D	1482	KA1RIF
1480	NH6T	1483	CE3PG

SSB

2205	EA7GFG	2210	K9IEY
2206	EA3EFF	2211	NH6T
2207	EA3AYK	2212	KC5AC
2208	AA6MR	2213	IK2JEX
2209	W1DOW	2214	IV3JDD

CW

2658	EA7BVQ	2662	IK2JEX
2659	IK2IKT	2663	WT2F
2660	UA0ZC	2664	I8IYW
2661	YU7FW		

Endorsements

Mixed: 450 N1WR, AC3D, IK2JEX. 500 N1WR, 4X4RE, IK2JEX. 550 N1WR, 4X4RE. 600 N1WR, 4X4RE. 650 N1WR, 4X4RE, VE3OMM. 700 4X4RE. 750 4X4RE. 800 4X4RE. 850 4X4RE. 900 4X4RE. 950 4X4RE. 1150 I2EAY. 1350 WB2YQH. 1450 WB4RUA. 1500 WB4RUA. 1550 I2EOW. 1600 I2EOW. 1650 I2EOW. 2500 UA3FT. 2550 I2PJA, UA3FT. 2600 I2PJA, UA3FT.

SSB: 350 EA7GFG, EA3EJI, KD5ZD, JR3TOE, AA6MR, IK2JEX. 400 EA7GFG, EA3EJI, JR3TOE, AA6MR, IK2JEX, DL8AAV. 450 EA7GFG, EA3EJI, JR3TOE, AA6MR, I8KUT. 500 EA7GFG, EA3EJI, JR3TOE, I8KUT. 550 N9ICH, EA7GFG, XE1KH, I8KUT. 600 XE1KH, I8KUT. 650 NE1KH, I8KUT. 700 IK7BDN, XE1KH, I8KUT. 750 KF7RU, IK7BDN, I8KUT, FE6FNA. 800 KF7RU, IK7BDN, I8KUT, FE6FNA. 850 IK7BDN, KF7RU, FE6BNA. 900 KA0ZFX, FE6FNA. 950 NE8Q, FE6FNA. 1000 K3IXD, FE6FNA, K3ZPG. 1050 FE6FNA. 1100 KS3F, FE6FNA. 1150 FE6FNA. 1350 IK5ACO. 1400 IK5ACO. 1450 LU8ESU. 1500 LU8ESU, I2EOW. 1550 LU8ESU. 1650 N7TT. 1700 N7TT. 1750 N7TT. 1850 I2MQP. 1900 I2MQP. 1050 I2MQP, WF4V. 2000 WF4V. 2100 NJ0C. 2550 I2PJA. 2600 I2PJA.

CW: 350 K1TG. 400 WATYU. 450 OK1DCA, FE1MNW, ZS6NT. 500 FD1MNW, W0ULU, I2MQP. 550 JF6TUU, I2MQP. 600 VE3OMM. 700 AH6JF. 800 KT2C, WA2EYE. 850 WA2EYA. 1250 G3VQO. 1350 K2POF. 1400 K2POF. 1500 N7TT. 1550 N7TT. 1600 PA0SNG. 1650 PA0SNG. 1950 N7TT. 2000 N7TT. 2050 N7TT. 2100 N7TT.

10 Meters: KA9MOM
80 Meters: CT4UW

Asia: NH6T
No. Amer.: JE3AVS, NH6T
Europe: JH6WMJ
Oceania: JR3TOE, CT4UW

Award of Excellence Plaque Holders: VK4SS, K6JG, N4MM, I8YRK, W4CRW, SM0AJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA, ON4QX, WA8YTM, YU2DX, OK3EA, I4EAT, OK1MP, N4NO, ZL3GQ, VK9NS, DE0DXM, DK4SY, UR2**, AB9O, FM5WD, I2DMK, W4BQY, I0JX, SM6CST, VE1NG, I1JQJ, WA1JMP, PY2DBU, HI8LC, KA5W, K0JN, W4VQ, KF2O, K3UA, HA8XX, HA8UB, W8CNL, K7LJ, W1JR, F9RM, W5UR, WB8ZRL, SM3EVR, CT1FL, K2SHZ, UP1BZZ, W8RSW, WA4QMQ, EA7OH, K2POF, DJ4XA, IT9TQH, W8ILC, K2POA, N6JV, W2HG, ONL-4003, VE7DP, K9BG, W5AWT, KB0O/G, HB9CSA, F6BVB, W1BWS, YU7SF, G4BUE, N3ED, DF1SD, K7CU, I1POR, LU3YL/W4, NN4Q, KA3A, VED7WJ, YB0TK, VE7WJ, VE7IG, K9QRF, YU2NA, N2AC, W4UW, NX0I, W9NUF, N4NX, SM0DJZ, DK5AD, WB4RUA, DK5AD, WD9IIC, W3ARK, I6DQE, LA7JO.

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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.

Lloyd, W6KG, and Iris, W6QL, Colvin—with Jim Henderson, KF7E, on the right—are usually on the programs of the Visalia International DX Convention and Dayton Hamvention.

accept DX check-ins, nor run list operations for DX stations, but rather provide services for all amateurs. INDEXA also provides monetary and equipment support for many DXpeditions to rare locations. For more information on INDEXA, send a self-addressed, stamped envelope (SASE) to INDEXA at P.O. Box 607, Rock Hill, SC 29731. (Remember the increase in postage rates!)

Jim Dionne, K1MEM, who handles *CQ*'s Worked All Zone (WAZ) Award, reminds DXers that the 5-Band WAZ plaques are *not* numbered. While the first five recipients received their plaques without charge, after those five, all plaques are unnumbered. The recipients are listed in order of plaques issued, and nothing stands in the way of an individual DXer taking the plaque down to a local trophy shop and adding a number. But neither Jim nor *CQ* can do so. Please don't ask.

Also, the WAZ program has been expanded this year. The new All-CW WAZ is now available for contacts made January 1, 1991 or later. This gives DXers a new incentive to work all zones on CW in 1991. Also, WAZ awards are available for the new bands—30, 17, and 12 meters. There are no time restrictions other than the legal use of the band in the given country. This should provide a good incentive for DXpeditioners to include the new bands in their planning. And speaking of awards for the new bands, *The DX Magazine* continues to offer its 30-Meter Century Club certificate. Same rules as DXCC, and same application form, but *no QSLs nor fee*. Send your list of contacts with 100 DXCC countries on 30 meters to *The DX Magazine*, Box 50, Fulton, CA 95439.

Avid award hunters will want a copy of the 1991 edition of Ted Melinosky, K1BV's comprehensive *DX Awards Directory*. The 1991 edition includes rules for 1729 awards from 117 DXCC countries, by far the most complete such directory. The new edition includes information on many USSR awards never before published. Cost in the US and Canada is $17.50 from Ted at 525 Foster Street, Suite 1001, South Windsor, CT 06074. (Connecticut purchasers add 8% sales tax.)

The Irish Radio Transmitters Society (IRTS) is sponsoring a special activity on St. Patrick's Day, March 17. They will try to get as many Ireland counties on the air as possible to help DXers make the contacts necessary for the Worked EI Counties Award, which is sponsored by the IRTS. The award is available to licensed amateurs who have worked EI or EJ stations located in at least 20 of the 26 Irish counties. Endorsements are available for individual band and mode contacts, and for working all 26 counties. The award is also available to SWLs. For more information, send an SASE to Joe Duffin, W2ORA, 4 Central Avenue, Moorestown, NJ 08057.

DX Gatherings

It's not too early to make plans to attend one or more of the many DX gatherings around the world this year. Even beginning DXers can learn a great deal at these events. For more experienced DXers, these activities provide a unique opportunity to meet with both fellow DXers from all over the world, and also with the participants of many of the major and rare DXpeditions of the past year. In addition to the formal programs, forums, and slide shows, the DXer may also have an opportunity to pick up QSL cards from some of the major DXpeditions. Many of these operations are now putting the contact base into a computer program, and when they bring this to the convention, they can confirm some contacts on the spot. Finally, the informal bull sessions, hospitality suites, and casual contacts provide an excellent opportunity for DXers to share their biggest successes, failures, and fish tales from the past year.

To help you plan your 1991 travel, here is some information about the DX gatherings this year.

The International DX Convention is better known as the Visalia convention, from the town in California where it has

The WAZ Program

Single Band WAZ

10 Meter SSB

370 ..... IK0AGU

15 Meter SSB

365 ..... IK0AGU

20 Meter SSB

826 ..... WA5TOS
827 ..... KA9PJZ
828 ..... IK0AGU

20 Meter CW

388 ..... SM4AMJ
389 ..... JF2UPM
390 ..... W0ULU

All Phone

599 ..... IT9CFN

WNZ

1—WNZ 15M CW KA8EBE
34—WNZ 10M SSB KC4ODE

160 Meters

69 ..... N4JJ

All Band WAZ

SSB

3658 ..... WB0UVN
3659 ..... AB4DU
3660 ..... LA2WR
3661 ..... FD1OCN
3662 ..... HK7MQC
3663 ..... KM4RX
3664 ..... IK1HXN
3665 ..... I7IJU
3666 ..... CP5NU
3667 ..... K1NIT
3668 ..... OK2BHM
3669 ..... NK2A
3670 ..... N4JA
3671 ..... WW5L
3672 ..... IK6FHX
3673 ..... IK4FNF
3674 ..... I8KUT
3675 ..... CX7BC
3676 ..... VE7XO

CW/Phone

6910 ..... KB6O
6911 ..... JH3LCU
6912 ..... WX7K
6913 ..... K2QMF
6914 ..... UA0ZC
6915 ..... KI6AN
6916 ..... K1NIT
6917 ..... WA1S
6918 ..... WA1N
6919 ..... IK0EFR
6920 ..... IN3NJB (CW)
6921 ..... DJ6OE (CW)
6922 ..... DL9LBR (CW)
6923 ..... YU7RU
6924 ..... NM4L
6925 ..... ON4AFU (CW)
6926 ..... N0DJJ (CW)
6927 ..... WK0B
6928 ..... HB9CEX (CW)

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (65 cents) size 4½ × 9½ to the WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Rd., Sudbury, MA 01776. 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 *CQ* awards is $4.00 for subscribers and $10 for non-subscribers. Please make all checks payable to the Awards Manager. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application. Send any questions to K1MEM by mail and include an SASE (please do not telephone).

When calling a rare station such as S21U in Bangladesh, always send your complete callsign, never a partial callsign. (JA1AJT photo)

been held for many years. This year the Northern California DX Club has the honor of hosting the event on April 12–14, and they have added a barbecue dinner on Friday night to the usual weekend events. This is the largest DX-only convention anywhere, and it attracts more than 600 dedicated DXers from all corners of the world. Preregistration is US $45 before March 15 ($50 at the door). This includes the Saturday night banquet, Sunday morning brunch, and admission to all programs and exhibits. An optional Friday night barbecue is available for an extra $20. Send your reservation to Louese Bloom, KA6ING, 2520 Heather Lane, San Bruno, CA 94066. The Holiday Inn in Visalia, where the convention meets, has been sold out since last summer, which shows how popular this event has become in recent years. However, the NCDXC will provide a shuttle bus to other hotels in Visalia, including the Radisson Hotel (800-333-3333). The NCDXC has even negotiated a special reduced air fare from American Airlines. Ask your travel agent about STAR S3141W8, or call American direct at 800-433-1790. (I co-sponsor the Friday evening cocktail party at Visalia; stop by and say hello.)

Hard-core DXers have an extra week to recover from Visalia before heading to the Mecca of hamdom—the **Dayton Hamvention**, April 26–28. Those DXers who made their reservations as they departed last year will be staying in the Stouffers again this year. Less far-sighted DXers will make their way to this hotel during the weekend, as it is the center of the DX events and hospitality suites. The Southwest Ohio DX Association will host a DX dinner on Friday night at the Stouffers, as well as organize the DX forum at the Hara Arena on Saturday. The Southeastern DX Club and the Kansas City DX Club host some of the best hospitality suites at the Stouffers. Follow the crowd to the suites.

Looking a bit farther ahead, **HamCom** in Dallas the second weekend in June usually includes a full day of DX activities and events, thanks to the Lone Star DX Association. Check the hamfest calendar for registration details. The next DX-only convention is the **Northwestern DX Convention** sponsored by the British Columbia DX Club this year. The dates are July 27–28, in Richmond BC, at the Vancouver BC airport. The weather in British Columbia is usually beautiful in July, and many DXers schedule their summer vacation to include this event. Previous attendees will receive registration information in the mail. Those not wanting to wait may make their reservations directly with

5 Band WAZ

As of November 30, 1990, 297 stations have attained the 200 zone level.

New recipients of 5 Band WAZ Award with all 200 zones confirmed:

UQ1GXX
RT4UA
N4JJ
IK0AGU
IK4ALM

The top contenders for 5 Band WAZ are:

N4WW, 199
W7OM, 199
SP9PT, 199
K6YRA, 199
K5UC, 199
LA4HW, 199
PY7ZZ, 199
DL9WW, 199
K0CS, 199
KB0G, 199
ZS6BCR, 199
HA8XX, 199
UA4RZ, 199
KB8DB, 199
AA4KT, 199
N4VZ, 199
RT5UY, 199
NA0Y, 198
K7UR, 198
I8IGS, 198
VE7DX, 198
W0PGI, 198
VE7AHA, 198
SM6AHS, 198
K1ST, 198
ZS6BCR, 198
VE6OU/6, 198
WB9Z, 198
W1JR, 198

691 Stations have attained the 150 zone level as of November 30, 1990.

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (65 cents) size 4½ × 9½ to the WAZ Manager, Jim Dionne, K1MEM, 31 De Marco Rd., Sudbury, MA 01776. Applicants should include sufficient postage for safe return of their QSL cards. The processing fee for all CQ awards is $4.00 for subscribers and $10 for non-subscribers. Please make all checks payable to the Awards Manager. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application. Send any questions to K1MEM by mail and include an SASE (please do not telephone).

COMMUNICATIONS ELECTRONICS INC.™

Emergency Operations Center has expanded to our new two acre facility and World Headquarters. Because of our growth, CEI is now your *one stop source* for emergency response equipment. When you have a command, control or communications need, essential emergency supplies can be rushed to you by CEI. As always, for over twenty two years, we're here and ready to help.

Our RELM two-way radio transceivers were especially created for government agencies. When you need to talk to police, fire, ambulance, or state, federal and international response forces, RELM transceivers may be quickly programmed for up to 48 frequencies. Listed below, are some of our most asked about transceivers. For additional assistance, call CEI at 313-996-8888.

NEW! RELM® RSP500-A

List price $465.00/**CE price $319.95/SPECIAL**
20 Channel • 5 Watt • Handheld Transceiver
Frequency range: 148-174 MHz. continuous coverage. Will also work 134-148 MHz. with reduced performance.
The *RELM* RSP500B-A is our most popular programmable 5 watt, 20 channel handheld transceiver. You can scan 20 channels at up to 40 channels per second. It includes CTCSS tone and digital coded squelch. Snap on batteries give you plenty of power. Additional features such as time-out timer, busy-channel lockout, cloning, plug-in programming and IBM PC compatability are standard. It is F.C.C. type accepted for data transmission and D.O.C. approved. We recommend also ordering the **BC45** rapid charge 1½ hour desk battery charger for $99.95, a deluxe leather case **LC45** for $48.95 and an external speaker microphone with clip **SM45** for $59.95. Since this radio is programmed with an external programmer, be sure to also order one **PM45** at $74.95 for your radio system.

NEW! RELM® UC102/UC202

List price $128.33/**CE price $79.95/SPECIAL**
Now...Handheld gear you can afford.
CEI understands that all agencies want excellent communications capability, but most departments are strapped for funds. To help, CEI now offers a special package deal on the RELM UC102 one watt transceiver. You get a UC102 handheld transceiver on 154.5700 MHz., flexible antenna, battery charger and battery pack for only $79.95. If you want even more power, order the RELM **UC202** two watt transceiver for only $114.95.

NEW! RELM® RH256NB-A

List price $449.95/**CE price $299.95/SPECIAL**
16 Channel • 25 Watt Transceiver • Priority Time-out timer • Off Hook Priority Channel
The *RELM* RH256NB is the updated version of the popular RELM RH256B sixteen-channel VHF land mobile transceiver. The radio technician maintaining your radio system can store up to 16 frequencies without an external programming tool. All radios come with CTCSS tone and scanning capabilities. This transceiver even has a priority function. A 60 Watt VHF 150-162 MHz. version called the **RH606B** is available for $429.95. A UHF 15 watt, 16 channel similar version of this radio called the **LMU15B-A** is also available and covers 450-482 MHz. for only $339.95. An external programming unit **SPM2** for $49.95 is needed for programming the LMU15B.

NEW! RELM® LMV2548B-A

List price $423.33/**CE price $289.95/SPECIAL**
48 Channel • 25 Watt Transceiver • Priority
RELM's new LMV2548B gives you up to 48 channels which can be organized into 4 separate scan areas for convenient grouping of channels and improved communications efficiency. With an external programmer, your radio technician can reprogram this radio in minutes with the **PM100A** programmer for $99.95 without even opening the transciever. A similar 16 channel, 60 watt unit called the **RMV60B** is available for $489.95. A low band version called the **RML60A** for 30-43.000 MHz. or the **RML60B** for 37-50.000 MHz. is also available for $489.95.

RELM® Programming Tools

If you are the dealer or radio technician maintaining your own radio system, you **must** order a programming tool to activate various transceivers. The **PCKIT010** for $149.95 is designed to program almost all RELM radios by interconnecting between a MS/DOS PC and the radio. The **PM100A** for $99.95 is designed to externally program the RMV60B, RML60A, RML60B and LMV2548 radios. The **SPM2** for $49.95 is for the LMV25B and LMU15B transceivers. The **RMP1** for $49.95 is for the RMU45B transceiver. *Programmers must be used with caution and only by qualified personnel because incorrect programming can cause severe interference and disruption to operating communications systems.*

★★★ *Uniden CB Radios* ★★★

The *Uniden* line of Citizens Band Radio transceivers is designed to give you emergency communications at a reasonable price. Uniden CB radios are so reliable they have a two year limited warranty.

PRO310E-A3 *Uniden* 40 Ch. Portable/Mobile CB ... $72.95
PRO330E-A3 *Uniden* 40 Ch. Remote mount CB ... $99.95
GRANT-A3 *Uniden* 40 channel SSB CB mobile $152.95
PC122-A3 *Uniden* 40 channel SSB CB mobile ... $113.95
PC66A-A *Uniden* 40 channel CB Mobile $78.95
PRO510XL-A3 *Uniden* 40 channel CB Mobile $34.95
PRO520XL-A3 *Uniden* 40 channel CB Mobile $49.95
PRO535E-A *Uniden* 40 channel CB Mobile $73.95
PRO538W-A *Uniden* 40 ch. weather CB Mobile ... $78.95
PRO640E-A3 *Uniden* 40 ch. SSB CB mobile $133.95
PRO810E-A *Uniden* 40 channel SSB CB Base ... $174.95

★★★ *Uniden Radar Detectors* ★★★

Buy the finest *Uniden* radar detectors from CEI today.
CARD-A3 *Uniden* credit card size radar detector... $127.95
RD3XL-A3 *Uniden* 3 band radar detector..... $124.95
RD9GTL-A *Uniden* "Passport" size radar detector... $89.95
RD9XL-A3 *Uniden* "micro" size radar detector ... $107.95
RD25-A *Uniden* visor mount radar detector..... $54.95

Bearcat® 200XLT-A

List price $509.95/**CE price $239.95/SPECIAL**
12-Band, 200 Channel • 800 MHz. Handheld Search • Limit • Hold • Priority • Lockout
Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The *Bearcat* 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 10 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the **BC 100XLT-A3** for only $179.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

Bearcat® 800XLT-A

List price $549.95/**CE price $239.95/SPECIAL**
12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz.
Now...nothing excluded in the 806-912 MHz band.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-A** is available for $178.95.

NEW! Uniden® MR8100-A

List price $849.95/**CE price $486.95**
12-Band, 100 Channel • Surveillance scanner
Bands: 29-54, 116-174, 406-512, 806-956 MHz.
The *Uniden* MR8100 surveillance scanner is different from all other scanners. Originally designed for intelligence agencies, fire departments and public safety use, this scanner offers a breakthrough of new and enhanced features. Scan speed is almost 100 channels per second. You get four digit readout past the decimal point. Complete coverage of 800 MHz. band when programmed with a personal computer. Alphanumeric designation of channels, separate speaker, backlit LCD display and more. To activate the many unique features of the Uniden MR8100 a computer interface program is available for $19.95. Due to manufacturers' territorial restrictions, the MR8100 is not available for *direct* shipment from CEI to CA, OR, WA, NV, ID or UT.

NEW! Ranger® RCI2950-A

List price $549.95/**CE price $249.95/SPECIAL**
10 Meter Mobile Transceiver • Digital VFO Full Band Coverage • All-Mode Operation Backlit liquid crystal display • Repeater Splits RIT • 10 Programmable Memory Positions
Frequency Coverage: 28.0000 MHz. to 29.6999 MHz.
The *Ranger* RCI2950 Mobile 10 Meter Transceiver has everything you need for amateur radio communications. The RF power control feature in the RCI2950 allows you to adjust the RF output power continuously from 1 watt through a full 25 watts output on USB, LSB and CW modes. You get a noise blanker, roger beep, PA mode, mike gain, digital VFO, built-in S/RF/MOD/SWR meter. Frequency selections may be made from a switch on the microphone or the front panel. The RCI2950 gives you AM, FM, USB, LSB or CW operation. For technical info, call Ranger at 619-259-0287.

RELM LMV2548B Only $289.95

OTHER RADIOS AND ACCESSORIES

XC365-A *Uniden* Ultra Clear Plus Cordless Phone... $89.95
CT785S-A *Uniden* speakerphone cordless phone... $109.95
BC55XLT-A *Bearcat* 10 channel scanner $114.95
AD100-A Plug in wall charger for BC55XLT..... $14.95
PS001-A Cigarette lighter cable for BC55XLT $14.95
VC001-A Carrying case for BC55XLT..... $14.95
BC70XLT-A *Bearcat* 20 channel scanner..... $159.95
BC142XL-A *Bearcat* 10 ch. 10 band scanner..... $84.95
BC147XLT-A *Bearcat* 16 ch. 10 band scanner $94.95
BC172XL-A *Bearcat* 20 ch. 11 band scanner..... $134.95
BC177XLT-A *Bearcat* 16 ch. 11 band scanner ... $134.95
BC590XLT-A *Bearcat* 100 ch. 11 band scanner.... $194.95
BC760XLT-A *Bearcat* 100 ch. 12 band scanner.... $254.95
BC002-A CTCSS tone board for BC590/760XLT..... $54.95
BC003-A Switch assembly for BC590/760XLT $22.95
BC855XLT-A *Bearcat* 50 ch. 12 band scanner ... $199.95
BC1-A *Bearcat* Information scanner with CB $129.95
BC330A-A *Bearcat* Information scanner..... $99.95
BC560XLT-A *Bearcat* 16 ch. 10 band scanner $94.95
BP205-A Ni-Cad batt. pack for BC200/BC100XLT... $39.95
ATS808-A *Sangean* shortwave receiver $159.95
ATS803A-A *Sangean* shortwave receiver..... $159.95
ATS800-A *Sangean* shortwave receiver $99.95
MS103-A *Sangean* shortwave receiver $84.95
74102-A *Midland* emergency weather receiver.... $39.95
77116-A *Midland* CB with VHF weather & antenna... $66.95
77118-A *Midland* CB mobile with VHF weather.... $62.95
77913-A *Midland* CB portable with VHF weather $79.95
76300-A *Midland* CB base station..... $92.95
FBE-A Frequency Directory for Eastern U.S.A..... $14.95
FBW-A Frequency Directory for Western U.S.A..... $14.95
RFD1-A MI, IL, IN, KY, OH, WI Frequency Directory ... $14.95
RFD2-A CT, ME, MA, NH, RI, VT Directory $14.95
RFD3-A DE, DC, MD, NJ, NY, PA, VA, WV Dir..... $14.95
RFD4-A AL, AR, FL, GA, LA, MS, NC, PR, SC, TN, VI ... $14.95
RFD5-A AK, ID, IA, MN, MT, NE, ND, OR, SD, WA, WY ... $14.95
RFD6-A CA, NV, UT, AZ, HI, GU Freq. Directory.... $14.95
RFD7-A CO, KS, MO, NM, OK, TX Freq. Directory $14.95
ASD-A Airplane Scanner Directory..... $14.95
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CBH-A Big CB Handbook/AM/FM/Freeband..... $14.95
TIC-A Techniques for Intercepting Communications ... $14.95
RRF-A Railroad frequency directory $14.95
EEC-A Embassy & Espionage Communications.... $14.95
SMH-A Scanner Modification Handbook..... $16.95
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USAMM-A Mag mount VHF ant. w/ 12' cable $39.95
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Add $4.00 shipping for all *accessories* ordered at the same time. Add $12.00 shipping per radio and $4.00 per antenna.

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Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability, acceptance and verification. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically or equivalent product substituted unless CEI is instructed differently. A $5.00 additional handling fee will be charged for all orders with a merchandise total under $50.00. Shipments are F.O.B. CEI warehouse in Ann Arbor, Michigan. No COD's. Not responsible for typographical errors.

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For orders call 313-996-8888 or FAX 313-663-8888

CIRCLE 146 ON READER SERVICE CARD

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 322. 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.

CW

W9DWQ	322	W0IZ	317	IT9TQH	311	AB4H	303	K9TI	296	G3KMQ	286
K2FL	322	K3UA	317	DJ1XP	310	N8MC	303	WD9IIX	295	K4JLD	286
K2TQC	322	W7ULC	317	W6ID	310	WA8DXA	301	KD8V	295	KP4P	283
N4JF	322	W4BQY	316	K9QVB	310	KZ4V	301	NY5L	294	AG9S	282
K4CEB	322	N6AR	316	IT9ZGY	310	YU2TW	300	K9DDO	294	JH1VRQ	281
K9MM	322	W0SR	316	W7CNL	310	I3OBO	300	N5FW	293	K7ZR	279
SM6CST	322	N2KW	316	WD9IIC	310	W0JLC	300	W6YQ	293	I5XIM	279
DL1PM	321	W6PT	315	W0HZ	310	N7RO	300	IT9VDQ	293	W2LZX	279
K6JG	321	K4XO	315	K8PYD	309	DL6QW	299	W3BBL	293	KB9XG	279
W2FXA	321	K9IW	315	WB4RUA	309	NN4Q	299	N5DX	290	W9NUF	279
K9AB	321	N4PN	314	W6SN	309	I8WY	299	KB0G	290	KB8DB	279
YU1HA	321	DL7AA	314	AA6AA	308	F3TH	299	VE7DX	289	HB9AFI	278
ON4QX	320	W1NG	314	W9RY	307	WA4IUM	299	N4AH	289	KA2DIV	278
N4KG	320	DL8CM	313	W4OEL	306	DJ2PJ	299	W1WLW	288	KA3R	277
OK1MP	320	EA2IA	313	KQ9W	306	W6DN	299	W4BV	288	DL1QT	276
N6AV	319	N6CW	312	W1WAI	306	I2QMU	299	K1VHS	288	KU0S	276
N4MM	319	WA2HZR	312	SM6CTQ	305	K3FN	297	G2GM	288	YV5ANT	276
SM3EVR	319	K2OWE	312	K4CXY	304	DJ7CX	296	K2JF	288	K2JLA	276
K1MEM	318	W9WAQ	311	W2UE	304	K8LJG	296	K8NA	287	NS7Z	276
K6LEB	317	K6EC	311	WA4JTI	304	WA4DAN	296	G2FFO	286	K4SE	275
DL3RK	317	K9BWQ	311	IT9QDS	304	WA8YTM	296	W9SC	286		

SSB

K2FL	322	W2FXA	318	K2JF	313	I0MBX	306	I2ZGC	299	I4CSP	288
W6EUF	322	IT9ZGY	318	KE4VU	313	KV2S	306	NW5K	299	LU7HJM	288
VE1YX	322	ZS6LW	318	EA4LH	313	VK3JF	306	WB6GFJ	299	OK1AWZ	287
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N4JF	322	OZ5EV	318	W8PCA	312	KA9ABC	306	K1VHS	299	AB9E	286
VE3MR	322	IT9XGY	318	N2SS	312	WA2MID	306	I8IGS	299	W9SC	286
DJ9ZB	322	W6DN	318	OE2EGL	312	WB4PUD	306	ZL1BOQ	299	PA0XPQ	286
4Z4DX	322	KS2I	318	ZL1BIL	312	XE1MDX	306	K8YVI	299	N8BJO	285
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W9DWQ	322	G4CHP	318	W2FGY	312	N4KE	305	WA0TKJ	298	K9MNT	285
W4DPS	322	WA4ECA	318	G3VOF	312	KE3A	305	I6PLN	298	IK7DBB	285
W0YDB	322	W7FP	318	WB3DNA	312	K3LUE	305	KA8T	298	KB5RF	284
EA4DO	322	KR9O	318	KQ9W	312	CX4HS	305	KB2FC	298	KF5AR	284
DL9OH	322	N2KW	318	I8KCI	312	W5LLU	305	DJ7CX	298	IK8BMW	284
VE3XN	322	I2QMU	318	WA4IUM	312	WA6DTG	305	K9SM	297	G4SZD	284
W3AZD	322	W4UNP	318	KB3OQ	312	K9TI	305	JH4PRU	297	VE2GHZ	284
YV1KZ	322	W8ILC	317	K8CMO	312	KZ8Y	304	EA9IE	297	NZ7D	284
OK1MP	322	N6AR	317	F2MO	311	K8VFV	304	XE1HI	297	KC7EM	283
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ZL1AGO	322	VE7WJ	317	K9RF	311	K4RIG	304	TI2JJP	297	WB3HAZ	282
ZL3NS	322	WA4DAN	317	K9HDZ	311	I4WZK	304	N4KEL/M	297	VE3MV	282
K6WR	322	YV5GWO	317	LA7JO	311	K4JLD	304	HP1JC	296	ZP5JCY	282
I4LCK	322	K4CXY	317	LU3YL	311	KD8V	303	YU7KV	296	I8DVJ	282
K2TQC	322	YV1AJ	317	N6OC	311	KC8YM	303	XE1OW	296	YB3CEV	282
W2SUA	322	N4CRU	317	NA5W	311	W6MFC	303	WD9GQV	296	K3NEE	282
K8LJG	322	DJ1XP	316	W8ILC/QRPp	311	K4LR	303	F6BFI	296	W3SOH	282
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EA2IA	322	N4WF	316	NN4Q	311	KB7VD	303	KB3KV	295	AE2B	281
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YU1HA	321	KR9O	316	KA6V	311	WA2FKF	303	KB0G	295	VE3NUP	281
I0ZV	321	I8LEL	316	AA6BB	311	IK1GPG	303	EA4KK	295	N1ALR	281
I8YRK	321	KC8EU	316	SM6CST	311	WA8YTM	302	W0IYR	294	EA8TE	281
VE2WY	321	WA4JTI	316	W4SSU	310	XE1KS	302	KK0C	294	PY2DBU	280
K9BWQ	321	K9HQM	316	K6EC	310	W2LZX	302	G3XTT	294	NP4CC	280
K6JG	321	W6SN	316	K8NA	310	KB0U	302	VE3XO	294	NX0I	280
K6YRA	321	K3UA	316	NJ0C	310	W0ULU	302	KI3L	294	G4FAM	279
N7RO	321	AG9S	316	I8XTX	310	W4BQY	302	I7UNX	294	W9VA	279
ON5KL	321	K8ZZU	316	KB4HU	310	XE1XM	302	WD0BNC	293	WB8TLI	279
YU1AB	321	K8PYD	315	G4ADD	310	K7EHI	302	I5BDE	293	W8URM	279
K5OVC	321	K4XO	315	WD8PUG	310	WD5P	302	WB3CQN	293	W5XO	279
TI2HP	321	AI8S	315	XE1OX	310	K1MEM	301	KB8O	293	K5AOL	279
W4NKI	321	W0SR	315	IK8BQE	310	N5FG	301	VE5FX	293	KB5DN	278
N4MM	321	WB1DQC	315	WE2L	310	I3OBO	301	IT9VDQ	293	EA6DE	278
I8ACB	321	VK4LC	315	KA5RNH	310	K9UAA	301	WD9IIC	293	JH8NYK	278
K9AB	321	TI2CC	315	DK2BL	309	KP4EOF	301	K4SE	292	KX5V	278
OA4OS	320	9H4G	315	AA6AA	309	N5FW	301	KC8JH	292	WN5K	278
I0AMU	320	K2JLA	315	AB9O	309	VE2PJ	301	AI5I	292	K4BYK	277
CT1FL	320	WA4WTG	315	KU9I	309	IK8GCS	301	W9NUF	292	VE3IUE	277
OE3WWB	320	W6NLG	315	N6AHV	309	K0HQW	301	KD5ZM	292	DF6EX	277
VE3MRS	320	WZ4I	315	KB9OC	309	KB1JU	301	VE6PW	292	KG9N	277
VE7DX	320	KE4HX	315	K1MIZ	309	VE3DLR	301	TI2LTA	292	I8WYD	277
SV1ADG	320	XE1AE	315	IV3YRN	309	N6CGB	301	YV1CLM	292	CE7ZK	277
WD8MGQ	320	KA3HXO	315	I5EFO	309	WA3HUP	301	WA4LOF	291	KA9I	277
IT9TGO	320	I8KDB	314	I1POR	309	VE3FJE	300	AC0A	291	KB9LN	277
W3GG	320	K9LKA	314	G4GED	309	WB4NDX	300	VE3FEA	291	WB0UFL	276
N4KG	320	OH5KL	314	IK8CNT	309	YU2TW	300	VP9CP	291	W4PTT	276
W4UW	320	OZ8BZ	314	KP4P	309	N4CRU	300	W8LKG	291	WD0DMN	276
I8AA	319	YV5DFI	314	WA9RCQ	309	KZ0C	300	SV1JG	291	HK6BER	276
OZ3SK	319	W9RY	314	N4PN	308	N8BKF	300	KE7UL	291	NC9T	276
DL6KG	319	I4EAT	314	WD9IIX	308	WT4T	300	VE3IPR	290	I8IYW	276
K9IW	319	NJ2C	314	K9QVB	308	KB2HK	300	W4JFE	290	XE1DU	276
KB8DB	319	K8CSG	314	WB6PSY	308	K7LAY	300	DU9RG	290	N0AMI	275
IT9TQH	319	KU9Z	314	N3ARK	308	KB9KD	300	XE1CI	290	N7ASL	275
YS1GMV	319	W6BCQ	314	VK4VC	307	KC2FC	300	K1HDO	290	WA4OPW	275
N6AHU	319	PY4OY	314	YV5AIP	307	KB2MY	300	VE3CKP	289	KC2RS	275
W7OM	319	I2LLD	313	N6AV	307	IN3ANE	300	I4UFH	289	NO4J	275
K1UO	319	W1NG	313	AI8M	307	KF7SH	300	W9TA	288	KC4MJ	275
KZ2P	319	W1LQQ	313	NS7Z	307	I2EOW	300	JA5PUL	288	KA5YCM	275
KB5FU	319	SM4CTT	313	K4MQC	307	VE4AT	299	AI9U	288	KI4FW	275
W2CC	319	WB4UBD	313	KZ4V	307	SV8CS	299	YV2EJU	288	NX4Y	275
I4ZSQ	318										

The WPX SSB test, March 30–31, is a good place to work new prefixes. In 1990 this MegaHertz Magazine (France) team operated as GJ0LYP from Jersey island. From the left: (rear) Claudia, F1NYQ/HB9CUY; Florence, F6FYP/GJ0LYP; and Marcel, F6DOW; (front) Sylvio, F6EEM/GJ0LWR; Denis, F6GKQ/GJ0LWQ; and Fritz, F6IMS/OE6FOG.

the Richmond Inn at 604-273-7878. (Be sure to mention the convention.) Sometime thereafter (August 3–4) is the WIMU convention in Jackson, Wyoming, near Grand Teton and Yellowstone National Parks. This general-interest convention always includes plenty of DX events, and again makes a great stop on a family vacation. By the way, WIMU stands for Wyoming, Idaho, Montana, and Utah.

Moving toward fall, we come to the Northern Illinois DX Association's W9DXCC dinner in early September. This all-day, DX-only affair features a wide range of technical programs, forums, and slide shows, culminating in the DX Hog of the Year award at the banquet. Later in the fall is the New England DXCC dinner, and the DX events at the New England Division convention in October.

DX events and conventions are not confined to North America. The **Lynx DX Group's Convention** will be held May 2–4 in the city of Oporto in Portugal. This Spain-based group supports many DXpeditions and provides a good show for Spanish-speaking DXers. The **International Hamvention** in Leningrad USSR provides a unique experience to operate from the USSR. Overseas attendees meet in Helsinki, Finland, and travel by train to the convention. Contact the Consulate of Finland, 5933 West Grovers Ave., Glendale, AZ 85308 for more details. The Tokyo, Japan Ham Fair (August 23–25) includes a comprehensive DX program. This is the second largest amateur radio convention in the world, and is only a step behind the Dayton Hamvention. For more information, contact the Japan Amateur Radio League (JARL), 14-

CQ DX Awards Program

SSB

1821	WA5HWB	1826	WA4PGM
1822	KM5R	1827	LU2FYU
1823	IK1GPG	1828	WS2O
1824	AB4UF	1829	YV1CLM
1825	N4WKX	1830	KA1SPO

CW

813	KM5R

SSB Endorsements

320	K2FL/322	310	WB6OKK/313
320	W4DPS/322	300	N3ARK/308
320	W2SUA/322	300	IK1GPG/303
320	K9AB/321	275	YV1CLM/292
320	I8ACB/321	250	WA4PGM/274
320	W4UW/320	250	KM5R/255
320	N4KG/320	150	AB4UF/154
310	KB5FU/319	28 MHz	LU2FYU
310	W2CC/319	28 MHz	KA5RNH
310	W4UNP/318	28 MHz	KA1SPO
310	I2QMU/318	3.5/7 MHz	KA5RNH
310	KA3HXO/315	QRPp	KA5RNH
310	PY4OY/314	Mobile	KA5RNH

CW Endorsements

320	K9AB/321	275	I2QMU/299
320	N4KG/320	275	W3BBL/293
310	K2OWE/312	200	KM5R/213

Total number of active countries is 322. 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 SASE 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.

2 Sugamo 1-chome, Toshima-ku, Tokyo 170, Japan. The **Clipperton DX Club** holds their annual convention near Paris, France in late September. Around the same time is the **HF Convention** of the Radio Society of Great Britain (RSGB). The Chiltern DX Club hosts an interesting assortment of DX events at the RSGB's gathering. Contact the RSGB at Lambda House, Cranborne Road, Potters Bar, Hertfordshire EN6 3JE, England, for details.

As convention sponsors firm up dates, locations, and prices, I will share these will you here. Meanwhile, this should provide enough information to begin making vacation and travel plans.

73, Chod, VP2ML

QSL Notes

Buzz, N5FTR, is now handling cards for **9M8FH**. He will be able to confirm past QSOs with 9M8FH, but expect a delay until Buzz receives the complete log. Buzz also handles cards for **A41KJ, P29BT, Z21BA,** and **ZS4PB**.

Bob "Kappy" Kaplan, WA4WTG, is QSL manager for the following: **ZF2IB, FY7AE, K7NJ/4Z, TJ1BF, ZF2GE, ZP5KS, 4Z4DX, ZC4DX, 4Z0DX, 4Z4HF, 4Z4LF, 4X4NJ, 4X4UF, 4X2BYB, 4X6BYB, 4X4FF/5N4, 5Z4RH, 6Y5MC, 8P6AH, 8P6IB, 8P0A, 9M6MG, 9M8PV, 4Z5DX,** and **4Z8DX**. His address is 718 SE 3 Lane, Dania, FL 33004.

Bob Preston, W7TSQ, can now confirm his **YB3ASQ** QSOs via his home address: 809 Cary Road, Edmonds, WA 98020.

QSL manager JA1NUT reminds DXers that the **XU8DX** card is over-sized. Use a European-sized return envelope, please.

Konstantin Dorofeev, UA6HSN, is QSL manager for **OD5RA, OD5RK, EO6AHG** and handles cards from Europe for **TA2AO**. Direct only, please, to Box 2, 357800 Georgievsk, USSR.

Vasil M. Kasyanenko, UW6HS, handles cards for **OD5EH, 9H1ED,** and **RB3MO/UI9B**. Vasie's address is Box 20, 357800 Georgievsk, USSR.

TG9CXM QSLs via K3BYV. Stateside

Glarey Luciano (Luc) Giorgio, I1YRL, has made 113,000 CW QSOs since 1974, and stands at 2042 prefixes on the CQ WPX Honor Roll.

SASE, please. DX stations may QSL via the bureau.

ZY0NS in the 1990 CQ WW SSB was on St. Catarina Island (SA-26). Operator and QSL route is Pedro Sirzanink, PP5SZ, Rua Padre Rome 60/704, Florianopolis-SC, 88010, Brazil.

YI1BGD has been very active since Iraq invaded Kuwait. However, the embargo of Iraq includes mail, so don't waste postage sending a direct card. Take Yokoyama, JL1BLW, visited Baghdad last fall and brought back copies of the YI1BGD log. QSL operator Samy via ON7LX (see below), operator Ali to JR1AIB, and other ops via JL1BLW. All have logs up to October 13, 1990 only. Confirming QSOs after October 13 will require another brave soul hand-carrying logs out of Iraq.

Carine Ramon, ON7LX, has a new postal code. Address is now Zeddijkweg 3, B-8210 Loppem, Belguim. Carine has logs for **9K2KS** until April 21, 1990. Carine will confirm later QSOs with Khalid when 9K2KS sends logs.

D44BC was operated by W6NV in CQ WW CW last year. QSL, as usual, direct to D44BC's Callbook address.

Jim, V73AS, provides the following information about confirming Marshall Islands QSOs: QSL **V73AU/KX6GL** to N8BX; **V73AQ/KX6OI** to Terry Gerdes AB5K, 15190 East Coachman Drive, Colorado Springs, CO 80908; and **KX6TY** to KS5H. **V73AZ/KX6DC** is the Roi Namur Radio Club. QSL to Box 997, APO San Francisco, CA 96555. Note that N4ASF operated the club station June–August 1990, and didn't leave a copy of his log. For this period only, try direct to N4ASF. Jim also has KX6DC from 1986, and *some* earlier logs. Use the above address. **V73AX/KX6BU** is the Kwajalein Radio Club. QSL to Box 444, APO San Francisco, CA 96555. This is also the address of the KX6/V73 bureau. For the following, use the given box number, APO San Francisco, CA 96555: **V73BY/KX6HW**: 922; **V73BF/KX6WS**: 963; **V73BB/KX6HN**: 548; **V73BQ/KX6BA**: 294; **V73AV**: 911; **V73AB**: 1410; **V73AC**: 1537; **V73BO**: 92; **V73CF**: 758; **V73CA**: 180; **V73BN**: 8147 (Zip code 96557).

And Eric Martin, K7ABV, reminds DXers to check foreign addresses. The USPS wants complete city, province, and country, without abbreviations.

QSL Information

3C1EA to EA4CJA
3D2XV to VK2BCH
3W4DX to RW3DX
3W4VL to UA3DK
4B1PAZ to XE2BCS
4K1A to UZ1PWA
4K2BDU to UA9MA
4K2OIL to UA9MA
4K4QQ to RA1QQ
4S7CF to 9V1JY
4U1UN to NA2K
4U45UN to NA2K
5B4AAL to WB8HWO
5N6ZHM to 5N6YBC
5R8JD to F6FNU
5T3OMTN to 5T5HH
5T5/N5JRC to WA5ZIJ
5W1RA to W6RQ
6FXBCS to VE7DP
6W1QC to JA8KJH
6W6JX to F6FNU
7Q7RM to K6KII
8P9HT to K4BAI
8Q7AJ to K9AJ
9L/OH7XM to OH7XM
9L1US to WA8JOC
9M2ZU to W4LRE
9M6OO to N2OO
9N1MM to N7EB
9Q5BG to F5JT
9Q5TE to SM0BFJ
9Q5XO to N4AXR
A61AD to WB2DND
AH3C to K9UIY
AP2JZB to G0DOO
BV2DA to DL7FT
C30CAG to F6GIN
C31SD to CT1AMK
C56/G4ODV to G4ODV
C6AFP to KR8V
CN2CU to DJ8MT
CN2CW to F2CW
CN2JO to F3MZ
CN2JP to AE6H
CN2LX to F9LX
CN2MF to KC7V
CR9FF to CT3FF
CT3M to CT3EE
CT3T to CT1BOH
CX8CW to CX8BBH
D68GA to N6ZV
D68JM to WV4F
EA8AGD to OH6DK
ES2WX to UR1RWX
FG5R to W7EJ
FM5BH to W3HNK
FO8IGS to F6EEM
FO4NR to F6ELE
FY5YE to W5JLU
HC8U to W6UE
HF0POL to KB6GWX
HH7PV to N2AU
HI8DMX to JA1ELY
HK0HEU to HK0FBF
HL30AP to HL5AP
HP1XBH to W4YC
HR1LW to JA1LW
HV3SJ to I0DUD
HY2X to F2VX
J28NU to F6FNU
J6LNJ to W8QID
J6LNN to KB6ZBI
J6LRR to W8PR
J6LRU to W8ILC
J6LRX to WD8IXE
J6LSC to N9AG
J8/K3IPK to K3IPK
JD1/JH1MAO to JA1GUC
JW8XM to LA8XM
K4SXT/DU3 to WB4KZW
KC6/N6ZMF to 7J1AIJ
L6LRR to W8PR
LX2PA to PA3DKC
OD5MM to HB9CYH
OM5KWW to OK3LL
OT5IG to ON5IG
OT6CW to ON6CW
PJ2/DL5XX to DK5MQ
PJ2/OH6LI to OH3TR
PJ7/K2KTT to K2KTT
SV5/SM0CMH to SM0CMH
T32Z to N7YL
T33R to OH3GZ
TA/HA0MM to HA0MM
TF3EJ to TF3IRA
TI0HE to TI2VVR
TJ1MR to F6FNU
TL8WD to DL8CM
TP5HA to F6FQK
TR8GL to F6IXI
TZ6CX to NP2CX
UA0QCI to JA0QX
UH8EA to W5BWA
UI9BWF to UA3TT
UZ2FWA to UA2FM
V2/KD6WW to KD6WW
V2/KQ2M to KQ2M
V29W to KD6WW
V85OM to N2OO
VK9LE to VK3OT
VP2EXX to KC8JH
VP2ML to K1RH
VP2V/WD0ENG to WB0CHL
VP2VCW to N6CW
VP5N to WB8GEW
VP5P to WN5A
VP5VAA to WS4E
VP5VDE to VK2DXI
VP5VDH to WD8MQJ
VP5VDK to NY8E
VP5VKS to WM2C
VP8CES to G1SWW
VP9HE to KD8IW
WF2R/KP4 to WF2R
WN4KKN/ZP5 to AA5BT
XE2GAT to K6OJ
XU8CW to JA1NUT
XW3UB to JA3UB
YN1CU to DJ8MT
YN1MF to I0WDX
YS1ECB to EZ7BO
YV4AB to YV4UA
ZD7VC to WT8S
ZD8CUE to G4ZVJ
ZF2NG to K9WYI
ZF2PS to KQ1F
ZK1OM to N6OM
ZS9Z/ZS1 to OH2BH
4L4F to Box 2345, Penza, 440028 USSR
5N6ZHM to Sam, Box 66, Jos, Plateau State, Nigeria
5W1KM to Mikio Watanabe JR3OIB, 2-19-5 Kotobuki, Takatsuki, Osaka 569, Japan
A71CD to P.O. Box 80074 Al-wakra, Qatar
CM8CH to Box 28, Puerto Rico, CP-77210, Cuba
ES4AA to Box 44, Kohtla Jarve, Estonia
FY5FP to Donner Leon, ON4ZD, Rue Gaston Dubois 6, B-1428 Braine l'Alleud, Belgium
HI8LUZ to Sergio Vazquez, Box 866, Santo Domingo, Dominican Republic
HR1ODA to Box 2299, Tegucigalpa, Honduras
J6LNM to Jack Ekstrom, K9BQL, 2654 South Pagosa Court, Aurora, CO 80013
J6L/K9BQL to (same)
JT1CS to P.O. Box 125, Ulan Bator 210620, Mongolia
KG4DD to Box 692, FPO New York NY 09593-0055
OA4AMM to Alan, P.O. Box 410114, Lima 41, Peru
OD5QX to Box 597, Tripoli, Lebanon
PJ7/WY2W to Rob Hummel, Box 92, South Deerfield, MA 01373
RA0BA to Alex, Box 1896, Norilsk 663305, USSR
SV5TS to Box 7, Paradissi 85106, Greece
T22KY to Box 3, Tokaimura 31911, Japan
UM8QDX to Box 1, Kadzhisai, Kirghiz 722452, USSR
V51BG to Box 2177, Windhoek, Namibia
VR6BX to Brian Young, Box 21, Pitcairn Island
ZK3KM to JR3OIB, 2-19-5 Kotobukichu, Takatsu city, Osaka 56
ZK3KY to Kyoko, P.O. Box 3, Tokaimura, 31911 Japan

CQ SHOWCASE

j•Com MagicNotch™ Audio Filter

The MagicNotch filter is an automatic audio notch filter designed to instantly remove heterodyne QRM from SSB reception. No tuning of the filter is required. When interference of a constant frequency is detected by the control circuitry, the internal switched capacitor active filter (SCAF) is automatically tuned to that frequency, effectively reducing the interference by up to 40 dB. The filter will continue to track any variation in the frequency of the interference until it disappears. The width of the notch is extremely narrow, so there is no noticeable degradation in the quality of normal speech signals. The filter activates in less than one second. Operation of the filter is indicated by a two-color LED which turns red when an interfering signal is locked in.

No modifications to existing equipment are necessary. The filter operates on the audio output from the receiver as obtained from the external speaker output. The built-in 2 watt amplifier is sufficient to drive any 8 ohm speaker. The filter is powered by 10–14 volts DC, which is usually obtained from the accessory connector of the rig. The 5.5″ × 3″ × 1.5″ unit is housed in a gray and blue aluminum enclosure. MagicNotch is available at the introductory price of $99.95 (plus $5 shipping and handling). For more information, contact j•Com, P.O. Box 194, Ben Lomond, CA 95005-0194 (408-336-3503), or circle number 102 on the reader service card.

Weekly Amateur Radio TV Show Premiers

The first weekly international amateur radio television series premiered on January 15 on Spacenet 3, Transponder 4. This weekly one hour series is devoted entirely to promoting and teaching amateur radio with features such as spotlighting amateur of the month, club and

organization activities, product reviews, tech tips, special events, etc. The program is hosted by Jack Smith, WA2QYT, a well-known, active promoter of amateur radio in the northeastern United States area.

The promoters are expecting this series to be picked up by most of the major cable companies. It will only take a few calls from active amateurs in each area requesting the show be put on your local cable. The total cable subscribers in the U.S. rank well above 50 million plus some 4 million dish owners. *CQ* is sponsoring a portion of these broadcasts. For more information, contact Jack Smith at 315-253-4301.

ZCo Corporation Zihua Morse 2.0™

This Morse code instructional software for the Macintosh™ starts the beginner by sending characters at a high rate, with pauses between characters to give the beginner time to respond. This method encourages learning the Morse code by the sound of the characters and keeps the sound constant while increasing the overall speed. The user starts by typing the characters at the keyboard to become familiar with the sounds of the characters. Next, the random character generator is used to send these characters in random order. Just the characters from the lesson are practiced; then all the characters learned so far can be integrated into the lesson. Finally, there is practice with predesigned lessons containing words, or creation of unique lesson files. In addition to the lessons provided, any combination of letters, numbers, and punctuation to be sent by the random character generator can be selected. Characters can be sent individually, by words, or by whole lines at a time.

System requirements are Macintosh Plus, SE, SE/30, II, IIx, IIci, IIfx running system 6.0. The non-speech version is $39.95; speech version $65.00 plus $3 for shipping and handling in North America or $7 elsewhere. For more information, contact ZCo Corporation, P.O. Box 3720, Nashua, NH 03061, or circle number 110 on the reader service card.

Tripp Lite Power Supply

The Tripp Lite PR-Series DC Power Supplies are for powering practically all types of 12 VDC equipment. The PR-Series' continuous-duty performance stands up to extended periods of operation for reliable operation, maker says. In addition to their new look, a dark metal cabinet, the PR-Series DC Power Supplies provide IC voltage regulation, automatic overcurrent protection, and full-line isolation.

PR-Series DC Power Supplies are available in 3 to 60 amp sizes with suggested retail prices starting at $38.50. For more information, contact Tripp Lite, 500 N. Orleans, Chicago, IL 60610-4188 (312-329-1777; FAX 312-644-6505), or circle number 107 on the reader service card.

AWARDS

BY DOROTHY JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The Story of the Month for March is:

Howard Clarke, WA4KER
USA-CA All Counties #655
Mixed, 2-3-90

"I was born on December 21, 1916 on the American Canal that was built in Panama and spent my entire life there. I served my apprenticeship as a ship rigger for the United States Government and worked at the Balboa and Cristobal Dry Docks. During those years I became interested in salvage diving. At first I taught myself the diving trade by 'hands on' ship repairs and general underwater maintenance work.

"During the first part of World War II, I went to a new diving school that had been constructed at Gatun, Canal Zone. The school was run by a Congressional Medal of Honor holder who was a Master Diver retired from the U.S. Navy. His medal was awarded for his diving done on the *USN Submarine Squalus* which sank and for his expertise on the use of the new Navy diving bell.

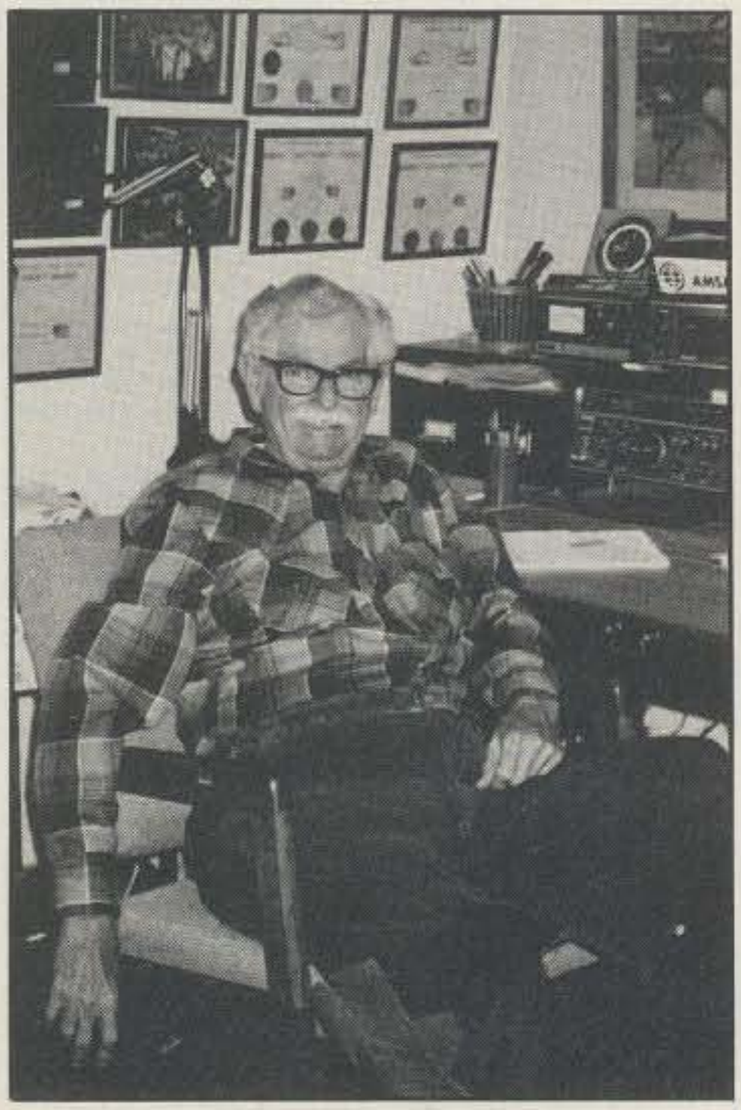
"Now let's jump forward 35 years and get into ham radio. A good friend of mine and my Elmer, Dave Coffey, KZ5DE, now a Silent Key, and I were about to retire after 37 years of government service. One day he came into my office with a funny looking gadget and said, 'This should be your retirement hobby.' Well, it turned out to be a hand key and a manual on code. He also gave me an old Army receiver and a coil of wire. He showed me where to hook the wire and where to set the dial to hear CW code. With Dave's expert instructions and my listening to CW code I got into it pretty heavily.

"My XYL, Emmy Lou, and I retired to St. Petersburg, Florida, and I found the local radio club. One of the hams directed me to a local ham radio instructor who ran a school. I got my Novice license on July 12, 1974, upgraded to General class on August 6, 1975, and I was on my way to a life of CW.

"I joined a senior amateur group in St. Petersburg and met some interesting characters. One of the group, Buck Lewis, W4BV, now a Silent Key, got me interested in CW County Hunting, and I was soon on the net. The CW net was not very active at that time, but I got on it most every day to hear Esther, KA4IFF; Bob, N5QQ, and a few others run counties. A couple of regulars—Woody, N0CYB, and Ed, WA6VJP—talked me into becoming the net control operator. I stayed with the CW net and was named Net Control Station of the year for 1986, 1987, and 1988.

"It was very difficult for a CW station in central Florida to get Alaska and Hawaii, at least it was hard for me, so I turned in my key for a mike. On the SSB net I soon found out the difference between the two nets, and a new and interesting avenue opened for me. After five years and five months, I finally got my last county, Fourth District in Alaska, and soon had my USA-CA All Counties Award #655, dated February 3, 1990 from Dorothy, WB9RCY, and *CQ* magazine.

"My thanks go to the many County Hunters on both CW and SSB who helped me to get this award, and especially to my XYL, Emmy Lou, who drove me through 48 states to give out 60 last counties. There are still more awards I would like, such as YL, Bingo, and the individual awards offered by some of the group. Now that I am on the other side of the fence, as it is often put, my energies will go to helping others get their awards by going mobile and acting as net control or assistant.—73, Howard, WA4KER"



Howard Clarke, WA4KER, USA-CA All Counties #655 at home in Florida.

Howard, WA4KER, circa 1950.

333 South Lincoln Ave., Mundelein, IL 60060

USA-CA Special Honor Roll

Danny Rozas, KC5P
USA-CA All Counties #680, Mixed
11-5-90

Robert Palambo, K9ZWH
USA-CA All Counties #681
All 20M SSB Mobile, 11-5-90

James J. Curtis, N8HAM
USA-CA All Counties #682
All SSB Mobile, 11-6-90

Awards Issued

Danny Rozas, KC5P, filed a complete collection of county confirmations and qualified for USA-CA All Counties #680, USA-CA 3000 #706, USA-CA 2500 #784, USA-CA 2000 #852, USA-CA 1500 #940, USA-CA 1000 #1133, and USA-CA 500 #2462, Mixed, dated 11-5-90.

Robert Palambo, K9ZWH, did it all in one giant leap by claiming USA-CA All Counties #681, USA-CA 3000 #707, USA-CA 2500 #785, USA-CA 2000 #853, USA-CA 1500 #941, USA-CA 1000 #1134, and USA-CA 500 #2463, All 20M SSB Mobile, dated 11-5-90.

James J. Curtis, N8HAM, filed his completely filled and certified record book and received USA-CA All Counties #682, USA-CA 3000 #708, USA-CA 2500 #786, USA-CA 2000 #854, USA-CA 1500 #942,

USA-CA Honor Roll

3000		N8HAM	942
KC5P	706	AA4HD	943
K9ZWH	707	K1DFO	944
N8HAM	708		
2500		**1000**	
KC5P	784	KC5P	1133
K9ZWH	785	K9ZWH	1134
N8HAM	786	N8HAM	1135
K1DFO	787	K1DFO	1136
VE1GU	788	KF7RU	1137
		K1CLN	1138
2000		**500**	
KC5P	852	KC5P	2462
K9ZWH	853	K9ZWH	2463
N8HAM	854	HA5KAG	2464
AA4HD	855	N8HAM	2465
K1DFO	856	K1DFO	2466
		JH2BCN	2467
1500		KB1AF	2468
KC5P	940		
K9ZWH	941		

The total number of counties for credit for the United States of America County Award is 3076. The basic award fee for subscribers to *CQ* is $4.00. For nonsubscribers it is $10.00. Initial application must be submitted in the USA-CA Record Book, which may be obtained from CQ Communications, 76 North Broadway, Hicksville, NY 11801, USA for $1.25. To qualify for the special subscriber rate please send a recent *CQ* mailing label with your application. To be eligible for the USA-CA, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated April 2, 1985. A complete copy of the rules may be obtained by sending an SASE to Dorothy Johnson, WB9RCY, USA-CA Custodian, 333 South Lincoln Avenue, Mundelein, IL 60060 USA. DX stations must include extra postage for airmail reply.

USA-CA 1000 #1135, and USA-CA 500 #2465, All SSB Mobile, dated 11-6-90.

Walter F. Ordway, K1DFO, took a big stride toward his goal by claiming USA-CA 2500 #787, USA-CA 2000 #856, USA-CA 1500 #944, USA-CA 1000 #1136, and USA-CA 500 #2466, All 20M SSB Mobile, dated 11-9-90.

Ronald P. Smith, VE1GU, filed his good application for USA-CA 2500 #788, Mixed, dated 11-15-90.

L. Wayne Burr, AA4HD, made a good addition to his fine record by claiming USA-CA 2000 #855 and USA-CA 1500 #943, All 20M SSB Mobile, dated 11-8-90.

Jerold A. Goetsch, KF7RU, filed his good application for USA-CA 1000 #1137, All SSB Mobile, dated 11-13-90.

Dr. William R. Welch, K1CLN, received USA-CA 1000 #1138, All SSB, dated 11-19-90.

Andrew F. Rugg, VE2AQP, who received USA-CA 500 #1-Z on 10-16-61 and USA-CA 1000 #106 on 10-22-66, both Mixed, as VE2-8679, qualified for USA-CA 1000 and USA-CA 500, All CW, dated 11-6-90.

USA-CA 500 certificates went to:

Danny Rozas, KC5P, USA-CA 500 #2462, Mixed, 11-5-90.

Robert Palambo, K9ZWH, USA-CA 500 #2463, All 20M SSB Mobile, 11-5-90.

Orion Radioclub, HA5KAG, USA-CA 500 #2464, Mixed, 11-6-90.

James J. Curtis, N8HAM, USA-CA 500 #2465, All SSB Mobile, 11-6-90.

Walter F. Ordway, K1DFO, USA-CA 500 #2466, All 20M SSB Mobile, 11-9-90.

Motomi Nasu, JH2BCN, USA-CA 500 #2467, Mixed, 11-9-90.

Wendy D. Kincaid, KB1AF, USA-CA 500 #2468, Mixed, 11-13-90.

Awards Available

"Chernobyl" Diploma. The "Chernobyl" Diploma was founded by the Soviet Radio Amateur Association, Union of the Chernobyl Movement. It is available to radio amateurs and SWLs worldwide. A total of 23 logged QSOs and 100 points is needed to qualify for this award. QSOs must have been made on or after April 26, 1986 and must have been made with amateur radio stations affected by the Chernobyl tragedy. Affected stations, required contacts, and point values are:

1. Memorial stations—One QSO (30 points each).

2. Hams who took part in eliminating the consequences of the accident—Two QSOs (15 points each).

3. Hams from oblasts affected by the tragedy and memorial station operators —20 QSOs (2 points each).

Memorial stations are RK3CH, RK3Y, RK5CH.

Hams involved are RA4LF, RV6ABL, RB5WL, UZ3AU, UA4AKA, UA9-154-

1680, UB4HX, UB4UGO, UB4JG, UB5EAY, UB5ERS, UB5HHX, UB5KCQ, UB5QLK, UB5SN, UB5UGD, UO5OOP, UT5ULK, UY5XE, UB5ERG, and RB5CF.

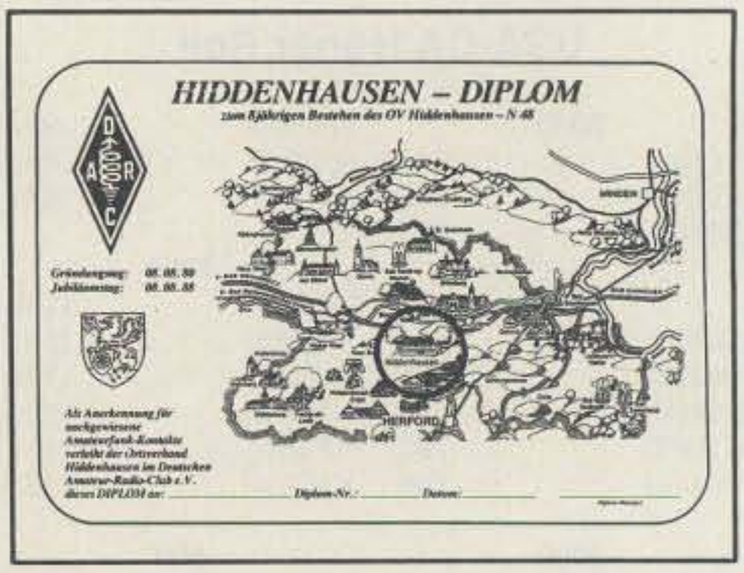
Affected oblasts are UA: Bryansk (3Y)N118, Kaluga (3X)N127, Orel (3E)N147, Tula (3P)N160; UB: Vitomir (5X)N063, Kiev (5U)N065, Chernigov (5R)N081. UC: Gomel (2O)N007, Mogolev (2S)N010.

Memorial station operators are RA3ACC, RA3APO, RW3AH, UA3DJK, UB5LGM, UV3ACQ, UV3DHH, UW3AG, and UY5OO.

The diploma is free, but "Union of the Chernobyl Movement" would appreciate donations for humanitarian activities.

Send GCR list and 5 IRCs (for return postage) to George Chlijanc, UY5XE, P.O. Box 19, Lvov, 290000, Ukraine, USSR.

Hiddenhausen Award. The Hiddenhausen Award is earned by accumulating 48 points working German stations after 8 August 1988 as follows: DOK N48 is worth 6 points; other DOKs with number 48 (e.g., G48, B48, etc.) are worth 4 points; any German station with 8 in the call is worth 2 points; and contact with DF0GH (mandatory for German applicants) is worth 10 points. For other European and DX stations these point values are doubled and contact with DF0GH is not required. The award is available to SWLs on a heard basis. Send GCR list and fee of DM10 or 10 IRCs to Friedhelm Berg, DG7YEY, Heidestr. 32, D-4983 Kirchlengern 1, Germany.



Hiddenhausen Award for working designated German amateur stations.

Worked Norwegian Cities (WNC). The Worked Norwegian Cities award is available to Radio amateurs and SWLs. It is earned by working different Norwegian cities from the list below.

The award is issued in three classes: Class 3—5 for DX, 10 for Europeans; Class 2—10 for DX, 20 for Europeans; Class 1—15 for DX, 30 for Europeans.

There are no date, band, or mode limitations. To apply, send GCR list and 10 IRCs, Nkr 20, or $3 U.S. to Larvik Society of NRRL, Award Manager, P.O. Box 59, N-3251 Larvik, Norway.

Cities list: Alesund, Arendal, Bergen, Bodo, Drammen, Egersund, Fredrikstad, Gjovik, Grimstad, Hammerfest, Halden, Hamar, Harstad, Haugesund, Holmestrand, Horten, Kongsberg, Kongsvinger, Kristiansand S, Kristiansund N, Kragero, Larvik, Lillehammer, Mandal, Molde, Mosjoen, Moss, Mo i Rana, Namsos, Narvik, Notodden, Oslo, Porsgrunn, Sarpsborg, Sandnes, Sandefjord, Stavanger, Skien, Steinkjer, Trondheim, Tonsberg, Tromso, Vardo.

Worked Norwegian Cities Award offered by the Larvick Society of NRRL.

The Helvetia Award. The Helvetia Award is earned by making confirmed contacts with all 26 Swiss cantons and half-cantons since 1 January 1979. This is a beautiful, multi-colored award showing the flags of each canton on its border. The award is issued in four categories: phone, CW, or mixed; all CW; RTTY; and SSTV. Cards must be sent, together with

Helvetia Award by Kurt Bindschedler, HB9MX, for working Swiss counties.

QSO information, to the sponsor.

The award is free, but sufficient IRCs should be sent to cover the cost of returning your cards. Apply to Kurt Bindschedler, B9MX, Strahleggweg 28, 8400 Winterthur, Switzerland.

Cantons: AG Aargau, GR Grisons, SZ Schwzy, AI Appenzell Inner Rhoden, JU Jura, TG Thurgau, AR Appenzell Outer Rhoden, LU Lucerne, TI Ticino, BE Berne, NE Neuchatel, UR Uri, BL Basle Country, NW Nidwalden, VD Vaud, BS Basle City, OW Obwalden, VS Valais, FR Fribourg, SG St. Gall, ZG Zug, GE Geneva, SH Schaffhausen, ZH Zurich, GL Glatis, and SO Solothurn.

The Helvetia Contest, held annually on the last full weekend of April, is an excellent time to work the rarer cantons, as portable operations often take place.

Polska Award. The Polska Award is offered for making contacts with provinces of Poland since 1 June 1975. It is available to licensed amateurs and SWLs. It is offered in three classes: Class 1—all 49 provinces; Class 2—35 provinces; and Class 3—20 provinces.

Polska Award available to amateurs and SWLs for logging contacts with provinces of Poland.

BB	Bielsko Bialla	SP9	KS	Krosno	SP8	RZ	Rzeszow	SP8
BK	Bialystok	SP4	LD	Lodz	SP7	SE	Siedlce	SP5
BP	Biala Podlaska	SP8	LE	Leszno	SP3	SI	Sieradz	SP7
BY	Bydgoszcz	SP2	LG	Legnica	SP6	SK	Skierniewice	SP7
CH	Chelm	SP8	LO	Lomza	SP4	SL	Slupsk	SP1
CI	Ciecnanow	SP5	LU	Lublin	SP8	SU	Suwalki	SP4
CZ	Czestochowa	SP9	NS	Nowy Sacz	SP9	SZ	Szczecin	SP1
EL	Elblag	SP2	OL	Olsztyln	SP4	TA	Tarnow	SP9
GD	Gdansk	SP2	OP	Opole	SP6	TG	Tarnobrzeg	SP7
GO	Gorzow	SP3	OS	Ostroleka	SP5	TO	Torun	SP2
JG	Jelenia Gora	SP6	PI	Pila	SP3	WA	Warzawa	SP5
KA	Katowice	SP9	PL	Plock	SP5	WB	Walbrzych	SP6
KI	Kielce	SP7	PO	Poznan	SP3	WL	Wloclawwk	SP2
KL	Kalisz	SP3	PR	Przemyal	SP8	WR	Wroclaw	SP6
KN	Konin	SP3	PT	Piotrow Tryb.	SP7	ZA	Zamosc	SP8
KO	Koszalin	SP1	RA	Radon	SP7	ZG	Zielona Gora	SP3
KR	Krakow	SP9						

Table I– Province abbreviations for the Polska Award.

EI8GT/W2ORA in the shack of EI8GT with the IRTS DX Trophy and Collins Cup.

EI Activity Day. The Irish Transmitters Society (IRTS) is promoting a special activity day on Sunday, 17 March 1991 (St. Patrick's Day). Their purpose is to get as many EI counties as possible on the air on that day to help amateurs achieve the Worked EI Counties Award. The WEIC Award, issued by the IRTS, is available to licensed amateurs worldwide who have worked EI or EJ stations located in at least 20 of the 26 counties of Ireland (EI/EJ). There are additional endorsements available for working all 26 counties and for individual bands and all mode contacts. It is available also to SWLs on a heard basis. Detailed information on the WEIC Award and membership in the IRTS is available from the IRTS, P.O. Box 462, Dublin 9, Ireland, or from Joe Duffin, W2OBA, 4 West Central Avenue, Moorestown, NJ 08057. Enclose an SASE, please. *(Detailed information about the WEIC award appeared in this column in the May 1990 issue.—ed.)*

Notes

The 20th edition of the *County Hunter Handbook* is now available. It contains 204 pages and is fully revised with the latest updates and new information, including a special article on Mobile Antennas. Order from the B & B Shop, P.O. Box 850652, Mobile, AL 36685. The price is $6.75, shipped first class in the USA.

Awards from the Promethius Amateur Association: QSLs, applications, and fees for Promethius Amateur Association Awards should go to PAA Manager, George Yankopolus, NA3O, 13 Glen Meadow Drive, Glen Mills, PA 19342, USA. *Do not* send them to the association address in the USSR, as was reported in this column in November 1990.

Happy Spring (Northern Hemisphere)!

73, Dorothy, WB9RCY

Radio FUNdamentals

BY BILL ORR, W6SAI

THINGS TO LEARN, PROJECTS TO BUILD, AND GEAR TO USE

The V-beam

The V-beam is a simple and cheap wire antenna. Originally known as the "RCA Model D" antenna, it was featured in *Handbooks* as early as 1934 (fig. 1). It is still in the latest edition of the *ARRL Antenna Book*. That's pretty good life for an antenna design, don't you think?

Most amateur handbooks provide a nifty pattern for the V-beam—nice, bidirectional lobes, with greatly attenuated minor lobes (fig. 2). If the wires of the beam are long enough, and the included angle is correct, a sizeable gain can be achieved, up to 7.5 dBd for a beam with 5-wavelength long legs.

The recently available computerized antenna programs provide an interesting insight into the V-beam antenna. The gain figure can be verified and the field pattern plotted. The interesting result is that the V-beam has large minor lobes, much greater in amplitude than pictured in the amateur literature.

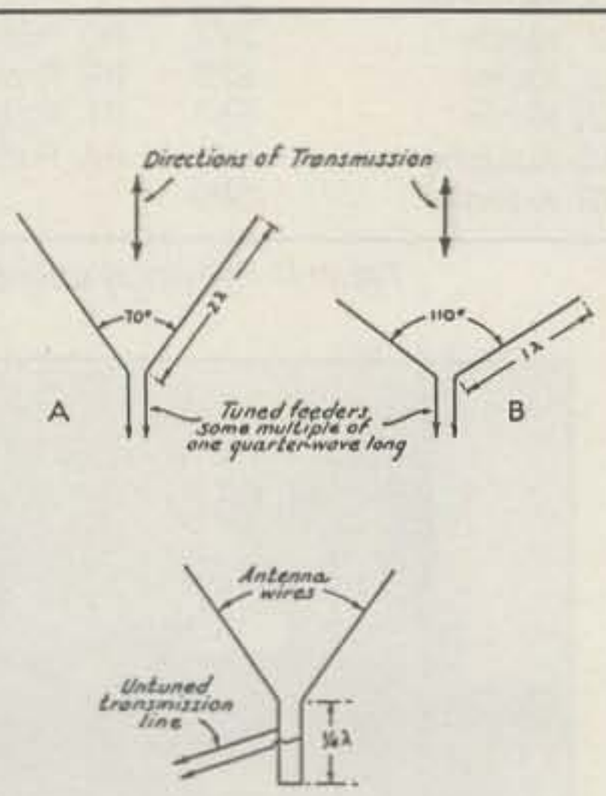


FIG. 1219 — THREE POSSIBLE VARIATIONS OF THE MODEL D DIRECTIVE ANTENNA

Fig. 1– The V-beam antenna, as shown in the 1934 issue of the Radio Amateur's Handbook. *Adapted from the RCA "Model D" beam antenna.*

V-beam Patterns

The azimuth pattern of a 5-wavelength V-beam is plotted in fig. 3 using the MN Antenna Analysis program of K6STI.[1] Look at the multitude of minor lobes! Four of them are only 6 to 8 dB below the main lobes, and others range in the −10 to −15 dB range. This means that for all practical purposes, the V-beam is an omnidirectional antenna with a field strength not much below a dipole in most directions off the main beam.

This point was brought to my attention by W2LX, who has a V-beam aimed at VK-ZL. It works very well in that direction, but Stu found that he could also work plenty of DX off the sides of the beam. Fig. 4 shows why this is so.

In real life, where wires sag and the interior angle of the V-beam is not accurate, the minor lobes are even larger than shown. Antenna gain is still present, but the pattern becomes more omnidirectional, with the minor lobes increasing in size. When erected over real earth with its losses and considering the signal reflection from various nearby objects, the minor lobes become even more blurred. The end result is gain along the main axis of the beam and near-dipole performance in all other directions.

48 Campbell Lane, Menlo Park, CA 94025

Strung between trees, as W2LX has done, the V-beam is a utility antenna good for operation on several bands. Used with a balanced antenna tuner and an open-wire feedline, the old antenna still does a good job in today's DX world of competition.

The Amazing G5RV Multiband Antenna

You hear a lot of G5RV antennas on the air these days. They must work, or fellows wouldn't be using them! Like the V-antenna, the basic G5RV is a very simple sky wire (fig. 5). It has been around a long time, disguised in many forms. Bill Stewart, K6HV, helped me trace the history of this antenna, and it seems to have more lives than a cat!

The original antenna design was conceived by Art Collins, W9CXX, of Collins Radio Co., and the antenna was packaged as a kit. The matching section was composed of heavy copper tubing, resulting in a clumsy and difficult assembly.

The idea seemed to die for a while, then resurfaced after the 50s, when it was popularized by R. Varney, G5RV, who replaced the copper-tubing matching section with one made of a two-wire transmission line. He also eliminated the balanced feedline and substituted a 75 ohm coaxial line.

The G5RV design consists of a 102 foot flattop center-fed with a 34 foot open-wire matching section (fig. 6). Various articles on the G5RV[2] confirm the belief that for "all-band" operation, a balanced antenna tuner is helpful.

The ZS6BKV Version

A few years ago a computer analysis on the G5RV antenna was run by Brian Austin, ZS6BKW.[3] Brian confirmed that the original G5RV design provided a low value of SWR when fed by 75 ohm coax only on the 7, 14, and 24 MHz bands. When fed with 50 ohm coax, the SWR was poor on all bands.

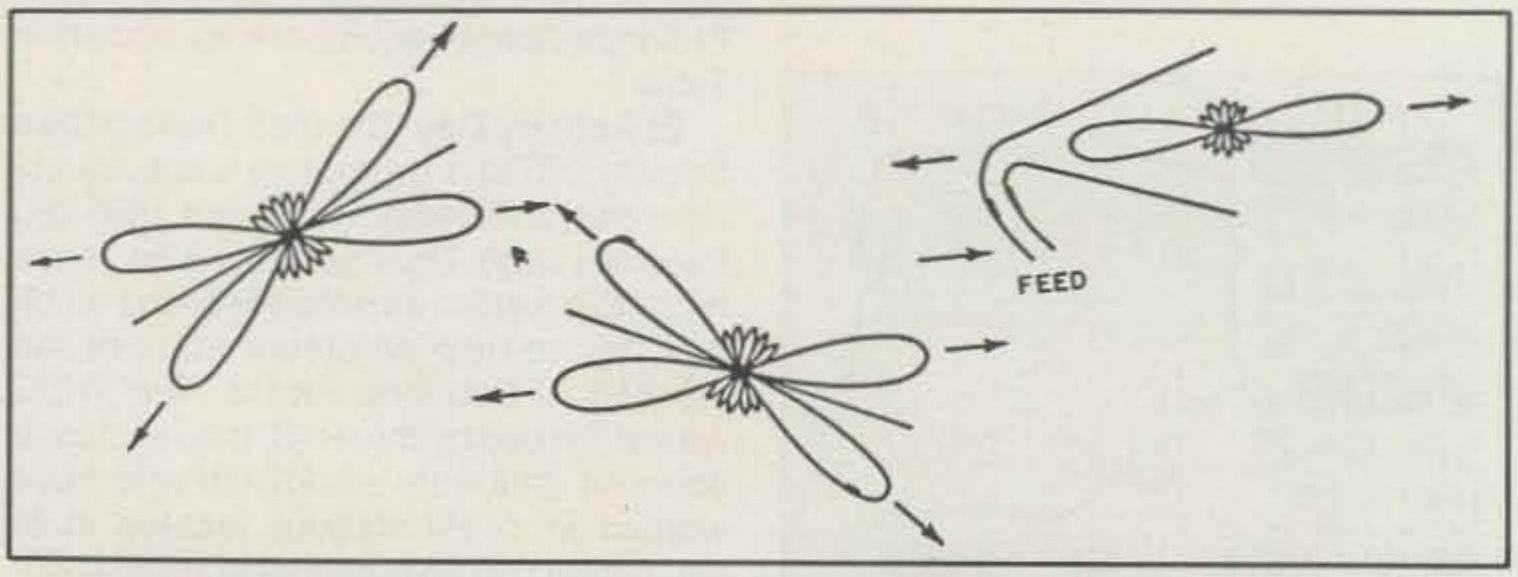


Fig. 2– Pattern of the V-beam antenna as given in the ARRL Antenna Book, *15th edition. These illustrations show how patterns of two long-wire antennas add up when placed at the proper included angle. Computer analysis of V-beam shows side lobes much greater than these here.*

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ARX2B	2m Vertical
AR270	2m/440 Vertical
A3S	3 Element Triband Beam
A4S	4 Element Triband Beam
A3WS	WARC Triband Beam
R5	5 Band No Radial Vertical
215WB	15 El. 2m Beam
230WB	30 El. 2m Beam
40-2CD	2 El. 40m Beam

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RS20A	16	20	99.00
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IC-751A	HF Xcvr	Call!
IC-735	HF Xcvr	Call!
IC-726	HF Xcvr (w/ 6m) ..	Call!
IC-725	HF Xcvr	Call!
IC-970	All Mode Base	Call!
IC-2400	2m/440 Mobile	Call!
IC-229A	2m 25W Mobile ..	Call!
IC-229H	2m 45W Mobile ..	Call!
IC-32AT	2m/440 5W HT	Call!
IC-24AT	2m/440 Tiny HT ..	Call!
IC-2GAT	2m 7W HT	Call!
IC-2SAT	2m Tiny HT	Call!

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DR-570T	2m/440 Mobile ..	Call!
DR-510T	2m/440 Mobile ..	Call!
DR-112T	2m 45W Mobile	Call!
DJ-120T	2m Tiny HT	Call!
DJ-160T	2m Small HT	Call!
DJ-560T	2m/440 HT	Call!

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TH5MK2	5 El. Triband	Call!
TH7DX	7 El. Triband	Call!
V2S	2m Vertical	Call!
18HT	80-10 Vertical	Call!
64BS	4 El 6m Beam	Call!
105BAS	5 El 10m Beam ..	Call!
155BAS	5 El 15m Beam ..	Call!
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MA-850	24 FT	85 FT	10 SQ. FT	3489
TX-438	22 FT	38 FT	15 SQ. FT	919
TX-455	21 FT	55 FT	15 SQ. FT	1385
TX-472	23 FT	72 FT	15 SQ. FT	2279
TX-489	24 FT	89 FT	15 SQ. FT	3959
HDX-538	22 FT	38 FT	30 SQ. FT	1179
HDX-555	22 FT	55 FT	30 SQ. FT	2079
HDX-572	23 FT	72 FT	30 SQ. FT	3559
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HBX56	56 FT	699.00
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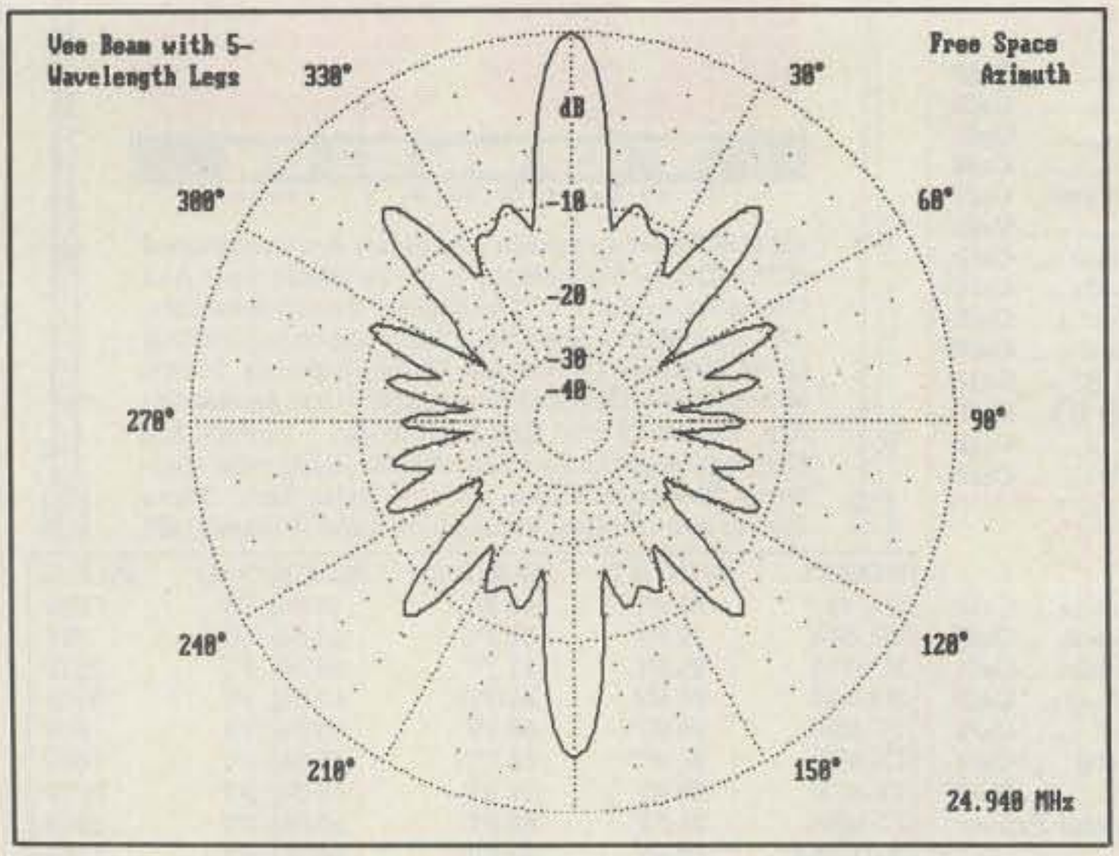


Fig. 3– K6STI analysis program shows side lobes of 5-wavelength V-beam. (See text for details.)

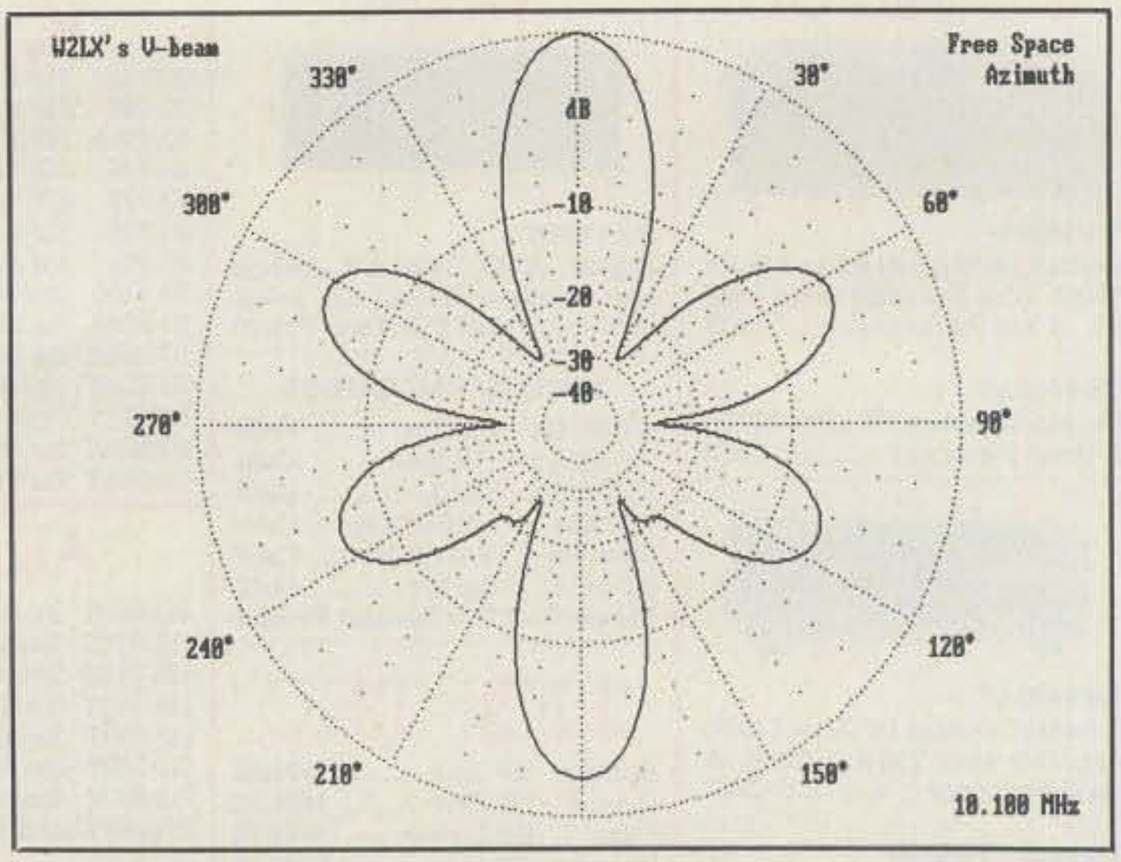


Fig. 4– Computer analysis of W2LX's short V-beam. Four minor lobes give good coverage at 60 and 120 degrees to main lobes.

These high values of SWR could be compensated for by the use of a balanced tuner at the station end of the coax line. However, ZS6BKW examined the computer program and came up with a new set of dimensions for the antenna which permitted 50 ohm feed, plus the use of 300 ohm ribbon line for the matching section.

The revised dimensions for the ZS6BKW antenna are given in fig. 7. The antenna provides a low value of SWR on the 7, 14, 18, and 24 MHz bands. On the 28 MHz band a low value of SWR is obtainable only over the range of 28.5 to 29 MHz.

This is quite an improvement over the original design, but an antenna tuner is required for 21 MHz operation, and would be helpful for full coverage of 28 MHz. Either antenna design will also work on 80 meters, with an appropriate antenna tuner.

Field Patterns of The G5RV Antenna

The field patterns of the original G5RV and the ZS6BKW version are substantially the same. On 80 meters the pattern is the familiar figure-8 of the conventional dipole. The pattern is the same on 40 meters, slightly narrower, and exhibiting a gain of about 0.5 dB at right angles to the antenna wire.

Computer plots of field pattern for the higher bands are shown in figs. 8 through 10. The 20 meter pattern has the main lobes at an angle of about 45 degrees to the wire. These lobes exhibit a gain of 1.02 dBd. The lobes at 90 degrees to the wire are down about 2 dB from the main lobes. In real life the deep nulls of the pattern will tend to be filled in to a great extent.

The 15 meter pattern shows the main lobes displaced about 65 degrees from the wire, with a large null at right angles to the wire. Four minor lobes exist, each down about 10 dB from the main lobes. It is not a very exciting pattern, as radiation in-line with the wire and at right angles to it is largely suppressed. Hopefully, the nulls will be filled in by virtue of the antenna environment.

The 10 meter pattern shows even more lobe splitting. Gain of the main lobes is about 2.45 dBd. Again, there are a lot of gaps in the plot.

Summing it up, the G5RV antenna operates like an ordinary random-length, center-fed wire with no special properties other than that it can be reasonably matched on most amateur bands with little effort.

The Balanced Antenna Tuner

I've mentioned the fact that the G5RV was originally designed to be used with a balanced transmission line. That's fine, but where does the prospective user obtain a balanced antenna tuner? All of today's tuners (sometimes called "Transmatches") have a balanced output derived from a balun (fig. 11). The balun is commonly a 4-to-1 design, providing a 200 ohm terminal point. This is okay if you have a 200 ohm transmission line with a low value of SWR on it. But this is not the case with the G5RV, the matching sec-

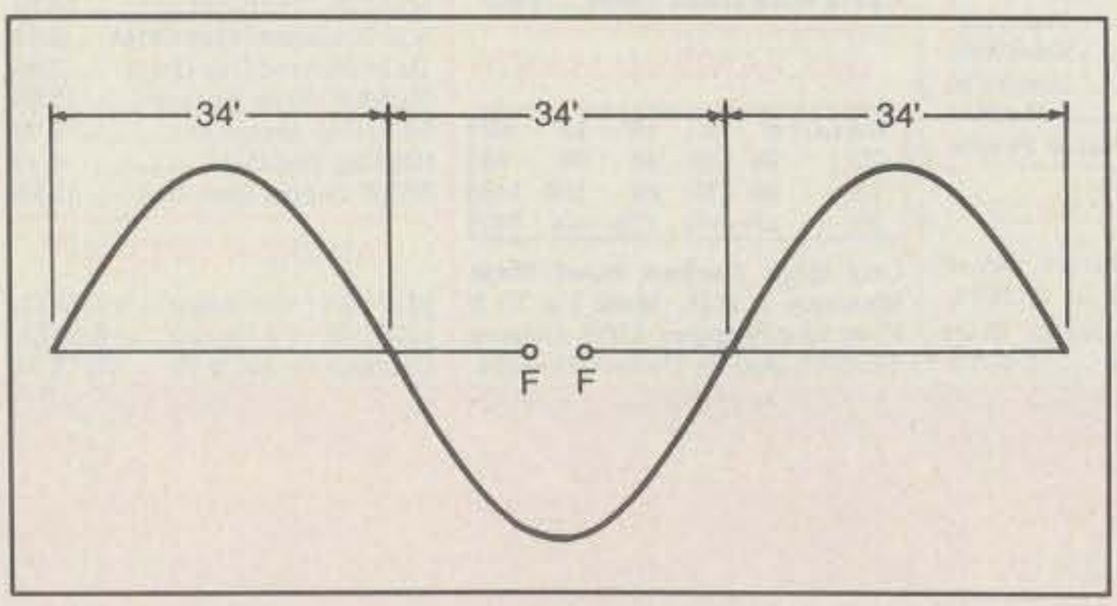


Fig. 5– Genesis of G5RV antenna is three half-waves at 14 MHz in phase, fed at the center segment. Current distribution is shown.

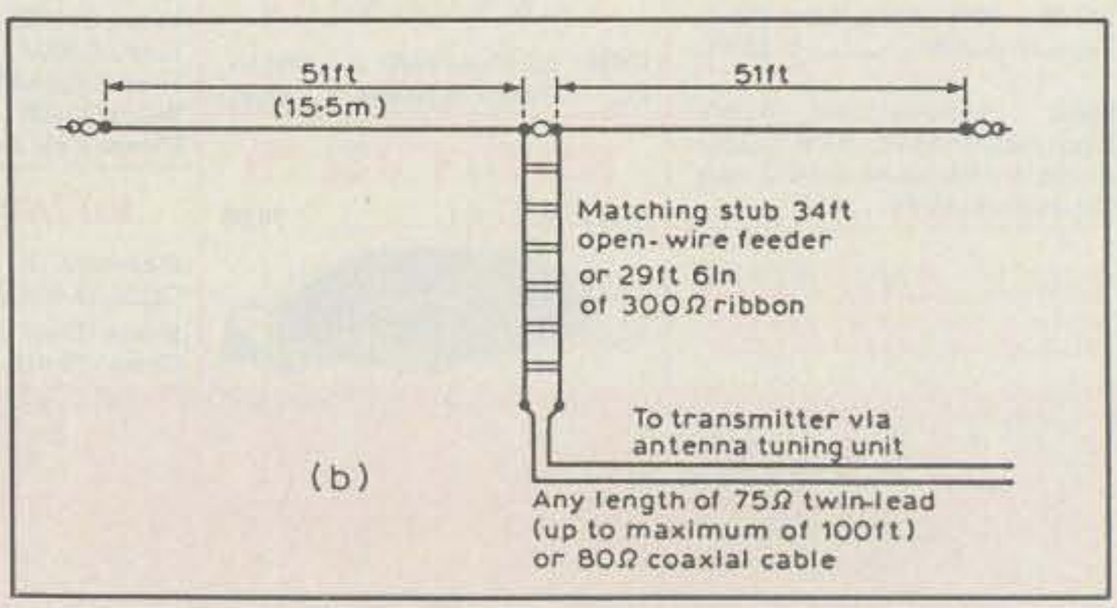


Fig. 6– Original G5RV antenna used open-wire stub and 75 ohm coax feed. Drawing from "hf antennas for all locations," by Moxon (RSGB).

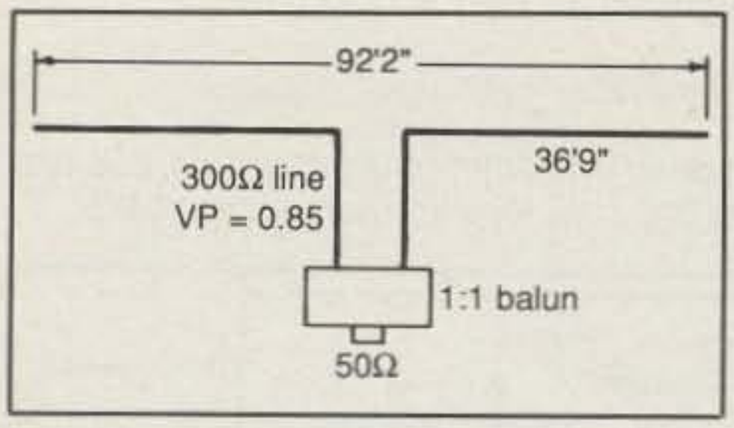


Fig. 7– ZS6BKV computer-derived G5RV antenna provides good match to 50 ohm line and uses 300 ohm ribbon line for matching section.

tion of which provides a widely varying reactive termination on most bands. The balun doesn't like this, and core saturation or flashover can take place under certain operating conditions.

The old Johnson "Matchbox," no longer in production (alas), is suitable for balanced, center-fed antenna systems. Information on building your own equivalent is in the *Radio Handbook* as well as the *ARRL Antenna Book*.

Parallel-Connected Dipoles

Parallel-connected dipoles are featured in most antenna handbooks, but very little practical information is given about them. It is said that the resonant length of a dipole in the presence of another is not the same as for the dipole by itself. A rather vague idea.

I've tried parallel connected dipoles and have had good luck with them, but noticed detuning at some times and not at others. I erected two dipoles connected at the feedpoint for 7 and 18 MHz. The angle between the two antennas was about 45 degrees. No problem! A textbook case. Both antennas acted as if the other was not there.

Later I cut the 18 MHz dipole to 14 MHz. I found the 14 MHz dipole severely detuned. It had to be lengthened to establish resonance. The conclusion I drew from this was that harmonically related dipoles exhibit detuning of the higher frequency dipole, but harmonically unrelated dipoles have little effect on each other. In either case, the dipoles had to run at a substantial angle from each other; 30 to 40 degrees of separation seemed to do the job.

The ON4UN Antenna Program

John, ON4UN, publishes his upgraded Yagi design program. The two-disk program is available in either monochrome or color. A plotting program is also available which will plot azimuth and elevation antenna patterns. In addition, it creates input files for the K6STI YO and MN programs. As such, the MN, YO, and ON4UN programs are ideal partners.

You can electrically design your Yagi with any of these programs. Element diameter, taper, spacing, and matching systems can be determined with a few keystrokes. Only one minor matter is left —building the antenna!

How should the antenna be built to withstand the vagaries of the weather? What is the wind load factor of the proposed antenna? If the rotary mast extends above the tower top, what is the stress on the mast? In short, how does the builder prevent the antenna from crashing down in high winds? (The VHF DX operator takes all this in stride. He says, "If my antenna doesn't come down in a high wind, it isn't big enough!")

But what about the rest of us? Consider the complex problems of element strength, sag, ice loading, mechanical balance, stress on the tower . . . wow! And what about stacking two antennas on one mast? Enough problems to cross the eyes of the best mechanical engineer.

Fortunately, these problems are met head-on in the ON4UN Mechanical Analysis Program, which is part of the overall Antenna program. The mathematical basis for the program is the article "Structural Evaluation of Yagi Elements," by Dick Weber (*Ham Radio* magazine, December 1989, pp. 29–46). The ON4UN program is available in the United States from the CQ Book Store, Main Street, Greenville, NH 03048.

The Dead-Band Quiz

In my December column I asked the readers to complete and identify the manuscript quotation, dated 1792: "I consul you by way of caution to forbear from crossing the moor in those dark hours when the powers of evil are exhalted."

I'm pleased to find that enthusiasts of the Sherlock Holmes stories are readers of this column, and some of them correctly identified the old manuscript read by Dr. James Mortimer that started the famous detective on one of his greatest cases.

The Sherlockian sleuth who provided the greatest insight into *The Hound of the Baskervilles* story is "Rick" Glisson, N4XMX. Rick also proposed that those amateurs interested in Mr. Holmes and his adventures set up a special net to meet from time to time on the "Speckled Band." Unfortunately, Rick does not give the frequencies of the Speckled Band, so the net has not yet been called to order.

Runner-up is Alex Funke, KC6IWR, who provides an interesting summary and insight into the quotation and also points out that Sherlock Holmes possibly may have been an early radio amateur, as he had extensive knowledge of the Morse code and other codes, and he refers to it during an episode in his life when he was a double

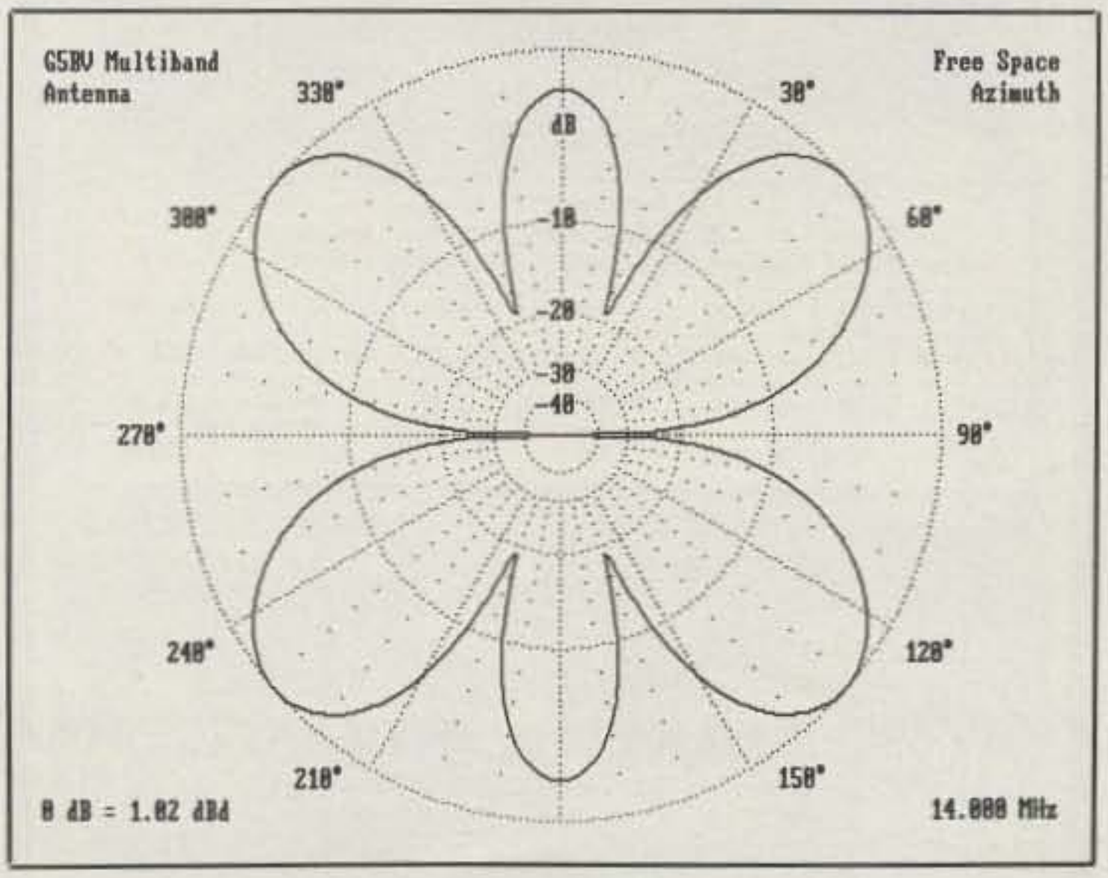


Fig. 8– Pattern of G5RV on 14 MHz.

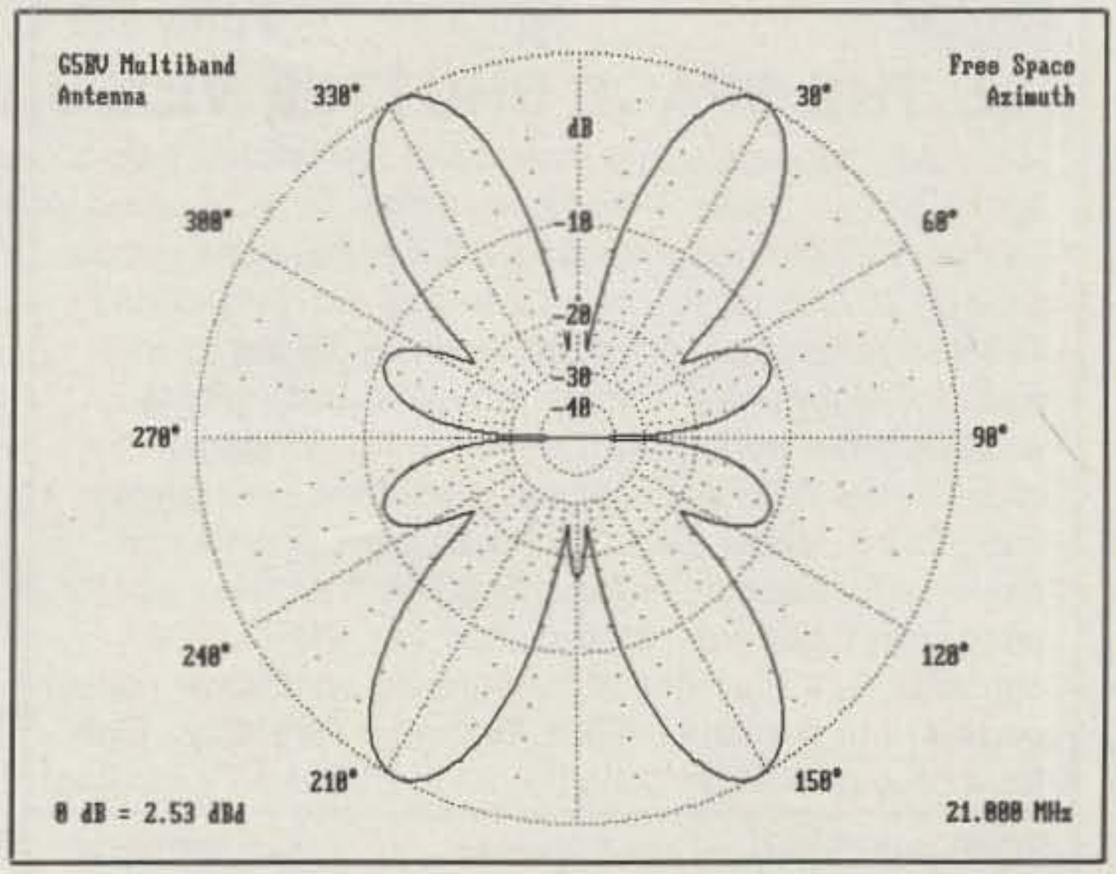


Fig. 9– Pattern of G5RV on 21 MHz.

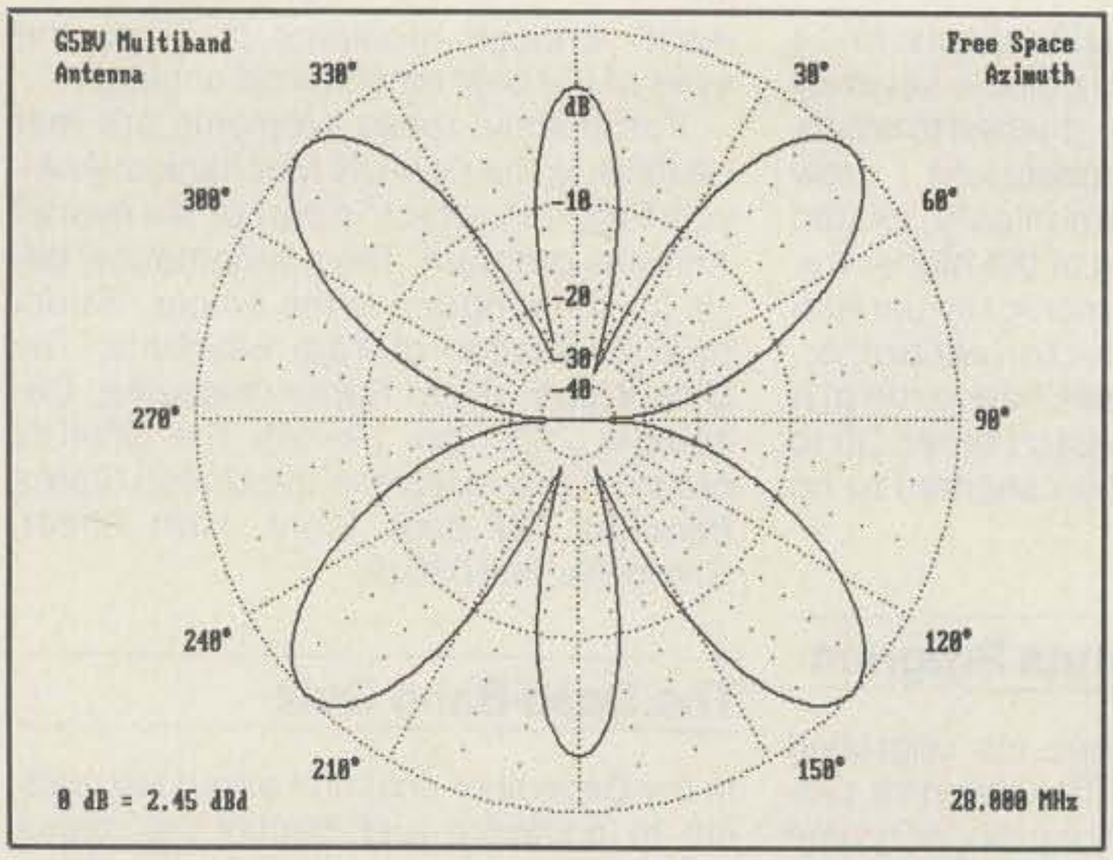
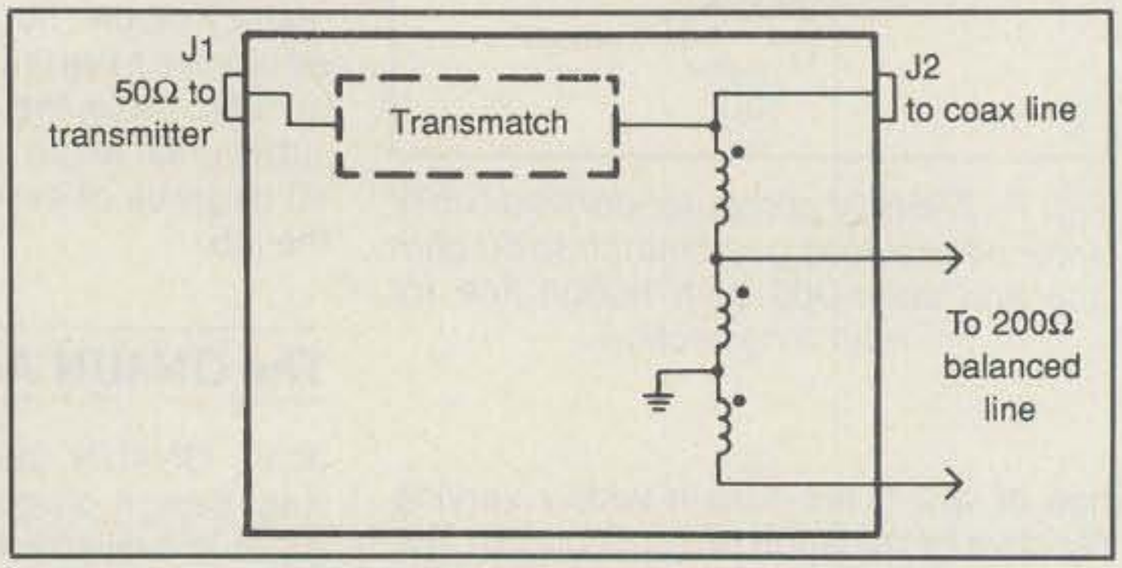


Fig. 10– Pattern of G5RV on 28 MHz.

Fig. 11– Ferrite balun used in many Transmatch tuners is not suitable for working into balanced line having high SWR.



agent: " . . . every last one of (the Naval signals), semaphore, lamp code, Marconi—a copy, mind you, not the original. That would have been too dangerous . . . ."

Rick and Alex, by virtue of their vast knowledge of the canon, receive autographed copies of the new edition of the *Beam Antenna Handbook*. Congratulations!

And thanks to the following who proved their accurate and extensive knowledge of *The Hound of the Baskervilles*: John Stroud, WA6WNN; Luther Phillips, KI4UZ; Brad Martin, N4YYP; Bob DiSilverio, KK6IJ; Marty Peritsky, K3PBU; and Robert Howe, W7EP.

And to the other readers of *CQ* who wrote to me, many thanks for your notes and good wishes: Jack, W2YYI; Wayne, AG4R; Fred, W5QJM; Bruce, W2AN/W2ICE; Dave, W6CUB; Shel, W6EL; Bob, W7GXX; Bill, W2YKG; and Hollis, WF6U. Thanks for your kind words. And to those who inquired about the whereabouts of my old friend Pendergast, he is now the Chief Engineer of that large Mexican communication company "Taco Bell."

Footnotes

1. MININEC (MN3.5), Brian Beezley, K6STI, 507½ Taylor, Vista, CA 92058.

2. Louis Varney, G5RV, "The G5RV Multiband Antenna," ARRL Antenna Compendium, Vol. 1., American Radio Relay League, Newington, CT 06111.

3. Brian Austin, "Computer-aided Design of a Multiband Dipole," Radio Communications, August 1985, Radio Society of Great Britain, Cranbourne Rd., Potters Bar, Herts., England EN6 3JE.

73, Bill, W6SAI

Announcing *(from p. 9)*

• The following hamfests, etc., are slated for March:

Mar. 2, **Shore Points ARC Springfest '91,** Holy Spirit High School, Absecon, New Jersey. Contact SPARC, P.O. Box 142, Absecon, NJ 08201.

Mar. 2, **15th Annual Glasgow, Kentucky Hamfest,** Cave City Convention Center, Cave City, Kentucky. Contact N4HCO, 1379 Whites Chapel Road, Glasgow, KY 42141. (VE Exams)

Mar. 3, **WECAFEST '91,** Mount Pleasant NYS Armory, Valhalla, New York. Contact Bob Wilson, N2DVQ, 2 Soundview Ave., Apt. AS, White Plains, NY 10606 (914-993-0711). (Handicapped accessible; VE exams)

Mar. 3, **Champaign-Logan ARC Hamfest/Computer Show,** Kenton Senior High School Athletic Facility, Kenton, Ohio. Contact Jerry Temple, N8MTZ, 402 Chesney St., Kenton, OH 43326 (419-675-5281).

Mar. 8, **Jefferson Barracks ARC 31st Annual Amateur Radio Auction,** Concordia Turner's Hall, South St. Louis City, Missouri. Contact Jefferson Barracks ARC, K@ZFK, 1624 Union Road, St. Louis, MO 63125.

Mar. 9, **Roselle Park, New Jersey Family Computer and Ham Festival,** Roselle Park High School, Roselle Park, New Jersey. For info call 201-241-4450, or 201-241-8902 BBS (24 hr. 300/1200).

Mar. 9, **North Jersey Hamfest,** Sheraton, Mt. Arlington, New Jersey. Contact Split Rock ARA, P.O. Box 610, Rockaway, NJ 07866. (VE exams 8:45 AM)

Mar. 9, **Old Fashioned Swapfest,** Tullahoma, Tennessee Airport, Hanger 6. Contact W4SFF, Middle Tennessee ARS.

Mar. 10, **Moonbase "America" Hamfest & Computer Fair,** Copley High School, Copley, Ohio. Contact KLenny Mack, KB8KTC, Copley High School, 3807 Ridgewood Rd., Copley, OH 44321.

Mar. 10, **Indiana Hamfest,** Indiana State Fairgrounds Pavilion Bldg., Indianapolis, Indiana. Contact Aileen Scales, KC9YA, 3142 Market Place, Bloomington, IN 47403 (812-339-4446).

Mar. 10, **Teays ARC Hamfest,** Pickaway County Fairgrounds, Circleville, Ohio. Contact Dan Grant, W8UCF, 22150 Smith Hulse Rd., Circleville, OH 43113 (614-477-3026).

Mar. 16, **ARCA Spring Hamfest,** Scottsdale Community College, Scottsdale, Arizona. Contact Allen Sklar, AA7BJ, P.O. Box 10878, Scottsdale, AZ 85271-0878 (602-491-0802).

Mar. 16, **30th Annual Michigan Crossroads Hamfest,** Marshall High School, Marshall, Michigan. Contact Wes Chaney, N8BDM, 616-979-3433. (VE exams starting at 9:30 AM; preregistration requested, contact Barry Polack, 330 East Berry Road, Rives Junction, MI 49277.)

Mar. 16, **Flemington, New Jersey Hamfest,** Hunterdon Central Regional High School Fieldhouse, one mile north of Flemington Circle. Contact Marty Grozinski, NS2K, c/o Cherryville Repeater Assn. II Inc., P.O. Box 308, Quakertown, NJ 08868 (908-806-6944, or 908-788-4080). (VE exams)

Mar. 16–17, **North Florida Ham/Swapfest,** Shrine Fairgrounds, Ft. Walton Beach, Florida. Contact Playground ARC, P.O. Box 873, Ft. Walton Beach, FL 32549.

Mar. 17, **Midland ARC St. Patrick's Day Swapfest,** Midland County Exhibit Building, east of Midland, Texas. Contact Midland ARC, P.O. Box 4401, Midland, TX 79704. (VE exams)

Mar. 17, **Sterling-Rock Falls ARS 31st Annual Hamfest,** Sterling High School Field House, Sterling, Illinois. Contact Sue Peters, Sterling-Rock Falls ARS, P.O. Box 521, Sterling, IL 61081, or call 815-625-9262.

Mar. 17, **Toledo Mobile Radio Assn. Hamfest,** Lucas County Recreation Center, Maumee, Ohio. Contact Bob Hanna, K8ADK, 2154 Circular Drive, Toledo, OH 43614.

Mar. 17, **South Shore ARC Indoor Fleamarket,** Viking Club, Braintree, Massachusetts. Contact Hal 617-335-5777 (evenings).

Mar. 23, **Parker County ARC Hamfest,** National Guard Armory, Weatherford, Texas. Contact Bob Sonnenberg, N5BJO, Rt. 6 Box 218, Weatherford, TX 76086.

Mar. 23, **Radio Amateur Society of Norwich Auction,** Monville Fire Department, Monville, Connecticut. Call KA1BB at 203-739-8016.

Mar. 23, **Lincoln Trail ARC 11th Annual Hamfest,** Pritchard Community Center, Elizabethtown, Kentucky. Contact Chuck Strain, AA4ZD, 502-351-1715. (VE exams, walk-in only, 9 AM)

Mar. 23, **Chestnut Ridge Radio Club Fleamarket,** Education Bldg., Saddle River Reformed Church, Upper Saddle River, New Jersey. Contact Jack Meagher, W2EHD, 201-768-8360.

Mar. 24, **HAMCOMP '91,** New Jersey National Guard 112th Field Artillery Armory, Lawrence Township, New Jersey. Contact HAMCOMP '91, c/o KB2ZY, 33 Bowne Station Rd., Stockton, NJ 08559 (SASE). (Wheelchair accessible)

Mar. 24, **13th Annual Lake County ARA Hamfest,** Madison High School, Madison, Ohio. Contact Roxanne, Lake County Hamfest, 5777 Fenwood Ct., Mentor on the Lake, OH 44060 (216-257-2036 from 6–9 PM weekdays, 10 AM to 4 PM weekends). (VE exams at 8:15 AM)

Mar. 24, **SEMARA Hamfest,** Grosse Pointe North High School, Grosse Pointe Woods, Michigan. Call 313-527-3497. (VE exams)

Mar. 30, **Portland, Maine Hamfest,** Westbrook JHS, Westbrook, Maine. Contact Ron Levere, KA1FI, 35 Riverbend Drive, Yarmouth, ME 04096 (207-846-9090). (VE exams at 9 AM)

Mar. 30, **Four States ARC 2nd Annual Swapmeet,** Four States Fairgrounds, at Loop 245 and I-30, Texarkana, Texas. Contact Travis Bailey, K5AVH, 903-792-2080. (VE exams)

Amateur Radio and The NEC

(from p. 38)

pass under or over power lines and must never run closer than a 2 foot parallel separation.

Open-wire feeders must be of the same construction and size as antenna wire, with the exception of small spans of less than 35 feet, where soft-drawn copper may be used. Clearance from any structure must be 3 inches or more. Entry into the ham shack must be made via an insulating bushing, drilled window pane, or an opening of a size such as to permit a clearance of at least 2 inches. An antenna discharge unit must also be installed to drain static charges.

Feeders and antennas must be installed to make accidental contact difficult.

Coaxial feed lines have no restrictions other than to be securely supported.

There you have it. Fortunately for amateur radio operators the NEC is very limited in scope for amateur installations. As for living up to these requirements, let your conscience be your guide. However, if you do everything in accordance with the code and your shack still burns down, you will have that warm, comforting feeling of knowing that it met code.

(Reference: National Electrical Code 1990, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.) CQ

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April 26, 27, 28, 1991

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• Asst. General Chairman, Ross Brown, WA8DQH

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1991 Deadlines
Award Nominations: March 1
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Advance Registration and banquet:
USA - April 4 Canada - March 31
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Spaces will be allocated by the Hamvention committee from all orders received prior to February 1. Notification of space assignment will be mailed by March 15, 1991. Checks will not be deposited until the selection process is complete.

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(Sunday)	_____	@ $8.00	$_____
Flea Market (Max. 3 spaces)	_____	$25/1 space $50/2 adjacent $150/3 adjacent	$_____
Admission ticket must be ordered with flea market tickets			
		Total	$ _____

* $13.00 at door
** $24.00 after April 24th, if available

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PACKET USER'S NOTEBOOK

BY BUCK ROGERS, K4ABT

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

The Digital Amateur Looks At The Future

Considering the climate that surrounds today's digital amateur, it is evident that we are about to undergo an all-out metamorphosis in our segment of the amateur radio hobby. Packet radio and all digital modes will definitely see a turn for the better. I'm not overlooking the changes to the voice medium of our hobby either. Voice is far behind the other communication modes, but it won't take long for it to catch up to the rest of the digital modes.

In a matter-of-fact statement, I will first direct your attention to the 1990 fall issue of *Communications Quarterly* (available from CQ Communications for $9.95; a one-year subscription to the quarterly is $29.95) and an article therein by Bryan Bergeron, NU1N, which explains Digital Signal Processing. Bryan provides us with a very detailed and interesting approach to the methods of processing signals in the frequency domain, no less. Those of us who feel that we have graduated to the time domain may in fact find that some "real world" use of the frequency domain still exists. Simply put, this is where we start when we begin the concept of digitizing and processing the spoken word.

This article is interesting to the newcomer. However, it is a *must* for the high-tech readers who enjoy the field of digital communications. For the communications engineer, I highly recommend reading this very interesting and timely article.

The State of the Art

I work at CONTEL Cellular, where we are involved in the most modern methods of communications available to mankind. As an RF engineer, I use RF in an almost exclusively digital environment. In the field, when a cellular phone customer is using a mobile phone, they are unaware of the numerous digital actions that are taking place in real-time when a cellular call is being processed. Even as the call is in progress, there are literally hundreds of events taking place to provide an error-free, clear conversation.

RF power is regulated to and from a cellular phone through digital signal processing and measurements that are made by sampling precise pulses from incoming signals. This pulse is then used as a gauge to inform specific circuitry to raise or lower the power level in accordance with the requirements of the user's phone. This action can occur at both the cellular site and the vehicle cellular phone. If the incoming signal to the cell site falls below a predetermined threshold, there is an automatic and instantaneous signal sent to neighboring cell sites.

This signal performs a series of tests and interrogations that check the signal strength from the cellular phone that is to be accepted. These tests are executed so fast and with such precision that no change in conversation levels is detected by the users. When the hand-off occurs, the cellular phone user has no more than a few milliseconds loss of conversation. Moreover, the user may never even know that a hand-off took place. Thus, the conversation continues as if nothing had happened.

Future Shock

From the user's viewpoint the cellular industry has brought us many new and wonderful features. As a matter of fact, it's not only the user who is benefiting The entire field of Telecommunications technology is reaping these benefits.

Because of the rapid growth in this segment of communications, we are about to enter another stage of future shock (that's a buzz-word that found its place in the mid-60s). A number of technological achievements occurred during that period. We saw the space race make quantum leaps. FM technology enabled us to place repeaters on high places so that much greater distances could be covered with very low power. Color television became an affordable entertainment medium to many.

These technological "booster shots" seem to occur at 22-year intervals, and this physio-bio-rhythmic cycle appears to have come full circle to reach that epoch again.

The 1990s opened by giving all of us a rude awakening. The political time-base was out of sync with the technological clock. Everyone had a theory about which method we should use to cure the illness that slowed the economy. In the meantime, there is a new learning curve developing which sends a timing pulse to us which makes us become more responsible in our jobs and less apathetic in our living environment.

A realignment of quality, output, and improvements in the final product is beginning to develop because our efforts are returning to more defined resolutions. This also brings about a new pride in ourselves, and thus a realignment of our goals.

The posture of the digital amateur is much the same. We may soon develop new and better ways to communicate via AMTOR, packet, and some yet undefined means of error-free digital modes. In our hobby many good things are happening which will make it more enjoyable and interesting. With that thought in mind, I've decided to cover a few of these components in this month's "Packet User's Notebook."

For SYSOPs and Users Alike

For the System Operators (SYSOPS) like myself who know the costs involved when implementing a new packet switch, there is some relief in store if you shop around for the switch components. The TNCs which we use to construct the switches haven't changed enough in price to talk about it, but the rest of our support category has.

Now more than ever we are increasing the number of local area networks (LANs). We also continue to increase the number of packet switches in these LANs. Therefore, for economic reasons we are constantly on the lookout for the best value for our packet dollar.

I've purchased many of the support components for several packet switches in my homr state of Georgia. Just a month ago I needed to add a packet switch here in the Atlanta area, but my funds were running low. I called my son Glynn, WB4RHO, to ask if he had an old antenna left over from any of his sites or a second-hand antenna that I could purchase "cheap" (that's southern for trade, barter, or buy at a low price). Not a chance. He and some of the South Alabama SYSOPs were about to install more ROSE switches just across the line in the Florida Pan-Handle, and any packet-switch items were already committed.

Glynn did offer a very interesting suggestion, though. He told me about an antenna he had found at a local electronic

506 Pheasant Ridge Drive, Warner Robins, GA 31088

wholesale supply house in Dothan, Alabama. The reason his suggestion was so interesting was in the amount of gain this antenna is purported to have, not to mention the economical price tag on it.

I Found A Local Supplier

This antenna is a newcomer to the antenna market, and its performance is certainly interesting. The antenna is manufactured by WINTENNA, Inc. and was designed by Jeff Wingard. The antenna is a WINTENNA Model 9209, and it sells for under $45. A local distributor sold me three of the 9209's for a little over $100, and that included shipping.

The 9209 is a collinear "multi wave" base station antenna which consists of double ⅝-wave antennas over a ¼-wave antenna that delivers up to 9 dB of gain. It is all fiberglass and solid aluminum construction. The three radials extend from the base outward ¼ wavelength. The base mounting bracket will fit masts up to 1½ inches in diameter. The antenna is lightweight and easy to side mount on existing towers. In addition, the person(s) who do the mounting of this antenna on the tower will find the 9209 easy to maneuver while setting it in place. I've installed two of the 9209's at new switch sites. In a third location I replaced a popular antenna of less gain with the 9209, and immediately we noticed a pronounced improvement in coverage.

Now that I've given you the good points of this antenna, I must also include a caveat. I don't recommend this antenna at high elevations where it could become covered with a heavy ice load. I'll explain my reason for this caution.

The overall length of the antenna is 10 feet for the 2 meter version, and the tip is made of hard-drawn aluminum. The tip constitutes about three feet of the top portion of the 9209. If it were to become loaded with a heavy coat of ice, it could bend, or even break. In one of my locations I decided to add a touch of durability to the antenna tip by exchanging the top section with a stainless-steel rod of equal length.

Before I continue on to other topics this month, I should mention that WINTENNA also manufactures a 220 MHz and 440 MHz version of this 9 dB collinear base station antenna. They are the 9309 (220 MHz) and the 9409 (440 MHz). The price is the same for either version.

Data Radios Are Packet Radios

Remember the days when we never left for the work place without our VHF transceiver in hand? We moved it to the car when we went to work and moved it back to the operating position in the shack when we returned home. As time went on, many of us decided to stop this frivolous exercise and buy another rig for the shack. This eliminated the need to ferry the VHF transceiver between the ham shack and the car each morning and evening.

With the advent of computer and radio interfacing, the trend has moved toward a third transceiver because the voice rig must always be handy in the shack to answer the XYL, to answer roll call of the net, for emergency communications, or for whatever excuse you can use to convince the XYL that a data radio is a necessary purchase.

In many instances there is no rebuttal because the XYL has begun to use the computer and feels that a transceiver attached to a TNC and the computer is an absolute necessity. As I stated before, we packeteers are growing in numbers at a pace not before imagined.

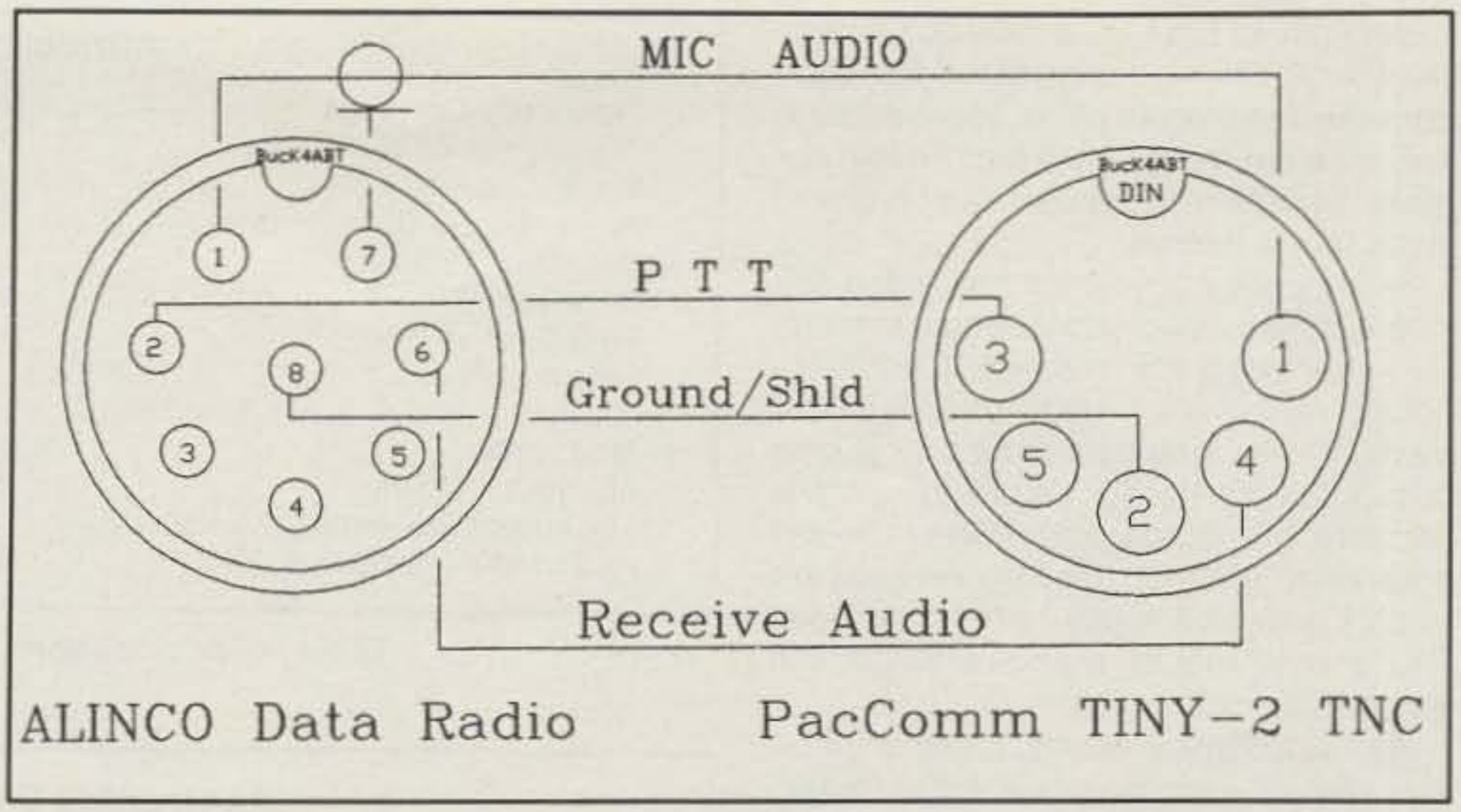

Fig. 1– The Alinco Data Radio provides all I/O connections to the same port. Note: Pin 6 equals RX AF out to TNC.

This Growth Has Not Gone Unnoticed

The manufacturers are beginning to discover that packet radio's growth rate is climbing at an ever-increasing rate. These numbers have become an indicator that points to a new market for the manufacturer. I should add that it is a new "kind" of market, also.

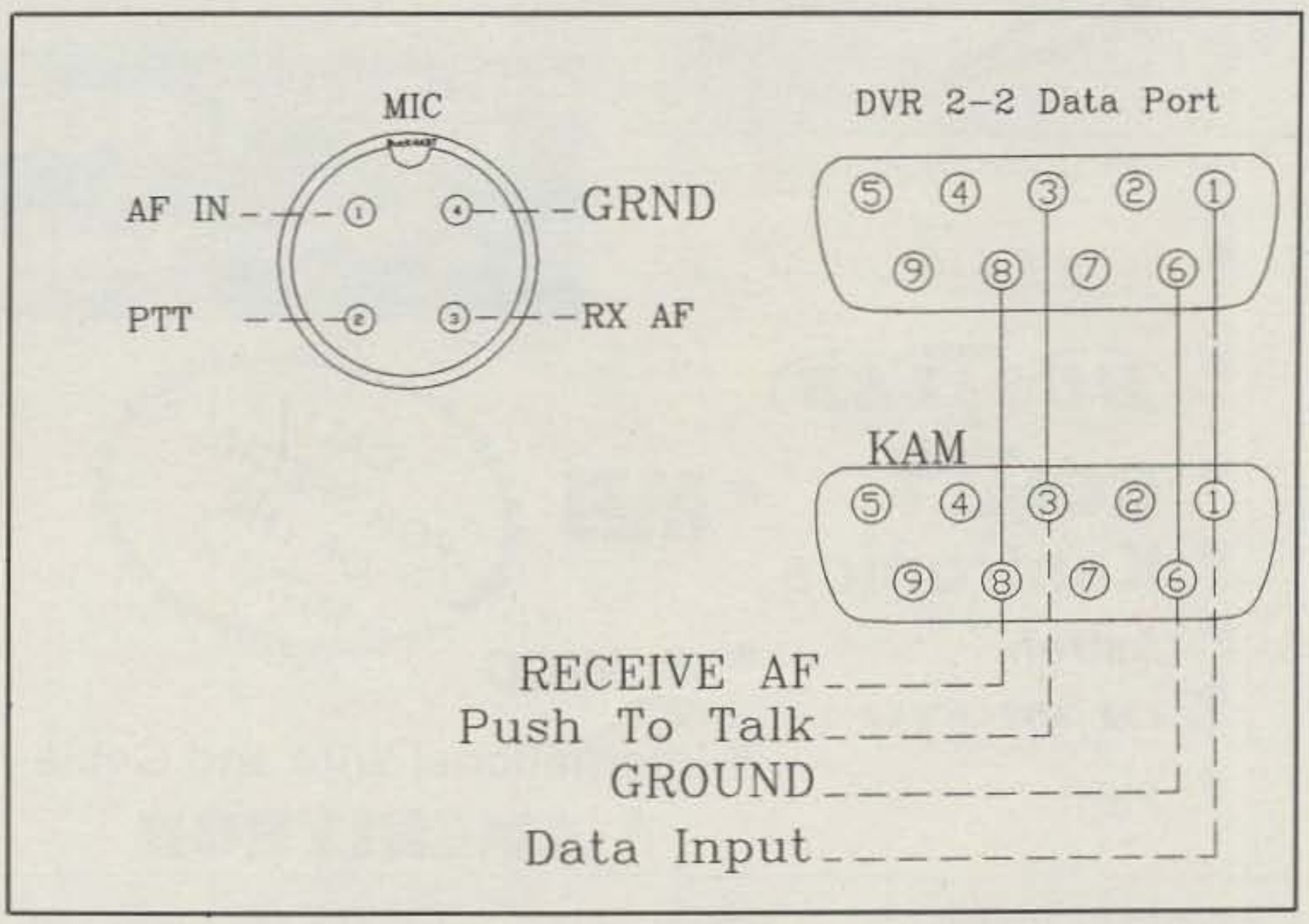

Fig. 2– The Kantronics DVR 2-2 crystal-controlled data radio interfaced to the Kantronics KAM. The DVR 2-2 has both mic input and data port connectors on the rear panel.

Because of the FCC action on December 13, 1990 which eliminates the code from the Technician class license, there may be even more "hackers" to join our ranks. Let's face it. This is in our favor and in our future interest.

In the packet arena we may soon see innovations that we cannot begin to imagine today. Sure, with the new ROSE technology we have a keyboard-to-keyboard medium over long hauls, but that is land based. We've hardly begun to use the PacSats, MicroSats, and AMSATs to any great degree. When this happens, packet radio's growth will take a quantum leap into a new era of digitized voice and worldwide communications.

As I write these words, there are new data radios being designed and manufactured for just this purpose. They are being constructed around the constraints that are related exclusively to packet and data communications.

Data radios are nothing new, but the accessory connections to the later models are. For instance, look at the new models at your local amateur radio supply house next time you visit. On the rear apron (panel) you will find some added ports that connect to an external device for either computer control or TNC interfacing. The output audio level is in the area of 200 mv. Another port you will find is an audio input that may have the exact same level requirements as the output of

Alinco Data Radio

Frequency Coverage	144–148 MHz
Transmitter Power Output	25 watts and 5 watts (switched)
Signal Type	F3
Power Supply Requirements	DC 13.8 V
Antenna Impedance	50 ohms
Receiver	dual conversion superheterodyne
Sensitivity	12 dB SINAD; less than –16 dBu
Selectivity	–6 dB less than +/–6 kHz –60 dB less than +/–12 kHz
Modulation	true frequency modulation
Spurious Radiation	better than –60 dB
Maximum Frequency Deviation	+/– 5 kHz
Audio Input Impedance, TNC	600 ohm approx.

Table I– Specifications of the Alinco Data Radio.

Kantronics DVR 2-2 Data Radio

Frequency Coverage	144–148 MHz
Transmitter Power Output	2 watts (12 VDC/1 ampere)
Mode	F3E (FM) F2D (AFSK) F1D (FSK)
Power Supply Requirements	DC 12 V +/–15%
Antenna Impedance	50 ohms
Receiver	dual conversion superheterodyne
Intermediate Frequency	1st: 10.7 MHz, 2nd: 455 kHz
Intermediate Frequency	1st: 21.6 MHz, 2nd: 455 kHz
Sensitivity	12 dB SINAD; less than .6 uV
Selectivity	–6 dB more than 15 kHz –60 dB less than 30 kHz
Modulation	varicap
Spurious Radiation	better than –60 dB
Maximum Frequency Deviation	+/–5 kHz
Data Drive Level	50 mv p/p, 600 ohm +/– 3 kHz

Table II– Specifications of the Kantronics DVR 2-2 Data Radio.

your TNC. The latest of these digital and data radios may combine all the I/Os into one common connector.

A growing number of companies are designing and marketing, or are about to market, an economically-priced "data radio." They are being introduced to fill the need for an "economically priced" transceiver. This data radio is tailored to meet the needs of the packeteer and digital ham shack. The new data radio will come without microphone, mobile mounting bracket, and the other frills that are *not* needed in the packet station. Instead, the data radio will have only the features and functions that are required by the packet user.

One such unit is the Alinco Data Radio, which supports memory channels, 25 watts of power output, and the standard repeater offsets. This makes an ideal unit for the new packeteer. This data radio has synthesized (channelized) tuning, but no weird offsets. The UP/DOWN buttons, DTMF keypads, and associated circuitry are omitted. These cosmetic features are mostly contained inside the microphone. Although the microphone will not be needed with the data radio, it may be purchased as an option.

The Alinco Data Radio also appeals to the system operator because of its low price (under $250). The printed specs for the Alinco Data Radio (see Table I) compare favorably to those of its voice counterparts.

Another dedicated data radio now available to the packet and digital amateur is the Kantronics DVR 2-2. This radio is also delivered without a microphone and mobile mounting bracket. Truly intended for use in a digital environment, it is built around the specs shown in Table II. The TXDelay of the DVR 2-2 is reported to be better than 5 milliseconds. Price of the DVR 2-2 is also under $250.

Frills, Thrills, Bells, and Whistles

The cosmetic features that are prevalent on many of the more expensive voice radios will not be part of the data radios that are beginning to come into the digital-transceiver marketplace. This is simply because we don't need the added bells and whistles in a packet or data radio environment.

This is only the beginning of the new trend in component systems tailored for packet radio use. Look for the "Terminal Node Transceiver" (TNT) to appear soon. And why not? A TNC-radio combo, complete with serial-port control.

If you discover a new product that is geared toward the digital amateur, then by all means send me information about its features so that I may pass it along to our readers.

Until next month . . . Happy Packeting.

73, de BucK4ABT @ WA4BRO

MorseMan Plus

The IBM-PC based Morse Code trainer the experts recommend

"A slick commercial program that clearly ranks among the top Morse trainer programs I've laid my hands on.", Karl Thurber, W8FX, March 1990 - **CQ Magazine**

"Morseman Plus is the slickest program to come along in a long time and I highly recommend it to those who want to learn Morse properly", Ike Kerschner, N3IK, May 1990 - **Monitoring Times** magazine

"One of the top Morse Code trainers available", Gordon West, WB6NOA, **West Radio School**

The reviews are in and ***Morseman Plus*** has scored the highest marks yet! The premier Morse Code trainer for the IBM-PC and compatibles will take the the newcomer from ground level to expert in record time! It is also ideal for the experienced ham trying to get to the 13 or 20 wpm level.

Morseman Plus is loaded with advanced features, such as FCC/VEC tests, random QSO's (over 20 trillion possible!). Other features include full Farnsworth implementation, ASCII text file creation and transmission, true random callsign generation, random characters and much more! ***Morseman Plus*** was designed by a CW expert (NE4L) who knows what it takes to get to that high level of proficiency. Hundreds of users can't be wrong!

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121-123 PC-Write **(3 disk set)** - Version 3.03 of the top shareware wordprocessor (hard drive req'd).

165-166 Q-Modem **(two disk set)** - THE modem communications standard for BBSing. Very full featured. Even good for packet radio.

170-171 Procomm **(two disk set)** - One of the best telecommunications programs available (easy to use).

190-192 PC-File 5.0 - THE shareware star in database systems. Easy to use with an extensive users manual. Customize your own powerful database system.

211 As Easy As - A true Lotus 1-2-3 clone. Does about 97% of what 1-2-3 does - and then some! Well supported.

275-276 DanCAD-3D **(2 disk set)** - A very sophisticated 3D frame and drawing program. Good general purpose CAD system.

278 PC-Key Draw - Top draw/paint/CAD system with many features, incl. antimation. Prints to Epson printers.

290 Flowdraw - Full-featured program for drawing schematics, flowcharts, HIPO's and more. (CGA req'd)

340 Printshop Clipart - 500 pictures in Printshop/Printmaster format. (requires Printshop/Printmaster)

683-684 C Tutor **(2 disks)** - An excellent way to learn the C programming language. Comes with several source code examples.

734 PC Tutor - interactive DOS tutor system for beginners. Covers just about everything you need to know.

761 Fortran Library - 142 routines for the Microsoft and Lahey FORTRAN compilers.

1082 Ham Radio 2 - Packet Terminal Programs - YAPP and Packtalk - both work well with most TNC's.

1084 Ham Radio 4 - Smith Charting, antenna design, counties listings and more (needs BASIC).

1085 Ham Radio 5 - AntennaX antenna analysis, RF engineering, antenna design program, Smith Chart matching and more.

1086 Ham Radio 6 - Sunrise/sunset predictions, circuit analysis and tropospheric path loss prediction

1087 Ham Radio 7 - QSL Maker, engineering programs, grid square calcs and more (req's BASIC)

1089 Mapper - EGA Great world map system. Shows grayline and shortpath , longpath, muf, luf plus much more by entering a prefix (EGA/VGA req'd).

1090 Miniprop 2 - Great propagation prediction program - the predecessor to Miniprop 3.

1091 TrakSat - nice satellite tracking system w/ good graphics & several example tracks

1092 PC-Track - The tops in EGA/VGA satellite tracking. Great graphics & easy to use. Easy to add new "birds".

1093 Telemetry Decoders - collection of telemetry decoders for the new PACSATS

1094 Icom Rig Control - Three programs to control IC735's with your PC.

1095 Paragon Rig Control - Control Ten Tec's Paragon HF rig with the PC.

1096 Radio Mods - A through listing of several modifications to many popular HT's, scanners and HF rigs.

1097 SSTV - View on the air SSTV activity. Hooks between game port and receiver. (CGA req'd).

1098 Yaesu FT767 Rig Control - Control FT757 and FT767 HF rigs with your PC.

1099 Kenwood Rig Control - Three programs to let you control your TS 140/440/940 with your computer.

1100 - Icom R7000 rig control - PC control for the R7000 - even has a logbook function, freq. database, ect.

1101 CW Decoders - a collection of on the air CW decoders. Turn your PC into a CW tx/rx unit

1102 FCC Exams - Prepares for novice thru general written exams. Cover all aspects of the test.

1109 DXCC Worldfix - countries listing, beam headings, sunrise/sunset times for any DXCC country.

1110 K1EA DX Contest Logger 4.25 - The tops in contest logging for CQ WW DX & WPX, WAE & ARRL DX contests.

1112 Contest Logging - An assortment of contest logging programs for Field Day and other contests.

1118 - QQSL v 3.1 - AA4M's QSL label program. A good program for automating QSL chores.

1119-1120 Total Ham (2 disks) - Excellent multipurpose station utility. Logging, awards keeping, counties, countries and much more.

1121 ARL Logbook - Fast logbook system. Add, delete, lookup QSO's and more.

1122 LOG-EQF - top rated logging program that also allows control of Kenwood HF rigs. Nice!

1131 Hamfest - Hamfest mailing list system - keeps track of vendors and attendees with year(s) attended

1132 - Packet Radio Tutorial - Very nice intro to the world of packet. 18 Chapters of text. Easy reading!

1140 W0RLI Packet BBS - The dominant packet BBS system - complete with all information.

1143 KAM Car - A dedicated RTTY/ASCII/CW terminal program for the KAM TNC (does packet also!).

1144 LanLink! - great multifunction terminal program. Has configurations for all popular TNC's.

1145 PK232 Terminal - Dedicated termprog that takes advantage of the features of the AEA TNC.

1146 Multiconnect PBBS - AA4RE's top notch multiconnect BBS. RLI/MBL compatible..

1148 K4ABT's PicPro - Send and receive packet pictures w/ a KAM. Also incl. WEFax pgm (EGA req'd)

1149 GeoClock - similar to DX edge - shows full view of Earth and moves light/dark areas real time (Herc/CGA/MCGA/ATT - for EGA/VGA see #1150)

1150 Geoclock EGA - the same as # 1149 except for EGA and VGA monitors.

1151-1152 ACE **(2 disks) Astrosoft Computerized Ephemeris** - top notch database of astronomical information. Deep sky & Messier objects, double stars, more.

1153-1154 Deep Space **(2 disks)** - Excellent star map system. Includes stars down to magnitude 2. Displays any skyview from any vantage point (CGA req'd)

1155 USN Floppy Almanac - By the US Naval Observatory - good retreival system with data for Messier & radio objects plus 1536 stars

1156 Skyglobe - The best star viewing system we've seen! Many, many features (CGA or EGA req'd)

1201 Storm - Hurricane tracking at its finest - includes several sample tracks of past storms.

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1250 World Atlas - Online information base - includes data on countries, rivers, cities and much more.

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CIRCLE 13 ON READER SERVICE CARD

PROPAGATION

BY GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

1951-1991—Fortieth Anniversary

This is a year of anniversaries for me. It marks my 50th year as a professional in the field of telecommunication engineering, my 50th year as a radio amateur, and my 40th year as editor of this Propagation column in *CQ* magazine.

Forty years ago this month, in the March 1951 issue of *CQ*, my byline appeared on this column for the first time.

CQ pioneered propagation forecasts specially tailored and simplified for use by radio amateurs. The first "Monthly DX Predictions" column appeared in the June 1946 issue, when *CQ* was little more than a year old. Edited by my good friend the late Perry Ferrell, the column appeared monthly until November 1949. Between December 1949 and February 1951, while *CQ* featured several outstanding articles dealing with radio propagation, there was no regular column devoted to this subject. The column was resumed in March 1951 under my byline.

Since then I have written 480 monthly "Propagation" columns without ever missing a deadline! Since my professional work has carried me to all corners of the world, the column has been written in more than two dozen countries under all sorts of conditions, from very peaceful to warlike.

In the field of shortwave radio propagation elapsed time is often measured in terms of sunspot cycles. By this system of reckoning, I have shared with readers of *CQ* the last years of Cycle 18, the record breaking once-in-a-lifetime conditions of Cycle 19, Cycle 20, Cycle 21, and now through the peak years of Cycle 22.

I look forward to continuing to write this column as a source of reliable propagation information throughout the remainder of Cycle 22 and into Cycle 23 and beyond!

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for March 1991

Propagation Index	*Expected Signal Quality* (4)	(3)	(2)	(1)
Above Normal: 1-2, 12, 18, 28-29	A	A	B	C
High Normal: 3, 7, 10-11, 13-14, 17, 25, 30	A	B	C	C-D
Low Normal: 5-6, 16, 19-20, 24	B	C	D	D-E
Below Normal: 4, 9, 15, 21, 23, 27, 31	C	C-D	D-E	E
Disturbed: 8, 22, 26	C-D	D	E	E

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9+, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S0 and S3, and with considerable fading and noise.

E—No opening expected.
3 dB per S-Unit.

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 excellent (A) on the 1st and 2nd; good (B) on the 3rd; fair-to-poor (C-D) on the 4th; good-to-fair (B-C) on the 5th and 6th, etc.**

George Jacobs, W3ASK, celebrates his 40th anniversary as Editor of CQ's "Propagation" column.

Solar Cycle Decline

Cycle 22 continues its slow but steady decline. The Royal Observatory of Belgium reports a monthly mean sunspot number of 131 for November 1990. Daily values ranged from a low of 77 recorded on the 1st to a high of 209 on the 7th. This results in a smoothed sunspot number of 147 centered on May 1990. May's number represents a drop of 2 points from the previous month's smoothed sunspot level, and a drop of 12 points from Cycle 22's high point of 159, which was recorded during July 1989. A smoothed sunspot number of approximately 124 is forecast for March 1991.

During November there was a corresponding decrease in the 10.7 cm solar flux level. The Algonquin Radio Observatory in Ottawa, Ontario reports a monthly mean level of 183. This results in a 12-month smoothed value of 192 centered on May 1990, a drop of 3 points from the previous month's level.

March Propagation

One of the questions I have been asked the most during my 40 years as Editor of this column is "What season of the year is best for DX propagation on the shortwave bands?"

This isn't an easy question to answer, since there are so many variables involved, and the answer could be different for different sets of conditions and for the various bands. In a general way, however, taking into account the overall number of hours that each band between *10* and *160* meters can be expected to open for DX, and the number of different areas of the world to which each band may open, I believe that the *spring* and *fall* months are optimum for DX propagation.

There is a solar-ionospheric relationship which helps to explain this. Spring and fall are the *equinoctial* seasons. These are the times when the sun is most nearly overhead at the equator, making night and day of almost equal length in all parts of the world. On March 21st and September 22nd of each year the sun is directly over the equator, and the length of night and day is exactly equal everywhere.

The vernal, or spring, equinoctial period in the northern hemisphere has a noticeable influence on shortwave propagation conditions for a period of several weeks lasting from late February through late April. The effects of the autumnal, or fall, equinoctial period are felt from early September through late October.

During equinoctial periods it is always spring in one hemisphere and fall in the other. This tends to create an ionosphere of similar characteristics throughout more of the world than is possible during

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 80 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 *standard* time is used at the *path midpoint*. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between N.Y. and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones *add* 2 hours in the PST zone; 4 hours in the MST zone; 3 hours in the CST zone, and 5 hours in the EST zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA *subtract* 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 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 quater-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
March & April 1991
Local Standard Time at Path Mid-Point
(24-Hour Time System)

Band (Meters)	Distance From Transmitter (Miles)			
	50-250	250-750	750-1300	1300-2300
10	*Nil*	09-18 (0-1)	07-09 (1) 09-12 (1-2) 12-13 (1-3) 13-16 (1-3) 16-18 (1-2) 18-21 (0-1)	07-08 (1) 08-09 (1-2) 09-12 (2-4) 12-16 (3-4) 16-18 (2-3) 18-20 (1-2) 20-21 (1)
15	*Nil*	07-09 (0-1) 09-13 (0-2) 13-14 (0-3) 14-16 (0-2) 16-20 (0-1)	07-09 (1-2) 09-13 (2-4) 13-14 (3-4) 14-16 (2-4) 16-19 (1-3) 19-20 (1-2) 20-21 (0-2) 21-23 (0-1)	07-08 (2) 08-09 (2-3) 09-16 (4) 16-19 (3) 19-21 (2-3) 21-23 (1-2) 23-01 (0-1)
20	11-13 (0-1) 13-16 (0-2) 16-21 (0-1)	08-09 (0-3) 09-11 (0-4) 11-13 (1-4) 13-16 (2-4) 16-18 (1-4) 18-21 (1-3) 21-02 (0-2) 02-08 (0-1)	06-07 (1-2) 07-08 (3) 08-09 (3-4) 09-18 (4) 18-22 (3-4) 22-00 (2-3) 00-02 (2) 02-06 (1)	06-07 (2) 07-08 (3) 08-10 (4) 10-15 (4-3) 15-22 (4) 22-23 (3-4) 23-00 (3) 00-02 (2) 02-04 (1-2) 04-06 (1)
40	06-07 (1-2) 07-09 (2-3) 09-18 (4) 18-20 (3-4) 20-22 (2-3) 22-00 (1-2) 00-06 (1)	06-07 (2-3) 07-09 (3-4) 09-11 (4-3) 11-13 (4-2) 13-15 (4-3) 15-20 (4) 20-22 (3-4) 22-00 (2-4) 00-03 (1-3) 03-06 (1-2)	06-07 (3-2) 07-08 (4-2) 08-09 (4-1) 09-13 (2-1) 13-15 (3-1) 15-17 (4-2) 17-19 (4-3) 19-00 (4) 00-03 (3-4) 03-06 (2-3)	06-08 (2-1) 08-15 (1-0) 15-16 (2-0) 16-17 (2-1) 17-19 (3-2) 19-03 (4) 03-04 (3-4) 04-06 (3)
80	07-11 (4) 11-18 (4-3) 18-22 (4) 22-00 (3-4) 00-07 (2-3)	07-08 (4-2) 08-11 (4-1) 11-16 (3-0) 16-18 (3-2) 18-20 (4-3) 20-00 (4) 00-05 (3-4) 05-07 (3)	07-08 (2-1) 08-11 (1-0) 11-16 (0) 16-18 (2-1) 18-20 (3-2) 20-03 (4) 03-05 (4-3) 05-07 (3-2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2) 22-03 (4-3) 03-05 (3-2) 05-07 (2-1)
160	05-07 (4-2) 07-09 (3-1) 09-17 (2-0) 17-19 (3-1) 19-20 (4-2) 20-05 (4)	05-06 (2-1) 06-07 (2-0) 07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-20 (2) 20-22 (4-3) 22-03 (4) 03-05 (4-3)	05-06 (1) 06-19 (0) 19-20 (2-1) 20-22 (3-2) 22-03 (4-3) 03-05 (3-2)	05-06 (1-0) 06-19 (0) 19-20 (1-0) 20-22 (2) 22-03 (3-2) 03-05 (2-1)

HAWAII
March & April 1991
Openings Given in Hawaiian Standard Time

TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	08-09 (1) 09-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-08 (2) 08-11 (1) 11-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-20 (2) 20-22 (1)	12-14 (1) 14-16 (2) 16-18 (3) 18-21 (4) 21-00 (3) 00-04 (2) 04-06 (3) 06-07 (2) 07-08 (1)	18-20 (1) 20-22 (2) 22-01 (3) 01-02 (2) 02-03 (1) 21-22 (1)* 22-01 (2)* 01-02 (1)*
Central USA	08-09 (1) 09-11 (2) 11-15 (3) 15-17 (4) 17-19 (2) 19-20 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	09-14 (1) 14-16 (2) 16-19 (3) 19-23 (4) 23-03 (3) 03-06 (2) 06-08 (3) 08-09 (2)	19-20 (1) 20-22 (2) 22-02 (3) 02-04 (4) 04-05 (2) 05-06 (1) 22-23 (1)* 23-02 (2)* 02-03 (3)* 03-04 (2)* 04-05 (1)*
Western USA	08-09 (1) 09-11 (2) 11-12 (3) 12-16 (4) 16-17 (3) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (4) 11-15 (3) 15-18 (4) 18-20 (3) 19-22 (2) 22-00 (1)	15-17 (3) 17-21 (4) 21-00 (3) 00-02 (2) 02-04 (1) 04-06 (2) 06-08 (4) 08-10 (3) 10-15 (2)	18-19 (1) 19-21 (2) 21-22 (3) 22-04 (4) 04-05 (3) 05-06 (1)* 21-22 (1)* 22-23 (2)* 23-04 (3)* 04-05 (2)* 05-06 (1)*

other times when it is summer in one hemisphere and winter in the other, and there are extreme differences in the ionosphere. It is this "ionospheric equalization" which takes place during the equinoctial periods that is responsible for optimum DX conditions.

This improvement is most noticeable on long circuits between the northern and southern hemispheres—for example, from the United States to Australia, to South America, to southern Africa, to southern Asia, to Antarctica, etc.

During these seasons conditions are also optimum for long-path as well as short-path openings, and during grey-line twilight periods associated with sunrise and sunset.

Look for these optimum conditions during March on the shortwave bands.

During March it should be a toss-up between *10*, *12*, and *15* meters for the best DX band during the daylight hours from sunrise to sunset, with *20* and *17* meters not far behind. Some DX openings are also expected on the *6* meter band during

the daylight hours. From sundown to midnight DX honors will likely be shared among *20*, *30*, and *40* meters, with some good openings towards the west and the south also possible on *17* and *15* meters. On days when conditions are High Normal or better, even the *12* and *10* meter bands may remain open for DX towards the west and the south well past sundown. Also check both *80* and *160* meters during this time frame for some good DX possibilities. In other words, between sundown and midnight DX may be possible on all shortwave bands between *10* and *160* meters!

Between midnight and sunrise the best DX bands should be *30*, *40*, and *80* meters, with openings to many areas of the world also possible on *20* meters. The *160* meter band should also open for DX to many parts of the world during this time period.

March looks like a great month for world-wide DX propagation conditions on all the amateur shortwave bands. For more detailed information concerning band openings, refer to the DX Propagation Charts for March which appeared in last month's column. This month's column contains Short-Skip Propagation Charts which are valid for both March and April 1991. These charts, which include data for Hawaii and Alaska, contain band opening predictions for predominantly one-hop paths, ranging in distance from 50 to 2300 miles. For day-to-day changes in shortwave propagation conditions expected during March, see the Last Minute Forecast which appears at the beginning of this column.

VHF Ionospheric Openings

Many of the solar-ionospheric relationships which can produce ionospheric openings on the VHF bands tend to maximize during equinoctial periods.

There is a good chance for an increase in widespread auroral activity during March, accompanied by auroral-scatter-type openings on the VHF bands and sporadic-E-type short-skip openings, up to distances of approximately 1200 miles on *6* and *2* meters. Check the Last Minute Forecast at the beginning of this column for those days during March that are expected to be Below Normal or Disturbed. These are the days on which auroral activity is most likely to occur.

Conditions should be optimum during March for *trans-equatorial scatter propagation* between the southern tier states and countries deep in South America. TE openings must cross the magnetic equator at or near a right angle, and signals are usually very weak, often with severe flutter fading. The best time for TE openings should be between 8 and 11 PM local time. TE openings are most likely to occur on *6* meters, but some may also be possible on *2* meters.

Solar activity is expected to be high enough during March to permit some regular F-layer DX openings on the *6* meter band to many parts of the world, particularly when conditions are High Normal or better. Signals arriving in the quadrant between northeast and southeast should peak by mid-morning. Noontime should be best for openings towards the Caribbean, Central America, and the northern countries of South America, although *6* meters may open in this direction as early as an hour or two after sunrise. During the afternoon hours expect the skip to extend deeper into South America and to shift towards the west and northwest. Trans-continental openings on *6* meters should be possible from about noontime through the late afternoon hours.

Not much meteor activity is expected during March, although some meteor-scatter-type openings may be possible on the *6* and *2* meter bands during minor meteor showers expected March 13–14 and 23–24.

As I begin my 41st year as Editor of this column, I again want to thank all of you, who for over four decades have taken the time to drop me a line expressing an interest in radio propagation and this column in particular. The greatest award an author can receive is feedback from his readers, and I have been humbled by the response over the years.

Writing this column for 40 years has been an interesting and stimulating part of my deep interest in amateur radio in particular and in communications in general. I am excited about the future of amateur radio, and I look forward to continuing to conduct this column during the years ahead.

73, George, W3ASK

ALASKA
March & April 1991
Openings Given in GMT #

TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	18-20 (1) 20-00 (2) 00-01)1)	16-18 (1) 18-22 (2) 22-01 (3) 01-02 (2) 02-03 (1)	13-15 (1) 20-22 (1) 22-01 (2) 01-03 (3) 03-05 (2) 05-06 (1)	06-13 (1) 07-12 (1)*
Central USA	19-21 (1) 21-00 (2) 00-02 (1)	17-19 (1) 19-22 (2) 22-00 (3) 00-02 (4) 02-03 (2) 03-04 (1)	14-16 (1) 20-23 (1) 23-02 (2) 02-04 (3) 04-05 (2) 05-07 (1)	07-14 (1) 08-12 (1)*
Western USA	20-23 (1) 23-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	18-20 (1) 20-22 (2) 22-23 (3) 23-02 (4) 02-04 (3) 04-05 (2) 05-06 (1)	16-18 (1) 18-20 (3) 20-00 (2) 00-02 (3) 02-04 (4) 04-05 (3) 05-06 (2) 06-10 (1)	07-09 (1) 09-12 (2) 12-14 (1) 09-10 (1)* 10-12 (2)* 12-13 (1)*

#See explanation in "How To Use Short-Skip Charts" in box at the beginning of this column.

*Indicates best time for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a propagation index of (2), or higher.

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.

For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.

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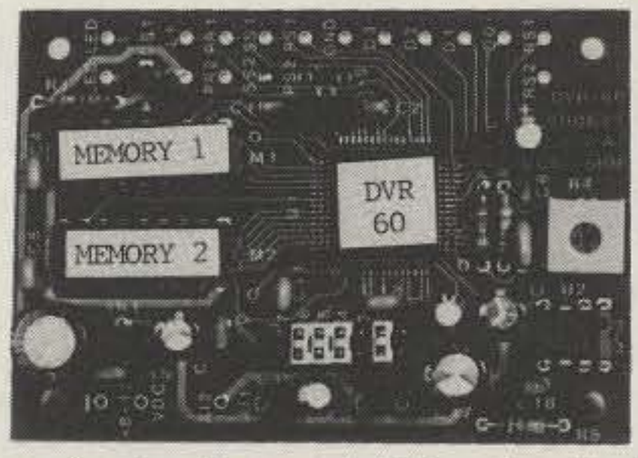

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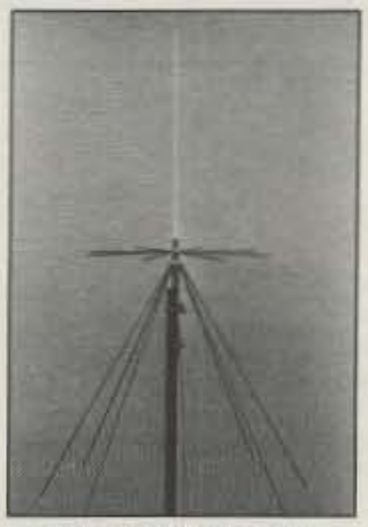

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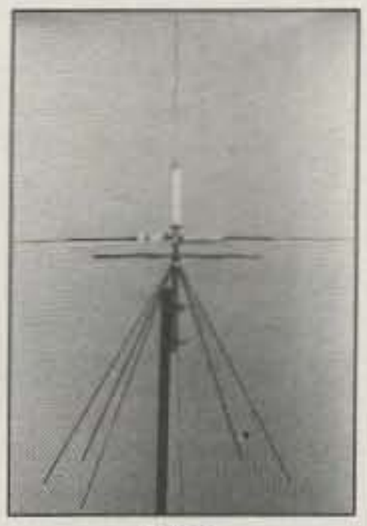

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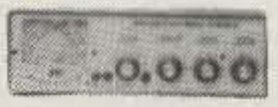

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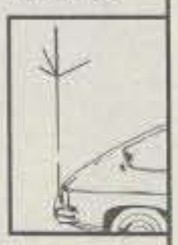

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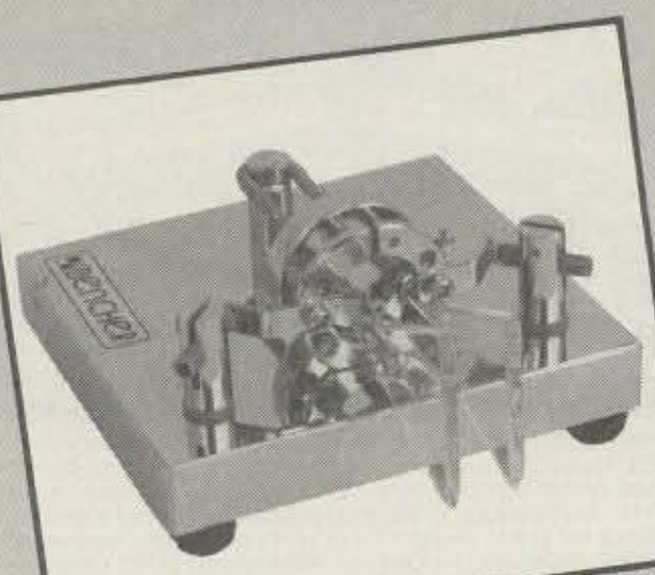

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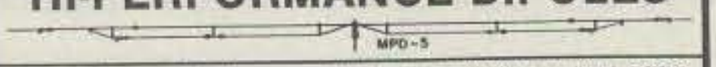

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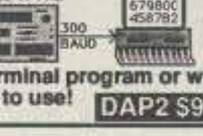

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CIRCLE 172 ON READER SERVICE CARD

Advertiser's Index

(Continued on page 131)

Kantronics**DataEngine**

If you'd like to run fast packet today, perhaps experiment with faster modes too, yet be compatible with today's 1200 baud system, then install a DataEngine at your station or node. The Kantronics DataEngine runs1200, 2400, and 9600 baud packet with matched plug-in modems and appropriate transceivers now. For example, you can install a DE9600 modem in the DataEngine, attach a Kantronics DVR2-2 9600 baud data ready transceiver and run 9600 on 2-meters! Most off-the-shelf transceivers are not 9600 ready.

Better yet, you can add a free G8BPQ networking EPROM (download from our factory TELCO BBS) and run the 9600 combination as a node! Further, with the BPQ code, you can run the DataEngine in multi-drop KISS mode, attaching a KPC-2 or KPC-4 to the RS-232 port, creating a three or four port node!

Or, plug in a DE9600 or DE19200 modem and couple the DataEngine with the Kantronic's D4-10 data ready transceiver for 440 MHz high speed packet operation. (The D4-10 shall be released in early 1991).

Or, if you're interested in the DX spotting network or in transferring computer files to a buddy at 2400 baud, plug in the DE2400 modem and couple the DataEngine to any off-the-shelf transceiver. The 2400 baud QPSK modem is compatible with existing narrow band FM rigs and matches the industry standard Kantronics KPC-2400 modem.

Or, roll your own, attaching an experimental modem(s) via the disconnect headers! You might want to work satellites, play with a new form of modulation, or design your own HF modem. The disconnect headers on the DE pc board leave room for two internal or external modems. Experimenters already report interfacing the DataEngine with a PSK modem for working satellites. To aid in this fun process, you can order the DE Developer's Manual.

After all, the DataEngine is designed with an open architecture. It's a dual port, full duplex TNC with 16-bit V40 microprocessor running at 10 MHz, 85C30 communications controller, capable of speeds to 56KB per port. It comes with 64K of EPROM and 64K of RAM, and has socket space for up to .5 megabytes of EPROM and .5 megabytes of RAM!

Even better, the DataEngine comes factory stock with a DE1200 modem already plugged in and an end-user EPROM which supports terminal, KISS, HOST and BBS modes. It's ready to go on existing 1200 baud channels! The host mode enables use of sophisticated terminal programs, such as the DataEngineer, developed for the DataEngine, including windows/split screen etc. Or again, dial your own terminal program! In effect the DataEngine is "developer and user ready."

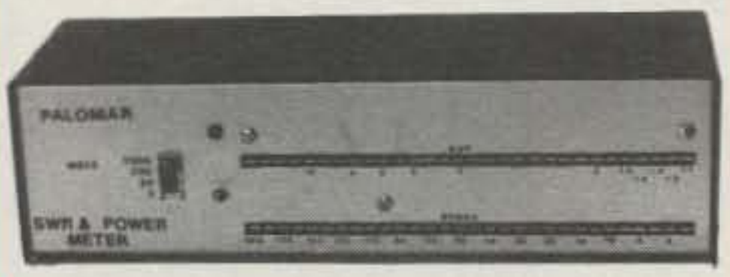
Specs: size 1-3/4"x6"x9", weight 2-1/2 lbs, power requirements nominally 12VDC at 150 ma. Input sensitivity 20 mvpp, Audio output drive jumper selectable from 10mvpp to 2vpp.

Options include: DE19200, DE9600, DE2400 and DE1200 modems, plus a developer's manual for modem and protocol experimenters. Plus more modems from Kantronics on the way!

For detailed specifications contact Kantronics. The Kantronics DataEngine, the TNC that can run fast today, and the platform to develop the next generation of advanced TNC applications.

Kantronics 1202 E. 23rd St., Lawrence, KS 66046, 913.842.7745 TELCO BBS 913.842.4678

SWR & POWER METER



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- **Automatic SWR display**

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Advertiser's Index

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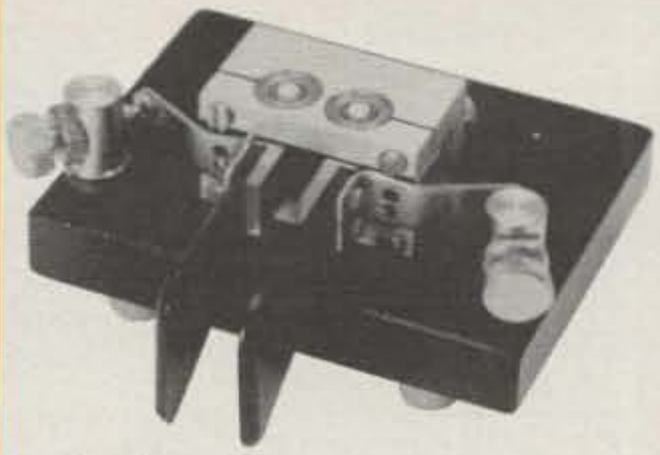

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- **Automatic mode-dependent AGC Selection**
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- **CPU controlled RF FSP (RF Frequency-Shifted Speech Processor):** For better intelligibility and pile-up "PUNCH" for competitive situations.
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- **50 Memories:** Independent ATU and mode/IF Filter Memory.
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- **Accessories/Options:** TCXO-2 (Temperature Compensated Crystal Oscillator), XF-10.9M-202-01 (2nd IF SSB Narrow 2.0kHz), XF-445C-251-01 (3rd IF CW Narrow 250Hz), SP-6 (External Speaker), MD-1C8 (Desk Microphone), YH-77ST (Headphones), LL-5 (Phone Patch Module).

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