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Amateur Radio

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MARCH 1983 $2.00

CQ

Results of the 1982 CQ WW WPX S.S.B. Contest . . . page 24

I don't believe I worked the who-o-ole WPX 'test!

CQ Interviews: John W. Townsend, Jr., W3PRB, and Morton H. Cohen, K3EH, Fairchild Space Company . . . page 15

Super-C.W.: Potentially Error-Free Morse Code . . . page 58

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THE RADIO AMATEUR'S JOURNAL

Scan the World.

NEW

SSB, CW, AM, FM, digital VFO's, 10 memories, memory and band scan, dual 24-hour clocks...

R-2000

The R-2000 is an all mode SSB, CW, AM, FM receiver that covers 150 kHz–30 MHz in 30 bands. New microprocessor controlled operating features and an UP conversion PLL circuit provide maximum flexibility and ease of operation to enhance the excitement of listening to stations around the world. Key features include digital VFO's, ten memories that store frequency, band, and mode information, memory scan, programmable band scan, fluorescent tube digital display, and dual 24-hour clock with timer.

R-2000 FEATURES:

- **Covers 150 kHz–30 MHz in 30 bands.**
  Uses innovative UP-conversion digitally controlled PLL circuit. UP/DOWN band switches (1-MHz step). VFO's continuously tuneable across 150 kHz–30 MHz.
- **All mode: USB, LSB, CW, AM, FM.**
  Provides expanded flexibility in receiving various signal types. Front panel mode selector keys, with LED indicators.
- **Digital VFO's for best stability.**
  50-Hz step, switchable to 500-Hz or 5-kHz, using front panel pushbutton switches. F. LOCK switch provided.
- **Ten memories store frequency, band, and mode data.**
  Complete information on frequency, band, and mode is stored in memory, assuring maximum ease of operation. Each memory may be tuned as a VFO. Original memory frequency may be recalled. AUTO. M switch for automatic storage of current operating data, or, when off, selective storage of data using M. IN switch.
- **Lithium battery memory back-up. (Est. 5 yr. life.)**
- **Memory scan.**
  Scans all memories, or may be programmed to scan specific memories. HOLD switch interrupts scanning. Frequency, band, and mode are automatically selected in accordance with the memory channel being scanned. The scanning time is approximately 2 seconds per channel.
- **Programmable band scan.**
  Scans automatically within the programmed bandwidth. Memory channels 9 and 0 establish upper and lower scan limits. HOLD switch interrupts scanning. Frequency may be adjusted, using the tuning control, during scan HOLD.
- **Fluorescent tube digital display (100-Hz resolution).**
  Built-in 7 digit fluorescent tube digital display indicates frequency or time, plus memory channel number. DIM switch provided. The display may be switched to indicate CLOCK-2, FREQUENCY, CLOCK-1, and timer ON or OFF by the front panel FUNCTION switch.
- **Dual 24-hour quartz clocks, with timer.**
  Permits programming two different time zones. Timer for ON and OFF programming. Timer REMOTE output on rear panel (not for AC power).
- **Three built-in IF filters with NARROW/WIDE selector switch. (CW filter optional.)**
  6 kHz wide or 2.7 kHz narrow on AM. 2.7 kHz automatic on SSB. 2.7 kHz wide on CW, or, with optional YG-455C filter installed, 500 Hz narrow. 15 kHz automatic on FM.
- **Squelch circuit, all mode, built-in, with BUSY indicator.**
- **Noise blanker built-in.**
  Eliminates pulse-type noise on SSB, CW, and AM.
- **Large front mounted speaker.**
- **Tone control.**
- **RF step attenuator. (0-10-20-30 dB.)**
  Four step attenuator, plus antenna fuse.
- **AGC switch. (Slow-Fast.)**
- **"S" meter, with SINPO "S" scale.**
- **High and low impedance antenna terminals.**
  A high impedance (500 ohm) terminal, and a low impedance (50 ohm) co-axial connector are provided.
- **100/120/220/240 VAC, or 13.8 VDC operation.** (Optional DCK-1 cable kit required for 13.8 VDC.)

Other features.
- RECORD output jack.
- Audible "beeper" (through speaker).
- Carrying handle.
- Headphone jack.
- External speaker jack.

Optional accessories:
- HS-4, HS-5, HS-6 headphones.
- DCK-1 DC cable kit.
- YG-455C 500-Hz CW filter.
- HC-10 World digital quartz clock.

More information on the R-2000 is available from all authorized dealers of Trio-Kenwood Communications
1111 West Walnut Street
Compton, California 90220.

KENWOOD

...pacesetter in amateur radio

Specifications and prices are subject to change without notice or obligation.

TS-830S

"Top-notch"...VBT, notch, IF shift, wide dynamic range

The TS-830S has every conceivable operating feature built-in for 160-10 meters (including the three new bands). It combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF.

TS-830S FEATURES:

- LSB, USB, and CW on 160-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz.
- Wide receiver dynamic range. Junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter high-Q active circuit in 455-kHz second IF.
- IF shift (passband tuning).
- Noise-blanker threshold level control.
- Built-in digital display. (fluorescent tube), with analog dial.
- 6146B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- Narrow/wide filter selection on CW.
- SSB monitor circuit.
- RIT and XIT (transmitter incremental tuning).

Optional accessories:

- SP-230 external speaker.
- VFO-230 external digital VFO with five memories, digital display.
- VFO-240 external analog VFO.
- AT-230 antenna tuner.
- YG-455C (500 Hz) or YG-455CN (250 Hz) CW filter for 455 kHz IF.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter for 8.83 MHz IF.
- KB-1 deluxe heavyweight knob.

TS-530S

"Cents-ational"...IF shift, digital display, narrow-wide filter switch

The TS-530S SSB/CW transceiver covers 160-10 meters using the latest, most advanced circuit technology, yet at an affordable price.

TS-530S FEATURES:

- 160-10 meters, LSB, USB, CW, all amateur frequencies, including new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- IF shift tunes out interfering signals.
- Built-in digital display (six digits, fluorescent tubes), with analog dial.
- Narrow/wide filter selector switch for CW and/or SSB.
- Built-in speech processor, for increased talk power.
- Wide receiver dynamic range, with greater immunity to overload.
- Two 6146B's in final, allows 220W PEP/180 W DC input on all bands.
- Advanced single-conversion PLL, for better stability, improved spurious characteristics.
- Adjustable noise-blanker, with front panel threshold control.
- RIT/XIT front panel control allows independent fine-tuning of receive or transmit frequencies.

Optional accessories:

- SP-230 external speaker with selectable audio filters.
- VFO-240 remote analog VFO.
- VFO-230 remote digital VFO.
- AT-230 antenna tuner/SWR/power meter.
- MC-50 desk microphone
- KB-1 deluxe VFO knob.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter.
- YK-88SN (1.8 kHz) narrow SSB filter.

TS-660

The TS-660 "QUAD BANDER" covers 6, 10, 12, 15 meters.

- FM, SSB (USB), CW, and AM
- Dual digital VFO's
- Digital display
- IF shift built-in
- 5 memories with memory scan
- UP/DOWN microphone
- All-mode squelch
- Noise blanker
- CW semi break-in/sidetone
- 10 W on SSB, CW, FM; 4 W on AM.

Optional accessories:

- PS-20 power supply
- VOX-4 speech processor/VOX
- SP-120 External speaker
- MB-100 Mobile mount
- YK-88C, YK-88CN CW filters
- YK-88A AM filter.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS

1111 West Walnut, Compton, California 90220

You've got to get a Santec to get it right!

Compare Santec to anything you like, and you'll see — you've got to get a Santec to get: ■ memory channels which store standard repeater offsets for instant recall ■ less than 10 ma drain in receive to conserve power while you're monitoring ■ extremely wide power options of 0.1 W, 1.0 W or even 3.5 W for varying conditions ■ an accurate 24 hour clock for instant reference ■ and a full two year extended service plan which no one else will match.

When you get a Santec, you also get: ■ the widest frequency range of any handheld ■ odd offsets other than ±600 kHz ■ variable step sizes in bandscan ■ a 500 ma battery with charger ■ a full six digit back-lighted LCD display for full frequency readout plus the memory channel number ■ the easiest keyboard entry of any handheld ■ eight modes of scan, search, manual control and open scan ■ the ability to change batteries without losing memory data ■ easily programmable bandscan ■ a frequency lock switch on the keyboard ■ an automatic low battery indicator ■ and much more.

FEATURE	SANTEC ST-144	YAESU FT-208	KENWOOD TR-2500
Size (mm)	68 x 170 x 47	61 x 168 x 49	66 x 168 x 40
Weight with Batt.	600 gm	720 gm	540 gm
Readout	LCD (full 6 digits)	LCD (4 digits)	LCD (4 digits)
Memory Channels	10	10	10
Memory of Offsets	YES	NO	NO
Memory Backup	YES, Capacitance	Yes, Lithium Batt.	Yes, Lithium Batt.
Scan (mem. & band)	YES	Yes	Yes
Search Mode	YES	NO	NO
Step Size	5-100 kHz	5 or 10 kHz only	Any 5kHz multiple
Battery	Quick Change Pack 500 ma-hr, 9.6 V	Quick Change Pack 450 ma-hr, 10.8 V	Slide-on Pack 400 ma-hr, 8.4 V
Frequency Coverage	142-148.995 Tx (149.995 optional) 142-149.995 Rx	143.5-148.495 Tx/Rx	143.9-148.995 Tx/Rx
Power (max)	3.5 W High 1.0 W Med. 0.1 W Low	2.5 W High 0.2 W Low	2.5 W High .3 W Low (approx.)
Priority	YES (in Mem/Scan)	Yes (Priority Ch.)	NO
Clock	YES	NO	NO
Computer Current Saver	YES (<10 ma)	NO (20 ma)	NO (27 ma)
Display	6 Digits + Mem. #	4 Digits + Mem. #	4 Digits + Mem. #

New! Affordable Price! See your Authorized Santec Dealer for details.

Competitors' specifications were obtained from published specifications sheets, and they are subject to change without notification to Santec or Encomm, Inc.

Shown with optional SM-3 speaker microphone.

Accessories for SANTEC Handheld Radios
clockwise from upper left:
- Leather Case (ST-LC)
- Base Charger & Power Supply (ST-5BC)
- Remote Speaker (MS-505)
- Mobile Charger (ST-MC)
- Speaker Microphone (SM-3)

The ST-144 μP is approved under FCC Part 15

SANTEC®

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Plano TX 75074

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CQ

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CQ The Radio Amateur's Journal

ON THE COVER: Larry Mulvehill, WB2ZPI, captures the look of a contester after the big event. Here we see Ken Spencer, N2AQQ, trying to figure out if it was all worth it. If you don't look like Ken after the CQ WPX Contest, it means you weren't trying.

MARCH 1983 **VOL. 39, NO. 3**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

Every so often we get a letter from a reader who wants to know why we didn't flash a banner headline on our cover to announce some new, dramatic happening in amateur radio. Occasionally, we even irk a group sponsoring an event when it appears that we left out their announcement. When checked out (we do check these things out), the latter usually proves to be a total misunderstanding with regard to time. Sending in an announcement, say, in February for a March issue is roughly two months too late to make print deadlines. With regard to missing an important FCC announcement or other notable happening, it is also a matter of timing. It's impossible to prognosticate these events down to the time and place. All of the amateur publications face these problems, which are only resolved by a happy coincidence of exact event timing and press time.

Television and radio give just about "real time" news coverage. By design, newspapers are generally one day behind, although they give more information than mere spot coverage. Weekly papers obviously are that much further behind the dailies; they are designed also to include what happened afterwards and to wrap up neatly the whole event. The monthly magazine, though, stands out in that it is not just 30 days behind "real time" events; it is somewhere between 45 and 60 days behind these events for the creation of the banner headline, and more like 60 to 90 days behind for the complete story. All of the major amateur publications are prepared that far in advance. However, due to various forms of distribution, we all have slightly different press schedules.

CQ probably has an earlier "closing" date by a few days than the others, because as many of you know, we are the only amateur magazine with national distribution on the commercial newsstands. This means that extra time (that few days) is needed to get *CQ* in the distribution chain. That few days difference is the critical time needed for an event to be reported. However, unlike TV or radio or even newspaper coverage, most magazine readers are aware of an event long before the magazine reaches their home or dealer's counter. I think that most readers (I know I do) appreciate an explanation and elaboration of the facts of an event and how they relate to them, and that is part of the function of a magazine.

A good case in point is coming up. Although this is the March issue, it is being produced in late December and very early January. On January 20th (while this issue is on press) the FCC will be holding hearings on whether or not to issue an NPRM (Notice of Proposed Rule Making) on the "no-code" issue and the "volunteer examiner program." What results on the 20th will be reported in our April issue. Sorry, there's not enough time for a cover banner.

Travels With CQ

The *CQ* Team will begin the 1983 Hamfest Season this month (January) by exhibiting at the SAROC Hamfest in Las Vegas. In early February we will be at the Tropical Hamboree in Miami, Florida, and later that month we will be at the LIMARC Hamfest in Huntington, New York. We will be covering both the Charlotte Hamfest and the Orlando Hamfest in March. Last year *CQ* was represented at 22 hamfests, and we're hoping to do as well or better in 1983. Of course, I'll let you know what went on at each one as it takes place (and how good each fleamarket was).

I would also like to encourage as many of you as possible to come out in support of your local groups who put on these hamfests and conventions. They work extremely hard all year with little or no recognition for all of their efforts. Their main aim is for everyone who shows up to have a good time, and nearly everyone does (except those who make a determined effort not to). So while you're walking around, stop by the club booth and give them a few words of thanks, and then come over to the *CQ* booth and say hi.

TRS-80® RTTY Program Available On Disk

In our November 1982 RTTY Special issue we featured an article by Buzz Gorsky, K8BG, called "The Complete TRS-80® RTTY System." Actually, the title was sort of a misnomer in that the program described was far too lengthy to reproduce within our pages. We asked those who were interested to send in $2.50 for a copy of the program and its description. We've received a large number of requests, and they still trickle in each day. Obviously, there are far more people out there actively using computers than first meets the eye.

Buzz has come up with an idea to help distribute the program even further. He will supply the program on disk to anyone who (1) mails him a blank disk, (2) encloses an s.a.s.e. for the disk's return, (3) and sends a check (in any amount) payable to AMSAT as a donation towards their work. That sounds like a great deal, and it helps out a good cause. If you would like to take advantage of Buzz's offer, write to him at 712 Hillside Drive, Carlisle, PA 17013.

Next Month

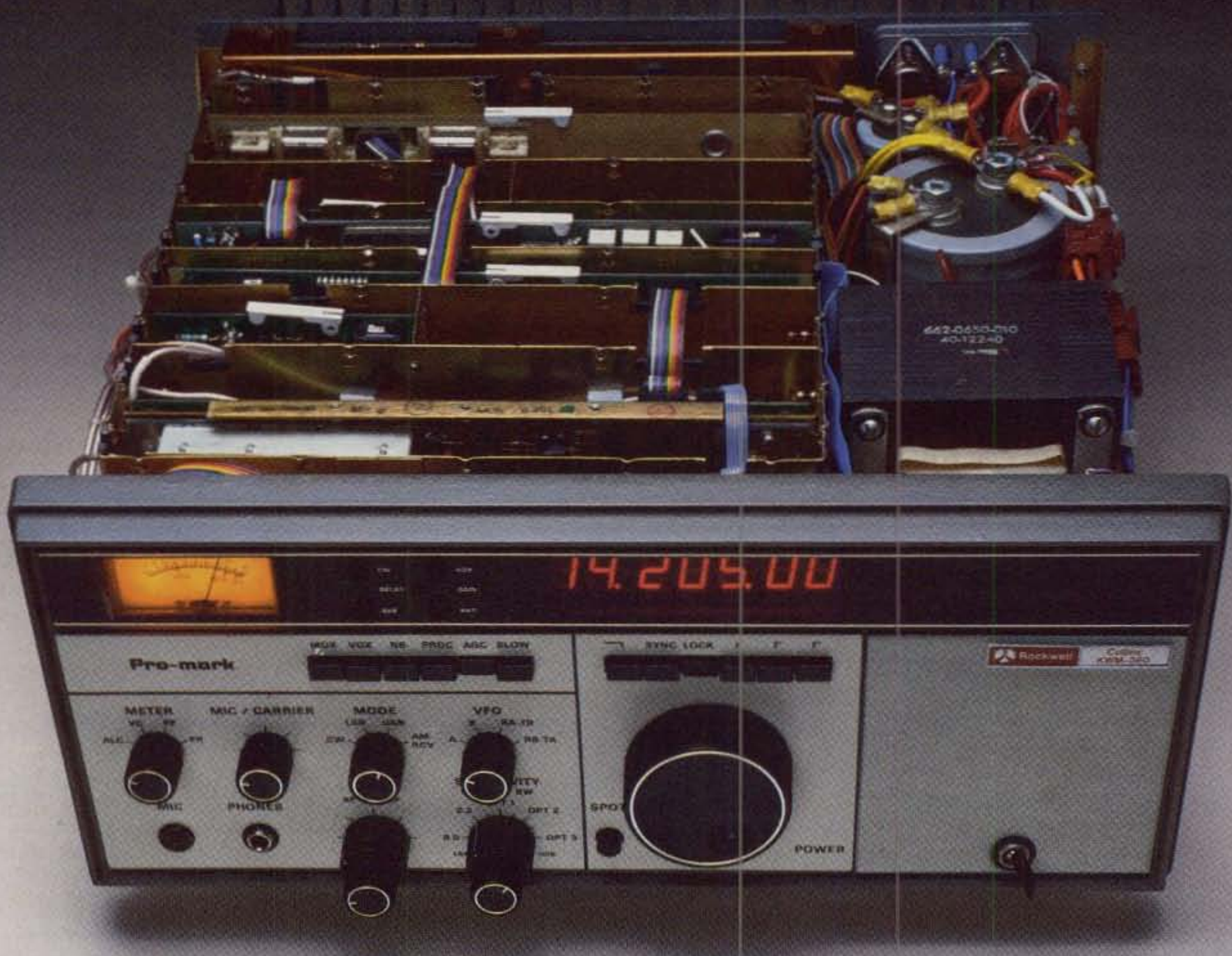
April is the first of our two Antenna Special issues this year. If the weather holds, it will be another mild winter, and when you are comfortably reading this issue in March, let your mind wander a bit to thoughts of antennas. We'll have a wonderous "array" of projects to choose from or just dream about. It's time to find out where you stored the ladder and to dig out some of those tools from the toolbox. It's also time to seriously look at some of the advertising and catalogs and to put to use those thousands of spec sheets you took home from last year's hamfests. Begin to lay the psychological groundwork for yourself and the entire family as to the absolute *need* for a new antenna system. Clothes, shoes, furniture, and even food can wait. The car will last another year or two, but DX awaits now and is softly calling to you.

Next month chronologically also means April, and April means Dayton. Dayton is still the magical word in amateur radio. If you want to be immersed in wall-to-wall amateur radio for as far as the eye can see, then you have to travel to Dayton for the experience. Fifteen to twenty thousand HT's all going at the same time are enough to tax any repeater and bring tears to the eyes of a battery salesman. Hot dogs and Strohs beer are more than enough to quench the appetite of any amateur gastronome, for amateurs live by more than bread alone . . . we live for the quest. Whatever the goal of the quest is, you'll find it there. Everything new, exotic, and desirable in the way of equipment is on display, surrounded by people who are anxious that you find out every last detail about their wonderful products. There are plenty of catalogs, spec sheets, and free items which you will be encouraged to take home. You will need very little encouragement to want to buy almost everything in sight; the enthusiasm is infectious. You'll need almost a full day alone just to check out everything at the fleamarket. If you've never been there, you owe it to yourself. If you decide to go, and I hope you do, stop by the *CQ* booth and say hello to the *CQ* gang.

Although all hamfests can't be as big as Dayton (so far, that is), almost all that we've been to in the last few years have shown a growth in attendance. If you're not taking part in these events or showing up to enjoy the fun, then you're missing out on another wonderful aspect of amateur radio.

73, Alan, K2EEK

The real beauty of the Collins KWM-380 is behind the panel, not on it.



At Collins, we know serious amateurs won't settle for less than professional performance. So we build every KWM-380 to commercial rather than amateur standards. For example, our PC boards are connected by ribbon cables with gold-plated pinfield connectors. The boards themselves are all glass epoxy, and virtually

unaffected by temperature and humidity which cause intermittents in the more commonly used phenolic boards.

Once built, every KWM-380 undergoes 24-hour burn-in, then is aligned and tested to meet or exceed every spec on the data sheet. Which makes us very confident about warranting your KWM-380 for one full year.

The result is a radio with superior performance and lasting quality, not front-panel glitter.

Frequency stability is just one example of its beauty: typically, drift is as low as 10-12 Hz per hour for normal ham shack environments. Other companies haven't matched our performance because they don't match our quality behind the panel.

Add some real beauty to your station. See the KWM-380 at your nearest authorized dealer. Collins Telecommunications Products Division, Defense Electronics Operations, Rockwell International, Cedar Rapids, IA 52498. Phone (319) 395-5963. Telex: 464-435.

Rockwell International

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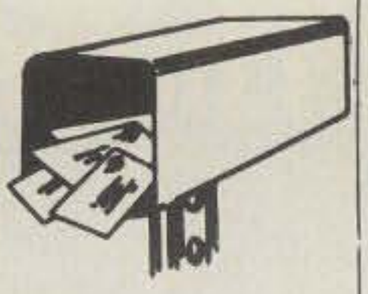
Our Readers Say



Still Fascinating After All These Years

Editor, *CQ:*

Thank you for the reminder that my subscription to *CQ* has nearly expired. I am pleased to enclose an International Money Order with the renewal notice form.

I have been a reader of the magazine since first being licensed in 1949, and I believe I was a subscriber before even then! Over the years I have successfully built many projects from within its pages and continue to do so with current solid state microcircuitry. Receipt of the magazine each month still carries the same fascination and enjoyment for me. Many thanks.

Ronald G. Barrell, G3FOP
Hertfordshire, England

The Key To Success

Editor, *CQ:*

Steve Russell's article in the October 1982 issue on modifying the AEA CK-1 contest keyer was the catalyst needed to finally get me to do similar work on mine. Not having access to a jig/saber saw nor needing a better speaker or internal power supply, I wanted to keep the new cabinet the same size as the original. Also, I have only a bridge table for an operating desk, and the aluminum cabinet Steve used costs over $6 by me. Radio Shack has a plastic "experimenter's box" of $5\frac{1}{16}" \times 2\frac{5}{8}" \times 1\frac{5}{8}"$ for $2 into which the keypad fits all but exactly.

An SPDT (275-613) for memory load/send, a DPDT with center-off (275-620) for tune/load/xmit, a DPDT (275-614) for right/left hand, 3-conductor phone and a phono jack (274-282, 274-280, respectively), and feet (64-2346) were all the components I needed. Incidentally, the part number for the plastic box is 270-333. I was going to use the original phono jack but felt all new was better. The power connector is from the original unit. Because I am ambidextrous and use my right hand for regular QSO's and my left for contests, I substituted a right-hand/left-hand switch in lieu of the one for keying polarity. If I had to do this over again, I'd probably put the power connector on the end with the input/output connectors. I don't think there would be any difficulty regarding possible hum pick-up.

I'm enclosing a Polaroid shot of the completed project. Total time involved, including getting the parts at the local "Shack," was under eight hours.

Thank you, Steve, for providing the incentive for me to do something I've wanted to do since I got the CK-1, and thank you, *CQ*, for publishing useful articles like Steve's for the active amateur. Perhaps one day I will be able to contribute an article that will galvanize others into action.

Rob Wanderer, KT2D
Oakland, NJ

One Month Too Late

Editor, *CQ:*

Re: "The '5 For 5' 2 Meter Antenna," article in December 1982 *CQ*. Praise, honor, and glory to David F. Plant, N7CGA, and his cohorts for a wonderful article that was concise, exact, and easily understood by guys like me.

Curses on the heads of the editorial staff of the great *CQ* magazine, for I went out and bought a double 7-element the day before the magazine arrived. Why didn't you put this in one month earlier?!

Bob Geary, K8YXZ
Dayton, OH

CQ Once Again

Editor, *CQ:*

After getting my retired brother in North Carolina into ham radio as a Novice three years ago, I purchased for him a subscription to *Ham Horizons*, which was changed to *Ham Radio* for the remainder of his subscription. The next year I got him a subscription to *QST*. Three months ago I got him a subscription to *CQ*, and on a recent visit he told me he liked *CQ* better than any.

I stopped taking *CQ* many years ago and have been taking *QST* and *73*, but they are pricing themselves out of business. Here is my check for a three-year subscription to *CQ*.

Ken Massie, WA8SOO
Ironton, OH

The ultimate team... the new Drake "Twins"

The TR7A and R7A offer performance and versatility for those who demand the ultimate!

TR7A Transceiver

• **CONTINUOUS FREQUENCY COVERAGE** — 1.5 to 30 MHz full receive coverage. The optional AUX7 provides 0 to 1.5 MHz receive plus transmit coverage of 1.8 to 30 MHz, for future Amateur bands, MARS, Embassy, Government or Commercial frequencies (proper authorization required).

• **Full Passband Tuning (PBT)** enhances use of high rejection 8-pole crystal filters.

New! **Both 2.3 kHz ssb and 500 Hz cw crystal filters, and 9 kHz a-m selectivity are standard,** plus provisions for two additional filters. These 8-pole crystal filters in conjunction with careful mechanical/electrical design result in realizable ultimate rejection in excess of 100 dB.

New! **The very effective NB7 Noise Blanker is now standard.**

New! **Built in lightning protection** avoids damage to solid-state components from lightning induced transients.

New! **Mic audio available** on rear panel to facilitate phone patch connection.

• **State-of-the-art design** combining solid-state PA, up-conversion, high-level double balanced 1st mixer and frequency synthesis provided a no tune-up, broadband, high dynamic range transceiver.

R7A Receiver

• **CONTINUOUS NO COMPROMISE 0 to 30 MHz frequency coverage.**

• **Full passband tuning (PBT).**

New! **NB7A Noise Blanker supplied as standard.**

• **State-of-the-Art features** of the TR7A, plus added flexibility with a low noise 10 dB rf amplifier.

New! **Standard ultimate selectivity choices** include the supplied 2.3 kHz ssb and 500 Hz cw crystal filters, and 9 kHz a-m selectivity. Capability for three accessory crystal filters plus the two supplied, including 300 Hz, 1.8 kHz, 4 kHz, and 6 kHz. The 4 kHz filter, when used with the R7A's Synchro-Phase a-m detector, provides a-m reception with greater frequency response within a narrower bandwidth than conventional a-m detection, and sideband selection to minimize interference potential.

• **Front panel pushbutton control** of rf preamp, a-m/ssb detector, speaker ON/OFF switch, i-f notch filter, reference-derived calibrator signal, three agc release times (plus AGC OFF), integral 150 MHz frequency counter/digital readout for external use, and Receiver Incremental Tuning (RIT).

The "Twins" System

• **FREQUENCY FLEXIBILITY.** The TR7A/R7A combination offers the operator, particularly the DX'er or Contester, frequency control agility not available in any other system. The "Twins" offer the only system capable of no-compromise DSR (Dual Simultaneous Receive). Most transceivers allow some external receiver control, but the "Twins" provide instant transfer of transmit frequency control to the R7A VFO. The operator can listen to either or both receiver's audio, and instantly determine his transmitting frequency by appropriate use of the TR7A's RCT control (Receiver Controlled Transmit). DSR is implemented by mixing the two audio signals in the R7A

• **ALTERNATE ANTENNA CAPABILITY.** The R7A's Antenna Power Splitter enhances the DSR feature by allowing the use of an additional antenna (ALTERNATE) besides the MAIN antenna connected to the TR7A (the transmitting antenna). All possible splits between the two antennas and the two system receivers are possible.

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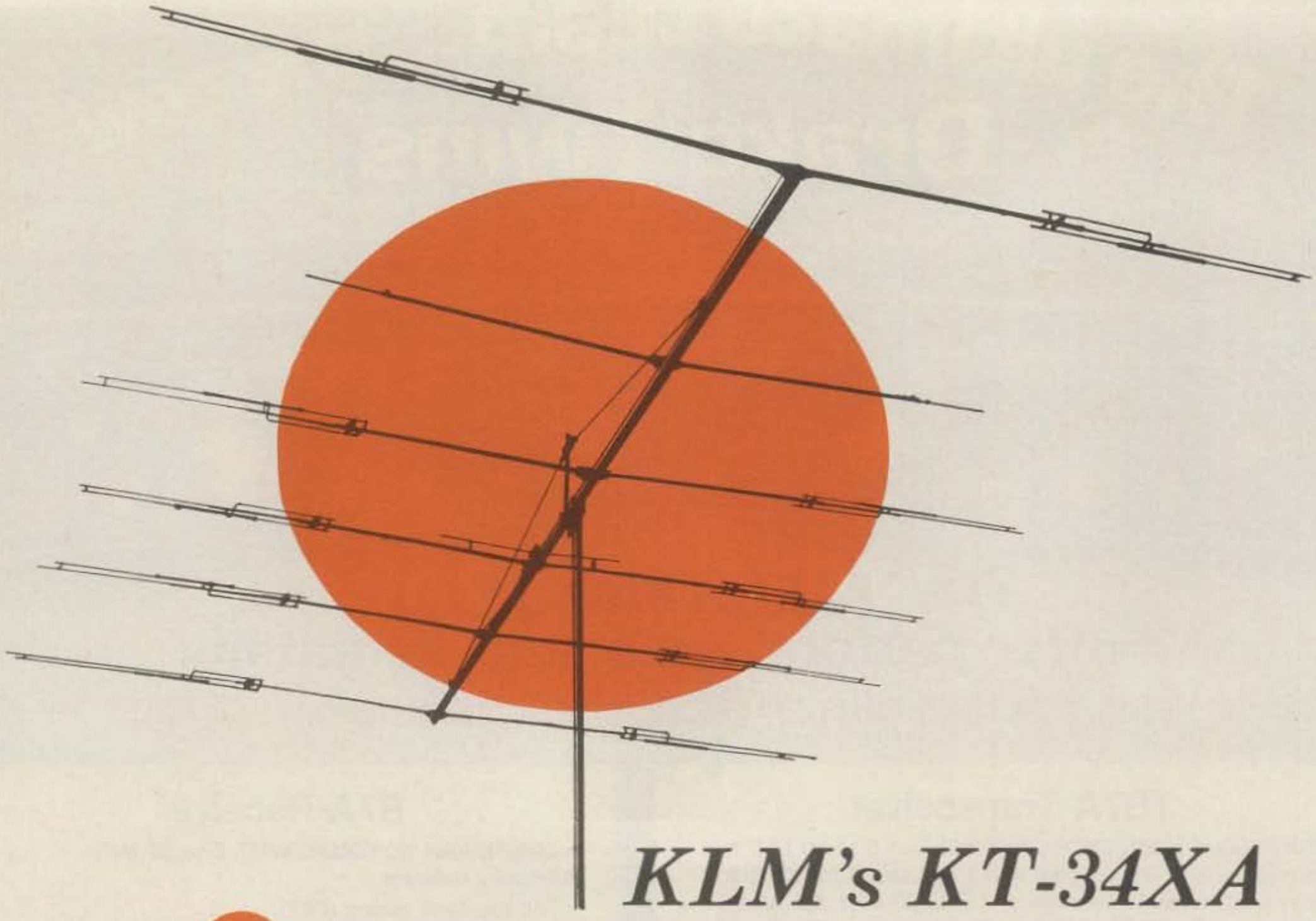

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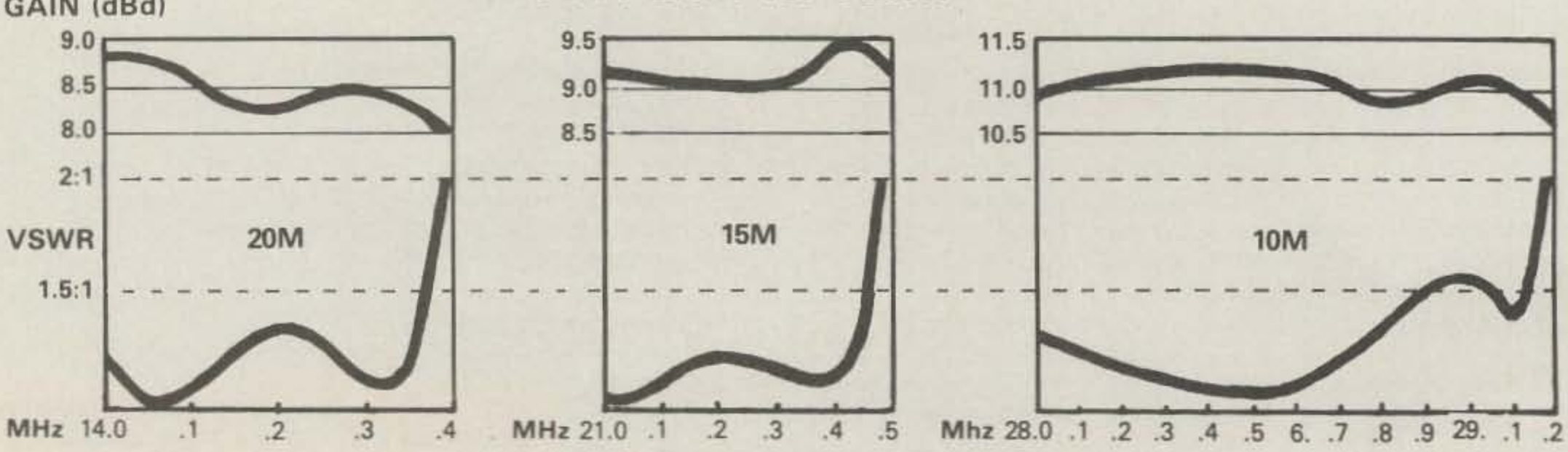
KLM's KT-34XA TRIBANDER is the 2nd generation of a unique new series of antennas designed to provide superior **broadband** coverage on 20, 15, and 10 meters. The combination of lossless linear loading and hi-Q air capacitors enables the KT-34XA to outperform **all** commercial available tribanders and meet or exceed the performance of a conventional stacked monoband system. The lower weight and windload of a single antenna mean reduced tower and rotator requirements. Thus, overall system costs can be kept to a minimum while enjoying the best of monobander-type performance.

KLM's field proven KT-34A is the heart of the "XA" model. The boom length of the "XA", however, has been doubled, and one tri-resonant and one full size 10 meter element have been added. These changes increase the gain to **11-11.3 dBd** on 10M, **9-9.5 dBd** on 15M, and **8.5-9 dBd** on 20M. Two driven elements are used to make the KT-34XA unusually broadbanded (a concept applied to many KLM antennas). Gain is virtually flat across each band except for 10 meters which has been optimized for the DX'er, 28-29 MHz. The chart below shows the remarkable performance qualities of the KT-34XA.

KT-34XA GAIN vs. VSWR



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The HW-5400's Frequency Entry Keypad option allows directly-synthesized QSY to any point in the band, and permits fast DX control when used with the Split Memory function. The matching HWA-5400-1 Power Supply/ Speaker & Digital Clock (not shown) provides a double-fused source of 13.8 VDC from 120 or 240 VAC.

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● **The First-Ever Single Yagi 220 MHz Moonbounce Contact** - This event took place on December 6, 1982, between Lee Fish, K5FF, Edgewood, New Mexico, and Dave Olean, K1WHS, Lebanon, Maine. K5FF used her home-built 30 foot dish with polarity rotation, while K1WHS used a single Cushcraft 220B Boomer Yagi vertically polarized on the side of his tower. Signals were quite good in both directions, and the contact was completed in a minimum length of time.

● **Anniversary Special Event Station GB2YM** - The City of Belfast YMCA formed a radio club in 1923. The club's first amateur radio license was issued in 1926 as GI6YM. In 1983 the club celebrates its sixtieth anniversary and hopes to have a monthly activity weekend throughout the year under the special event callsign GB2YM. They would like to hear from any other YMCA radio clubs and possibly to make contact with them on the air during 1983.

● **Armored Forces Amateur Radio Net** - This is an informal and nonprofit organization, no dues required. It is an amateur radio net made up of veterans and present-day service people from the many various units and divisions of Armored Forces. They are not connected with the military in any other way, and at the present their roster of members located in 30 states plus 3 DX locations includes 95 operators. They are seeking additional members with valid amateur licenses who are veterans or present-day personnel in the Armored Forces of the United States. "A Far Net" runs skeds on several bands through the week year round, and members have available a QSL card. For more information, contact Armored Forces Amateur Radio Net, Harry B. Thomsen, W2PJH, 348 Jefferson Ave. Apt. 15, Canandaigua, NY 14424.

● **Christmas in July** - W1FHP and the Hen House Gang would like to thank the thousands of fellow amateurs for the fine reception of their Christmas Special from the "Little Town of Bethlehem, Conn." (December 1982). They will be back in July 1983 for their "Christmas in July" from one of the following states: Maryland, Pennsylvania, or New York. Consult *CQ* for more information of time and place in the future.

● **SWEARS Anniversary Special Event Station** - The Southwire Employees Amateur Radio Society (SWEARS) based in Carrollton, GA, will activate the second annual SWEARS Anniversary Special Events Station on March 26, 1983, to honor the 33rd anniversary of the parent company's (Southwire Co.) first production of wire. Specially designed QSL cards will be awarded. Plans call for operation on 14.270 MHz, 21.345 MHz, and 28,600, all ± 10 kHz. Novices should check the first 10 kHz of the 15 and 10 meter band. Operation will likely not be continuous on all bands, so check all frequencies. For information, contact Terry Martin, WD4AON at (404) 832-5375.

● **The following hamfests, fleamarkets, etc., are scheduled for March.**

March 4, **Split Rock ARA Electronics Auction,** Morris Plains, NJ. Contact Split Rock ARA, P.O. Box 3, Whippany, NJ 07981.

March 6, **Old Bridge Radio Association Amateur Radio, Computer, and Electronic Auction,** Old Bridge, NJ. Contact Fred, WA2BJZ, at 201-257-8753.

March 11, **Jefferson Barracks ARC Auction and Hamfest,** South St. Louis, MO. Contact Jefferson Barracks ARC, 1624 Union Road, St. Louis, MO 63125.

March 12, **Shore Points ARC Springfest '83,** Harbor City, NJ. Contact SPARC, P.O. Box 142, Absecon, NJ 08201.

March 13, **Delaware Valley Radio Association Fleamarket,** New Jersey National Guard 112th Field Artillery Armory, Lawrence Township, NJ. Contact DVRA, P.O. Box 7024, W. Trenton, NJ 08628 (s.a.s.e.).

March 13, **Martinsville Hamfest,** Martinsville, IN. Contact Aileen Scales, KA9MBK, 3142 Market Place, Bloomington, IN 47401 (s.a.s.e.).

March 13, **Randolph ARA Hamfest,** Winchester, IN. Contact RARA, Box 203, Winchester, IN 47390, or call Jake Life, W9VJX, at 317-584-9361.

March 19, **Midland ARC St. Patrick's Swapfest,** Midland County Exhibit Building, south of Midland, TX. Contact Midland ARC, P.O. Box 4401, Midland, TX 79704.

March 19, **Radio Association of Erie, PA, Hamfest,** Erie, PA. Contact KA3CXO.

March 20, **Teays ARC "King of the Pumpkin Hamfest,"** Circleville, OH. Contact Dan Grant, W8UCF, 22150 Hiuse Road, Circleville, OH 43113 (s.a.s.e.).

March 20, **Toledo Mobile Radio Association Auction and Hamfest,** Maumee, OH. Contact J. Honisko, KB8YD, 1733 Parkway Dr. N., Maumee, OH 43537 (s.a.s.e.).

March 26, **Salem Mini-Hamfair,** Rickreal, OR. Contact L. Apperson, WA7OWM, 629 Georgia Street, Salem, OR 97302.

March 27, **Lake County ARA Hamfest and Computer Fest,** Madison, OH. Contact Lake County Hamfest Committee, 37778 Lake Shore Blvd., Eastlake, OH 44094 (s.a.s.e.), or call 216-953-9784.

March 27, **LAMARSFEST 1983,** Grayslake, IL. Contact LAMARS, P.O. Box 751, Libertyville, IL 60048 (s.a.s.e.).

March 27, **Conemaugh Valley ARC Hamfest,** East Taylor Fire Hall, 4 miles north of Johnstown, PA. Contact Conemaugh Valley ARC, 2829 Bedford St., Johnstown, PA 15904.

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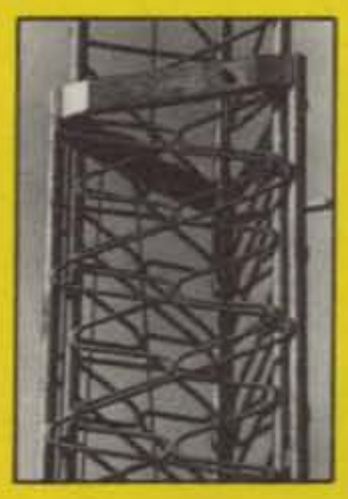

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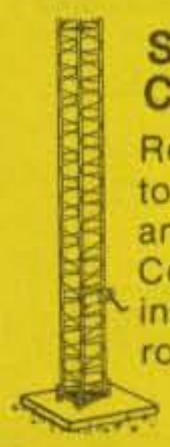
	HG-54HD	3	54 ft. 16.5 m	21.5 ft. 6.6 m	19.53 in. 496.1 mm	16 sq. ft.-60 mph 1.5 sq. m-96 km/h	575 lbs. 261 kg
	HG-70HD	4	70 ft. 21.3 m	21.5 ft. 6.6 m	22.63 in. 574.7 mm	16 sq. ft.-60 mph 1.5 sq. m-96 km/h	1100 lbs. 499 kg
SIDE-SUPPORTED	HG-33MT2	4	33 ft. 10.1 m	11.5 ft. 3.5 m	13.75 in. 349.3 mm	8.5 sq. ft.-50 mph .79 sq. m-80 km/h	210 lbs. 95 kg
	HG-50MT2	3	50 ft. 15.2 m	21 ft. 6.4 m	11.5 in. 292.1 mm	6.0 sq. ft.-50 mph .56 sq. m-80 km/h	290 lbs. 132 kg
	HG-35MT2	2	35 ft. 10.7 m	20.5 ft. 6.2 m	9.25 in. 235 mm	9.5 sq. ft.-50 mph .88 sq. m-80 km/h	187 lbs. 85 kg



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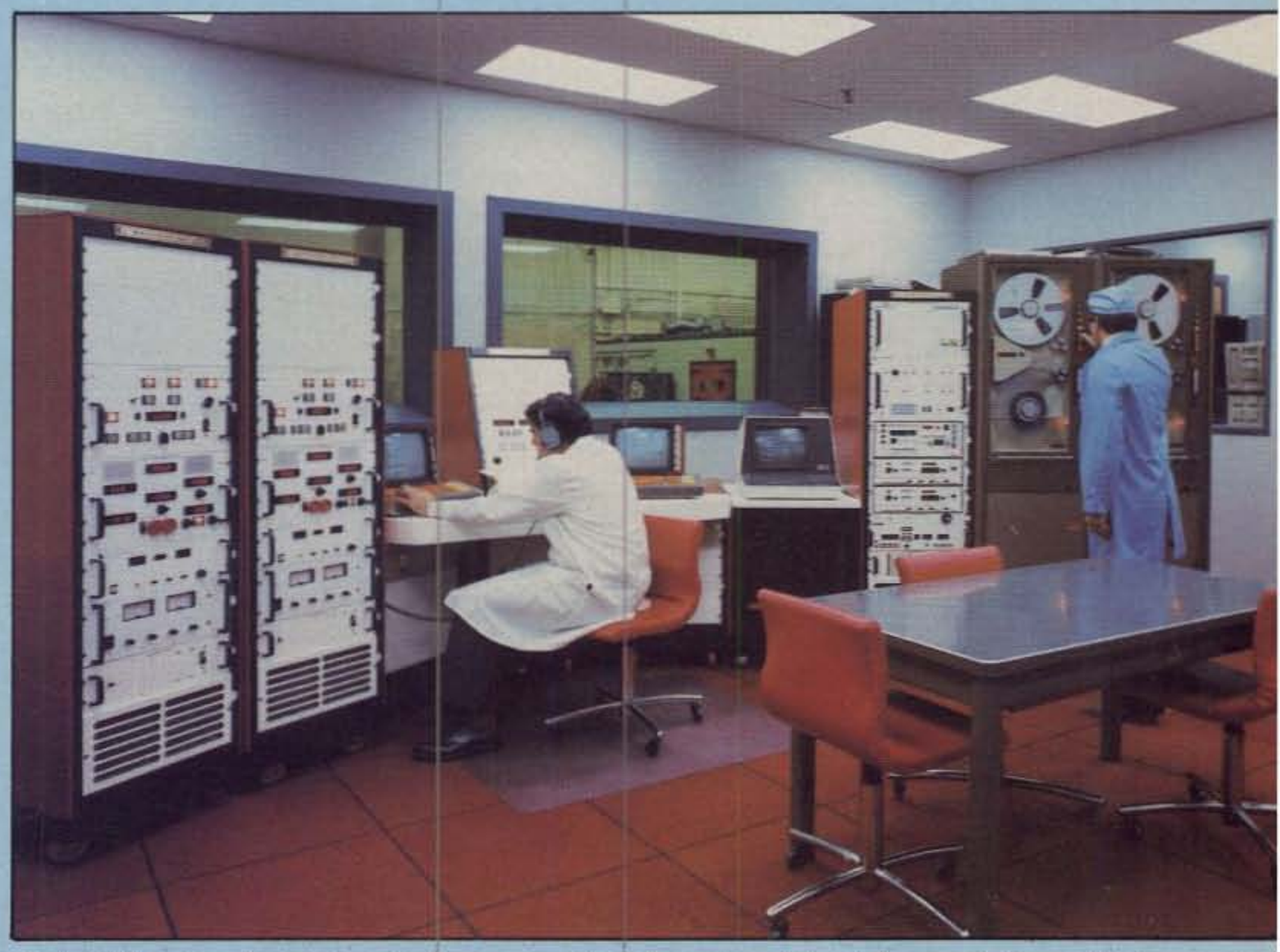
In this exclusive interview, the President and Senior Director for Space Marketing for Fairchild Space Company reveal how future OSCAR satellites might be carried into orbit.

Dr. John W. Townsend, Jr., W3PRB, President, Fairchild Space Company.

Mr. Mort H. Cohen, K3EH, Senior Director, Space Marketing, Fairchild Space Company.



Fairchild computer automated spacecraft test center utilized for modular multimission spacecraft—a forerunner of the Leasecraft system.

CQ Interviews: BY DR. THEODORE J. COHEN*, N4XX

Dr. John W. Townsend, Jr., W3PR
Vice President, Fairchild Industries
President, Fairchild Space Company
and
Mr. Morton H. Cohen, K3EH
Senior Director, Space Marketing
Fairchild Space Company

Dr. John (Jack) W. Townsend, Jr., W3PRB, is a Vice President of Fairchild Industries and President of Fairchild Space Company. He was born in Washington, D.C., and attended Williams College, where he received a BA in 1947, an MA in 1949, and a ScD (Hon.) in 1961 in Physics. During World War II he served as an officer in the Army Air Forces for over three years.

Dr. Townsend began his career at the Naval Research Laboratory in 1949 as a research physicist instrumenting V-2, Viking, and Aerobee sounding rockets for upper-air research. When NASA was created in 1958, he transferred with his Branch and the Vanguard Project into the new Agency, becoming Chief of its Space Science Division. He was named Assistant Director, Space Science and Satellite Applications, of the NASA Goddard Space Flight Center in 1959, and Deputy Director in 1965.

In 1968 Dr. Townsend was appointed Deputy Administrator of the Environmental Science Services Administration in the Department of Commerce by President Johnson. Under a reorganization plan in 1970, this Agency became part of the National Oceanic and Atmospheric Administration (NOAA), and Dr. Townsend was appointed Associate Administrator by President Nixon. He ended thirty years of Federal Service in January of 1977. Since that time he has been employed by Fairchild Industries as its Vice President. Up until January 1st of this year, Dr. Townsend was also President of the Fairchild Space & Electronics Company. Fairchild Industries at that point reorganized in an effort to position itself better for expected growth in space activities and in communications and electronics. Fairchild's Space & Electronics Company was divided into two divisions: Fairchild Space Company and Fairchild Communications and Electronics Company. Dr. Townsend is now President of the Fairchild Space Company.

Dr. Townsend received the Navy's Meritorious Civilian Service Award in 1957, NASA's Medal for Outstanding Leadership in 1962, the Arthur S. Flemming Award in 1963, and the NASA Distinguished Service Medal in 1971.

Dr. Townsend is a member of the National Academy of Engineering and the International Academy of Astronautics. He is a Fellow of three professional societies and a member of three others, and has published a number of papers and articles. He is currently a member of the Space Applications Board and the Committee on NASA Program Changes of the National Research Council.

Morton H. Cohen is Senior Director of Marketing, Space Products, Fairchild Space Company, Germantown, Maryland. Mr. Cohen joined Fairchild Space & Electronics Company in June 1977 as Director of Space Marketing. He has been deeply involved in some of Fairchild's recent successes in the space product line, including the Multimission Modular Spacecraft (MMS) I&T contract, the Communications and Data Handling contract, and the militarized MMS.

During the last 20 years, Mr. Cohen has held significant Washington marketing director positions with EMR, General Dynamics, and Spacetac, and he has participated directly in every major space program sponsored by NASA. The companies he represented made major contributions to the tracking, telemetry, and command aspects of manned programs such as Mercury, Gemini, Apollo, and Spacelab, and to numerous unmanned scientific satellite programs.

Mr. Cohen received a BS degree in Electrical Engineering from the University of Connecticut in 1952, and an MS degree in Electrical Engineering from the same institution in 1955. He is a member of numerous societies, including the Institute of Electrical and Electronic Engineers (IEEE), American Institute of Aeronautics and Astronautics (AIAA), Armed Forces Communications and Electronics Association (AFCEA), National Space Club, and the American Astronautical Society (AAS). He served on the council of the National Capital Section of AIAA from 1978–79, and currently he is a member of the AIAA National Space Systems Committee.

CQ is pleased and honored to have had the opportunity to meet with these distinguished engineers, and takes great pride in bringing you this exclusive interview.

CQ: Jack, when did you first get interested in amateur radio, and how did it affect your professional life?
Townsend: I first got interested when I was about 13 years old, and it affected my life in a profound way. I started out to be a chemist. However, after the war, I found myself with enough college credits in physics—as a result of communications and radar countermeasures experienced in the Air Force—to graduate much more quickly. My amateur radio experience led to the service school education, and that really sparked my interest in physics. Although I became a research physicist, my early work largely involved electronics, which was sophisticated for its day because of the rocket and satellite research program in which I was involved at the Naval Research Laboratory.

CQ: How about you, Mort?
Cohen: Well, Ted, my father was one of the first radio amateurs, back before World War I. He began to teach us the code almost before we could walk. As a result, my interest in radio and engineering was almost predestined, and it greatly influenced my subsequent choice of professional career.

CQ: Years ago, possession of an amateur license was considered a good ticket into the fields of communications and electronics. As employers of technical people, does the possession of an amateur license today carry as much weight as it did, say, in the 1950s or '60s?
Cohen: Probably not as much today as it did in the 50s and 60s, when a very high percentage of EEs came from an amateur radio background. I think the advent of digital electronics and computers, and the emphasis on these things, plus the rapid increase in the complexity and maturity of technology, had a lot to do with the change.

CQ: What kind of background, experience, and education do you look for today when hiring professional people?
Townsend: My company hires more electrical engineers than any other single category. To be professional, they must have a degree and come from a good school. Naturally, we look for the better students, and, in particular, we look at any associated experience they may have had. Interest in amateur radio, computers, and other high-technology hobbies certainly helps. Experience in electronics which was obtained in any of the military services is an additional "plus."

CQ: Do you see any specific areas in which today's college graduates are, in general, deficient?
Townsend: Yes, indeed! Students today, even high-ranking ones, verge on the border of illiteracy. My son teaches remedial English, and you wouldn't believe how bad the situation is.

Virtually everything we do today involves computers, microprocessors, and software in some way.

CQ: Mort, how important is it for your professional employees to be "computer literate"?
Cohen: Virtually everything we do today involves computers, microprocessors, and software in some way. So it is almost essential for professional employees to be "computer literate." Most of the recent graduates and a high percentage of the experienced people we hire are well versed in computer technology.

**Media-Tech, 8603 Conover Place, Alexandria, VA 22308*

Fairchild Space Company, Germantown facility at night.

CQ: Jack, what about continuing education for your scientific and technical personnel? Do you encourage and support it?
Townsend: Fairchild actively supports continuing education. We pay tuition towards advanced degrees, conduct courses on the premises in areas such as microprocessor technology, and most recently we have embarked on a joint work/study program leading to a Masters degree at the University of Maryland. The student works three days, goes to school two days, and receives his MS in two years. All costs are borne by the company, and the employee is paid full salary at his peer level.

A shortage of engineers definitely exists.

CQ: There is an ongoing debate regarding the question of whether or not a shortage of engineers exists. Some argue that there is, indeed, a shortage, while others say that below-standard wages are turning people away from the engineering professions. What is your opinion?
Townsend: A shortage of engineers definitely exists, Ted. It may be somewhat worse on the West Coast, but it is not easy to find people on the East Coast, either. Below-standard wages are certainly not turning people away from engineering, because a starting salary of $25,000 a year is certainly not "below standard." I think the real problem here is that the demand is up, and the supply is down. The supply is down because student interest and enrollment starting at the secondary school level are simply not what they should be to support a modern society which is becoming increasingly dependent on electronic technology.

CQ: In what technical areas does Fairchild Space Company have the greatest problem finding qualified professional employees today?
Townsend: Electronic engineers, particularly experienced people with a "systems bent," are probably in the shortest supply.

CQ: Mort, let's discuss Fairchild's Leasecraft concept. First, what is it?

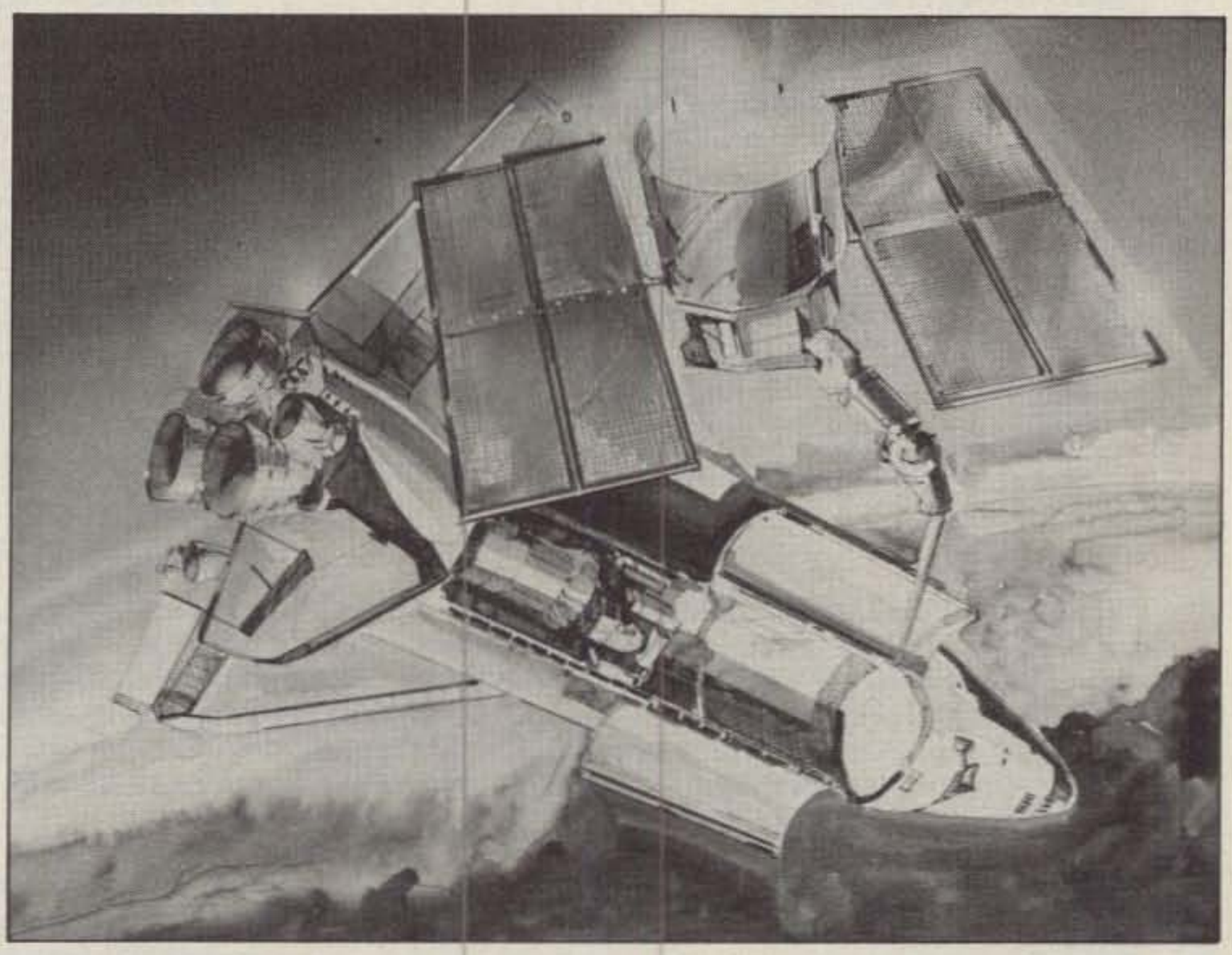
Leasecraft can carry payloads brought up in the Shuttle into orbit, and it can be used to change them out sequentially.

Cohen: Leasecraft is a highly innovative idea whose time has come. It is a leased, on-orbit service which provides a very capable spacecraft built using proven technology. Leasecraft can carry payloads brought up in the Shuttle into orbit, and it can be used to change them out sequentially. The system is modular for ease of servicing, and it has a propulsion capability for orbit raising or lowering.

CQ: What types of orbits would be attained using your vehicle?
Cohen: Leasecraft will operate in any orbital inclination in which the Shuttle Transportation System can operate. The most popular of these are 28°, 56°, or polar. Within a given plane, the Leasecraft on-board propulsion system allows us to move up—or down—from the Shuttle parking orbit . . . that is, from an altitude of about 150 nm to approximately 600 nm. Initially, most of our service will be at 28°. Ultimately, we will have Leasecraft operating at 56° and in polar orbits, as well.

CQ: What are the benefits to be gained using Leasecraft over those obtained using the more conventional launch vehicles NASA employs today?
Cohen: First of all, Ted, Leasecraft is designed as an extension of the Shuttle system, and is something which makes servicing of satellites possible for the first time. Expendable Launch Vehicles don't have this capability. So, instead of launching expensive satellites and payloads on ELVs, and kissing them goodbye forever, we are talking about the ability to put a modular, serviceable spacecraft—or mini-platform—permanently on-orbit.

J. Townsend (seated) and M. Cohen in the Fairchild Radio Club ham shack.



The first Leasecraft carrying a materials processing factory ready for release from the Space Shuttle after operational checkout. From the Shuttle parking orbit the Leasecraft propulsion system will move the factory to its operational orbit at 300–400 nautical miles above Earth.

MESSAGE PROCESSOR TERMINAL

MPT3100

Message processing is now available for radio communications systems. The MPT3100 is a complete up-date of the popular HAL DS3100 RTTY terminal, adding the ability to store RTTY messages, edit them, and retransmit them singly or in preset groups. ALL of the previous features of the DS3100 and MSO3100 are retained and new mailbox commands are included. The editor may be used with any file that is stored. The MPT3100 includes ASR (Auto Send-Receive), MSO (Message Storage Option - "mailbox"), and TRO (Traffic Relay Option) modes. The MPT3100 is a new software package that works in ANY DS3100 with MSO3100 circuit board. Some of the features of the MPT3100 are:

NEW FEATURES OF MPT3100:

- Automatic storage of all received text in files separated by the standard "NNNN" terminator (TRO-REC mode)
- Full editing capability of all files stored by mailbox (MSO) or by TRO storage
- Editor allows insertion or deletion of text in any part of a stored message - 15 keyboard edit commands
- Editor may be used even while receiving, transmitting, or storing messages - even when MSO mailbox is in use
- Files may be renamed, created in the editor, cut into smaller files, and deleted with keyboard commands
- Message files may be transmitted singly or in batches
- Transmitted messages may be serial-numbered automatically
- The full format requirements for NAV MAR COR MARS NTP-8(A) are supported
- New TRO commands include: RXON, RXOFF, DIR, SEND, STOP, RESUME, RESTART, EDIT, CUT, CREATE, QUIT, RENAME, DELETE
- On-screen status indicators show: TRO mode; bytes of memory remaining; file names being recorded, transmitted, and edited
- MSO mailbox .SDIR directory command revised to shorten time required for transmission
- New .DIR [filematch] and .SDIR [filematch] mailbox commands give listing of only file names that include [filematch]
- Programmable "header ID" for each mailbox transmission

MSO Mailbox Features:

- Programmable MSO call-up command
- Mailbox may be controlled by external station to store message files, read files, delete files, and list the file directory
- DS3100 operator may perform all MSO operations on the keyboard without transmitting
- Mailbox transmissions include user-prompting and automatic CW and RTTY indentification
- HELP messages are provided to assist the new user in operation of the mailbox
- All mailbox messages stored may also be edited, renamed, and transmitted using TRO commands
- MSO commands are: .DELETE, .DIR, .DIR [filematch], .ENDFILE, .FILEHELP, .HELP, .KY1ON/OFF, .KY2ON/OFF, .PRINTON/OFF, .QBF, .READ, .RYS, .SDIR, .SDIR [filematch], .WRITE

DS3100ASR Terminal Features:

- Send and receive ASCII, Baudot, Morse codes
- ASCII or Baudot at 45, 50, 57, 74, 100, 110, 134, 150, 300, 600, 1200, 2400, 4800, and 9600 baud; full or half duplex
- Morse code at 1 to 175 wpm
- Full length 72 character line / 24 line screen display.
- 50 line pre-type on-screen transmit buffer
- True "ASR" operation - pretype transmit text while receiving
- 150 line receive display buffer
- MSO 3100 adds 32K bytes of additional storage
- 12 inch, P31 green display built-in
- Control functions are clearly marked on keytop
- On-screen status indicators with real-time indication
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- Positive and negative Morse key outputs
- ASCII printer output prints Baudot, Morse, or ASCII text
- Operates on 105-130 / 210-250 VAC 50-400 Hz power

WHEN OUR CUSTOMERS TALK, WE LISTEN – and we have been listening. Rather than making a proven product obsolete – a product that is well known and respected for its reliability and capabilities – HAL has completely rewritten the software of the DS3100 to offer the features that our communications customers have been asking for. A full year in the preparation, these are features that could only be designed by people who know and operate RTTY. Best of all, ANY DS3100 can be modified at the factory to include the MPT3100! In marked comparison to other radio equipment that is made obsolete by new models every 6 to 12 months, the DS3100 lives on – a full 4 years after its announcement.

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Please write for even more details about the MPT3100 Message Processor Terminal. Call your dealer or HAL for prices and how to get a new MPT3100 or to arrange for modification of your present DS3100.

CIRCLE 61 ON READER SERVICE CARD

Leasecraft is designed as an extension of the Shuttle system, and is something which makes servicing of satellites possible for the first time.

Then, at any time of our choosing, we have the capability of rendevouzing with the Shuttle, and of putting on or taking off payloads. Since the user pays only for developing his payload, he saves a lot of money. And since we are already on-orbit with our platform, he saves the spacecraft transportation costs. In addition to these very substantial savings, he is leasing the service, so his spacecraft costs are not only fixed, but are deferred in time to the actual time of use. This helps considerably in budgeting for programs in which up-front dollars are big and in which there is always the spectre of cost overrun on spacecraft development. On top of all this, the Leasecraft service relieves the customer of the considerable headache of dealing with the mounds of paper and certifications needed to fly on the Shuttle, and it guarantees required on-orbit services.

If an OSCAR occupied a nook or a cranny in Leasecraft, it could even be repaired in orbit if it were designed with this in mind.

CQ: Jack, do you foresee the possibility that the Amateur Satellite Corporation (AMSAT) will be able to place OSCAR satellites aboard Leasecraft? If so, how would AMSAT go about setting things in motion?
Townsend: Yes, I think we could strike a deal. When I was Deputy Director at the Goddard Space Flight Center, and later, Associate Administrator of NOAA, I was instrumental in giving the okay for the early OSCAR rides. If an OSCAR occupied a nook or a cranny in Leasecraft, it could even be repaired in orbit if it were designed with this in mind. Write me a letter some time later this year to get things going.

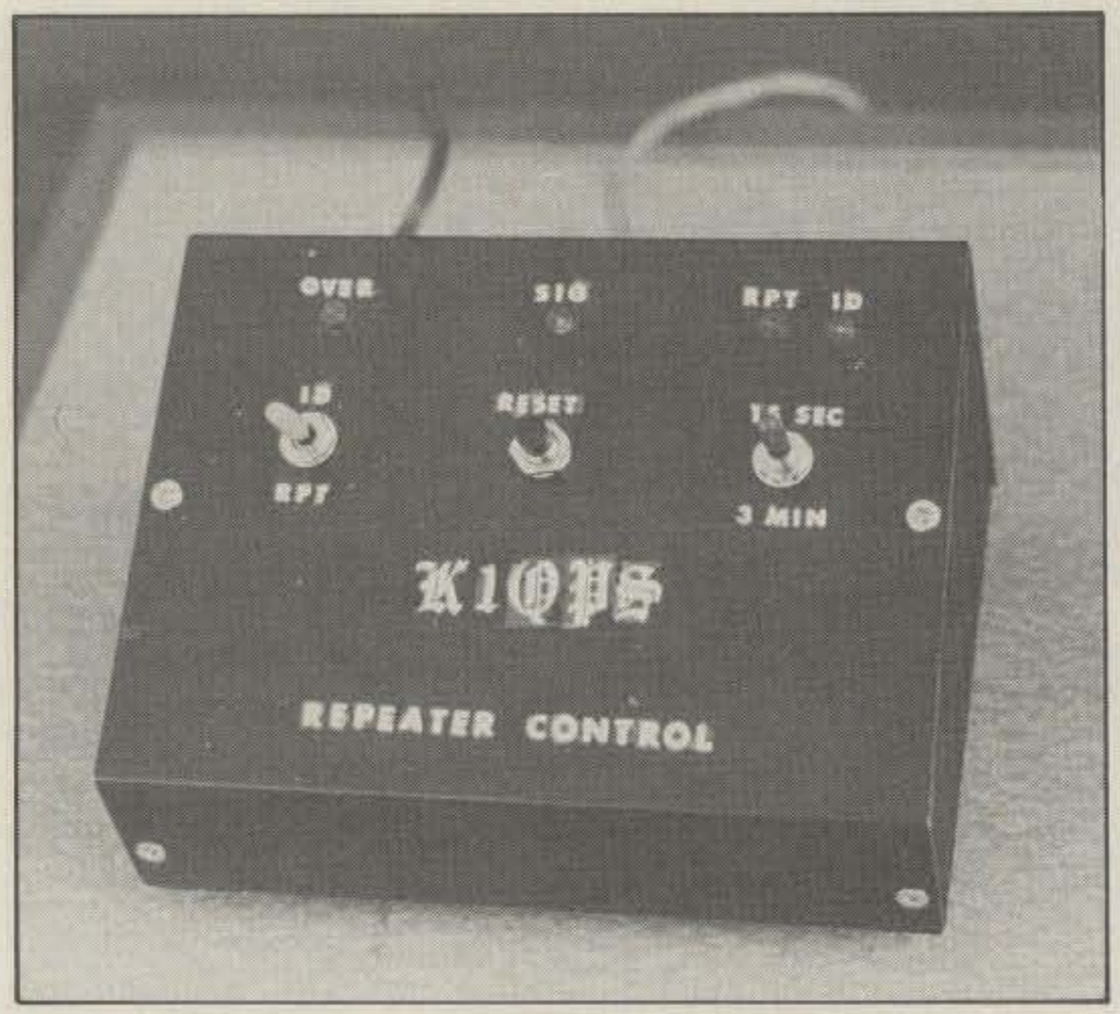
CQ: The French have introduced—at least on paper—a plan to launch commercial satellites for considerably less expense than for current NASA launches. Assuming that the French achieve their goal, how will their launch costs compare to those using the Shuttle and Fairchild's Leasecraft?
Cohen: Ted, this is an on-going debate, but I would direct your attention to the recent Ariane failure and attendent loss of two valuable satellites, as well as to the consequent surge in launch insurance premiums. There is also some argument concerning the extent to which the European governments underwrite their developments, something which makes a comparison of costs difficult.

Aerial view of the Fairchild Space Facility located in Germantown, Maryland, adjacent to Highway 270. Over 900 people are employed in the facility comprised of 5 buildings occupying about 300,000 square feet of space. Sales in 1982 were $60 million.

CQ: On a lighter note, Jack, what aspect of amateur radio do you enjoy the most? Are you on the air today?
Townsend: I am on the air today, but only infrequently. I still enjoy it, but a lack of good antennas seems to be the biggest problem. As one gets older, one gets lazier and spends more time contemplating projects than doing them.

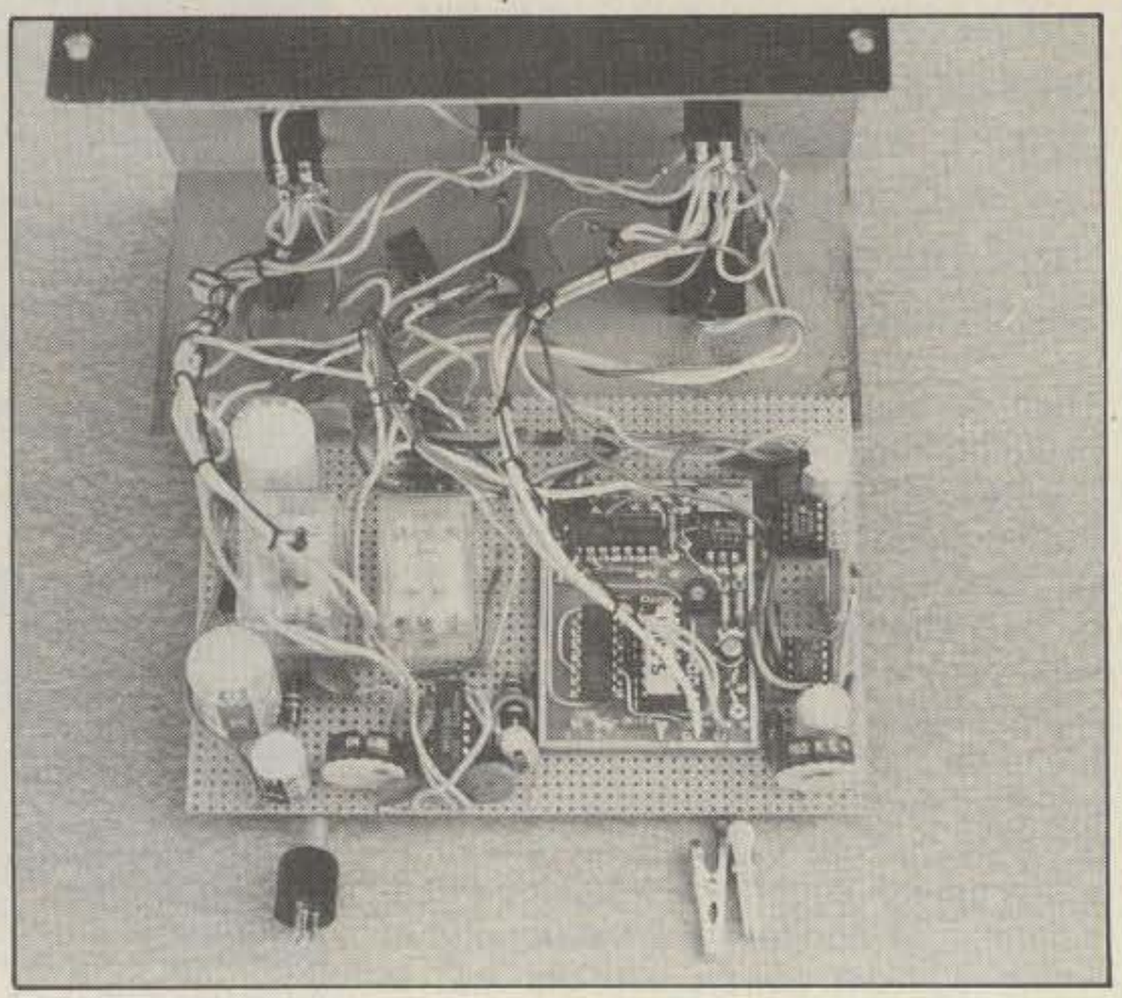
CQ: Mort, how about you?
Cohen: As you know, Ted, having rousted me out of bed many times early in the morning, DXing is still my most enjoyable activity, with Honor Roll just a couple of contacts away. I also like to tinker with building—mostly with kits these days. My operating is sporadic, but I manage to get in a few licks every week.

CQ: Jack and Mort, thank you for being with us today!
Townsend: It was our pleasure! CQ



Instant repeater control box.

Interior of instant repeater control box showing construction on perfboard.



Although it is not an "instant" project, it can be put on line almost instantly when needed. The Instant Repeater might even make a good club project.

The Instant Repeater

BY WALTER M. BECKER*, K1QPS

There are times when the ability to produce a repeater instantly is priceless, as in an emergency situation. There are other times when it is just fun, as on field day or for mountain-topping.

The repeater control described here is easy to build and can be carried in a jacket pocket. Any modern transceiver can be used as a transmitter, and another, or any good receiver, can be used for the receiver. No additional power supply is required. Control can be by a local operator or by telephone line or radio from a remote location.

Two vertical antennas, or two beams, or one of each can be mounted on the same mast. (I use two beams here at the home QTH.) They should be separated by an odd multiple of ¼ wave at the transmit frequency—19″ or 54″, etc. Desensing is not a problem.

The repeater is voice or touch-tone® actuated and cannot be kerchunked.

Construction is on perfboard. All parts are available at Radio Shack stores except the ID module. This can be home-built using PROM technology, or one such as can be obtained from Autocode can be used.

Two cables, a four conductor shielded with the appropriate plug and a two conductor with alligator clips, connect the control to the equipment. LEDs on the instrument indicate repeater on, signal ac-

*Box #201, New Castle, NH 03854

Parts List

(All parts are Radio Shack Stock Nos.)

1	perfboard	276-1394	$1.89	1	.047 mFd 50V capacitor	272-1068	.39
2	relays, 12V 10 ma SPDT	275-003	2.99 ea.	6	.01 mFd 50V capacitors	272-1065	.30 ea.
1	14 pin DIP socket	276-1999	.40	1	10 ohm ¼ watt resistor	271-1301	.08
2	8 pin DIP socket	276-1995	.30	4	1K ¼ watt resistors	271-1321	.08 ea.
1	556 IC	276-1728	1.49	5	10K ¼ watt resistors	271-1335	.08 ea.
2	555 IC	276-1723	.99 ea.	1	27K ¼ watt resistor	271-1340	.08
6	diodes 1A 50 PIV	276-1101	.25 ea.	1	47K ¼ watt resistor	271-1342	.08
1	transistor 2N2222	276-1617	.14	2	1 MEG trim pots	271-229	.59 ea.
1	cabinet	270-264	4.95	1	50K trim pot	271-219	.59
1	push switch NC	275-1548	.54	2	green LEDs	276-034	.40 ea.
2	DPDT center off toggle switch	275-620	2.39 ea.	2	red LEDs	276-034	.49 ea.
1	¼″ closed circuit phone jack	274-55	.75	1 Autocode or equiv. PROM module, 8116 Glider Ave., Los Angeles, CA 90045, $49.95.			
2	475 mFd 35V capacitors	272-1030	.99 ea.				
3	100 mFd 35V capacitors	272-1028	.79 ea.	Misc.—2′ shielded cable with appropriate plug; 3′ #20 zip cord with alligator clips or plug			
1	10 mFd 35V capacitor	272-1025	.59				

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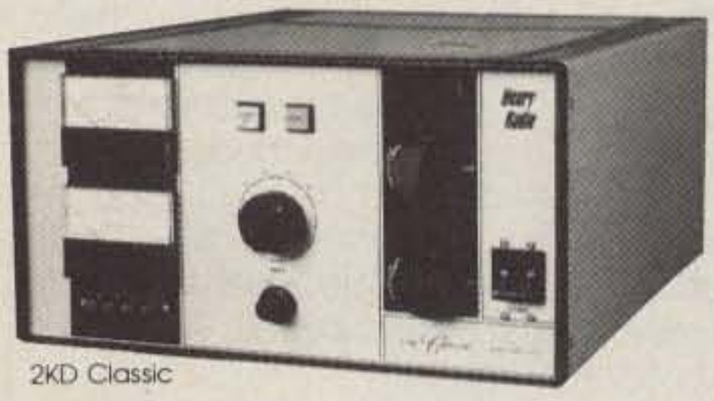

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2K Classic, 2K Classic "X"
and 3K Classic similar in appearance

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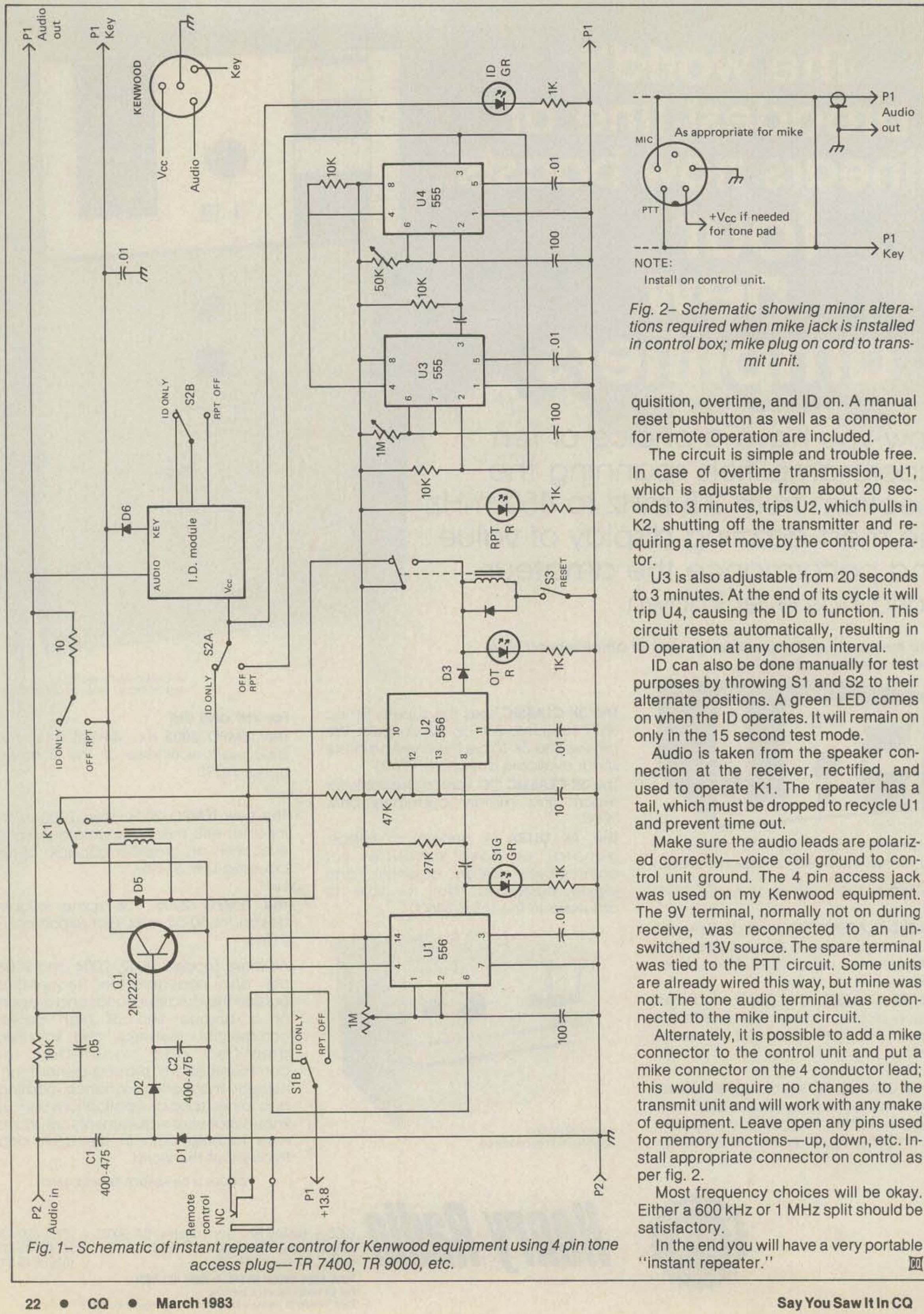

Fig. 1– Schematic of instant repeater control for Kenwood equipment using 4 pin tone access plug—TR 7400, TR 9000, etc.

NOTE:
Install on control unit.

Fig. 2– Schematic showing minor alterations required when mike jack is installed in control box; mike plug on cord to transmit unit.

quisition, overtime, and ID on. A manual reset pushbutton as well as a connector for remote operation are included.

The circuit is simple and trouble free. In case of overtime transmission, U1, which is adjustable from about 20 seconds to 3 minutes, trips U2, which pulls in K2, shutting off the transmitter and requiring a reset move by the control operator.

U3 is also adjustable from 20 seconds to 3 minutes. At the end of its cycle it will trip U4, causing the ID to function. This circuit resets automatically, resulting in ID operation at any chosen interval.

ID can also be done manually for test purposes by throwing S1 and S2 to their alternate positions. A green LED comes on when the ID operates. It will remain on only in the 15 second test mode.

Audio is taken from the speaker connection at the receiver, rectified, and used to operate K1. The repeater has a tail, which must be dropped to recycle U1 and prevent time out.

Make sure the audio leads are polarized correctly—voice coil ground to control unit ground. The 4 pin access jack was used on my Kenwood equipment. The 9V terminal, normally not on during receive, was reconnected to an unswitched 13V source. The spare terminal was tied to the PTT circuit. Some units are already wired this way, but mine was not. The tone audio terminal was reconnected to the mike input circuit.

Alternately, it is possible to add a mike connector to the control unit and put a mike connector on the 4 conductor lead; this would require no changes to the transmit unit and will work with any make of equipment. Leave open any pins used for memory functions—up, down, etc. Install appropriate connector on control as per fig. 2.

Most frequency choices will be okay. Either a 600 kHz or 1 MHz split should be satisfactory.

In the end you will have a very portable "instant repeater." CQ

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FL-52	455 KHz 500 Hz CW filter	96.50	**89.95**
FL-53	455 KHz 250 Hz CW filter	96.50	**89.95**
EX-254	Mobile mount	TBA	
HM-10	Mobile scan microphone	39.50	

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IC-730	8-band 200w PEP Xcvr w/mic	$829.00	**649.95**
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FL-44	455 KHz SSB filter	159.00	**129.95**
FL-45	500 Hz CW filter	59.50	
EX-195	Marker unit	39.00	
EX-202	LDA interface; 730/2KL/AH-1	27.50	
EX-203	150 Hz CW audio filter	39.00	
EX-205	Transverter switching unit	29.00	
HM-10	Mobile scan microphone	39.50	

Common accessories - 720/740/730		Regular	SALE
PS-15	External 20A power supply	$149.00	**134.95**
EX-144	Adaptor; CF-1/PS-15	6.50	
CF-1	Cooling fan for PS-15	45.00	
PS-20	20A switching ps w/speaker	229.00	**199.95**
CC-1	Adaptor; HF radio to PS-20	10.00	
CF-1	Cooling fan for PS-20	45.00	
SM-5	8-pin electret desk mic	39.00	
SP-3	External speaker	49.50	
	Speaker/phone patch (specify radio)	139.00	**129.95**
AT-100	100w 8-band automatic ant tuner	349.00	**314.95**
AT-500	500w 9-band automatic ant tuner	449.00	**399.95**
AH-1	5-band mobile ant w/tuner	289.00	**259.95**

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IC-551D	80w 6m Xcvr	699.00	**599.95**
PS-20	20A switching ps/spkr	229.00	**199.95**
CF-1	Cooling fan for PS-20	45.00	
EX-106	FM adaptor	125.00	**112.95**
IC-451A	430-440 SSB/FM/CW Xcvr/ps	899.00	**769.95**
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AG-1	15 db preamp for IC-451A	89.00	**79.95**
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IC-3AT	.15/1.5w 220 HT/batt/cgr/TTP	299.95	**239.95**
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IC-4A	.15/1.5w 440 HT/batt/wall cgr	269.95	**229.95**
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BC-25U	Extra 15-hour wall charger	$10.00
BC-30	1/15-hour drop-in charger for BP-2/3/5	69.00
BP-2*	450 ma, 7.2v 1w extended time battery	39.50
BP-3	Extra standard 250ma 8.4v 1.5w battery	29.50
BP-4	Alkaline battery case	12.50
BP-5*	450 ma, 10.8v 2.3w high power battery	49.50
**BC-30 required to charge BP-2 & BP-5*		
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CA-2	Telescoping ¼-wave 2m antenna	10.00
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RESULTS OF THE 1982 CQ WORLD WIDE WPX S.S.B. CONTEST

BY BERNIE WELCH*, W8IMZ

For those who chronicle things, the CQ WW WPX Contest traces its roots back to our SSB Contest, which saw the light of day in 1957. The first official CQ WPX Contest came about in 1968, and throughout all of these years a fine tradition has been built up regarding this very popular annual event. In recent years one man has pushed, cajoled, coerced, convinced, and most importantly loved that contest into being bigger than any other contest in amateur radio, save our WW DX Contest. Bernie Welch, W8IMZ, brought life, vitality, and, most importantly, fun to this Contest. Through additional arm-twisting he planned, promoted, and pulled off the additional coup of a C.W. section which was an immediate hit when introduced in 1979.

Having accomplished these monumental tasks, Bernie is stepping down as WPX Contest Director starting with the 1983 Contest. The new WPX Director is Steve Bolia, N8BJQ. Steve has been a neighbor of Bernie's, and like Bernie, has extensive Air Force background. For the past few years Steve has served several "tours of duty" with Bernie sorting and scoring logs, so he is no stranger to either the WPX Contest or Bernie's methods. Bernie will continue on in the capacity of Contest Advisor, lending his expertise where needed. We look forward to working with Steve to ensure the continuation of growth and, through your efforts, popularity of the Contest.

Thank you, Bernie, for a job well done.

—K2EEK

We dedicate the '82 WPX Contest to the memory of Richard C. "Dick" Spenceley, KV4AA, who became a silent key on the 30th of July last year. Among his many outstanding achievements, Dick was the founder of the CQ WPX. He enjoyed contesting and could be heard in the pile-ups of most major competitions. Thanks, Dick. (W8IMZ)

During the many years that I have been associated with this contest, I cannot recall ever experiencing the extraordinary super propagation present during this year's event. It has long been the hopes of many WPX contesters that one year we would be endowed with the best of the contest seasons. This certainly must have been the year. Participation was the greatest and resulted in a five-plus percent increase in the number of logs received.

Thirty-three All-Time records changed ownership, including the highest score ever in the history of the WPX contest (24,065,600) by Pedro Piza, Jr., NP4A, and his multi-multi Puerto Rico group. Their 890 prefix multiplier is also a record. Ron Moorefield, W8ILC, holds the QRPp top spot. He is also the first to achieve a one-million plus in that category. Steve Gecewicz, K0CS/VP9, erased his ZF2EO, North America record 80 meter score.

Of the total U.S.A. records, eight of the ten changed ownership, while Africa and North America each had four updated to lead the continental groups.

Lar, Y24UK, ran a close race with Randy, KH6XX, for the world S/O-A/B honors. The computer showed Lar the winner by just 43,000 points. Congratulations to both of these FB ops. Lar is associated with *Funk Amateur Magazine* in the GDR.

The World 7 MHz record is not easily broken, but, Klaus, DJ4PT, did it with a big win. This is also an indication of the trend to 40, 80, and 160 meters in contesting. We had six stations scoring over 1,000,000 on 40. One major complaint by many United States amateurs is, "Why don't the DX tune for U.S. stations up in the U.S. bands for s.s.b. contacts?" In all fairness, I must say that some do, and they usually can be found on the winner lists. Check the rules; you may be missing many six point contacts as well as new prefix multipliers.

Many stations from all the continents provided the traditional outstanding DX pileup action. Expeditions add excitement and are important to this contest.

Two stations—AB0I, A/B-S/O operated by WA6DGX, and multi-single KJ9W—proved you can win from the midwest

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U.S. The KN6M multi-multi west coast group's 11,000,000 plus is the big one in the States and fourth worldwide. It's reassuring to see some new calls at the top.

How about this? While Gordon, N5AU, was busy with Ray, KC5EA, winning a trophy at VP2EC, Randy Thompson, K5ZD, operated home station N5AU and won Gordon a second trophy for 28 MHz! I wonder if this is also a first?

Although it probably will never be a part of any All-Time records listing, our statistics show that we received more logs from U.S.A., 8th District participants this year than we have from any other district in any previous contest. This is primarily due to the outstanding efforts of the Northern Ohio Amateur Radio Society, a general-interest club that knows what team work is all about. Vy FB . . .

Following the contest, in a "QRZ-DX" bulletin I read an item by the editor, K5FUV, in which he indicated he was only playing around with QRPp in this one, but enjoyed it. For the record, he came in third place world wide. If he ever decides to go for the big win, W8ILC had better watch out. Hi, Hi!

Did you know that over 1,025 different prefixes could have been worked this year? That logs from 4K1A were transmitted to the USSR via radio, transferred to the correct contest log forms, and then mailed to the *CQ* office? That H44SH wonders why no one has yet donated a trophy for Oceania A/B-S/O? That the new 160 meter trophy donated by Arch, K8CFU/4, should stimulate additional world-wide activity on the top band? That in the nice department, the KH6MD log is on top of the pile? That the WPX Awards Program is managed by Norm Koch, K6ZDL? Applications go to him.

Multi-operator, single transmitter stations that were still not aware of the change in the rules ("only one transmitter and one band permitted during the same time period, defined as 10 minutes, no exception") have been listed in the multi-multi category for which they were qualified. There are no new rule changes in the '83 version published in the January '83 *CQ*. However, clarification of some items has been made, and new trophy donors have been added.

The '82 Contest Forum at the Dayton Hamvention was the ultimate, the height of which I doubt could ever be reached again anywhere. Thanks to all who made it possible, especially to Ed, N3ED; Bert, KL7IRT; John, W1XX; Dick, WD8CRY; Pedro, NP4A; *CQ* Editor, Alan, K2EEK; Kansas City DX Club, Steve, WB0ISW; Bob, K0FYJ; Steve, K0CS; Dick, K5IU; Ron, N4KE; John, N4MM; Frankfort Radio Club, Jay, N3AW; NOARS Pres., Mike, K8US; and the premier motion picture, "To Win The World," Peter, WB2ZKJ; Gene, N2AA; and Steve, N8BJQ. Stand up and take a bow. You all deserve an encore.

This year's working Contest Committee did another super job. My Chief Assistant, Steve Bolia, N8BJQ, was again the key man and his computer proved invaluable. Long hours and patience by Ray Smith, KR8B, and Ron Moorefield, W8ILC, assured a FB final product. Even Myron Crofoot, WB4VQO, gave me a one-day assist during a visit. The top man of all *CQ* Contests, Chairman Frank Anzalone, W1WY, always provides the right answers and needed support. My XYL, Eleanor, ex-WA2UJI, provided the administrative support so necessary to meet the deadlines.

Beginning with the 1983 Contest, all WPX Contest logs go either to the *CQ* office or to the Callbook QTH of Steve, N8BJQ. I have chosen to retire as the WPX Contest Director, effective with the next event. I will continue as one of the *CQ* magazine gang as Contest Advisor and possibly in other areas later. Thank you all for your support, and please continue to do the same for the new Director, N8BJQ.

Last but not least, I respectfully remember so many of the top DX Contesters who have become silent keys over the years. None will be remembered more than three good friends that departed the contest scene in '82: Jim Lawson, W2PV, a WPX Contester almost from its beginning and the first U.S. station I'd hear in contest pileups from my DX QTH's; Dick Spenceley, KV4AA, Mr. WPX, who started it all and enjoyed most DX contests (see photo); and Jesse Bieberman, W3KT, who was many things to different people, but he found the time to pass out contest multipliers.

Hope to work ya in the next one on the 26th and 27th of March '83 (GMT).

73, Bernie, W8IMZ

Ron Moorefield, W8ILC, is the new World QRPp All-Band Champion. He had to increase his power from 1 to 5 watts for this accomplishment.

Many WPX Contesters attended the '82 Dayton Hamvention. (Left to right) The new North America 7 MHz Champion, Terry Appleton, W4GSM, operator of FG0DYM/FS; Bernie, W8IMZ; Bert Curwen, KL7IRT; and Eric Sjolund, SM0AGD, DX Hall of Fame member.

Random Contest Comments

"Excellent conditions on 28 MHz. Goal was to break one million points QRPp . . . *W8ILC.* In WPX, the AG3 prefix must add 100 watts. Great fun (QRPp) . . . *AG3H.* First contest QRPp. I'm the son of OA8V . . . *4T8CW (op. OA8CW).* Biggest thrill working the Pacific on all 3 h.f. bands (QRPp) . . . *G3FTQ. CQ* contests are a "must" for QRPp DXers . . . *AD2Y.* The WPX is best contest for QRPp stations . . . *JI1CBF.* No new countries, s.s.b. QRPp total—162 . . . *W6YVK.* First WPX was super fun . . . *KL7IBT.* Worked ZL1AAS with beam on Europe on 28 MHz (QRPp) . . . *WD9AEU.* Working contest with s.w.r. 1:6, all bands—short circuit in the balun . . . *OE1SBA.* Had to start my car only three times during contest to reload my battery (QRPp) . . . *ON6EB/Mobile.*

"Nine new countries—s.s.b. (QRPp) . . . *N1BZG.* It is difficult for QRPp to QSO. Will you make special frequency for QRP, especially on 28 MHz? . . . *JG3WCZ.* Helical mobile whip in the window (QRPp) . . . *EA2SN.* I prefer the c.w. It saves my voice, at least operating QRP. Hi . . . *SM0BYD.* Fantastic conditions . . . *N3KZ (op. KH6CP).* Everything I could do with 4.3 watts, 73! . . . *YO8CIE.* Super time QRPp. More should try it . . . *K3ZR.* Was glad to get number 001 from TL8CB and 7Q7LW . . . *KA1R.* Plenty of activity and some new countries for me on 40 meters . . . *K1RB.* Worked an old friend, Ricardo, CX2CO, after many years . . . *W1WY.* Thrilled to work VK2, ZL0, and ZK1 with my old rig (35 watts PEP) . . . *N1BTW.* Breaking pile-ups with 80 watts and CB antenna . . . *N2BIN.* Should be a special category for ops with 2 harmonics in the shack . . . *KS2M.* You can only do so much with an antenna at 22 feet, even if it is a 6-element Yagi . . . *KC2X.*

"I used the TRS-80 computer for logging. You need about 4 hands to keep everything going . . . *KC2ME.* Some 25 years of hamming—this one contest was the most enjoyable ever . . . *W2MYA.* My brand new prefix put me on the good end of some small pile-ups . . . *KI3L.* Little sleep + disturbed neighbor + 8 other household members = losing 4 pounds and one headache. Hope it was worth it . . . *KC3N.* Wish more European stations would work split (40 meters) . . . *KB3PD.* It'll be another 11 years before we get one like this again . . . *AI2C/4.* I worked UG6- . . . *NU4B.* The band still lives (28 MHz) . . . *KD4FX.* I'll be on 160 next year . . . *WB4VQO.* Best contest yet! . . . *N4BAA.* The anti-contest jammers surely had a field day . . . *W5OB.* Biggest thrill—working Venezuela on 40 and 80 meters . . . *K5DEC.*

"What a going-away party 10 meters has given! It could never be this good again . . . *N5AU (op. K5ZD).* Biggest thrill—beating out N5AU in the CE0AE pile-up . . . *W5AH.* Rain static is nature's way of telling you it's time for an off break . . . *KM5X.* While calling *CQ* contest, called by 7X2LS, CE0AE, and 9V1TL. Nice to be the "rare one" for a change . . . *AC6V.* Discovered after contest that clock

4X1X, operated by Seth, 4X6DX, found the special call very popular. He's 15 years old and growing.

was 10 minutes slow! Had to go back and correct logs . . . *KJ6Z*. Lots of activity—had lots of fun . . . *KE6NO*. Sure was nice to have Europe on almost 24 hours a day. What propagation . . . *W6CN*. Age 66, ham 50 years—old enough to know better, but too young to quit . . . *W6YMH*. Wish more would use dummy load or get solid state rigs that require no tune up . . . *W7RIR*. Ten meters super. Never been called by so many rare DX stations . . . *WB7FDQ*. Don't try to operate with sore throat; nobody can hear you . . . *WA7PEZ*.

"There should be a separate category for dipoled non-transceiver stations! . . . *AF7Q*. Biggest thrill—working 190 stations in the first hour . . . *AI7B*. Surprised to have XZ9A call me . . . *W7FP*. The new call helped a bunch. Great contest as always . . . *KO8T*. Definition of "Frustration"—calling CQ on 20 meters . . . *KB8LH*. TNX *CQ* . . . *KC8JL*. Biggest thrill—getting all our "NOARS" members active in the contest . . . *N8BTT*. A fun contest . . . *W8JXM*. First solo in major contest. Learned a lot about contesting . . . *N8BNE*. Took five minutes to pull out TA1SU's call, but worth it . . . *AI9J*. Breaking through European pile-up to work 5H3BH for DXCC country #201 . . . *KB9AW*. Super contest, wonderful conditions . . . *W9LT*.

"Getting done duping! We had a computer while test was running; unfortunately, we couldn't get a hard copy, so I redid it by hand. Yuck . . . *WB9GGD*. This is the contest I wait for each year. The rates were fantastic, and it's not everyday you get called by 7Q7, 3V0, JT1, ZB2, BV2, XZ9, 3B8, 5B4, JX5, ST2, RH8, etc. . . . *AB0I (op. WA6DGX)*. I wasn't even going to get into the contest, but who can work just one? . . . *KF0Z*. Had a fun time with 50 watts to a 30' wire up to 10' . . . *KC0NS*. Met a lot of old friends, especially OK's . . . *W0UYL*. Missed lots of U.S.A. prefixes. No skip except into Florida and parts of California (28 MHz) . . . *N0DBG*. We tried for the world record, but will have to wait till next year . . . *VP2EC (op. KC5EA)*.

"I've been trying to work JY1 for years. He called me during a big run on 20 M. I almost said, "What's your suffix?" . . . *VE3PCA (op. VE3KKB)*. Everyone thought we were in Mexico . . . *XK5GF*. Having so many friends around the world giving me much moral support for this contest . . . *KL7IF*. Bermuda in March is good propagation for a DXpedition to Antarctica . . . *W8TN/VP9*. Forty meters without an amplifier is rough going . . . *VP9AD*. Great contest but 30/48 (hours) is not enough . . . *VE6OU*. Being near the 1000 QSO mark was very exciting . . . *VE3KOY*. SP prefixes missed. We hope our SP friends will be back soon . . . *VE3BMV*. Working Morocco—a great feat with my 80 ft. longwire . . . *ZF2FV (op. WD8MRF)*.

"Wish 40 mtrs. was a bit better. Could have been the antenna—or maybe—then again—or? . . . *6Y5HN*. Lost luggage enroute. Murphy constant companion during test. WPX still the best test . . . *VP2MGQ (op. N4MO)*. How about a handicapping equation for the old, old timers (which you, too, will be someday)? . . . *PP2ZDD*. Lots of new prefixes in the U.S. made the score grow more than expected . . . *CE6EZ*. Amazing conditions on 15, and nice to work so many prefixes on one single weekend. Thanks . . . *CE3NR*. Sorry for having to ask for so many repeats, but every time a motor bike went by, my VOX tripped . . . *OA4SS*. One million points more than last year. It's marvelous . . . *YV2AMM*. If it had not been for lousy conditions (?) and very heavy QRN over the whole weekend, the score could have been a half million points. My head's still ringing . . . *VK3AKK*.

"High point—working zone 40 for the first time in a contest. Low point—no SP prefixes. I could have had a new world record! . . . *KB7IJ/KH2*. Thank the FCC. I can work my own prefix and get 3 points for it . . . *KG6DX (Guam)*. It's necessary to have a beam now on 7MC to keep up with the top brass . . . *ZL4BO*. My Swedish callsign is SM5IWC . . . *EA8ZI*. My last WPX (s.s.b.) from Liberia. Many thanks to all who worked me during the last 4 years worth of contests . . . *EL2AV*. Here you go on expedition, and you end up with TVI. You have to go single band and finally the rig takes fire! Why me? . . . *SM0GMG/CT3*. Thank you very much for the nice contest . . . *UL7QF*.

"Still need the call of the CB station that I worked on 10 meters . . . *HA0DU*. My 10th WPX Contest, and since 1973 I won every year a certificate as single op. all band. This could be a record . . . *IV3PRK*. Best WPX contest ever from this side . . . *I6NOA*. Thanks for an enjoyable weekend . . . *LA1RN*. In CT land everybody asks for special prefixes for WPX, so my regular call becomes a rare one . . . *CT4NH*. Won the battle for a new prefix. It was fun to come out with CU for the first time . . . *CU5ZG (op. CT1ZG)*. Many nice prefixes worked . . . *YO5BRZ*. Worked quite a few new U.S.A. prefixes, but still worked a lot of old friends, and it's good to see they're still around . . . *GM4GPN*. One week before test I got C30MK call for Andorra, but there was 7 ft. of snow on the site, so I did it at home, but will try again next year . . . *EA3WZ*.

"I worked my last state for WAS: KH6XX . . .

Chris, G3VBL, saw contest action as GB4DX. He says the stack of 3400 QSL cards resulted from his participation.

Giovanni, I5JHW, relaxes with his son following the contest. He is the QRPp 28 MHz certificate winner for Italy.

The LA4O Contest team expeditioned to Morokulien as LG5LG. (Left to right) LA4HW, LA1PBA, LA6EV, LA4DCA, and LA8UU in front.

SM0JOQ. I'm prefix hunting . . . *YU2CQ*. I had many QRN from city and high-voltage transformer . . . *YU3CAB (op. YU3RM/X)*. It would be great to receive all new prefixes confirmed with QSL's . . . *YU3VM*. Highlight was the call by 4K1A . . . *OE1WO*. Many QRM—not from speaker, but from my son, 3 weeks old . . . *OE1LPW*. I had QRM on my station from my electric handicap chair . . . *OZ1DAF*. Food always seemed to arrive when I had a big pile-up, and I found it difficult to eat while wearing a headset and boom mike. For future contests I hope to improve efficiency by arranging intravenous feeding and having a catheter inserted. In that way I do not have to stop operating . . . *GB4DX (op. G3VBL)*.

"I am a YL operator, age 15, licensed in Novice call since '81. Got my full s.s.b. Extra class license 2 weeks ago. TNX for FB contest . . . *OH1ZF*. Worked only times no BC or TV in use, and bingo I have some TVI problems . . . *OH2EX*. Congratulations to U.S. and Canadian stations for their discipline, patience, and graciousness . . . *F6CGE*. Outstanding conditions on higher bands, not too bad on 40 and 80 meters . . . *DL8PC*. It's very hard to read the JA's through the BC QRM on 40 meters . . . *DJ4PT*."

QRPp —SECTION— WORLDWIDE

W8ILC	**A**	**1,044,012**	**970**	**459**
AG3H	**A**	**424,320**	**535**	**320**
K5FUV	**A**	**348,335**	**505**	**299**
4T8CW	**A**	**323,632**	**492**	**226**
JA1MCU	**A**	**270,220**	**406**	**229**
AB8X	**A**	**190,855**	**354**	**245**
G3FTQ	**A**	**178,157**	**446**	**217**
G5CMX	"	169,332	359	206
W9PNE	**A**	**169,200**	**341**	**225**
HA5KD	**A**	**156,615**	**381**	**197**
4N1K	**A**	**152,670**	**391**	**210**
		(Opr: B. Mitrasinovic)		
AD2Y	**A**	**143,964**	**318**	**186**
UR2TBG	**A**	**132,352**	**319**	**188**
JI1CBF	"	113,685	258	159
W6YVK	**A**	**111,878**	**305**	**169**
JA1KFX	"	92,563	234	151
KL7IBT	**A**	**80,388**	**188**	**174**
KA1CZF	**A**	**59,185**	**180**	**133**
W8VSK	"	53,467	196	127
W1BL	"	51,840	154	120
WD9AEU	"	37,950	147	110
GM3RFR	**A**	**35,217**	**164**	**117**
K8CV	"	33,370	132	94
N8CQA	"	23,672	118	88
DE1SBA	**A**	**21,627**	**100**	**81**
WD9IYT	"	20,022	94	94
ON6EB/M	**A**	**19,800**	**122**	**88**
UB5MNO	**A**	**14,364**	**90**	**63**
UA3GEA	**A**	**13,332**	**97**	**66**
WD8RIN/4	**A**	**12,480**	**102**	**96**
JHØALB	"	7,900	55	50
KB2ZS	"	5,546	81	59
KA9CEJ/M	"	5,040	45	40
YO7BKT	**A**	**4,800**	**78**	**50**
W2DW	"	1,344	26	24
UB5AAQ	"	493	19	17
RA9UAD	**28**	**283,731**	**589**	**229**
UB5MPD	**28**	**282,815**	**491**	**247**
UY5XE	"	188,000	339	200
I5JHW	**28**	**174,708**	**308**	**207**
G3VOF	**28**	**146,150**	**296**	**185**
JA1EF	**28**	**142,868**	**285**	**191**
WD8IDD	**28**	**142,208**	**284**	**202**
WB3EKV	**28**	**117,132**	**267**	**172**
IØSKK	"	112,022	285	158
EA2AEA	**28**	**98,421**	**278**	**159**
N1BZG	**28**	**86,139**	**208**	**153**
JA6YCC	"	79,500	232	150
		(Opr: JA6-9330)		
JE2PKD	"	20,315	91	85
JG3WCZ	"	19,460	107	70
UA4WBJ	**28**	**15,375**	**101**	**75**
EA2SN	"	11,895	75	61
UA9AMF	"	11,221	85	49
VE5ACY	**28**	**2,542**	**37**	**31**
UB5DAG	"	1,428	24	21
UA3IDX	"	1,003	23	17
JK1RJQ	**21**	**70,290**	**199**	**142**
SM6HQK	**21**	**22,936**	**121**	**94**
KA5N	**21**	**2,688**	**49**	**42**
SMØBYD	"	1,372	35	28
JA9CRI	"	855	19	15
OH2BLU	21	98	8	7
N3KZ	**14**	**81,012**	**208**	**157**
		(Opr: KH6CP)		
K3ZR	"	75,332	193	148
IØOAY	**14**	**40,334**	**247**	**134**
JA2JSF	**14**	**14,328**	**87**	**72**
PAØNRD	**14**	**11,680**	**122**	**80**
JF2PKI	"	2,262	31	29
YO6UO	**14**	**1,410**	**40**	**30**
OK1DKW	14	864	30	24
YO9CUF/3	7	264	15	12
VE3CKR	**3.5**	**51,512**	**152**	**94**
UB5VBY	**3.5**	**51,146**	**227**	**107**
OK1AIJ	**3.5**	**23,400**	**138**	**90**
YO8CIE	**3.5**	**11,440**	**98**	**65**
OK3TEI	"	1,560	32	26
ON6NL	3.5	1,250	28	25
UC2ODD	1.8	598	19	13

SINGLE OPERATOR NORTH AMERICA

UNITED STATES

KC1F	**A**	**3,007,760**	**2116**	**560**
KA1R	**A**	**2,822,576**	**2063**	**536**
AK1A	"	2,501,136	1890	528
WA1FCN	"	552,500	603	340
AK1B	"	463,200	640	300
W1DYH	"	206,610	360	213
N1AFC	"	137,241	301	207
AD1Z	"	115,200	274	180
KD1U	"	65,280	200	128
K1RB	"	51,291	152	123
KF1B	"	28,025	122	95
W1WY	"	25,466	157	119
KA1GGE	"	22,256	120	107
W1PLJ	"	15,744	84	64
N1BTW	"	11,753	77	73
KG1E	**28**	**2,587,680**	**1980**	**540**
K1KJT	**28**	**710,640**	**826**	**329**
WB1FPF	"	361,386	480	306
AA2Z/1	"	199,044	372	194
K1KNQ	"	22,230	101	78
W1CTR	"	2,190	32	30
W1BK	**21**	**67,989**	**190**	**131**
K1NG	**14**	**837,704**	**995**	**392**
		(Opr: N1BMU)		
KE1E	"	140,679	324	203
WB1EAZ	**7**	**62,464**	**165**	**128**
AA1M	"	17,664	88	69
N1BMV	**3.8**	**33,792**	**251**	**132**
W1BB	1.8	12	2	2
K2SS	**A**	**3,272,922**	**2267**	**521**
KF2O	**A**	**995,125**	**920**	**419**
K2VV	"	499,950	647	275
N2US	"	478,368	616	302
N2BIN	"	193,191	349	213
KS2M	"	160,095	320	195
W2FUI	"	112,042	251	151
K2QF	"	110,700	258	180
KR2B	"	102,706	246	178
KA2EAY	"	66,500	186	133
KC2CK	"	57,225	261	175
WA2LJM	"	54,046	169	122
WB2PXA	"	45,018	168	122
W2FTY	"	28,300	101	100
KT2D	"	7,865	64	55
K2IAV	"	3,885	39	37
KC2X	**28**	**1,201,089**	**1086**	**447**
N2AU	**28**	**1,126,596**	**1074**	**446**
KN2N	"	983,340	1124	405
KC2ME	"	220,472	291	248
W2FGY	"	93,177	212	153
W2KZE	"	36,288	127	96
KS2G	21	20,176	112	97
W2UL	"	1,491	24	21
W2MYA	**14**	**289,602**	**484**	**279**
N2BK	"	41,472	150	128
WA2IFS	**7**	**119,184**	**334**	**191**
K2BQ	**1.8**	**10,192**	**228**	**98**
K3WJV	**A**	**1,051,056**	**1056**	**432**
W3ICM	**A**	**536,190**	**665**	**366**
W3ARK	"	490,254	627	303
KI3L	"	386,952	524	276
W3FQE	"	75,520	206	128
KB3NQ	"	41,070	144	111
N3RL	"	40,848	134	111
W3ETB	"	6,958	56	49
K3FN	**28**	**434,816**	**527**	**316**
KA3ANG	**28**	**196,344**	**338**	**243**
KB3QQ	"	96,807	200	183
KC3N	**21**	**1,138,632**	**1136**	**454**
WB3DNA	**21**	**182,016**	**330**	**237**
K3ND	"	34,884	141	114
N3AZS	"	32,025	125	105
W3HDH	"	24,864	103	84
N3GB	"	24,099	138	87
WA3VPL	"	19,610	118	74
KB3PD	**7**	**90,464**	**270**	**176**
KA3R	**3.8**	**55,706**	**262**	**161**
W3BGN	**1.8**	**4,488**	**159**	**68**
N1GL/4	**A**	**1,815,696**	**1420**	**486**
AI2C/4	**A**	**1,408,924**	**1264**	**451**
K4KZZ	**A**	**950,088**	**1333**	**372**
WØRAO/4	"	405,888	1010	302
W4WKQ	"	396,210	570	281
N4XD	"	317,013	464	251
KD4OL	"	194,928	343	262
W4WJJ	"	167,856	323	208
WB5YLT/4	"	159,000	322	212
W2DSE/4	"	139,944	275	168
NU4B	"	102,720	263	192
W4KMS	"	100,650	258	165
K4OD	"	88,704	227	154
W4BV	"	78,507	203	143
N4FGF	"	71,918	201	154
WB4PHW	"	48,944	165	108
NG4E	"	43,554	141	122
W4OGG	"	20,596	116	76
N4EOC	"	13,195	74	65
N4EZE	"	5,106	50	37
K4XO	"	1,054	19	17
KD4FX	**28**	**1,904,352**	**1522**	**498**
NU4Y	**28**	**1,702,194**	**1450**	**471**
AA4VK	**28**	**1,583,023**	**1255**	**493**
WB4VQO	"	170,310	296	210
KA4MCM	"	136,017	462	127
N4MM	"	117,312	247	192
N4RA	"	49,938	157	123
W4UYC	**21**	**91,168**	**232**	**176**
N4FKF	"	5,929	57	49
W4YN	**14**	**29,162**	**113**	**87**
KC4OV	**7**	**165,600**	**426**	**240**
N4BAA	**7**	**131,028**	**272**	**183**
KG4W	"	66,528	259	154
WB4UBD	"	7,630	40	35
WA4FBH	**3.8**	**49,170**	**212**	**149**
NI4R	"	31,920	196	114
AA4MM	**1.8**	**4,368**	**198**	**78**
K8CFU/4	"	1,600	79	50
K5NW	**A**	**1,316,484**	**1188**	**468**
N5RM	**A**	**1,235,226**	**1153**	**458**
N5DKG	"	967,708	1374	428
		(Opr: WB5WHR)		
WA5SOG	"	621,986	755	353
K1DWQ/5	"	326,013	457	271
W9PL/5	"	307,238	508	298
WA5IYX	"	305,448	529	264
W5OB	"	118,917	275	181
K5DEC	"	117,216	268	198
KV5F	"	78,916	230	181
KC5HO	"	8,580	65	60
N5CPO	"	384	12	12
N5AU	**28**	**3,094,249**	**2038**	**571**
		(Opr: K5ZD)		
N5CDO	**28**	**759,407**	**1077**	**341**
W5ASP	"	152,775	337	225
W5AH	"	88,077	220	187
W1GOM/5	"	9,513	70	63
KM5R	**21**	**2,627,859**	**2387**	**559**
WB5LYT	"	18,675	100	83
KA5NDC	"	6,231	81	67
W5FO	**14**	**9,177**	**74**	**69**
KM5X	**7**	**543,382**	**624**	**259**
N5JJ	**7**	**532,656**	**571**	**274**
K5BZU	**3.8**	**52,052**	**261**	**169**
K5UR	**1.8**	**3,264**	**121**	**68**
KM6B	**A**	**2,261,457**	**1898**	**431**
NE6I	**A**	**1,148,063**	**1229**	**409**
AC6V	**A**	**605,852**	**837**	**382**
W2KVA/6	"	579,312	741	298
WB6JMS	"	474,953	683	293
WA6TKT	"	403,137	700	237
WD6FLB	"	401,703	592	293
K6XO	"	215,009	450	211
N6JM	"	156,088	324	179
WA6UFY	"	145,136	322	188
W6BYH	"	127,218	255	182
AA6DP	"	93,840	255	184
WB6TGD	"	50,310	201	130
W6OUL	"	34,680	120	120
KJ6Z	"	32,606	148	119
K6ZDL	"	21,824	104	88
AJ6V	"	18,323	103	73
KE6NO	"	15,865	140	95
AA6EE	"	14,476	104	77
W6OKK	"	4,032	45	36
W6KBD	"	3,838	42	38
WB6FCR	**28**	**647,400**	**986**	**300**
KS6Q	"	4,536	52	42
NI6G	**21**	**2,479,297**	**2082**	**493**
		(Opr: N6IG)		
NF6W	"	159,174	412	239
K6TMB	**14**	**663,143**	**792**	**377**
W6CN	"	181,260	350	228
N6RO	**7**	**881,886**	**854**	**309**
W6YMH	"	11,792	80	67
KO6G	**3.8**	**282,864**	**584**	**249**
		(Opr: N6NE)		
K6HNZ	**3.8**	**198,380**	**438**	**218**
K7RI	**A**	**4,062,252**	**2853**	**532**
		(Opr: W7WA)		
N7RO	**A**	**1,436,694**	**1277**	**433**
N7ABJ	**A**	**1,415,150**	**1271**	**415**
W7GUR	"	115,440	267	195
W7PQE	"	55,227	192	123
KI7M	"	39,243	160	127
W7RIR	"	10,440	64	60
K7WA	"	9,350	73	50
KC7V	"	5,814	61	57
W7JKA	"	806	31	26
WB7FDQ	**28**	**1,427,268**	**1578**	**498**
AG7M	**28**	**1,121,505**	**1341**	**385**
WA7PEZ	"	143,429	383	187
W7AYY	"	114,534	281	162
WA7CGR	"	19,198	117	58
WB7QYG	"	15,812	92	84
AF7Q	"	2,501	105	61
AI7B	**21**	**4,151,232**	**2825**	**576**
KC7EH	**21**	**900,240**	**1090**	**330**
KB7G	"	547,459	765	317
W7LXR	"	524,610	751	270
W7MLJ	"	149,800	307	200
KI7H	"	61,576	211	172
N7DF	**14**	**1,114,528**	**1033**	**464**
W7FP	"	354,750	503	330
WB7WQE	"	125,200	279	200
K7UR	**7**	**482,448**	**588**	**228**
AJ7S	"	150,480	282	132
KO8T	**A**	**1,741,977**	**1558**	**501**
N8BJQ	**A**	**1,062,160**	**979**	**440**
KB8LH	**A**	**705,789**	**785**	**357**
KC8NF	**A**	**561,771**	**687**	**333**
W8IMZ	"	470,594	571	314
KF8K	"	461,790	594	315
KA8JRI	"	422,432	584	307
KN8D	"	419,785	548	295
N8AKF	"	418,988	552	298
W8FDN	"	378,840	530	280
N8TN	"	371,490	589	305
W8UPH	"	315,082	480	257
K8LJG	"	307,560	452	264
AI8S	"	300,849	501	289
KC8JZ	"	232,800	406	291
N8BLB	"	220,298	375	229
N8BRQ	"	219,810	350	255
KB8XB	"	216,447	404	231
W8ANM	"	189,441	348	217
KU8E/M	"	151,443	329	213
WA8YTM	"	137,475	314	195
KN8R	"	136,030	515	223
AE8N	"	103,695	241	155
N8CLR	"	95,580	252	162
WD8ADH	"	90,477	218	173
K8DB	"	81,389	200	151
K8JK	"	79,968	205	136
WA8GMT	"	78,280	210	152
WA8CAE	"	76,560	206	176
AF8O	"	73,788	208	156
K8IQB	"	68,530	223	154
N8DNA	"	62,338	192	142
AD8L	"	55,944	154	111
W8CY	"	46,256	157	112
KD8V	"	38,010	144	105
AC8W	"	36,531	120	99
K8NZ	"	34,104	132	98
N8BTT	"	29,197	120	97
W8BTD	"	24,849	109	99
W8VEN	"	24,605	129	95
WD8IPJ	"	22,050	112	90
K8KXK	"	20,424	103	74
W8GBE	"	20,160	103	96
K8HF	"	18,368	103	82
WD8NZR	"	13,884	96	78
AI8M	"	10,120	127	92
W8JXM	"	9,506	52	49
WB8TIW	"	8,379	71	57
N8DSG	"	7,991	74	61
W8VQV	"	6,300	76	50

K8RSH	"	3,680	42	40
KA8JBT	"	3,294	62	54
KC8LI	"	2,112	37	33
N8BZK	"	1,656	51	46
W8QWI	"	420	12	12
W8UA	**28**	**1,343,952**	**1146**	**459**
N8BNE	**28**	**641,580**	**773**	**340**
WD8MOV	"	243,801	380	263
WB8TLI	"	229,578	362	249
KC8CH	"	123,328	293	188
		(Opr: N8DCJ)		
WA8NDE	"	118,170	256	195
WB8VPQ	"	93,541	223	161
WD8IDE	"	33,154	130	121
KA8ETK	"	3,696	48	44
K8MR	"	3,552	38	32
KR8K	**21**	**643,720**	**797**	**380**
		(Opr: N8ACA)		
WD8IDZ	**21**	**131,720**	**287**	**185**
AA8R	"	107,868	234	178
KR8B	"	46,417	166	133
W8YCG	"	28,294	112	94
KB8TT	"	22,176	107	88
K8DD	"	4,440	40	40
K8NA	**14**	**2,252,688**	**1518**	**568**
WD8PCG	"	374	12	11
KC8JH	**7**	**172,608**	**379**	**232**
WA8LXJ	**7**	**135,168**	**303**	**192**
WB8VPA	"	21,922	114	97
WA8RCN	"	1,104	30	24
KB8WB	**3.8**	**17,112**	**236**	**124**
W8UVZ	"	3,294	83	61
KB8DB	"	476	14	14
W8LRL	**1.8**	**16,576**	**329**	**112**
AI9J	**A**	**3,078,640**	**2208**	**580**
AG9E	**A**	**764,012**	**913**	**409**
WD9DBC	"	284,289	442	271
WB9TDR	"	168,670	324	202
K9BG	"	163,830	311	215
W9UP	"	129,696	286	224
WB9VJU	"	37,300	133	100
W9MP	"	27,896	109	88
K9YAX	"	25,714	112	86
KK9W	"	21,606	115	78
K9BQL	"	20,979	101	81
KK9A	"	17,925	102	75
AK9N	"	17,510	100	85
N9CTS	"	9,960	70	60
K9GDF	"	2,296	42	41
KB9AW	**28**	**224,875**	**356**	**257**
WB9HRO	"	50,566	149	131
WA9MRU	"	4,095	41	35
K9QVB	**21**	**229,015**	**372**	**281**
WB9TIY	"	150,792	303	206
AG9S	**7**	**232,776**	**537**	**244**
WD9AHJ	**1.8**	**3,564**	**203**	**81**
AB8I	**A**	**4,107,378**	**2667**	**578**
		(Opr: WA6DGX)		
WB8ISW	**A**	**717,360**	**796**	**336**
KG8N	"	126,887	302	223
WA2HFI/8	"	125,430	280	185
KF8Z	"	69,984	200	162
KR8I	"	67,195	190	151
W8PPF	"	62,721	314	69
W8AGX	"	57,820	168	118
KA8D	"	37,948	125	106
AC8E	"	19,173	100	83
KC8NS	"	5,760	85	72
N8CZO	"	598	25	23
WA8ETC	**28**	**713,804**	**784**	**364**
W8GOR	**28**	**382,568**	**646**	**232**
N8AVT	"	160,485	313	195
N8DBG	"	97,680	209	185
K8TLM	"	76,587	193	147
K8NN	"	64,752	170	142
K8VBU	"	36,181	135	97
KJ8D	"	29,624	120	92
K8VUA	"	4,200	40	35
KB8C	**21**	**479,142**	**676**	**342**
W8UYL	**14**	**161,352**	**322**	**216**
K8RWL	"	38,703	174	133
WB8ZRL/8	**7**	**11,088**	**75**	**72**

ALASKA

KL7IF	**A**	**1,674,770**	**1667**	**373**
KL7AF	"	318,318	454	231

BERMUDA

W8TN/VP9	**28**	**760,612**	**1033**	**316**
VP9AD	**7**	**325,650**	**388**	**195**
K8CS/VP9	**3.5**	**679,098**	**604**	**259**

CANADA

VE6OU	**A**	**5,253,399**	**3175**	**591**
VE7BTV	**A**	**3,868,410**	**2674**	**545**
VO1CM	**A**	**647,436**	**766**	**326**
VE3MUV	**A**	**558,554**	**617**	**317**
VE7BSM	"	345,825	550	225
K8UKO/VE8	**A**	**146,248**	**394**	**181**
VE3EZU	"	80,229	211	141
VO1AW	"	42,125	141	125
VE2XL	**A**	**19,824**	**114**	**84**
VO2CW	"	5,848	54	43
VE4AKX	"	1,464	26	24
VE3KOY	**28**	**932,790**	**956**	**354**
VE3FEA	"	363,740	501	260
VE2DVI	**28**	**232,320**	**391**	**220**
VE2FSU	"	221,961	347	241
VE7EOA	**28**	**209,600**	**409**	**200**
VE3MKJ	"	74,053	189	149
VE3MAM	"	3,094	36	34
VE3BMV	**21**	**3,690,450**	**2283**	**590**
VY1CM	**21**	**401,582**	**717**	**199**
VE3GWM	"	70	5	5
XK5AE	**14**	**189,875**	**393**	**217**
		(Opr: VE5AE)		
VE3DYB	**14**	**49,266**	**154**	**119**
VE3LAJ	"	34,112	118	104
VE2PD	**14**	**18,924**	**91**	**83**
VY1DV	**14**	**13,359**	**80**	**73**
VE3EEW	**7**	**788,718**	**722**	**267**
VE3BBN	**1.8**	**24,522**	**106**	**61**

CAYMAN IS.

ZF2FV	**28**	**215,137**	**620**	**169**
		(Opr: WD8MRF)		

COSTA RICA

TI5GSL	**A**	**223,161**	**433**	**219**
TI2LO	**A**	**69,361**	**205**	**139**
TI2WK	"	63,119	177	127

DOMINICAN REP.

HI3AMF	28	21,600	141	75
HI8GB	**3.5**	**452,760**	**500**	**220**

GUATEMALA

TG9WB	**21**	**206,040**	**492**	**202**
TG9GI	**14**	**2,062,944**	**1723**	**494**

JAMAICA

6Y5HN	**A**	**2,862,374**	**2036**	**521**

MEXICO

6D5ZZA	**A**	**2,009,889**	**1871**	**427**
6D5LLS	**28**	**469,872**	**887**	**234**

MONTSERRAT

VP2MGQ	**A**	**4,421,995**	**3052**	**607**
		(Opr: N4MO)		

PUERTO RICO

NP4CC	**3.8**	**236,716**	**352**	**166**

ST. MARTIN

FG8DYM/FS	**7**	**1,497,096**	**909**	**348**
		(Opr: W4GSM)		

AFRICA

CANARY ISLANDS

EA8ZI	**28**	**779,055**	**837**	**311**
EA8ADY	21	7,038	53	46

CEUTA & MELILLA

ED9IB	**A**	**533,057**	**584**	**281**

LIBERIA

EL2AV	**14**	**1,720,456**	**1323**	**436**

MADEIRA ISLANDS

SM8GMG/CT3	**7**	**1,021,592**	**600**	**286**

MOROCCO

CN8CO	**A**	**3,594,374**	**2097**	**511**
CN8CY	**28**	**2,947,811**	**2027**	**487**

SOUTH AFRICA

ZS5IV	**A**	**486,360**	**590**	**280**
ZS4SP	**28**	**84,980**	**206**	**140**

TANZANIA

5H3BH	**A**	**409,851**	**500**	**279**

ZAMBIA

9J2TY	**A**	**90,626**	**271**	**113**
		(Opr: JL1PKX)		

ASIA

ISRAEL

4X1X	**A**	**3,932,586**	**2531**	**529**
		(Opr: 4X6DX)		
4X6DK	**28**	**48,112**	**150**	**124**
4Z4VG	**21**	**283,815**	**420**	**255**
4X4UH	**14**	**2,288,646**	**1657**	**477**

JAPAN

JG1ILF	**A**	**2,864,128**	**1953**	**512**
JR1RNC	**A**	**2,732,240**	**1951**	**476**
JI1QPU	**A**	**2,149,795**	**1738**	**445**
JA8JHA	**A**	**1,807,280**	**1536**	**410**
JR1AIB	"	1,720,002	1369	439
JA6LDD	"	1,508,104	1134	442
JA4CUU	"	1,427,472	1339	414
JR6OJD	"	1,391,670	1137	423
JF1SEK	"	1,284,052	1183	379
JA3HTT	"	885,172	866	361
JH1KRC	"	842,055	857	365
JA7UFZ	"	704,352	768	319
JM1NKT	"	675,168	753	312
JA6BIF	"	617,500	700	325
JH3GRE	"	596,594	683	317
JA8BMS/1	"	242,394	391	213
JE3DYW	"	238,924	372	212
JA8SW	"	226,800	374	216
JR3XEX	"	216,936	380	207
JA1AOD	"	190,092	363	186
JA6LYV	"	183,887	322	229
JH1UUT	"	175,330	327	197
JA6CM	"	140,760	293	170
JR6EZE	"	133,326	288	162
JR7XBN	"	115,665	258	165
JK1DSR	"	111,045	246	165
JJ1VFE	"	96,791	230	151
JR1TMI	"	90,200	252	164
JA6AKV	"	78,912	206	137
JR7XKN	"	77,184	219	134
JL1CWS	"	66,906	192	126
JA2TKO	"	55,216	168	119
JN1AFQ	"	54,288	187	117
JH0OXB	"	52,212	159	114
JR3WXA	"	52,015	167	103
JA6QDU	"	36,500	128	100
JA1ALX	"	34,592	131	92
JA1IT	"	33,696	121	96
JA7KM	"	33,320	120	98
JA6EZF	"	23,821	118	83
JA1OHP	"	22,800	100	80
JA1AJA	"	4,830	48	35
JI3JQQ	"	4,773	46	37
JA1AAV	"	1,925	28	25
JH5KKM	"	1,541	23	23
JE7FMW	"	936	20	18
JF1EEK	**28**	**2,441,226**	**1722**	**502**
JL1KRT	**28**	**2,310,255**	**1736**	**471**
JI1QQI	**28**	**2,021,760**	**1547**	**468**
JH1AGU	**28**	**1,335,704**	**1133**	**412**
JL1EEI	"	1,284,403	1161	401
JF2GYH	"	695,181	778	317
JE3SEN	"	441,280	565	280
JL1OLH	"	401,304	514	276
JF3KNQ	"	248,742	389	234
JA6EFT	"	220,224	361	222
JA6GGD	"	197,620	365	205
JA8FIZ	"	120,288	262	168
JA9GLT/3	"	116,793	254	171
JA1JGP	"	109,494	287	158
JA1FO	"	81,732	207	147
JO1CRA	"	79,800	205	150
JA3BBG	"	57,200	158	130
JA4AQR	"	33,475	111	103
JH2OAN	"	30,906	130	102
JA6PL	"	29,548	114	89
JL1NRR	"	21,075	101	75
JH1CNN	"	20,444	101	76
JR1OYL	"	16,284	85	69
JH0VXA	"	10,670	76	55
JA1AAT	"	4,340	47	35
JR1AHH	"	3,366	35	34
JA1DSR	"	2,296	32	28
JH3LPT	**21**	**1,511,184**	**1205**	**456**
JR1WHW	**21**	**1,054,391**	**1023**	**367**
JF2IWL	"	321,475	439	275
JI1QLB	"	258,240	381	240
JR4BSM	"	254,057	410	240
JA8UJY	"	165,208	300	193
JN1GRY	"	131,720	292	178
JA1DCO	"	77,184	201	144
JJ1AEB	"	71,394	190	146
JL1TVV	"	58,404	173	124
JR3CVJ	"	52,094	152	122
JH8TDZ	"	37,714	131	109
JN1KKN	"	36,800	136	100
JM1AHX	"	20,294	98	73
JA9THA	"	17,556	97	66
JE6PWW	"	15,708	91	66
JR7RHR	"	10,317	66	57
JH7PWS	"	6,072	46	46
JE3XWJ	"	5,400	49	40
JI3JGJ	"	4,440	43	40
JA9XWR	"	3,270	56	30
JG1OWV	"	147	7	7
JH1OEL	"	75	5	5
JA6GIJ	**14**	**1,238,160**	**1147**	**402**
JH8NYK	**14**	**298,551**	**438**	**249**
JH0LFE	"	224,675	378	215
JA1GSK	"	109,620	240	174
JM1LPN	"	73,470	203	155
JA1FKY	"	12,726	72	63
JA4PA	"	4,674	41	38
JH1FJK	"	4,120	40	40
JA2BAY	**7**	**611,544**	**618**	**249**
JH4IFF	**7**	**112,922**	**193**	**131**
JA0VBJ	"	6,720	37	32

KOREA

HL9AZ	**A**	**39,050**	**140**	**110**
HL9KW	**A**	**34,056**	**117**	**99**

KUWAIT

9K2BE	**28**	**1,302,372**	**1236**	**389**
		(Opr: G4BWP)		

MONGOLIA

JT1KAI	**A**	**64,020**	**450**	**110**
		(Opr: L. Gantulga)		
JT1BG	**A**	**47,815**	**159**	**131**

SAUDI ARABIA

HZ1HZ	**A**	**1,776,789**	**1352**	**459**

SYRIA

OE1EHB/YK	**A**	**243,360**	**426**	**195**

U.S.S.R.

ARMENIA

UG6LQ	**14**	**964,205**	**977**	**373**
UG6GDS	"	396,159	627	249

One of the top scoring YL's in the contest was Anita, KN2N. Vy FB.

HA5OM and HA5GF adjusting the HG5A club station 10 meter beam. It's located on top of a hill at 1500 feet.

Comparing his 14 MHz score with last year's results in CQ is Luis, CT4NH.

ASIATIC

UA9MR	**A**	**1,165,098**	**1236**	**381**
UA9AED	"	532,532	707	266
UA9OO	"	270,974	426	218
UA9OGK	"	244,436	405	212
UA9MQ	"	27,632	110	88
UA9AFG	"	2,970	40	33
UA9CRR	**28**	**770,445**	**1003**	**351**
UA9FAT	"	478,584	684	289
UA9YCO	"	464,252	906	277
UA9HBE	"	234,054	447	226
UW9CR	"	53,324	370	117
RA9FEC	"	51,072	217	112
UA9OGF	"	28,785	129	101
UV9AX	"	9,487	69	53
UA9CMS	"	7,155	54	45
UA9CTL	"	6,808	50	46
UA9HAB	**21**	**854,694**	**1709**	**309**
UA9AKO	"	418,362	527	294
UA9XWR	**14**	**192,585**	**370**	**185**
UW9CL	**7**	**54,020**	**132**	**73**
UA0SGL	**A**	**814,986**	**1185**	**342**
UA0FCL	"	19,120	97	80
EK0DTD	"	15,318	116	74
UA0CDM	"	3,240	36	30
UA0WAM	**28**	**1,177,671**	**1468**	**381**
UA0ZDD	"	802,102	1137	329
UA0CED	"	589,820	891	308
UA0SMA	"	386,370	630	270
UA0QEP	"	274,468	520	236
UA0SME	"	53,816	235	124
UA0QCA	"	396	12	11
UA0ZBF	**21**	**483,393**	**877**	**269**
UA0PJ	**14**	**24,621**	**116**	**87**
UA0WAY	**3.5**	**8,316**	**55**	**33**

AZERBAIJAN

UD6BQ	**A**	**790,951**	**829**	**313**

GEORGIA

UF6RB	**21**	**11,718**	**67**	**62**
UF6FFF	**14**	**79,506**	**231**	**126**
UF6FER	**3.5**	**25,944**	**101**	**47**

KAZAKH

UL7DA	**A**	**859,902**	**1582**	**361**
UL7QF	"	501,072	622	292
UL7GBP	"	8,925	65	51
UL7EAF	**28**	**376,986**	**697**	**249**
RL7PCV	"	119,986	358	162
UL7PFE	"	55,860	232	114
UL7BAZ	**21**	**529,038**	**750**	**303**
UL7LCW	**3.5**	**12,810**	**71**	**35**
UL7LBM	"	7,056	50	28

KIRGHIZ

UM8MCY	**A**	**126,490**	**280**	**182**
UM8MAZ	"	22,410	94	90
UM8MDX	**14**	**630,476**	**832**	**308**

TADJIK

UJ8JCQ	**A**	**83,160**	**236**	**140**

TURKOMAN

UH8BO	**28**	**20,367**	**100**	**73**

EUROPE

AUSTRIA

OE1WO	**21**	**103,200**	**277**	**172**
OE1LPW	**14**	**134,070**	**360**	**205**
OE7SHI	**3.5**	**23,660**	**124**	**91**

BALEARIC IS.

EA6GP	**A**	**667,780**	**964**	**346**
EA6FS	"	14,193	99	83
EA6HK	"	9,360	92	72
EA6DE	**28**	**161,028**	**359**	**189**

BELGIUM

ON4XG	**A**	**91,572**	**263**	**156**
ON5FV	**21**	**14,746**	**102**	**73**
ON5WL	**3.5**	**93,058**	**290**	**161**

BULGARIA

LZ2DB	**A**	**57,962**	**215**	**146**
LZ2KPB	"	41,344	256	128
		(Opr: M. G. Nickolov)		
LZ1QG	"	24,192	160	96
LZ2KKZ	"	2,448	38	36
		(Opr: G. Genschev)		
LZ1ZF	"	1,953	44	31
LZ2CC	**21**	**2,263,850**	**1835**	**475**
LZ1KPZ	**14**	**89,362**	**338**	**182**
		(Opr: G. Gavrailov)		
LZ1RN	"	59,584	253	152
LZ1HL	"	7,296	63	48
LZ1KDP	**7**	**714,420**	**671**	**294**
		(Opr: LZ2CJ)		
LZ2VP	"	8,064	73	48
LZ1HP	3.5	5,280	60	44

CORSICA IS.

FC9UC	**14**	**1,712,304**	**1619**	**506**

CZECHOSLOVAKIA

OK1MSN	**A**	**1,658,674**	**1442**	**446**
OK1DLA	**A**	**482,959**	**619**	**313**
OK1AJN	**A**	**470,265**	**745**	**293**
OK2BTI	"	250,588	557	244
OK1EP	"	228,975	399	213
OK1KZ	"	191,611	423	217
OK3CRH	"	184,685	452	215
OK2PDE	"	150,902	300	197
OK1DNJ	"	87,360	308	168
OK1XC	"	80,229	230	141
OK1AMF	"	77,958	231	142
OK2BBI	"	72,996	217	132
OK2EC	"	49,060	170	110
OK2BSA	"	26,602	107	94
OK2SWD	"	20,532	107	87
OK1DVK	"	14,982	82	66
OK1BB	"	14,168	113	77
OK3CPN/p	"	12,780	97	71
OK2PDT	"	11,999	84	71
OK1AOU	"	7,497	55	51
OK1AVD	"	3,348	38	31
OK2YN	"	1,638	26	21
OK1ARI	**28**	**1,405,152**	**1497**	**328**
OK3JW	**28**	**1,119,456**	**1165**	**338**
OK3CSC	"	946,080	1026	324
OK3CFA	"	759,801	975	291
OK2RU	"	608,015	780	277
OK3MB	"	329,604	496	242
OK1AGN	"	76,250	225	122
OK3CEG	"	4,440	40	37
OK2BQZ	"	2,232	35	24
OK3KAG	**21**	**585,438**	**767**	**318**
		(Opr: OK3-27010)		
OK2BQL	"	167,384	344	196
OK3KEX	"	68,444	218	142
		(Opr: OK3-26928)		
OK1ASQ	"	5,120	48	40
OK1DIB	"	2,028	28	26
OK3YDP	"	779	19	19
OK1DCU	**14**	**404,974**	**662**	**277**
OK1FV	"	198,450	447	225
OK3YK	"	92,185	337	179
OK1ALQ	"	58,320	195	120
OK2PDC	"	14,276	162	83
OK1AYQ	"	5,720	78	55
OK2PBG	"	1,325	27	25
OK1TN	**7**	**697,004**	**693**	**308**
OK1AFB	"	40,018	179	107
OK2QX	"	2,448	38	34
OK7MM	**3.5**	**358,300**	**600**	**205**
		(Opr: OK3ZWA)		
OK3CGP	**3.5**	**171,518**	**489**	**191**
OK3YCL	"	88,660	303	155
OK2HI	"	83,844	308	137
OK1KCU	"	66,666	272	123
		(Opr: OL4BEV)		
OK3IAG	"	40,716	180	117
OK2BBS	"	15,142	155	67
OK1MNV	"	3,096	46	36
OK3CQW/p	**1.8**	**3,286**	**49**	**31**
OK2ABU	"	50	7	5

DENMARK

OZ5EV	**A**	**1,104,750**	**1072**	**375**
OZ7JZ	**A**	**826,210**	**1012**	**290**
OZ1CAH	"	372,645	499	273
OZ4MD	"	273,095	371	283
OZ4RT	"	217,170	368	254
OZ1FRR	"	183,546	342	198
OZ9BR	"	133,056	380	176
OZ6EI	"	53,845	210	121
OZ1EXZ	"	30,448	126	88
OZ1DAF	"	26,361	141	101
OZ2BM	"	12,608	69	64
OZ1AXG	"	1,173	23	23
OZ1FLH	**28**	**48,941**	**168**	**109**
OZ4VW	"	520	16	13
OZ1BOA	**21**	**9,048**	**61**	**52**
OZ1DTF	**14**	**1,228,338**	**1299**	**387**
OZ3SK	**14**	**1,098,390**	**1139**	**410**
OZ8ME	"	13,884	163	78
OZ3ZK	**3.5**	**7,812**	**66**	**62**

ENGLAND

GB4DX	**A**	**5,222,725**	**3308**	**575**
		(Opr: G3VBL)		
G4FAM	**A**	**2,767,400**	**1856**	**548**
G2AJB	"	45,500	186	130
G3RKH	**28**	**97,200**	**224**	**150**
G3XBY	**21**	**370,296**	**532**	**278**
G3NT	"	210,231	383	213
G3YZR	**14**	**57,229**	**232**	**151**
G4KIU	"	50,840	266	155
G3HWL	"	6,384	62	57
G3NLY	**7**	**449,224**	**469**	**241**

FAROE IS.

OY1A	**A**	**14,616**	**112**	**87**

FINLAND

OH5NQ	**A**	**2,902,592**	**2325**	**434**
OH1MA	**A**	**1,459,502**	**1466**	**407**
OH6LK	**A**	**1,207,410**	**1400**	**334**
OH2KP	"	268,060	540	260
OH7NW	"	93,224	275	172
OH1RZ	"	62,348	207	143
OH2VZ	"	38,520	141	107
OH6XY	"	31,886	130	107
OH3BU	"	29,920	177	110
OH2EX	"	9,729	95	69
OH2DN	"	1,456	29	26
OH6MO	"	588	15	14
OH4MF	"	352	12	11
OH5PA	**28**	**36,720**	**124**	**108**
OH2JQ	"	24,390	102	90
OH4TY	"	12,194	86	67
OH7YF	"	3,952	38	38
OH5OQ	"	3,234	39	33
OH6AC	**21**	**1,984,232**	**1861**	**388**
		(Opr: OH6CS)		
OH3UU	**21**	**900,600**	**1052**	**300**
OH1AJ	"	284,796	474	243
		(Opr: OH1IO)		
OH1ZF	"	137,825	290	185
OH2BDN	"	120,120	375	195
OH4MM	"	30,528	130	106
OH1UR	"	3,854	42	41
OH4MI	"	3,780	44	42
OH1EB	"	176	8	8
OH1IG	**14**	**1,702,768**	**1603**	**496**
OH2AW	**14**	**452,312**	**921**	**328**
		(Opr: OH2BBH)		
OH6CD	"	12,400	126	80
OH1IJ	**7**	**352,342**	**592**	**241**
OH6AS	"	160	11	10

FRANCE

F6BFN	**A**	**1,404,035**	**1304**	**421**
F6EXQ	"	135,048	308	204
F5IL	"	26,320	118	94
F6CGE	**28**	**213,568**	**405**	**188**
F6FJE	**21**	**18,450**	**116**	**82**
F6CLM	"	442	14	13
F9XA	**14**	**24,309**	**143**	**111**

GERMANY (FRG)

DJ3HJ	**A**	**3,555,262**	**2280**	**586**
DK0MM	**A**	**3,280,328**	**2201**	**548**
		(Opr: DJ7IK)		
DL8PC	**A**	**3,216,774**	**2167**	**517**
DK5AD	"	1,563,712	1380	424
DJ0BA	"	1,015,508	1104	331
DL4SAR	"	950,118	1077	338
DK9MC	"	382,500	500	300
DK5DS	"	250,580	440	220
DJ3EJ	"	232,064	396	259
DK0CW	"	185,538	411	214
		(Opr: DL7PD)		
DJ8UV	"	177,325	336	205
DK6BT	"	176,720	360	235
DF2RG	"	86,716	244	163
DL9OE	"	54,964	220	151
DK5WQ	"	42,822	151	122
DL3ME	"	28,122	130	109
DK5GX	"	16,848	96	78
DL3SAR	"	9,222	68	58
DJ6QO	"	6,273	52	51
DF6UX	"	5,115	75	55
DL4MBO	"	2,016	43	32
DF8XC	**28**	**1,199,358**	**1520**	**414**
DL0UR	"	24,510	110	86
		(Opr: DH2SAI)		
DJ0ZT	"	10,863	75	51
DF4NP	**21**	**174,124**	**386**	**202**
DK6TH/p	"	351	16	13
DL9VDQ	**14**	**6,344**	**66**	**61**
DF8AN	"	2,457	64	39
DJ4PT	**7**	**1,692,480**	**1142**	**410**
DL9HN	**3.5**	**140,140**	**429**	**182**
DK8AX	"	29,848	138	91
DL6GBL	"	11,284	91	62
DJ6QT	**1.8**	**5,978**	**81**	**49**
DJ2YE	"	836	25	22

GERMANY (GDR)

Y24UK	**A**	**6,285,436**	**3869**	**586**
Y22OM/a	**A**	**2,495,230**	**2039**	**470**
Y22JJ	**A**	**1,157,275**	**1130**	**389**
Y57WJ	"	513,271	670	319
Y39XF	"	504,192	738	312
Y43WK	"	496,790	823	329
Y38YK	"	388,360	613	292
Y47XF	"	378,556	605	293
Y47ON	"	326,583	612	277
Y55ZD	"	211,367	582	229
Y53TA	"	190,112	435	208
Y54ZI	"	158,603	332	199
Y38TI	"	144,256	373	196
Y44XD	"	140,148	450	204
Y51ZE	"	122,930	312	190
Y32ZF	"	119,757	303	191
Y57ZL	"	97,475	252	175
Y48YA	"	93,264	302	174
Y66ZN	"	90,922	307	169
Y53XF	"	81,900	217	156
Y35WF	"	79,048	256	164
Y71SH	"	77,274	290	159
Y22HI	"	67,480	206	140
Y54XL	"	66,030	225	142
Y58ZA	"	52,197	192	127
Y41ZH	"	51,272	232	116
Y22HF	"	45,810	167	115
Y24WL/a	"	43,700	164	115
Y31ZE	"	34,320	149	104
Y44XF	"	34,001	146	121
Y38WI	"	33,480	136	108
Y44WA	"	31,080	152	111
Y59YM	"	28,900	151	100
Y57TH	"	18,312	101	84
Y25QN/a	"	13,690	94	74
Y68TG	"	9,300	85	62
Y62ZH/p	"	8,024	84	59
Y33TA	"	6,556	47	44
Y35XF	"	6,264	70	54
Y34YF	"	5,848	50	43
Y39WG	"	5,494	66	41
Y22CC	"	5,360	51	40
Y46XL	"	4,738	49	46
Y22GC	"	4,716	45	36
Y61UF	"	4,680	53	36
Y49RF	"	4,230	52	45
Y34SE	"	2,010	33	30
Y22XO	"	1,920	36	30
Y22WK	"	1,274	40	26
Y31WI	"	1,242	30	27
Y51TG	"	1,034	24	22
Y27MN	"	465	15	15
Y59ZD	"	243	9	9
Y65TN	"	72	6	6
Y25TO	"	50	5	5
Y35LM	**28**	**1,293,600**	**1400**	**352**
Y27FN	**28**	**1,253,718**	**1387**	**327**
Y56YF	**28**	**514,995**	**750**	**247**
Y37XJ	"	172,900	340	190
Y24GF/a	"	153,916	335	174
Y32UG	"	76,140	207	135
Y24LE	"	66,155	186	131
Y37ZE	"	63,984	186	124
Y76WN	"	63,837	195	123
Y53WL	"	48,174	150	111
Y38WA	"	43,460	144	106
Y25FG	"	42,521	180	101
Y67ZG	"	33,077	122	97
Y51YM	"	13,862	88	58
Y23YE	"	10,260	66	54
Y53UA	"	7,728	60	46
Y54SA	"	5,330	48	41
Y62XG	"	4,212	40	36
Y21JH	"	2,492	34	28
Y26NL/p	"	2,241	30	27
Y37XL	"	2,175	35	29
Y22YE/a	"	2,160	28	27
Y23EE	"	2,072	30	28
Y56ZA	"	1,064	20	19
Y24SG	"	918	18	17
Y51YF	"	280	10	10
Y38ZD	"	176	8	8
Y31PA	**21**	**876,990**	**1038**	**310**
Y87XL	"	27,090	142	90
Y24LA	"	3,060	37	34
Y44SO	**14**	**418,190**	**832**	**310**
Y37UF	**14**	**112,304**	**437**	**192**
Y24DF	"	46,426	238	139
Y38YE	"	44,289	225	133
Y71WN	"	23,331	170	101
Y32RC	"	4,455	99	45
Y27VH	"	1,530	31	30
Y66QL	"	1,008	30	28
Y51XE	"	960	22	20
Y24PE	"	736	26	23
Y45RA	**7**	**349,860**	**1470**	**238**
Y78XL	"	10,904	83	58
Y67XL	**3.5**	**145,920**	**436**	**192**
Y32UC	**3.5**	**113,280**	**356**	**160**
Y44XI	"	27,400	160	100
Y51WE	"	11,340	102	63
Y23LE	"	3,936	56	47

GREECE

SV1MO	**A**	**394,680**	**721**	**345**
SV8AU	**28**	**1,543,278**	**1762**	**402**

HUNGARY

HA8DU	**A**	**418,554**	**707**	**337**
HA4XX	"	292,825	680	265
HA5NR	"	2,871	52	33
HA8ZB	**21**	**1,564,641**	**1506**	**387**
HA8KAZ	"	134,300	354	170
		(Opr: Olasz Imre)		
HA2MN	**14**	**97,464**	**407**	**186**
HA9RE	**7**	**520,560**	**668**	**270**
HA5KLF	"	1,144	25	22
		(Opr: HA5TI)		

IRELAND (REP. OF)

EI1DH	**A**	**718,796**	**944**	**299**
EI7CC	**14**	**167,307**	**436**	**257**

ITALY

IV3PRK	**A**	**4,727,823**	**2970**	**573**
IO6FLD	**A**	**4,394,490**	**2915**	**555**
I2SVA	**28**	**1,249,332**	**1350**	**321**
I3GRX	"	728,643	959	267
I6NOA	**7**	**1,104,312**	**840**	**376**
I4IKW	"	241,188	362	199

I.T.U.

4U1ITU	**A**	**4,303,572**	**2849**	**546**
		(Opr: OH2BBM)		

JAN MAYEN

JX5VAA	**A**	**37,204**	**204**	**131**

Club station VE1DXA was the top Canadian Multi-Single entry. Op's (left to right, front) Walter, VE1AWS; Bob, VE1YX; John, VE1FH. (Back) Kurt, VE1TT; Harley, VE1MX; Mike, VE1UG; Peter, VE1CEG; and Sauli, VE1AIH.

TROPHY WINNERS

SINGLE OPERATOR - ALL BAND

WORLD - North Florida DX Assn. Trophy. Won by: **Lar Wilke, Y24UK.**
U.S.A. - Bob Epstein, K8IA Trophy. Won by: **Station AB8I.** Opr. **Ron DeBry, WA6DGX.**
CANADA - Garth Hamilton, VE2VY Trophy. Won by: **John Sluymer, VE6OU.**
CARIB./C.A. - Ray Alea, KC4OV Trophy. Won by: **Nigel Hoyow, 6Y5HN.**
EUROPE - Bernie Welch, W8IMZ Trophy. Won by: **Tine Brajnik, YU3EY.**
JAPAN - Palm Garden Radio Club Trophy. Won by: **Kiyoshi Matsumoto, JG1ILF.**
S. AMERICA - Ron Moorefield, W8ILC Trophy. Won by: **Station P42J.** Opr. **John Thompson, W1BIH.**
WORLD-QRPp - Dayton Amateur Radio Assn. Trophy. Won by: **Ronald L. Moorefield, W8ILC.**

SINGLE OPERATOR-SINGLE BAND

WORLD - John N. Reichert, N4RV Trophy. Won by: **Rich Blaney, KB7IJ/KH2.** (28 MHz)
U.S.A. - Richardson Wireless Klub Trophy. Joe Johnson, W5QBM Memorial. Won by: **Station N5AU.** Opr. **Randy Thompson, K5ZD.** (28 MHz)
U.S.A. - 7 MHz - William Diggins, WA8LXJ Trophy. Won by: **Ken Keeler, N6RO.**
U.S.A. - 21 MHz - Ted Pauck, Jr., K8NA Trophy. Won by: **Bob Wruble, AI7B.**
CANADA - Gene Krehbiel, VE7KB Trophy. Won by: **Yuri Blanarovich, VE3BMV.**
EUROPE - Myron E. Crofoot, WB4VQO Trophy. Won by: **Vocina Miran, YU3VM.** (21 MHz)
JAPAN - Ken Ruddock, K6HNZ Trophy. Won by: **Masanaga Kase, JF1EEK.** (28 MHz)
WORLD - 21 MHz - Lee Wical, KH6BZF Trophy. Won by: **Victor J. Vasquez.B., YV3BJL.**

WORLD - 7 MHz - William Diggins, WA8LXJ Trophy. Won by: **Klaus Kuhlemeier, DJ4PT.**
WORLD - 1.8 MHz - Arch Doty, Jr., K8CFU/4 Trophy. Won by: **Peter Posnikoff, VE3BBN.**

MULTI-OPERATOR, SINGLE XMTR.

WORLD - Mike Badolato, W5MYA Trophy. Won by: **Station VP2EC. Oprs. Gordon Fogg, N5AU** and **Ray Sawtelle, KC5EA.**

MULTI-OPERATOR, MULTI-XMTR.

WORLD - Henry Thel, VE7WJ Trophy. Won by: **Station NP4A, Pedro Piza, Jr.** and Oprs. **KP4BO, KP4BZ, KP4CC, KP4EC, KP4EQF, KP4O, KP4P, KØOO, N4KE, N4TO, NP4AT, NP4AZ, NP4DU, WP4CBB.**
U.S.A. - Bert Curwen, KL7IRT Trophy. Won by: **Station KN6M, Morris J. Young** and Oprs. **JH3DPB, N6BPL, N6PO, W6SZN.**

CONTEST EXPEDITION

WORLD - Northern Ohio DX Assn. Trophy. Won by: **Station FGØDYM/FS.** Opr. **Terry Appleton, W4GSM.** (7 MHz)

(The **WORLD-Club Competition** Trophy & the **U.S.A. Club Competition** Trophy winners will be announced with the C.W. results, as each is a combined S.S.B. & C.W. award.)

NETHERLANDS

PA0IJM	**A**	**401,220**	**698**	**270**
PA0LIE	**A**	**119,424**	**276**	**192**
PA3BGA	"	61,855	177	139
PA3BDK	"	25,944	126	92
PA0YN	"	7,540	57	51
PA0INE	"	4,864	46	38
PA3ADI	28	1,752	25	24
PA0LRK	"	918	18	17
N7CVW/PB	"	192	8	8
PA0RRS	**21**	**21,840**	**99**	**84**
PI1PT	**7**	**12,348**	**108**	**63**

NORWAY

LA2TO	**A**	**427,752**	**616**	**312**
LA9FY	**A**	**309,690**	**644**	**270**
LA3WBA	"	67,326	269	147
LA5KO	"	21,756	100	74
LA2GN	"	18,320	108	80
LA1RN	"	17,064	105	79
LA3JAA	"	5,796	58	46
LA7SI	"	3,260	62	50
LA3JT	"	3,040	36	32
LA5TBA	"	2,492	33	28
LA2LV	"	2,100	28	25
LA6ZV	"	1,872	26	24
LA4HH	"	588	14	14
LA7YW	"	112	8	8
LA4YW	**28**	**41,730**	**150**	**107**
LA5JX	**28**	**26,144**	**120**	**86**
LA7CL	"	624	16	13
LA7ZN	"	363	11	11
LA7JO	**21**	**2,154,880**	**1796**	**448**
LA9DI	"	65,208	195	143
LA2BBA	"	61,920	202	144
LA5QK	**3.5**	**30,300**	**150**	**101**

PORTUGAL

CT1AHU	**A**	**55,879**	**323**	**173**
CT4NH	**14**	**1,515,852**	**1510**	**474**
CU5UA	**14**	**1,245,132**	**1270**	**427**
		(Opr: CT1UA)		
CU5ZG	"	120,156	345	204
		(Opr: CT1ZG)		

ROMANIA

YO6KEA	**A**	**1,726,272**	**1502**	**432**
		(Opr: YO6AWR)		
YO6AFP	**A**	**139,620**	**322**	**195**
YO6OO	"	124,763	305	179
YO2CJ	"	63,648	416	153
YO9HP	"	45,548	222	118
YO9CBZ	"	41,400	189	120
YO8BDA	"	30,192	145	102
YO8BOI	"	4,360	45	40
YO2BEH	"	96	6	6
YO3KWJ	**28**	**1,719,902**	**1633**	**379**
		(Opr: YO3JW)		
YO6KNI	"	54,216	185	108
		(Opr: YO6BCW)		
YO5BRZ	**14**	**117,018**	**353**	**198**
YO9HT	"	111,474	340	198
YO8BSE	"	73,162	323	157
YO8KGE	"	17,080	100	70
		(Opr: YO8BNM)		
YO6LV	**3.5**	**35,070**	**171**	**105**
YO4BXX	**3.5**	**34,532**	**197**	**97**
YO9BSF	"	25,284	164	86
YO8BNN	"	3,600	75	25
YO2CBF	"	1,911	50	13

SARDINIA IS.

IS0QDV	**21**	**28,496**	**203**	**104**
IS0WON	**14**	**810,674**	**1191**	**397**

SCOTLAND

GM3RAO	**A**	**374,288**	**593**	**298**

SHETLAND IS.

GM4GPN	**A**	**710,338**	**908**	**346**

SPAIN

EA3WZ	**A**	**2,997,444**	**2341**	**471**
EA1ABT	**A**	**2,802,852**	**2208**	**477**
EA3DFA	"	550,620	750	315
EA5ANR	"	55,825	208	145
EA5BVG	"	31,130	144	110
EA2ZE	"	12,936	118	77
EA7ATE	"	207	9	9
ED2QU	**28**	**1,869,270**	**1706**	**390**
EA3CTI	"	278,892	438	244
EA3BSE	"	114,228	280	167
EA3ARX	"	2,030	29	29
EA7AYD	**21**	**267,282**	**488**	**279**
EA2CR	"	30,935	143	115
EA1AGN	**14**	**27,090**	**186**	**105**
EA4BV	"	2,496	34	26

SVALBARD

JW0P	**A**	**272,195**	**674**	**245**
		(Opr: SP2BHZ)		

SWEDEN

SM6BGG	**A**	**1,059,960**	**1107**	**365**
SM0BDS	**A**	**496,213**	**632**	**289**
SM0JOQ	"	184,968	375	252
SM5CMP	"	164,065	313	209
SM5ARG	"	117,486	289	183
SM7WT	"	95,580	216	162
SM5CSS	"	85,848	242	168
SM7EMQ	"	68,376	167	132
SM0CHA	"	14,880	58	40
SM7LSU	**28**	**124,184**	**251**	**172**
SM5DYC	**28**	**86,043**	**235**	**129**
SM5IMO	"	83,204	233	122
SM6MSG	"	46,640	160	110
SM5ALD	"	44,690	152	109
SM0LPO	"	39,449	148	103
SM0FM	"	18,675	85	75
SM4BTF	"	17,750	90	71
SM6LIF	"	14,784	79	66
SM0MC	"	10,260	64	54
SK1AQ	"	7,095	55	43
		(Opr: SM1CXE)		
SM5EQW	"	950	24	19
SM4DLS	"	602	15	14
SM7AIL	**21**	**67,048**	**215**	**136**
SM2DQS	**21**	**44,416**	**156**	**128**
SM0KV	"	30,960	122	90
SM7TV	"	20,000	115	80
SK2HG	**14**	**95,190**	**309**	**190**
		(Opr: SM2HQG)		
SM7AIO	"	29,964	132	132
SM6JY	"	12,560	111	80
SM7DLZ	**3.5**	**327,012**	**701**	**229**
SM4JLU	"	720	20	18

SWITZERLAND

HB9AAA	**A**	**1,052,862**	**1050**	**379**
HB9AON/p	**A**	**118,503**	**325**	**189**
HB9O	"	4,796	51	44

YUGOSLAVIA

YU3EY	**A**	**5,315,520**	**3143**	**560**
YU2OM	**A**	**394,680**	**612**	**276**
YU2BHI	"	240,540	399	211
YU1NZW	"	187,798	358	233
YU7AV	"	170,226	354	193
YU1ANO	"	114,700	320	185
		(Opr: YU1OWW)		
YU7SF	"	112,670	345	190
YU2CQ	"	103,385	230	155
YU7NZR	"	99,624	261	168
YU5XAF	"	16,032	105	96
YU1PKC	"	546	14	13
YU7AU	**28**	**2,239,420**	**1891**	**410**
YU3DKS	**28**	**1,393,920**	**1468**	**330**
		(Opr: YU3THM)		
YU3CAB	**28**	**1,296,348**	**1869**	**354**
		(Opr: YU3RM/X)		
YU3TLA	"	705,276	865	286
YU7AJH	"	608,634	778	289
		(Opr: YU7WW)		
YU7QDT	"	407,640	546	258
YU7ORQ	"	1,679	28	23
YU3VM	**21**	**2,683,980**	**2006**	**481**
YU1DW	**21**	**1,362,710**	**1463**	**370**
YU7KMN	**14**	**832,218**	**1225**	**398**
		(Opr: Opsenica Stanko)		
YU2SBD	"	165,375	426	225
YU3APR	**3.5**	**658,722**	**649**	**303**
		(Opr: YU3DM)		
YU2HDE	"	166,440	399	190
		(Opr: E. Calopo)		

U.S.S.R.

EUROPEAN

UA6ARE	**A**	**442,488**	**780**	**309**
UA3QBP	**A**	**438,792**	**698**	**282**
UA3TN	**A**	**358,196**	**575**	**298**
UA1AET	"	103,622	333	197
UV3CS	"	53,157	215	141
UA3AAH	"	48,980	166	124
UA6HKN	"	33,000	150	120
UA3DSN	"	32,448	145	96
UA3DUA	"	19,796	120	101
UA3TAG	"	13,351	113	79
UA1NBR	"	9,638	85	61
UW3ZU	"	7,420	59	53
UW1AE	"	2,079	37	33
UA6AKT	"	1,035	25	23
UA3TCH	"	837	32	27
UA1TBP	"	792	18	18
UA6RB	"	430	10	10
UA6AJG	"	330	15	15
UA3AKC	**28**	**897,120**	**1178**	**315**
UA4WWA	**28**	**660,486**	**853**	**318**
UA1AWO	**28**	**601,123**	**828**	**257**
UA3TDK	"	473,774	699	301
RA3LAL	"	318,474	483	234
RA3DKE	"	310,660	522	245
UA4LBF	"	207,888	462	244
UA3QJK	"	155,372	340	179
RA3DPD	"	138,600	316	168
UA4FDZ	"	107,172	321	156
UA3DCY	"	106,904	258	161
RA3DDU	"	101,246	264	142
UA3TBK	"	84,552	259	156
UA3TEW	"	65,144	203	136
UA3DQS/U6A	"	51,165	202	135
UA6AJF	"	41,789	190	131
UZ3TG	"	34,299	160	103
UA3QEE	"	17,615	120	65
UA3DNU	"	15,066	81	62
UA3TES	"	13,528	109	76
UA4WBX	"	12,798	86	79
UA3MDV	"	5,217	51	47
UA3DAT	"	4,888	52	47
UA3DLD	"	4,080	40	34
UW3HV	**21**	**1,999,866**	**1882**	**471**
UW3UO	**21**	**542,160**	**892**	**251**
UV3DN	"	354,576	667	267
UA4CZ	"	135,373	319	233
UV3NH	"	88,088	245	182
UA6LGP	"	87,592	290	184
UA3VAS	"	20,900	111	95
UA6AJO	"	9,936	87	72
UW6FZ	**14**	**462,735**	**747**	**339**
UW3EH	**14**	**128,576**	**321**	**224**
UA3ALE	"	56,485	230	143
UA3QBC	"	15,006	125	82
UA3IDT	"	429	13	11
UA3PBY	7	260	10	10
UA4UBC	**3.5**	**36,380**	**169**	**85**
UA3SAX	**3.5**	**24,528**	**136**	**73**
UA3DRB	"	18,602	120	71
UA3XBB	"	1,404	30	26

BYELORUSSIA

UC2OBZ	**A**	**42,945**	**141**	**105**
UC2LBE	"	11,781	77	63
UC2ACL	"	5,160	70	43
UC2ACI	**28**	**85,008**	**232**	**138**
UC2AFF	"	40,082	160	98
UC2WBL	**21**	**15,720**	**110**	**60**
UC2OBP	**14**	**302,586**	**423**	**282**
UC2OBI	"	101,400	320	200

ESTONIA

UR2RHF	**A**	**95,823**	**225**	**169**
UR2RKB	**28**	**555,360**	**734**	**267**
UR2RAM	"	49,914	154	118
UR2RGJ	"	30,644	115	94
UR2OI	"	75	5	5
UR2RHK	**3.5**	**45,582**	**203**	**107**

KALININGRAD

UA2EC	**A**	**275,725**	**450**	**269**

LATVIA

UQ2GFN	**A**	**2,139,875**	**1851**	**475**
UQ2GCN	**A**	**166,566**	**421**	**213**
UQ2CR	"	109,872	320	168
UQ2MF	"	7,728	60	56
RQ2GGI	**28**	**152,772**	**320**	**174**
UQ2GCL	"	31,680	155	110
RQ2GAI	"	22,989	110	79
UQ2DZ	"	6,248	50	44

LITHUANIA

UP2NK	**A**	**3,716,870**	**2720**	**491**
UP2BAO	**A**	**1,029,665**	**1160**	**403**
UP2PBW	"	448,220	733	307
UP2BIC	"	146,202	362	177
UP2BBF	"	116,406	333	174
UP2PBM	"	89,628	301	154
UP2NO	"	40,524	211	132
UP2PW	"	29,639	210	107
UP2PCK	"	21,631	139	97
UP2BHT	**28**	**153,224**	**307**	**179**
UP2BHI	"	17,537	91	71
UP2BIS	"	6,532	58	46
UP2DM	"	6,028	50	44
UP2PAW	**21**	**298,849**	**560**	**215**
UP2NA	**21**	**116,648**	**278**	**171**
UP2PAP	"	96,118	215	187
UP2AV	"	40,875	176	109
UP2BDX	"	13,536	102	72
UP2PCB	**14**	**233,964**	**600**	**286**
UP2PAE	"	94,620	313	190
UP2PAQ	"	64,170	247	155
UP2BV	"	15,312	132	87
UP2OU	**3.5**	**156,692**	**411**	**172**
UP2BEN	**3.5**	**98,700**	**352**	**141**
UP2BCW	"	75,456	279	131

MOLDAVIA

UO5OCL	**A**	**182,262**	**478**	**222**
UO5OCR	"	26,182	227	106
UO5OEK	**28**	**157,651**	**352**	**181**
UO5OBD	"	2,639	33	29
UO5SA	**7**	**72,072**	**251**	**132**
UO5GR	**3.5**	**8,554**	**78**	**47**

UKRAINE

UT5HP	**A**	**3,051,657**	**2340**	**531**
UB5VAZ	**A**	**1,749,462**	**1674**	**429**
UB5UKO	"	302,232	534	294
UY5TE	"	169,882	502	202
UB5AAL	"	57,855	201	145
UB5WAF	"	37,064	152	113
UB5UBU	"	19,928	112	94
UB5VEG	"	10,496	82	64
UB5HEX	"	8,478	63	54
UB5UKW	"	3,300	34	33
UB5ABY	"	960	23	20
UB5IFN	**28**	**931,224**	**1078**	**322**
UB5ILU	**28**	**539,396**	**729**	**299**
RB5CCO	**28**	**467,483**	**686**	**257**
UT5RY	"	227,509	454	179
UB5EJA	"	152,523	347	189
UB5IPJ	"	126,085	300	167
RB5IGV	"	70,950	220	150
UB5QFJ	"	64,220	188	130
UB5UGD	"	55,454	168	119
UB5MLP	"	36,000	156	100
UB5VCK	"	29,939	125	91
UB5DBV	"	22,344	100	76
UB5VAA	"	12,390	72	59
RB5GCJ	"	9,381	65	53
RB5MAU	"	2,964	42	32
UB5MBZ	**21**	**1,216,060**	**1275**	**410**
UB5ICS	"	109,214	313	203
UB5KAN	**14**	**201,500**	**489**	**250**
UY5YB	**14**	**118,594**	**353**	**197**
UB5GAU	"	68,103	222	161
UB5MIZ	"	62,550	285	150
UB5JK	"	42,255	244	135
UB5MGV	"	37,389	183	121
UB5PS	"	290	11	10
UB5WCW	**7**	**170,328**	**406**	**188**
UB5FDF	"	51,754	180	113
UB5PBA	**1.8**	**5,796**	**68**	**42**

OCEANIA

AUSTRALIA

VK2APK	**A**	**1,072,260**	**1058**	**322**
VK2BQS	"	88,060	208	148
VK6QH	"	290	11	10
VK6NSD	**28**	**296,066**	**581**	**179**
VK6FS	"	27,264	98	96
VK3SM	**14**	**35,748**	**331**	**108**
VK3AKK	**7**	**380,380**	**349**	**190**

FRENCH POLYNESIA

FO8GW	**A**	**292,400**	**577**	**170**

GUAM

AH2L	**A**	**3,507,018**	**2482**	**457**
KB7IJ/KH2	**28**	**4,743,144**	**3181**	**504**
KG6DX	**14**	**2,858,124**	**1880**	**516**

HAWAII

KH6XX	**A**	**6,242,967**	**3876**	**531**
AH6J	"	42,636	149	102
KH6MD	**28**	**2,460,816**	**2023**	**414**

INDONESIA

YB0ACL	**28**	**383,953**	**673**	**197**

NEW ZEALAND

ZL1AAS	**28**	**779,076**	**817**	**323**
ZL4BO	**7**	**375,354**	**358**	**189**

PHILIPPINES

DU1CPL	**28**	**775,170**	**963**	**270**
DU1EFZ	**3.5**	**4,480**	**37**	**20**

SOLOMON IS.

H44SH	**A**	**2,723,592**	**2159**	**401**

SOUTH AMERICA

ARGENTINA

LU5FGG	**A**	**3,054,464**	**2092**	**487**
LU7MAO	"	176,076	280	219
LU4MEE	"	56,628	176	117
LU8FEU	**28**	**2,882,048**	**1901**	**512**
LU1VK	**28**	**973,566**	**914**	**363**

BOLIVIA

CP6EL	**28**	**1,003,746**	**992**	**345**

BRAZIL

PP2ZDD	**A**	**1,936,766**	**1335**	**457**
ZY5CIG	**A**	**1,093,690**	**1034**	**358**
PY3ASN	"	155,868	289	186
ZY1NEZ	"	140,873	265	179
ZY3ZZ	"	30,870	121	90
PY3EM	"	3,234	37	33
PY3AMK	"	2,565	34	27
PP5DT	"	1,020	20	20
PY4KL	**28**	**163,348**	**292**	**194**
PY1BVY	"	21,450	97	78
PY2AJK	**21**	**1,238,674**	**1077**	**386**
PY1BKA	14	3,230	37	34
PY2ED	7	3,550	27	25
ZY5XFR	3.5	2,496	26	24

CHILE

CE6EZ	**28**	**3,621,024**	**2416**	**508**
CE3NR	**21**	**2,058,342**	**1617**	**429**
CE6COR	**3.5**	**30,976**	**159**	**88**

COLUMBIA

K3ZO/HK3	**A**	**31,209**	**122**	**103**
HK5FCI	"	5,676	45	44

EASTER IS.

CE0AE	**28**	**109,428**	**279**	**132**

ECUADOR

HC1EA	**28**	**852,334**	**930**	**322**
HC1HC	**7**	**815,140**	**554**	**265**

NETH. ANTILLES

P42J	**A**	**4,568,652**	**2720**	**556**
		(Opr: W1BIH)		

PERU

OA4AWD	**A**	**3,514,147**	**2065**	**511**
OA4SS	**28**	**502,920**	**669**	**254**

VENEZUELA

YV2AMM	**A**	**5,692,896**	**2812**	**594**
YV1CD	**A**	**1,306,422**	**960**	**351**
YV4BOU	**28**	**76,112**	**187**	**142**
YV3BJL	**21**	**3,965,735**	**2351**	**565**
YV5IHC	"	25,960	103	88
YV3AZC	**7**	**1,478,576**	**749**	**341**
YV5EUX	**7**	**1,287,384**	**769**	**291**
YV2IF	"	489,654	424	198
YV4ABR	"	9,102	47	41
YV3BQS	**3.5**	**699,300**	**567**	**210**

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

KJ9W	**6,168,450**	**3559**	**697**
AI6V	**5,775,330**	**3437**	**605**
N4WW	**5,427,385**	**3244**	**701**
K4VX/8	**3,812,872**	**2452**	**592**
KG5U	**3,683,125**	**2268**	**625**
K2BA/4	3,628,368	2299	592
AC3A	**3,617,880**	**2399**	**584**
KK5I	3,331,973	2466	589
KJ9D	2,836,416	2074	528
W9LT	2,834,528	1985	566
AB2L	**2,820,147**	**2083**	**561**
K3ZJ	2,722,031	1934	533
NC6T	2,636,285	2338	515
AB6R	2,518,992	1937	476
WB9GGD	2,149,564	1733	502
KI2P	2,071,552	1766	544
KG1D	**1,951,409**	**1646**	**487**
AK0A	1,920,190	1531	530
KB2MG	1,856,471	1511	491
AD1O	1,826,214	1554	507
KC5DX	1,736,378	1618	511
KI3C	1,496,838	1333	471
W60WQ	1,204,438	1354	337
KV5Q	1,170,769	1630	467
NR4S	1,134,466	1126	458
AC6I	1,044,605	1080	401
KQ2O	975,348	941	396
KD4RH	907,327	968	383
KM0R	755,540	868	370
K07T	**522,928**	**602**	**392**
NG6P	451,560	722	284
AC6H	413,568	709	288
WD6GFF	287,310	552	314
KM0E	284,088	493	266
N1BMS	249,936	416	246
WD6EIW	111,166	293	163
KA8HDR	**56,126**	**187**	**133**
WV2ZOW	42,256	213	139

NORTH AMERICA

VP2EC	**11,808,137**	**6138**	**719**
VE1DXA	**8,272,704**	**4285**	**704**
XK5XK	**7,788,599**	**4401**	**637**
VE7WJ	**5,734,416**	**3425**	**579**
VE3PCA	**5,463,913**	**2844**	**619**
WL7E	**5,255,619**	**3555**	**537**
XK5GF	3,536,460	2409	540
VE7UBC	2,558,007	2129	459
VE5XZ	589,248	710	288

AFRICA

4K1A	**1,769,042**	**1579**	**382**

ASIA

4X2BYB	**6,754,010**	**3764**	**618**
JH7YJF	**5,388,888**	**3260**	**604**
JA9YBA	**5,356,857**	**3069**	**599**
JA7YAA	3,788,778	2494	526
JH3YJM	2,341,118	1698	459
JA1YNE	1,949,020	1565	460
4Z4EC	1,752,520	1400	440
JA0ZAV	599,760	651	315
JA7YDX	76,172	198	122

EUROPE

HG6V	**7,992,720**	**4161**	**720**
F8OP	**7,243,530**	**4501**	**595**
PA2TMS	**6,091,159**	**3182**	**713**
SL8ZG	**5,938,515**	**3392**	**645**
HG5A	5,377,905	3308	585
OH2AA	**5,037,508**	**3386**	**557**
ED3VM	**4,862,604**	**3446**	**628**
OK1KSO	**4,741,958**	**2998**	**542**
ED7TH	4,532,892	3255	569
LG5LG	**4,252,755**	**2861**	**579**
YU3DBC	**3,820,281**	**2633**	**471**
G4LAB/p	**3,380,044**	**2763**	**491**
G8JC	3,137,300	2514	458
DL8UE	**3,063,445**	**2341**	**511**
I8KWX	**3,056,872**	**2333**	**494**
HA4KYN	2,453,500	2009	500
GW4BRS	**2,402,288**	**1997**	**482**
HA0KLE	1,966,824	1813	463
SK0LM	1,935,342	1620	474
DF0AJ/p	1,866,880	2002	320
HB9BLQ	**1,430,052**	**1425**	**412**
IT9WPO	**1,159,383**	**1502**	**381**
HA9KPU	1,110,740	1221	395
ON6RM	**1,020,996**	**1174**	**359**
EI7DJ	**1,002,588**	**1133**	**402**
DF2AO	992,664	965	408
Y33ZB	**966,345**	**1130**	**345**
HA3KNA	925,336	1085	376
YU7AJD	807,030	953	366
F8WE	733,900	1037	358
HA2KRZ	622,050	955	325
Y55ZG	608,260	934	340
LA2Y	606,671	1121	299
OK3KII	555,363	830	307
HA5KDB	533,200	875	344
OZ5EDR	**459,489**	**614**	**291**
OK1KUR/p	441,099	803	279
LA5RO	409,266	823	297
HA5KHE	390,050	645	290

HA8KAX	335,233	640	281
LZ13C	**334,685**	**823**	**271**
YU3CYZ	322,224	658	274
HA5KKN	316,239	503	231
HG1KZC	257,890	465	205
HA5KKB	225,616	459	236
SL7CA	178,190	395	206
GM4GRC	**153,712**	**347**	**208**
Y57ZD	118,146	440	174
OK1KYS	101,536	240	167
OK1KZD/p	65,660	298	140
YO6KNT	57,023	193	127
SK2IV	56,100	187	132
OK2KYC	42,240	154	110
OH8TA	40,984	146	72
YU4CBC	21,624	110	106
OK1KMP	17,205	150	93
ED3SFG	12,283	118	71
YU1RA	6,796	48	46
OK1KIR	6,210	61	45
OK2KVI	612	20	18

OCEANIA

P29PS	**4,410,480**	**3104**	**470**
ZL8AEO	**3,106,766**	**2151**	**494**
ZL2AH	1,728,000	1576	375

SOUTH AMERICA

ZY5EG	**8,005,824**	**3900**	**656**
YV3IUP	**4,261,644**	**2845**	**516**
PP5CIT	1,459,529	1299	379
PU8ZBJ	481,915	593	281

U.S.S.R.
CLUB STATIONS

ASIA

UK8QAA	**7,264,872**	**4625**	**642**
UK9AAN	**4,833,634**	**2597**	**598**
UK7PAL	**4,822,870**	**2945**	**598**
EM8C	**4,487,184**	**3347**	**564**
UK8AMM	4,456,792	3360	538
UK9FER	2,956,983	2084	489
UK7BAL	1,393,528	1356	373
UK9YAZ	909,359	1039	361
UK8AAS	**816,304**	**1032**	**326**
UK8FAD	735,750	1603	270
UK8SAV	573,276	854	303
UA9YEW	327,834	671	234
UK7NAQ	184,960	368	160
UK8KAB	80,934	314	141
UK9FEN	55,811	179	119
UK9XBD	10,140	80	52
UK9XAN	5,628	48	42
UK8MAA	3,042	44	26
UK9WAN	2,040	36	30

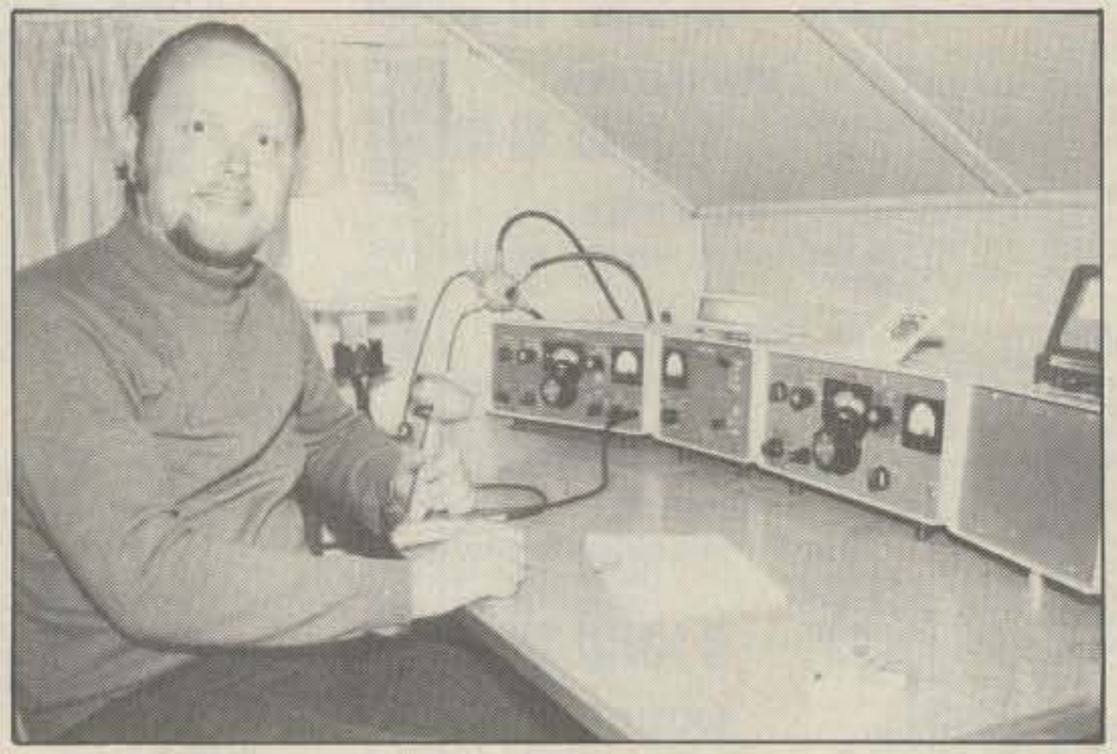
EUROPE

R6L	**9,286,800**	**5452**	**710**
UK6APA	**7,312,760**	**4049**	**686**
UK2BBB	**6,345,570**	**3458**	**670**
UK2PCR	5,752,592	3473	596
UK2RDX	**5,743,652**	**3448**	**596**
UK2GKW	**5,736,794**	**3617**	**581**
UK5MAF	**5,517,600**	**3333**	**627**
UK2GBL	4,486,768	2926	572
UK2PAP	3,733,960	2541	554
UK5UDX	3,386,350	2523	517
UK6LAA	3,296,140	2591	580
UK2GAB	2,706,660	2185	495
UK6XAA	2,020,389	2148	483
UK5GKW	1,657,865	1636	473
UK4HAL	1,571,760	1713	444
UK2RAW	1,524,862	1560	421
UK5QBE	1,456,484	1520	428
UK4WAB	1,341,570	1461	454
UK3DAH	1,238,736	1413	393
UK5QAV	1,176,186	1289	426
UK4ABZ	998,191	1147	421
UK3DBG	984,504	1332	381
UK2BCC	881,475	979	365
UK3ABO	870,100	1104	385
UK1NAD	**864,600**	**1304**	**393**
UK5OAA	**670,320**	**1013**	**360**
UK2RAQ	489,300	738	300
UK5FAA	484,056	764	324
UK5EFW	420,420	729	286
UK1ZBB	408,340	780	340
UK3QBW	386,022	741	294
UK4UAL	323,536	797	277
UK4ACE	323,056	658	254
UK5FAD	321,030	620	290
UK2WAF	**268,888**	**480**	**244**
UK3DBV	261,360	600	270
UK3AAH	227,734	528	247
UK5AAA	216,405	507	229
UK1AAW	194,040	647	396
UK6LTG	194,010	400	223
UK2AAF	166,242	382	206
UK6APP	139,944	395	204
UK5IBM	133,292	348	188
UK5ICX	127,764	335	189
UK2BCE	108,225	300	185
UK3QAA	93,795	287	169
UK5HAB	83,524	258	157
UK2PRC	80,712	262	171
UK3MBJ	65,136	248	138
UK5WBG	43,927	144	109
UK4FAX	31,605	176	129
UK5UBE	16,544	119	88
UK3ABI	15,288	122	104
UK3RCO	4,018	61	49
UK5JDF	2,002	28	26

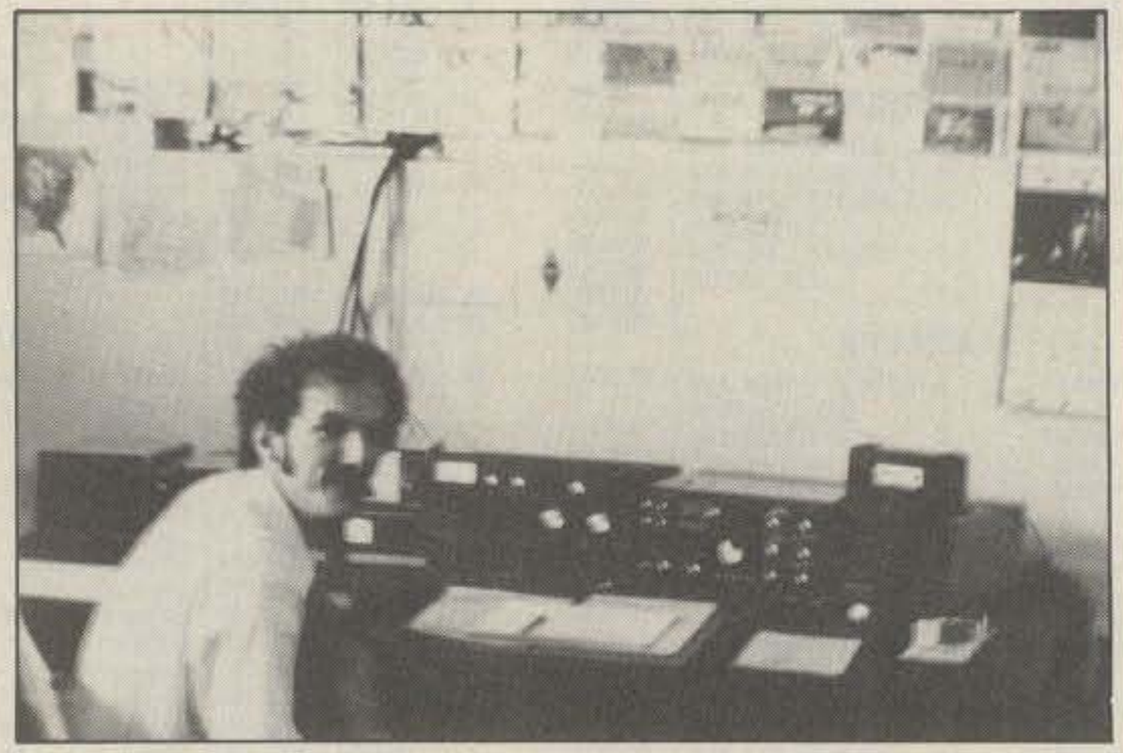
MULTI-OPERATOR
MULTI-TRANSMITTER
WORLD WIDE

NP4A	**24,065,600**	**9762**	**890**
KL7RA	**14,633,290**	**7491**	**745**
KL7IRT	11,963,854	6170	707
KN6M	**11,756,580**	**6483**	**660**
AD8R	**8,417,208**	**4786**	**751**
VE7ZZZ	**8,252,657**	**4791**	**659**
KQ8M	8,123,136	4875	768
UK5IBB	**6,743,943**	**4094**	**681**
VK2ERT	**6,398,495**	**3492**	**563**
UK4FAV	**4,108,817**	**2814**	**577**
4N8SM	**3,779,963**	**3212**	**621**

CHECK LOGS: The following logs were used for cross-checking. Check logs & SWL logs are always appreciated. Thank you. EA3AVX, EA7AGL, EZ5PAA, EZ0DAA, G3DOG, JE4ADO, K4GNE, K6FM, KE6PK, KF3J, KI1G, KV4AA, LA1H, LA7NY, LA9OI, LA9PW, N9AG, OD5LX, OK1MYN, OK1PCL, OZ1CCB, PA0RRS, PI1PT, RB5PAW, RA0CDM, SM5ARL, SM5BDV, SM5LL, SM7NJJ, SM0CMH, UA1DJ, UA3AHA, UA4NAA, UA6ALL, UA6HFO, UA9XWU, UK2FAA, UK3DBW, UK3SAP, UK3QAE, UK3WAF, UK3XAB, UK4NBM, UK4PNZ, UK5PAA, UK6HCZ, UK9FFF, UK9OAE, UL7BAZ, UN1CC, UW3RR, W1PM, Y22TO, Y26SO, Y27DL, Y27GL, Y31YE, Y57SM, Y78WN, YU7AD, and SWL Stations OK1-22522 and Y2-7684/E.



A WPX contester for many years, Ralf, CE6EZ, is top 28 MHz from South America and world second place.



U.S.A. 7th District, 28 MHz certificate award winner is Michael, WB7FDQ.

WORLD TOP SCORES
SINGLE OPERATOR

ALL BAND

Y24UK	**6,285,436**	**P42J**	**4,568,652**
KH6XX	6,242,967	VP2MGQ	4,421,995
YV2AMM	5,692,896	IO6FLD	4,394,490
YU3EY	**5,315,520**	4U1ITU	4,303,572
VE6OU	**5,253,399**	**AB0I**	**4,107,378**
GB4DX	5,222,725	K7RI	4,062,252
IV3PRK	4,727,823	4X1X	3,932,586

SINGLE BAND

28 MHz

KB7IJ/KH2	**4,743,144**
CE6EZ	3,621,024
N5AU	**3,094,249**
CN8CY	2,947,811
KG1E	2,587,680
KH6MD	2,460,816
JF1EEK	**2,441,226**

21 MHz

AI7B	**4,151,232**
YV3BJL	**3,965,735**
VE3BMV	**3,690,450**
YU3VM	**2,683,980**
KM5R	2,627,857
NI6G	2,479,297
LZ2CC	2,263,850

14 MHz

KG6DX	2,858,124
4X4UH	2,288,646
K8NA	2,252,688
EL2AV	1,720,456
FC9UC	1,712,304
OH1IG	1,702,768
CT4NH	1,515,852

7 MHz

DJ4PT	**1,692,480**
FG0DYM/FS	**1,497,096**
YV3AZC	1,478,576
YV3EUX	1,287,384
I6NOA	1,104,312
SM0GMG/CT3	1,021,592
N6RO	**881,886**

3.5 MHz

YV3BQS	699,300
K0CS/VP9	679,098
YU3APR	658,722
HI8GB	452,760
SM7DLZ	327,012
KO6G	282,864
OK7MM	258,300

1.8 MHz

VE3BBN	**24,522**
W8LRL	16,576
K2BQ	10,192
DJ6QT	5,978
UB5PBA	5,796
W3BGN	4,488
AA4MM	4,368

QRPp

W8ILC	**AB**	**1,044,012**	N3KZ	14	81,012
AG3H	AB	424,320	YO9CUF/3	7	264
RA9UAD	28	283,731	VE3CKR	3.5	51,512
JK1RJQ	21	70,290	UC2ODD	1.8	598

MULTI-OPERATOR
SINGLE TRANSMITTER

VP2EC	**11,808,137**	UK0QAA	7,264,872
R6L	9,286,800	F8OP	7,243,530
VE1DXA	8,272,704	4X2BYB	6,754,010
ZY5EG	8,005,824	UK2BBB	6,345,570
HG6V	7,992,720	KJ9W	6,168,450
XK5XK	7,788,599	PA2TMS	6,091,159
UK6APA	7,312,760	SL0ZG	5,938,515

MULTI-TRANSMITTER

NP4A	**24,065,600**	**KN6M**	**11,756,580**
KL7RA	14,633,290	AD8R	8,417,208
KL7IRT	11,963,854	VE7ZZZ	8,252,657

STATION OPERATORS
MULTI-OPERATOR SINGLE-TRANSMITTER

KJ9W & K9GL, K9HMB, WB9TIY, KB0RC. **AI6V** & N6KT, N6TV, WA6VEF. **N4WW** & N4SA, NX4N. **K4VX/0** & KM9D, N9NB, N9NC. **KG5U** & K5GN, KN5H. **K2BA/4** & KB8MF, N8II. **AC3A** & N3AMK, W3GM. **KK5I** & K5JZN, N5CG, N5DWY, K7CW, WB0TKJ. **KJ9D** & KK9V, W9OBF. **W9LT** & KB9PT. **AB2L** & WB1AFZ, KA2IEZ, KA2JMP, KT2H, N2ALK, WA2EOW, WA2MYU, Rich. **K3ZJ** & KB3RM, N4CFI. **NC6T** & NF6H, N7NR. **AB6R** & KA6FZN, NC6U, N6AW, W6HT, WA6LFF. **WB9GGD** & K9RX, KA9AKZ.

KI2P & KA2CDE, KA2KJQ, KF2X, KG2Y, N2HR, N6IN, DK9PO. **KG1D** & K1NYK, KA1VC. **AK8A** & K0RWL, K0VBU, KM0L, N0AJI, N0CLV. **KB2MG** & KA2MNJ, KA2DLK, N2AZM, W2LVZ, WA2PVV, WA2UYY, WA2YDG, WB2KEX. **AD1C** & KA1BJH, KA1EVH. **KC5DX** & KA5KPO, KA5KSS. **KI3C** & K3FD, K3LR, WD8PUH. **W6OWQ** & K6CSL, N6AUV, N6BV. **KV5Q** & KB5CA, WB5YJN. **NR4S** & NE4G. **AC6I** & N6ADI, WB6TNB, WD5JEA. **KQ2O** & K2BK. **KD4RH** & WA4DZG, N6AV. **KM8R** & KM0P, W0HBH. **KO7T** & KD7T, KI7I, N7ALS. **NG6P** & KD4NL, N6DUF, N6EXW, N6FOR, WB7SND, N9PI.

AC6H & KB6BP, W6IBR, W6JI, W6LEN, W6TSE. **WD6GFF** & KA6RJK. **KM8E** & KA0GNA, KM0L, N0CCX, WB0VHN. **N1BMS** & K1ZZJ, KA1ERC, KA1UE, KG1K. **WD6EIW** & N6ESV. **KA8HDR** & WD8NOP. **WV2ZOW** & K2MF. **VP2EC:** KC5EA & N5AU. **VE1DXA:** VE1AIH, VE1CEG, VE1FH, VE1MX, VE1YX. **XK5XK:** VE5DX, VE5RG, VE5XK. **VE7WJ** & VE7ZG, VE7ZZ/N7ZZ, N7AKQ, W7XN, W7ZR. **VE3PCA:** VE3CRG, VE3CXL, VE3KKB, VE3MHI, VE2ZP. **WL7E:** AL7H, KL7EC, KL7HNU. NL7P.

XK5GF: VE5ACM, VE5ADA, VE5AEJ, VE5GF, VE5MC. **VE7UBC:** VE7BRU, VE7CMK, VE7CXC, VE7CXN, VE7DES. **VE5XZ** & VE5BBN. **4K1A:** 4K1HK/UA3HK, UW3EU, UA0CEY, UA0QDB, UA1-144-7/4K1, Yuri. **4X2BYB:** 4Z4HF, 4Z4LF, G3UML. **JH7YJF:** JA7DWU, JH7LRS, JH7NHE. **JA9YBA:** JA9LJI, JA9LNJ, JA9LWB, JA9OTX, JH0CAZ, JH0HHU. **JA7YAA:** JG1IGW, JH7CUO, JH7GFO, JH7HWR, JH7RVD, JH7UJN, JH7WTC, JR7OMD. **JH3YJM:** JA3BAG, JA3HVC, JA3IXL, JA3MMQ, JA3QGI, JA3XGF, JE3CJZ, JH3FJG, JH3QKV, JR3EOI. **JA1YNE:** JA1CG, JA1CAJ, JA1FO, JA1OCG, JA1QXY, JA1VNA, JE1IIN, JE1TSD, JF1OKX, JH1TFL, JH1XOX, JK1NSR, JR1BAL, JR1QQG, JR7ASY.

4Z4EC: 4Z4TR, 4X4-1401, 3 Ops. **JA8ZAN:** JA0OSV, JA0RUG, JA0TEN, JA0VHI. **JA7YDX:** JE7NLA, JH7THS, JR7UHG. **HG6V:** 6 Ops. **F8OP** & F6BDN, F6CTT, F6EPY. **PA2TMS** & NL6398, PA2161. **SL8ZG:** SM0AJU, SM0DJZ. **HG5A:** HA5FM, HA5FN, HA5GF, HA5HO, HA5JI, HA5LN, HA5LZ, HA5MK, HA5OM, HA7RY & 1 Op. **OH2AA:** OH2BAZ, OH2BNP, OH2BQS, OH2BWN. **HA5KKC/7:** HA5MO, HA5VM, HA5WE.

ED3VM: EA3AON, EA3BAT, EA3CBD, EA3LI, EA3NI, EA3NJ, EA3VM. **OK1KSO:** Club Gp. **ED7TH:** EA7AZJ, EA7CEC, EA7CFW, EA7TH, EA7WC, EC7ATF. **LG5LG:** LA1PBA, LA4DCA, LA6EV, LA8UU, LA8WY, LA9HW. **YU3DBC:** YU3TFY, YU3TOR, YU3TPZ. **G4LAB/p:** G4IAQ, G4IAR, G4EOF, G4GEE, G4MMQ. **G8JC:** G3RMF, G3TQZ, G3TWD, G4FWR, G4KTW, G4LUB, G4MKO, G4NEC, G4NMR, G6CMV, G6FOF, G8ASO, G8NSL, G8NWR, G8TIC, G8XGG. **DL8UE:** DF3AV, DJ5FT, DL3LU, DL7BI. **I8KWX** & I0FLY, I0SNY, I0UBZ, I0UZF. **HA4KYN:** 4 Ops.

GW4BRS: GW3ZIY, GW4DZE, GW4JOG, GW4LFV, GW4MOZ, GW6CJJ. **HA8KLE:** 6 Ops. **SK8LM:** SM0CXU, SM0DRD, SM0FSK. **DF8AJ/p:** Club Gp. **HB9BLQ** & HB9CIP. **IT9WPO** & IT9AUA, IT9QHW, IT9RYJ, IT9UJU. **HA9KPU:** 4 Ops. **ON6RM:** ON5AW, ON5CC, ON6XN. **EI7DJ:** EI3BK, EI3EC, EI3EG, EI6AK, EI6BA, EI8AU, EI8DK. **DF2AO** & DK8KW, DL8AAE. **Y33ZB** & Y33XB. **HA3KNA:** HA3NS, HA3NU, & 1 Op. **YU7AJD:** YU7MCL, YU7ORS, YU7PXX, & 3 Ops. **F8WE** & F6CUN, F6KKW. **HA2KRZ:** 6 Ops. **Y23ZG** & Y55UG, Y55XG.

LA2Y: LA1HZ, LA3FX, LA3IX. **OK3KII:** OK3CEI & Club Gp. **HA5KDB:** HA5TI, HA5WF, Laci. **OZ5EDR:** OZ1BHA, OZ1BMA, OZ1CCM, OZ1CKG, OZ1EDE, OZ1EMW, OZ1EYZ, OZ1EZB, OZ1FOD, OZ3QN. **OK1KUR/p:** OK1AET & Club Gp. **LA5RO:** LA9XBA, LA9YBA. **HA5KHE:** 3 Ops. **HA8KAX:** HA8BT & 1 Op. **LZ13C:** 3 Ops. **YU5CYZ:** Club Gp. **HA5KKN:** HA5KN & 3 Ops. **HG1KZC:** 6 Ops. **HA5KKB:** HA5KB, HA5PS, HA7UW. **SL7CA:** SM7DRQ & SM7GXP. **GM4GRC:** GM3YOR, GM4EJI, GM4HBG, GM4LYQ, GM8ZTV. **Y57ZD** & Y57WD.

OK1KYS: OK1DEY, OK1FRF. **OK1KZD/p:** OK1DHJ & Club Gp. **YO6KNT:** YO6AHP & YO6AZL. **SK2IV:** SM2CDF & SM2AGJ. **OK2KYC:** Club Gp. **OH8TA:** OH8LB & OH8MC. **YU4CBC:** Club Gp. **OK1KMP:** 2 Ops. **ED3SFG:** EA3BOX, EA3CVA. **YU1RA** & YU1OZS. **OK1KIR:** Club Gp. **OK2KVI:** 2 Ops. **P29PS** & P29KK, P29NPL, P29NYL. **ZL8AEO** & WB8WMS, ZL1AXB. **ZL2AH** & ZL2ACW, ZL2AOE, ZL2IR. **ZY5EG:** PY2BW, PP5CT, PY5ALP, PY5CA, PY5EG. **YV3IUP:** SP3GEM, YV1ACQ, YV2COC, YV3ADQ, YV3ADR, YV3BNB, YV3BQG.

PP5CIT: PP5ABY, PP5AJ, PP5CAD, PP5HF, PP5JA, PP5MQ, PP5WAL, PP5WAQ, PP5WAS, PP5CAX, PP5DT, PY2DDZ. **PU8ZBJ:** PY8ZBJ, SM6APO, SM7DZZ. **UK8QAA:** UA0QAS, UA0QBB, UA0QCA, UA0-09874. **UK9AAN:** UA9AEN, UA9AIS, UA9AJD, UL7LEZ, UA9-1541099, UA9-1651288. **UK7PAL:** UL7PAE, UL7PBY, UL7PCZ, UL7PEZ, UL7-023158, UL7-023202, UL7-023349. **EM8C:** UA0CAF, UA0CBO, UA0CBR, UA0CBW, UA0CCD, UA0CCO, UA0CCR, UA0CCW, UA0CDM, UA0CDT, UA0CFT, UA0CFX, UA0-110300.

UK8AMM: UA0AAA, UA0AAK, UA0AAL, UA0ACQ, UA0AJX, UA0-103267. **UK9FER:** UA9FAJ, UA9FAL, UA9FAR, UA9FDA, UA9FDW, UA9FGJ. **UK7BAL:** 3 Ops. **UK9YAZ:** 3 Ops. **UK8AAS:** UA6LYJ, UI8AFU, UI8-053800, **UK8FAD:** 5 Ops. **UK8SAV:** 3 Ops. **UA9YEW:** 2 Ops. **UK7NAQ:** UL7NAC, UL7NAJ, UL7NCF. **UK8KAB:** UA0IZ, UA4-13321/UA0. **UK9FEN:** 3 Ops. **UK9XBD:** 2 Ops. **UK9XAN:** UA9-090426, UA9-090445, UA9-090484. **UK8MAA:** Club Gp.

UK9WAN: 2 Ops. **R6L:** UA6LHK, UA6LIG, UA6LO, UA6NX, UA6-150262, UA6-151060. **UK6APA:** UA6APP, UA6APW, UA6AQJ, UA6ARA. **UK2BBB:** UP2BAS, UP2BAV, UP2BAW, UP2BBB, UP2BIJ, UP2-038938, UP2-0381039, UP2-0381052, UP2-0381053. **UK2PCR:** UP2BBT, UP2BCR, UP2BCT, UP2BDF, UP2BFI, UP2BFL, UP2BIO, UP2PAV, UP2PCI, UP2-038728. **UK2RDX:** UR2QD, UR2RNA, UR2RNJ, UR2RRJ, UR2-083159, UR2-083160. **UK2GKW:** UQ2GKN, UQ2OI, UQ2-03783. **UK5MAF:** UY5LK, RB5MUV, UB5MDC, UB5MJX, UB5MNX, UB5MNY, UB5MOA.

UK2GBL: UQ2ON, UQ2-037134, UQ2-037218. **UK2PAP:** UP2OX, UP2BIL, UA4LAL/UP2. **UK5UDX:** UB5RCA, UB5UAL, UB5XCM, UB5-0652, UB5-065734. **UK6LAA:** UA6LBQ, UA6LCT, UA6LD, UA6LDX, UA6LFA, UA6LGX, UW6LZ, UW6MW. **UK2GAB:** 4 Ops. **UK6XAA:** 8 Ops. **UK5GKW:** 6 Ops. **UK4HAL:** Club Gp. **UK2RAW:** UR2RMZ, UR2-083129. **UK5QBE:** Club Gp. **UK4WAB:** 4 Ops. **UK3DAH:** 3 Ops. **UK5QAV:** 4 Ops. **UK4ABZ:** UA4AKL, UA4-156732, UB5-0671253. **UK3DBG:** 4 Ops. **UK2BCC:** UP2BDW, UP2BHK, UP2BJK, UP2-038346, UP2-0381656. **UK3ABO:** Club Gp.

UK1NAD: UA1NBF, UA1NBO, UA1NCF, UN1-088334. **UK5OAA:** 7 Ops. **UK2RAQ:** 4 Ops. **UK5FAA:** 3 Ops. **UK5EFW:** 3 Ops. **UK1ZBB:** UA1ZCM, RA4AOS, UA1-143176. **UK3QBW:** UA3QKZ, UA3QOQ, EZ3QAU. **UK4UAL:** UA4UAB, UA4UBG, UA4UBW. **UK4ACE:** 3 Ops. **UK5FAD:** UB5FDG, UB5-070466, UB5-070467. **UK2WAF:** 3 Ops. **UK3DBV:** UA3DFO, UA3-1421762, UA3-1421771. **UK3AAH:** UA3AAZ, UA3DLT, UA0ACE, UA3-170523, UA3-170385, UA3-170905.

UK5AAA: 3 Ops. **UK1AAW:** UA1-1691843, UA1-1692008, UA1-1692023. **UK6LTG:** UA6-150331, UA6-150621, UA6-150628. **UK2AAF:** UC2AHL, UC2AHR, UC2AIA. **UK6APP:** UA6ARX, EZ6ACB, EZ6ADW. **UK5IBM:** UB5ITU, UB5-0731512. **UK5ICX:** 3 Ops. **UK2BCE:** 3 Ops. **UK3QAA:** UA3QIX, EZ3QCE, UA3-1212086. **UK5HAB:** UB5HFG, UB5-07173. **UK2PRC:** UP2BBM, UP2BDG. **UK3MBJ:** 3 Ops. **UK5WBG:** Club Gp. **UK4FAX:** UA4-148144, UA4-148415, UA4-148416. **UK5UBE:** UB5UBE, UB5-0652083, UB5-0652085. **UK3ABI:** 2 Ops. **UK3RCO:** EZ3RBX, EZ3RCR. **UK5JDF:** 2 Ops.

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NP4A & KP4BO, KP4BZ, KP4CC, KP4EC, KP4EQF, KP4O, KP4P, K0OO, N4KE, N4TO, NP4AT, NP4AZ, NP4DU, WP4CBB. **KL7RA** & AL7AF, AL7CG, AL7CQ, KL7RN, KL7UN, KL7Y, NL7V. **KL7IRT** & AL7AK, AL7Z, KL7AG, KL7GL, KL7LF, KL7R, NL7L, W7BJV, WL7AKS. **KN6M** & JH3DPB, N6BPL, N6PO, W6SZN. **AD8R** & AC8W, AJ8K, K8DD, K8LX, K8QKY, KE8B, WA8TBQ, WA8YVR. **VE7ZZZ:** VE7ARQ, VE7ENI, VE7ENF, VE7ENS, VE7EOC, VE7EOH, VE7EON, VE7EOW, VE7EPZ, VE7SK, VE7VX, VY1DD.

KQ8M & K8DB, K8NZ, K8US, KA8JCI, N8ATR, N8BTT, N8DMM, W8CAR, W8GBE, WB8DQP, WD8IJP & 2 Assists. **UK5IBB:** UB5IJK, UB5ILD, UB5IML, UB5IOK, UB5IQS. **VK2ERT:** VK2BLC, VK2BXQ, VK2DDC, VK2DDQ, VK2DGX, VK2DNN, VK2DVU, VK2ERB, VK2PBX, VK2VSK. **UK4FAV:** UA4FBL, UA4FCM, UA4FDY. **4N8SM:** 12 Ops.

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K7RI	4,062,252	AK1A	2,501,136
K2SS	3,272,922	KM6B	2,261,457
AI9J	3,078,640	N1GL/4	1,815,696
KC1F	3,007,760	KO8T	1,741,977

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28 MHz		21 MHz	
N5AU	**3,094,249**	**AI7B**	**4,151,232**
KG1E	2,587,680	KM5R	2,627,859
KD4FX	1,904,352	NI6G	2,479,297
NU4Y	1,702,194	KC3N	1,138,632
AA4VK	1,583,023	KC7EH	900,240
WB7FDQ	1,427,268	KR8K	643,720

14 MHz		7 MHz	
K8NA	2,252,688	**N6RO**	**881,886**
N7DF	1,114,528	KM5X	543,382
K1NG	837,704	N5JJ	532,656
K6TMB	663,143	K7UR	482,448
W7FP	354,750	AG9S	232,776
W2MYA	289,602	KC8JH	172,608

3.8 MHz		1.8 MHz	
KO6G	282,864	W8LRL	16,576
K6HNZ	198,380	K2BQ	10,192
KA3R	55,706	W3BGN	4,488
K5BZU	52,052	AA4MM	4,368
WA4FBH	49,170	WD9AHJ	3,564
N1BMV	33,792	K5UR	3,264

QRPp

W8ILC	**AB**	**1,044,012**	WD8IDD	28	142,208
AG3H	AB	424,320	KA5N	21	2,688
K5FUV	AB	348,335	N3KZ	14	81,012

MULTI-OPERATOR SINGLE TRANSMITTER

KJ9W	6,168,450	KG5U	3,683,125
AI6V	5,775,330	K2BA/4	3,628,368
N4WW	5,427,385	AC3A	3,617,880
K4VX/0	3,812,872	KK5I	3,331,973

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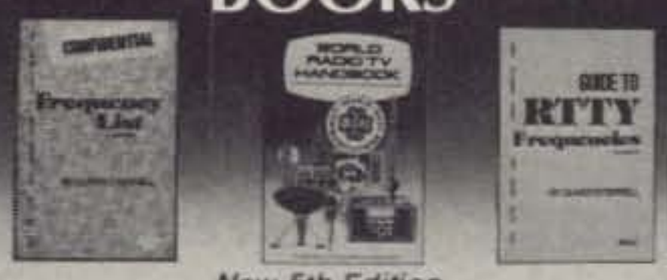

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Independent Dot & Dash (Full) Weighting	Yes	Yes	Yes
Calibrated Speed, 1 WPM Resolution	Yes	Yes	Yes
Calibrated Beacon Mode	Yes	N/A	No
Repeat Message Mode	Yes	N/A	Yes
Front Panel Variable Monitor Frequency	Yes	Yes	Yes
Message Resume After Paddle Interrupt	Yes	N/A	Yes
Semi-Automatic (Bug) Mode	Yes	Yes	Yes
Real-Time Memory Loading Mode	Yes	N/A	Yes
Automatic Word Space Memory Load	Yes	N/A	Yes
Instant Start From Memory	Yes	N/A	Yes
Message Editing	Yes	N/A	Yes
Automatic Stepped Variable Speed	No	No	Yes
2 Presettable Speeds, Instant Recall	No	No	Yes
Automatic Trainer Speed Increase	Yes	Yes	N/A
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CIRCLE 34 ON READER SERVICE CARD

CQ Reviews:

The MFJ-989 Versa-Tuner V Antenna Tuner

BY JOHN J. SCHULTZ*, W4FA

Everyone probably has his or her own reactions when receiving a new piece of equipment, ranging from prolonged admiration of the appearance of a unit to rushing to put it into operation—often without thoroughly reading the operating instructions. I have fallen into the habit of first wanting to see what a unit looks like inside. So, off come the covers and I go probing around the "innards." Admittedly, this approach is subject to a lot of criticism since one basically should do *nothing* with any piece of equipment until the basic instruction sheets or manual furnished with a unit have been read and understood. With many types of equipment one can seriously damage interior components if a prescribed disassembly procedure is not followed. Fortunately, in the case of relatively straight-forward gear, such as an antenna tuner, this is not usually the case.

Anyway, taking off the top cover of the top-of-the-line MFJ-989 Versa-Tuner V, one is immediately impressed by the quality of the components and the sturdy construction. The variable capacitors are wide-spaced 6 kv types, and the roller inductor is a 36μh type using 14-gauge plated wire with a silver-plated roller contact. The main components are mounted on a type of sub-chassis so the wiring between the front-panel meter and meter switching and the s.w.r/power-sensing circuitry on the rear panel of the unit can be run under the sub-chassis and shielded from the main r.f. components. The top and bottom covers fit snugly, and there is proper bare metal to bare metal contact where it should be for shield bonding purposes. All the little things, such as not skimping on the use of lockwashers and good hardware, are evident.

The most impressive feature from a visual evaluation was the straight-forward r.f. wiring. There is none of the rather circumvent wiring seen in some tuners. Apparently, MFJ gave quite a bit of thought to component placement for good, straight-forward wiring (including getting away from the idea that the inductor control "must" be in the center of the front panel). The overall result is that of a quite sensible component layout where the available space is well utilized without having the components crowded together—and that is in a design that is quite compact for its power handling level.

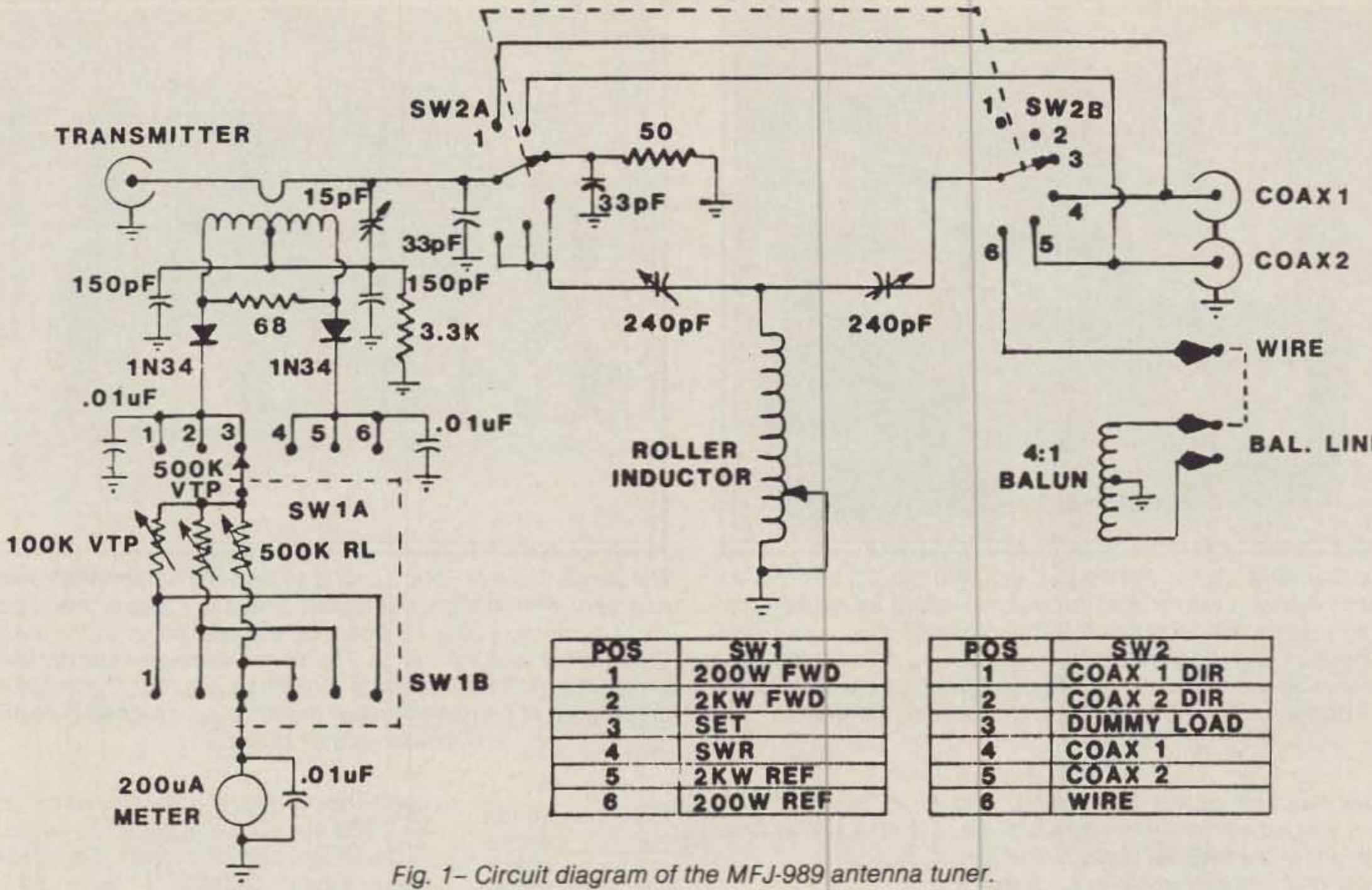
The MFJ-989 front panel measures only about 10½" × 4½" for a 3 kw tuner! The roller inductor rotates a full 99 turns with its setting indicated on two digits of the three-digit front-panel counter. The meter used is particularly large and clear, and note the scale expansion for the lower power levels (e.g., from "0" to the "10" watt marker). A tilt bale can raise the front panel of the unit, if desired.

The size of the unit, by the way, is about 10½" × 4¾" × 14½". It is not a "small" unit if you see it next to a 100 watt class transceiver, but for its power class it must have just about the most compact front-panel dimensions (4¾" × 10½") of any tuner on the market. These front-panel dimensions are impressive when one actually uses the unit as part of a group of equipment. It takes up a minimum amount of "operating" space when one wants to keep a high-power station reasonably compact and the tuning controls for all the equipment involved within a short arm's reach for quick adjustments. Its appearance is also rather "sharp," with a black front panel and raised, brushed-aluminum lettering.

The circuitry of the MFJ-989 is shown in fig. 1. As with most MFJ tuners, a conventional T-network design is used. However, since a roller inductor is used instead of a tapped inductor, all three arms of the network are continuously variable. The 250 pF capacitors/36μh inductor dimensions provide enough range such that the tuner can handle most conventional antenna loads from 160–10 meters *continuously* (including, of course, the new WARC bands). It, therefore, is useful on any of the h.f. MARS frequencies, as well as for commercial applications, although the latter usage is not covered under the tuner's warranty.

Balanced antenna loads are handled by routing the output of the tuner to a 4:1 toroid core balun. The input/output switching is arranged so one can select either a built-in 50 ohm/300 watt dummy load, one of two coaxial outputs either through the tuner or direct, and a single wire/balanced line output. The 50 ohm internal dummy load, by the way, is intended primarily for use with tube-type transceivers so their tuning controls can first be adjusted and then left alone as one proceeds to adjusting the tuner controls and then the tuning controls on a linear amplifier (when the latter is being used).

*c/o CQ Magazine



POS	SW1
1	200W FWD
2	2KW FWD
3	SET
4	SWR
5	2KW REF
6	200W REF

POS	SW2
1	COAX 1 DIR
2	COAX 2 DIR
3	DUMMY LOAD
4	COAX 1
5	COAX 2
6	WIRE

Fig. 1– Circuit diagram of the MFJ-989 antenna tuner.

The derating curve for the dummy load is 300 watts for 30 seconds and 100 watts for 1.5 minutes. As indicated on the diagram, a back-panel jumper must be installed, depending upon whether one uses a single wire or balanced-line output. Although it is not indicated in the diagram, one can also have the option of a bypass routing when using the single-wire/balanced-line output as long as one of the coax outputs is not being used. A jumper between the unused coax output connector and the "single-wire" terminal will do the trick nicely.

Complete s.w.r./power metering is provided using circuitry built around a line current sampling transformer wound on a toroid core. The circuitry provides either for conventional s.w.r. measurement (where the meter switch must be placed to **Set**, the **SWR Set** control adjusted for full-scale meter deflection, and the meter switch returned to the **SWR** position) or for pre-calibrated power ranges of 0–200 or 0–2,000 watts forward or reflected. One might think at first that the reflected power ranges should be much lower than those of the forward power ranges. But, the sensitivity of the pickup circuitry for lower power levels makes this unnecessary and somewhat simplifies the circuitry.

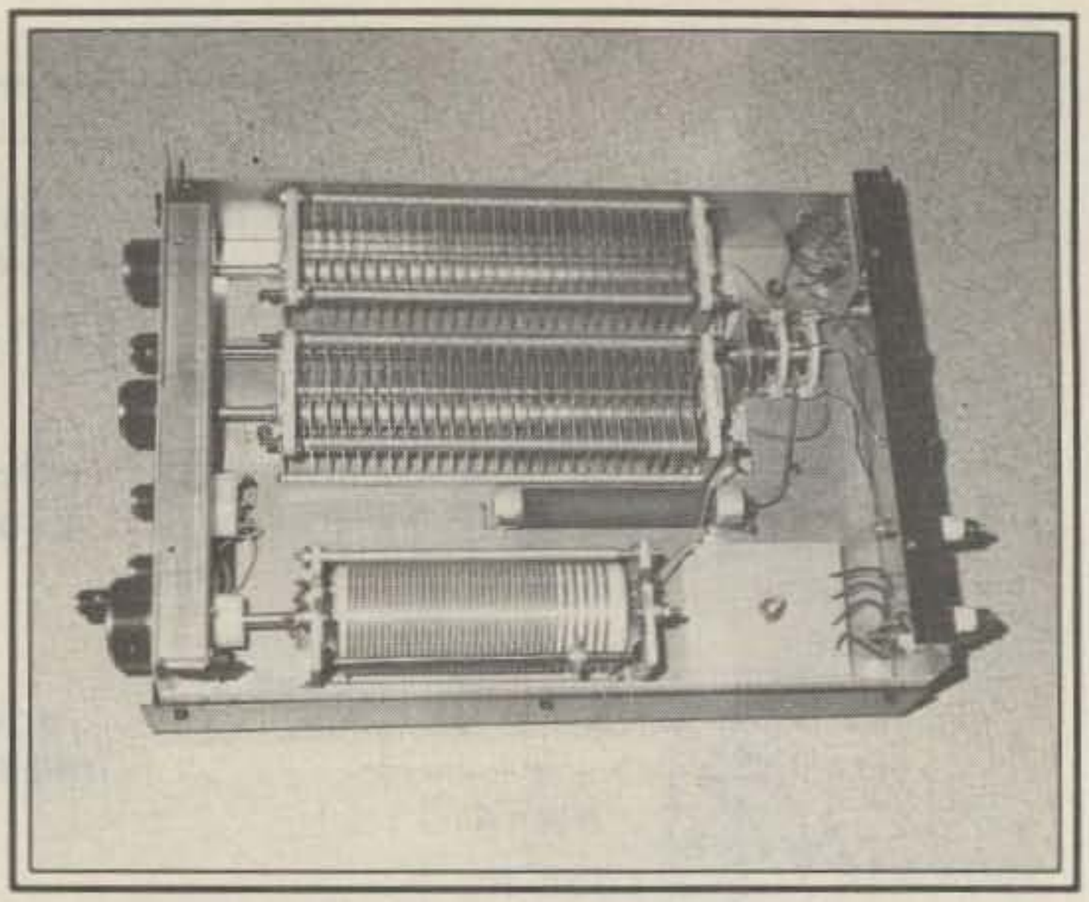
For instance, one can see on the meter face (which is particularly large and easy to read) that the 0–200 watt range has an expanded scale at the lower power levels and a compressed one at the higher power levels. In this case, the non-linearity of the power scale has a distinct advantage. One can easily read low power levels down to a few watts in the reflected power position on the 0–200 watt scale. This allows for quite precise low s.w.r. tuning using low power when initially adjusting the tuner. The compression at the upper end of the power scale allows for a quick indication of whether any *significant* power output increase is achieved when one "touches-up" final tuning on a tube-type transceiver or linear for maximum power output.

The tuner was tried using an SB-220 linear and a multi-band coaxial feed antenna and a multi-band balanced wire feed antenna. The tuner is rated to handle 3 kw PEP r.f. output power, and of course, an unmodified SB-220 will not reach that power level. Nonetheless, if the MFJ-989 could perform well with the SB-220, it was felt that such performance would be indicative of that obtainable with almost any legal-limit amateur linear. The performance of the MFJ-989 was indeed good. Tuning was easy, and no signs of component overheating or arc-over took place on any band used (limited to 80–10 meters in this case at the 2 kw PEP input level). Some rough measurements which could be made indicated that the insertion loss of the tuner was far less than a fraction of a dB. The power scales on the MFJ-989 were checked against some commercial-grade equipment and fell well within the ±2% tolerance claimed, which is rather good and more than adequate for any amateur use.

The only negative impression had to do with the rotation of the **Transmitter** and **Antenna** tuning knobs. The knobs are placed on their shafts such that the capacitors have a maximum capacitance at **1** and a minimum at **6**. This apparently was done so the capacitors would have the same sense of rotation as that of the roller inductor knob where the inductance increases as the knob is rotated counterclockwise. In the case of the roller inductor knob the sense of rotation wasn't considered important since one always had the turns counter to watch to judge whether the inductance was being increased or decreased. But, I never could get a feel for the "reverse" capacitor rotation. The cure, of course, was simple and almost instant. The set screws on the capacitor knobs were loosened and the knob simply rotated 180° so **1** indicated *minimum* capacitance and **6** *maximum* capacitance.

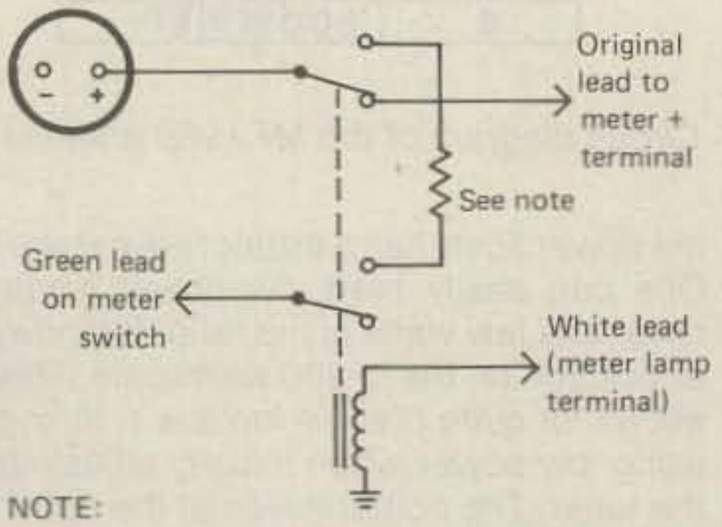
Over a period of time I noticed that to "tune-up" I invariably would place the tuner's meter switch in the 0–200 watt reflected-power range position and then gradually increase the transmitter power output level as the tuning controls on the tuner were adjusted for minimum reflected power. The meter switch was then changed to the forward 0–200 watt position for "barefoot" operation or to the 0–2,000 watt position for tune-up/operation of a linear. The s.w.r. scale was, in fact, never used, since by using the calibrated power scales for tune-up, I felt that I got a far better grasp on where a trans-

This rear view shows the coaxial input/output connectors as well as the heavy-duty feed-through insulators for single-wire/balanced-line connections. A 9–12 volt input jack is provided for backlighting the front-panel meter, but, as noted in the text, can also be used to control a relay which can be installed to automatically switch meter ranges during "tune up."



The inside of the MFJ-989 sports some hefty components within a very well thought-out layout. The s.w.r./power measurement circuitry is on a PC board on the rear panel to the left of the antenna selector switch. The switch itself uses two paralled wired wafers for a 9 ampere handling capacity. The balun incorporated is behind the roller inductor sandwiched between two insulator boards.

mitter's output power was going, and there was no necessity to fiddle with adjustment of the **SWR Set** control. The sensitivity of the power scale is such that it thoroughly suffices for tune-up using either an exciter alone or with a linear.



NOTE:
Approximately 20.5KΩ (measure resistance between brown and orange leads on meter switch, with switch not in "1" or "6" position and duplicate value).

Fig. 2– Wiring modifications for relay switching of the meter scale to simplify tune-up. Only wiring which is changed is shown. The relay can be any small 9–12 volt, d.p.d.t. type.

To slightly simplify the tune-up process, my MFJ-989 was modified to equip it with a relay controlled by the tune-mode selector switch in the transceiver being used so the MFJ-989 meter was automatically set on the 0–200 watt reflected scale during tune-up. A small crystal-can relay was used and fastened on top of the meter housing in the MFJ-989. The back-up light jack in the MFJ-989 was used to supply power to the relay, and this sort of had the added bonus that the meter back-up light came on during tune-up to alert me to the fact that the meter scale had been switched. This modification was not a major thing, but has proved very useful over a period of time to save on another one of those knob-twisting/meter-switching manipulations required during tune-ups. The wiring modifications for the MFJ-989 are shown in fig. 2.

One might ask, by the way, if one really needs a tuner capable of handling 3 kw output if one doesn't use such a power level. Of course, one can't "outgrow" such a tuner as one changes the power level used in a station, but one has to balance that against the economics of purchasing a high-power tuner. On the other hand, there is a school of thought that says one should use the heftiest tuner possible at any power level to reduce power losses in the tuner. The best I can objectively judge is that the latter point of view does have some validity if one is trying to match into an antenna system which normally would present an s.w.r. of at least 1:3 or *more* to a transmitter. The MFJ-989 is, of course, only one of a whole series of MFJ "Versa-Tuners." One might also want to examine the features of other models in the series to optimize the trade-off's between features and cost for a tuner to be used in one's own specific station situation.

All in all, the MFJ-989 turned out to be a very fine piece of equipment, and it should provide any user with excellent service for a number of years. About the only failure that one could probably imagine taking place over an extended period of time is deterioration of the rubber drive belt coupling the inductor shaft to the turns counter. However, that part is easily field-replaceable. The instruction sheets which come with the unit present a number of installation and operating hints and some suggestions for initial operating adjustments. It carries a complete 12-month warranty, and there is the excellent MFJ 30-day moneyback trial period on the product. Who could ask for more?

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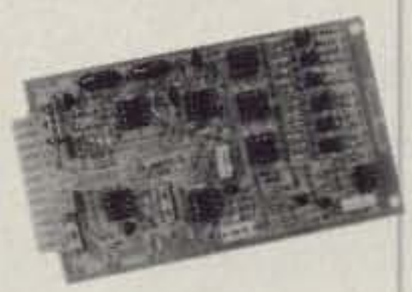

DM-170

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CIRCLE 57 ON READER SERVICE CARD

W2JTP comes up with another great workbench project. This workbench supply is versatile enough to power most of your breadboarding needs.

A Workbench Low-Voltage Power Supply

BY BYRON H. KRETZMAN*, W2JTP

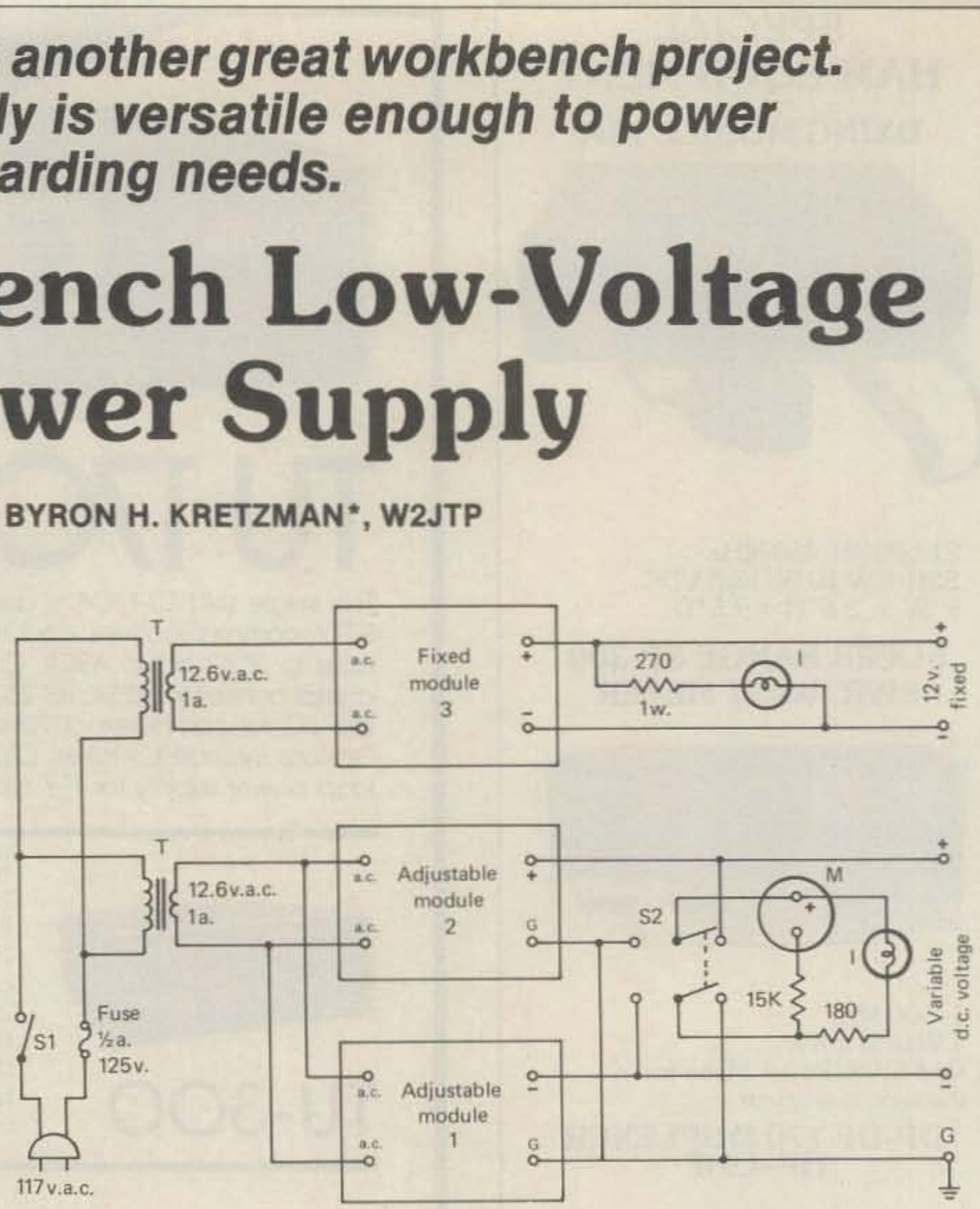
Every solid-state project gotten into the last few years has resulted in the breadboarding of a power supply to fit the requirements of the moment. It seemed that every new project required yet another breadboarding of a power supply. So, it was decided to build a power supply for the workbench which could take care of just about all requirements.

Since some integrated circuits (IC's) require a negative as well as a positive supply—such as ± 5 volts, ± 9 volts, or ± 12 volts—two regulated, adjustable voltage-supply modules were built into a box. To facilitate adjustment and checking of the desired voltages, a 0–15 volt meter was mounted on the front panel with a switch to enable measurement of either supply. Because panel-mounted controls have a habit of being accidentally moved, the voltage-adjust pots were left inside the box, one on each power-supply module. They are set once for the project underway, and then left alone. The output of each adjustable supply module is fused with a 0.5 amp fuse, also inside the box, although each supply can provide up to 1.0 amps. (The philosophy is that if a fuse blows, you had better find out why before replacing it.) The common (center) of the two voltages provided is grounded as shown in fig. 1.

A third regulated power-supply module, using a separate transformer, provides fixed 12 volts d.c. brought to two panel binding posts so that either plus or minus can be grounded as desired. The output of this supply is fused with a 1.0 amp fuse, although the supply can provide up to 1.5 amps if necessary. As with the other two modules, the fuse is on the module inside the box for the same reason (see fig. 3).

Fig. 1 is a diagram of the power-supply box. Most of the components can be obtained from Radio Shack stores or from Cortlandt Electronics, 86 West Broadway, New York, NY 10007. The two

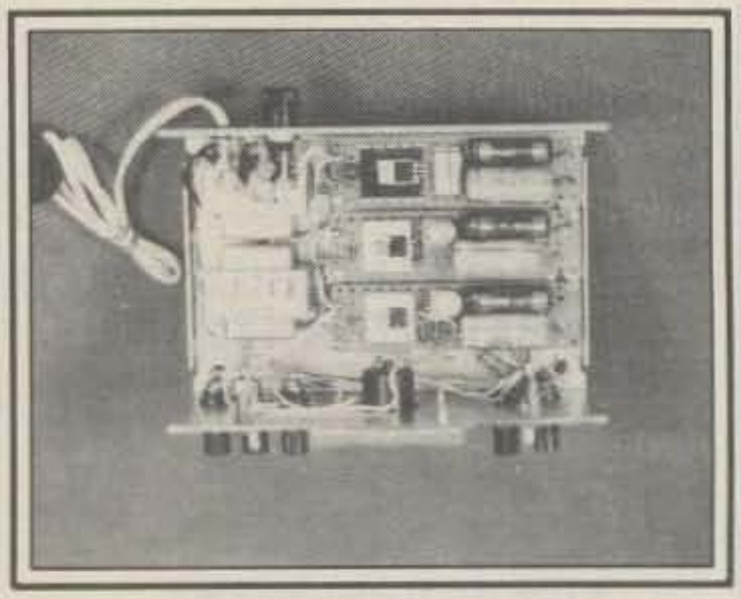
*431 Woodbury Road, Huntington, NY 11743



LEGEND:
I = Muralite #L10/20, 10v. = 20mA.
M = Meter, 0-15v.d.c. Radio Shack #270-1754 (15K resistor supplied with meter).
T = 12.6v. @ 1.0a. or Radio Shack #273-1505.
S1 = Switch, miniature SPST, Radio Shack #275-324.
S2 = Switch, miniature DPDT, Radio Shack #275-1546.

Fig. 1– Diagram of the workbench LV power supply.

The workbench LV power supply.

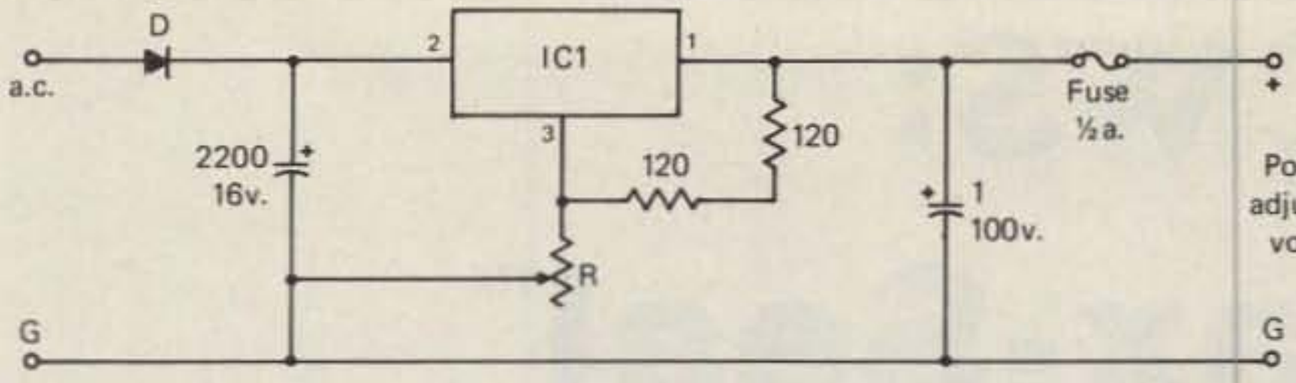


Inside the workbench LV power supply.

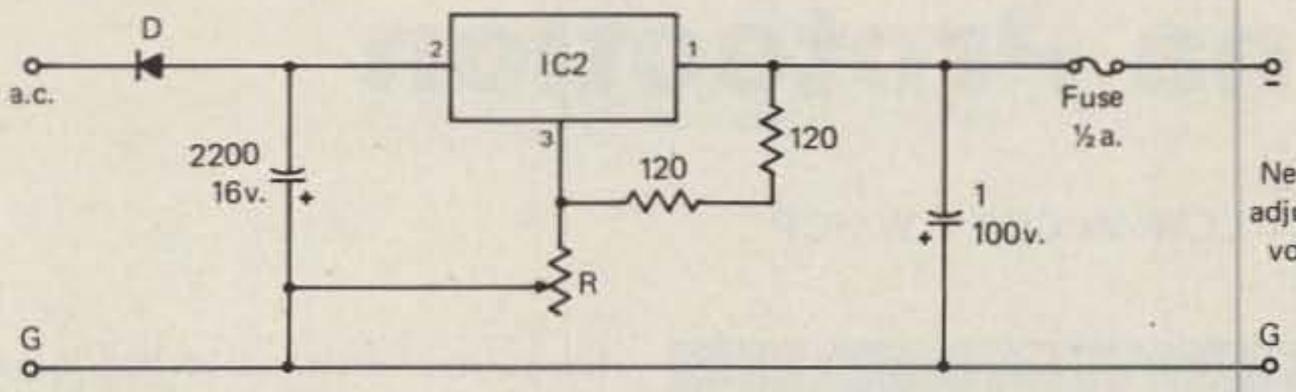
"P-48" transformers were obtained from the latter. Two Radio Shack #273-1505 transformers could be substituted.

Note that only one transformer supplies a.c. to both the positive (#2) and the negative (#1) modules, with one side grounded. This saving of a transformer is accomplished by using a half-wave diode rectifier in each supply module. (Don't throw up your hands at this. The hum is less than 0.001 volts r.m.s. at the terminals, which is about 80 dB below 9 volts.) If you used full-wave bridge rectifiers, you would need *two* transformers.

The power supply is built into a 3½" × 7⅛" × 5$^{11}/_{16}$" metal cabinet (Radio Shack #270-269). The primary fuse, 0.5A 125V, is in a panel-mount fuse post (Radio



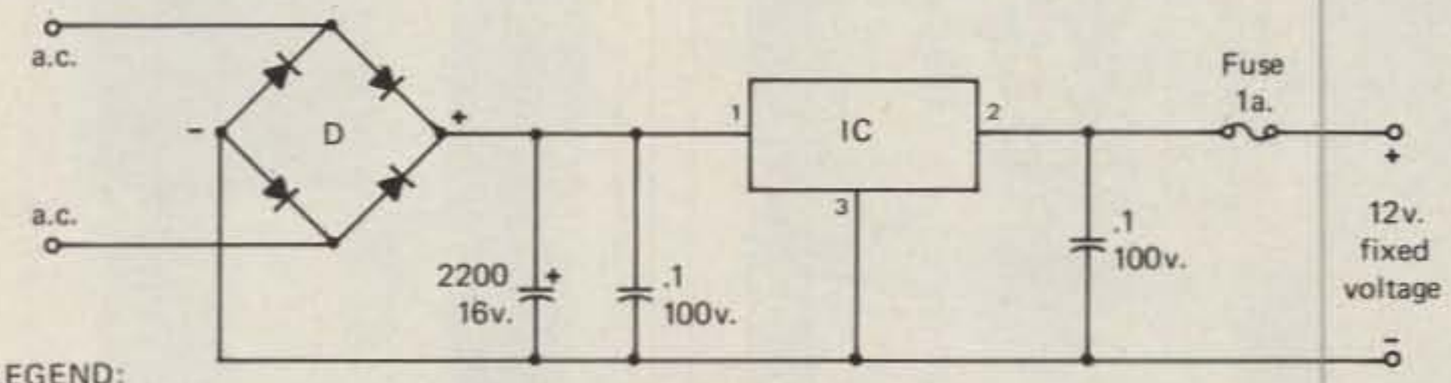
ADJUSTABLE MODULE 1



ADJUSTABLE MODULE 2

LEGEND:
R = 5K PC potentiometer, Radio Shack #271-217.
D = 1a. 50PIV diode, Radio Shack #276-1101
IC1 = LM317T, Radio Shack #276-1777
IC2 = LM337T, Radio Shack #276-1779.

Fig. 2– Schematic diagram, adjustable voltage modules.

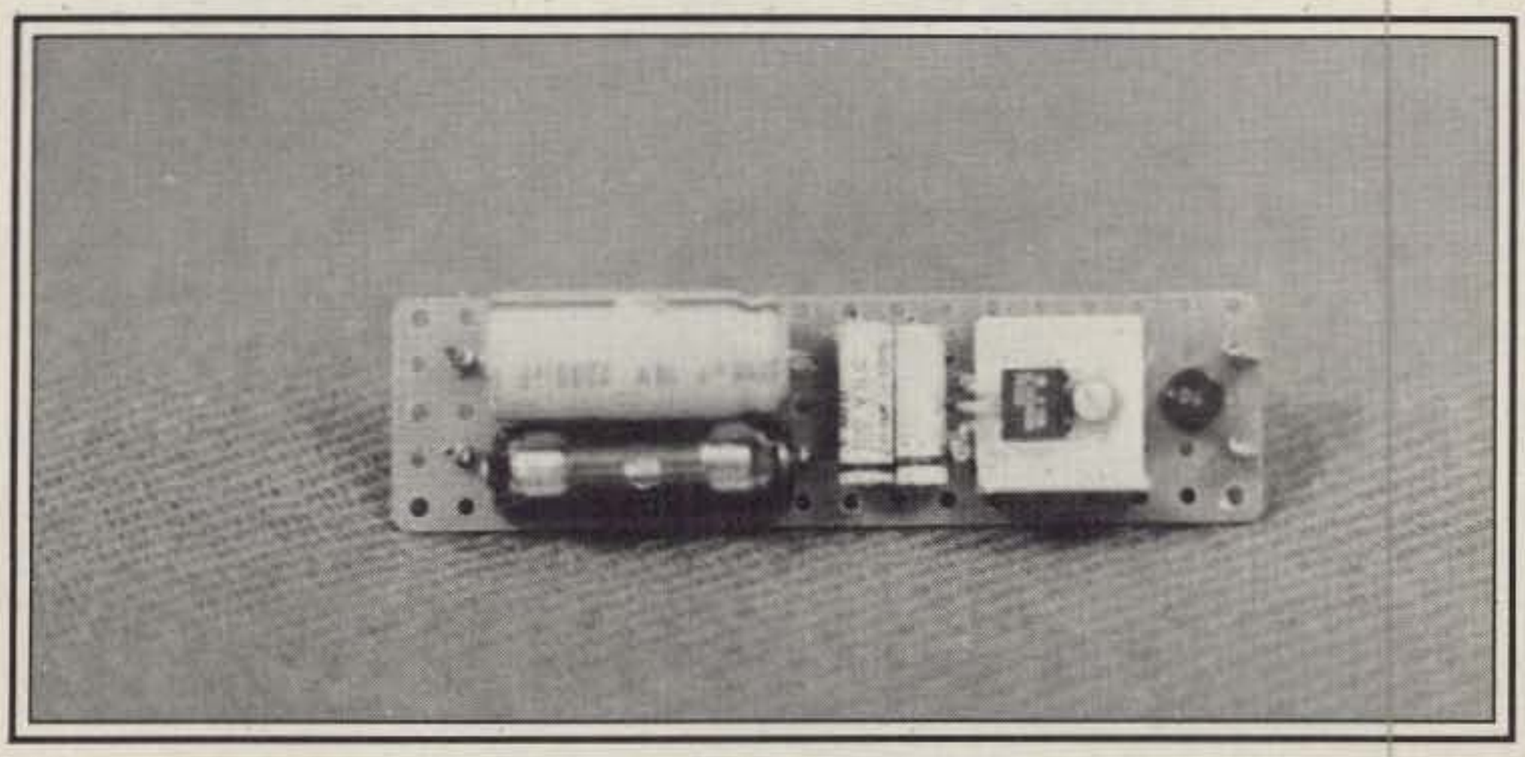


LEGEND:
D = Bridge rectifier, 1.4a. 50PIV, Radio Shack #276-1151.
IC = LM7812, Radio Shack #276-1771.

Fig. 3– Schematic diagram, fixed voltage module.

Shack #270-364) on the back panel. The a.c. cord is brought out through a grommet, also on the back panel. Note that one side of the line is bypassed to the chassis by a 0.1 mF 200 volt mylar capacitor. The binding posts on the front panel can be Radio Shack #274-662.

Each power supply module, except for the transformer, is built on a 1″×5″ piece of bakelite Vector "peg-board." PC board material, without the foil, can also be used. While the fixed 12 volt supply (#3) used a Radio Shack #276-1363 heat sink, a simple heat sink made from a couple of pieces of scrap aluminum angle could have been used as it was for the other two modules. In all three, however, be sure to use a silicone heat-sink grease (such as the Radio Shack #276-1372) in mounting each IC to the heat sink. The fuse holder on each module is a Radio Shack #270-739. The main filter capacitors (2300 mF at 16 volts) were obtained from Cortlandt Electronics. Radio Shack #272-1020 (2200 mF at 35 volts) can also be used.



A fixed voltage module.

CQ Reviews:

Coax-Seal™ Antenna Protection

BY LEW McCOY*, W1ICP

At the Dayton Hamvention last year I visited the Universal Electronics booth, and they had a rather interesting and also revealing exhibit. The exhibit consisted of a small transmitter, a Bird Wattmeter, a fish tank with water in it, and a dummy load. There were two coax lines running from the wattmeter to the dummy load via a switching arrangement. The two lines ran under the water in the tank. PL-259 coax connectors were immersed in the water and the lines were joined via female units. One line was not protected against the water, and the other line and its fittings were covered by Coax-Seal™, a product Universal was selling. The idea was that the Coax-Seal™ kept out the moisture, preventing high-power losses through the fittings because of mismatches created by the moisture. When the lines were switched to the protected versus the unprotected, the losses shown by the unprotected fitting were unbelievable! It almost looked like a carnival come-on.

Many amateurs don't realize that losses, particularly at v.h.f., can skyrocket if coax is allowed to become contaminated by moisture or corrosion. Or, as Ed Tilton, W1HDQ, the Dean of V.H.F., pointed out on many occasions, poorly made coax fittings can add as much as 5 to 10 decibels of loss!

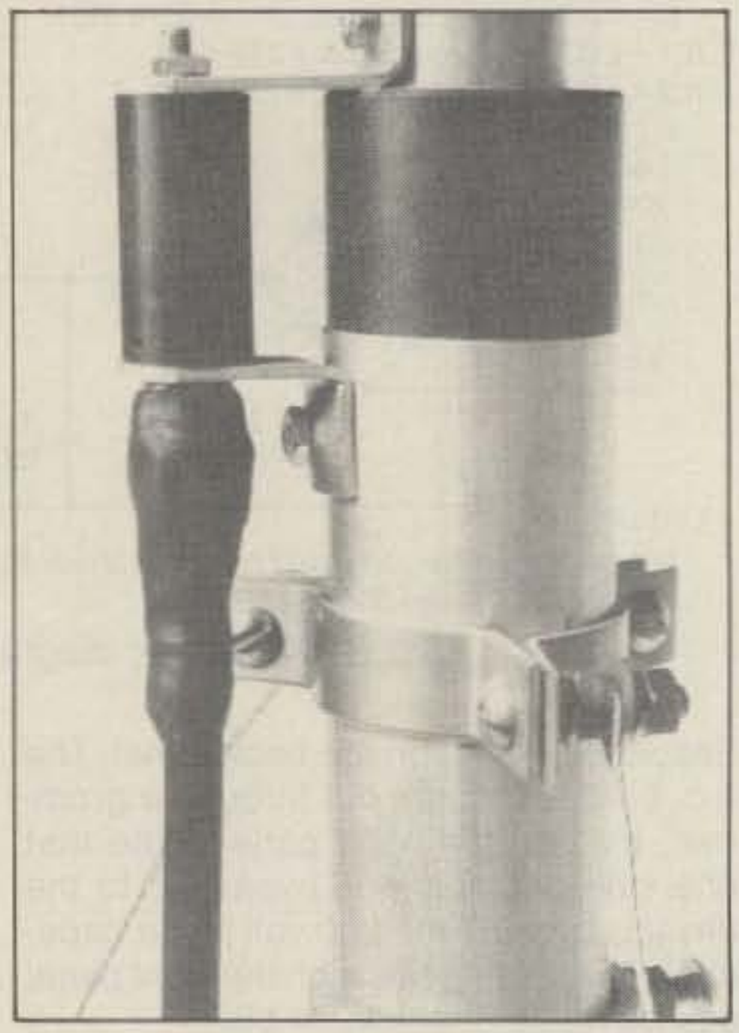
In any case, if you plan to join coax fittings where they may be exposed to any moisture, dampness, etc., then we can recommend the Coax-Seal™ product. Coax-Seal™ is a pliable, plastic material that can be wound over coax fittings or soldered connections (feed lines) of any shape or size. The material provides a long-lasting, flexible, waterproof, and dustproof seal. The manufacturer states that it will stay flexible from −25° to 350°F (−32° to 177°C). The material will maintain its seal regardless of the movement of the coax. It adheres to poly easily. Also, it can be removed and reinstalled if desired.

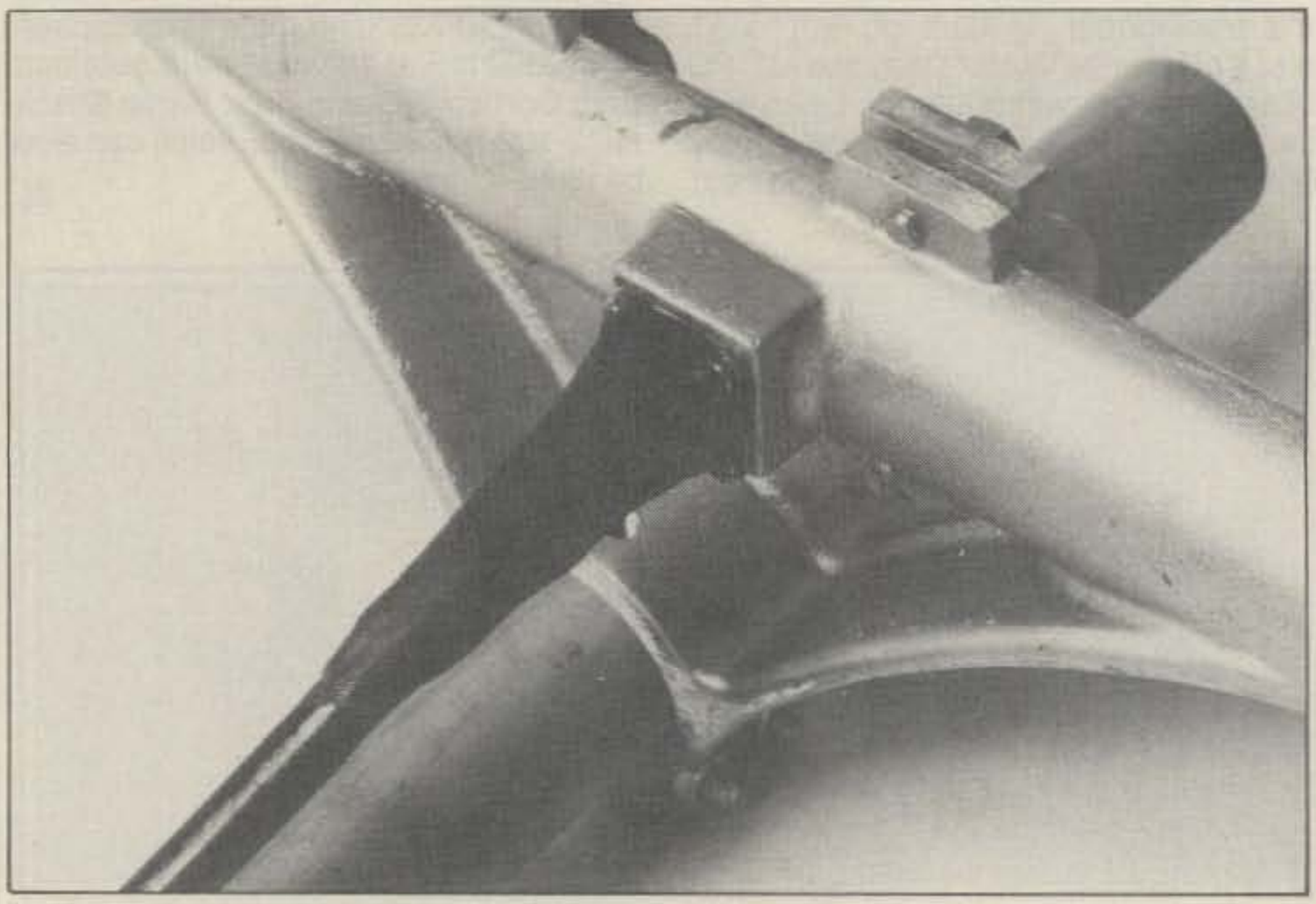
For more information, contact Universal Electronics, Inc., 1280 Aida Dr., Reynoldsburg, Ohio 43068.

*200 Idaho St., Silver City, NM 88061

Coax-Seal™ antenna protection coating.

This shows the typical vertical installation with its feed point. The Coax-Seal™ provides excellent moisture protection for a normally wet-point fitting.





The driven element of a beam with its feed point adequately protected.

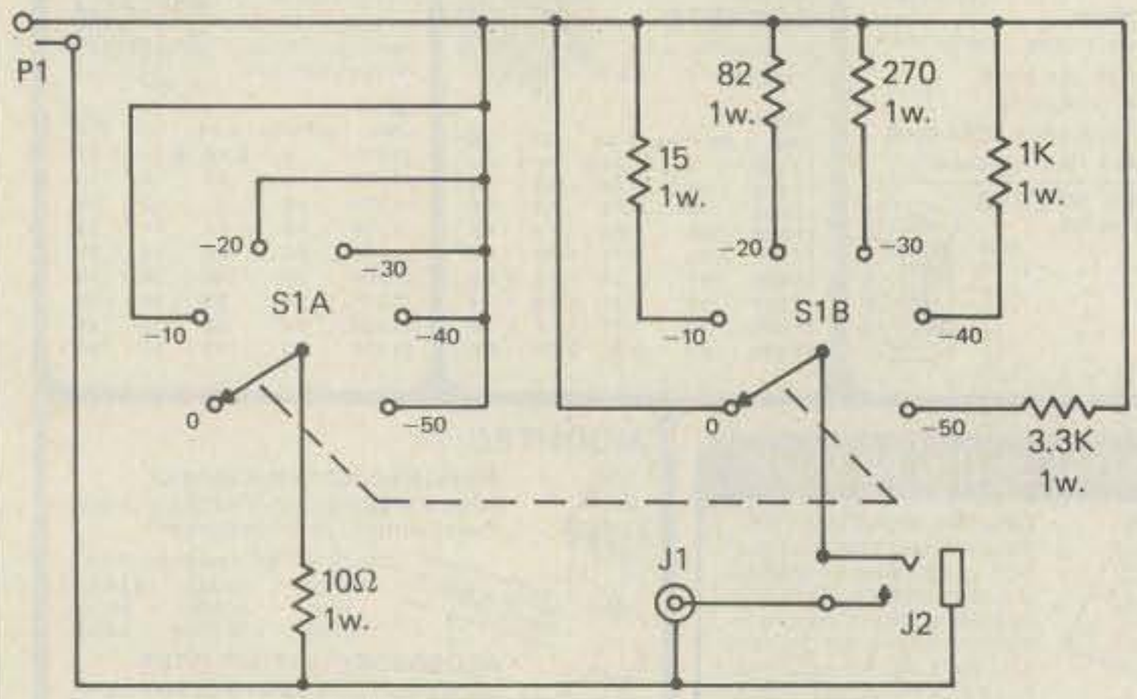
K2SE comes up with another interesting project for the shack. It's a great one-evening project that you can build for a few bucks that will get years of use.

AN OUTBOARD VOLUME CONTROL FOR YOUR RECEIVER

BY ED SOLOV*, K2SE

Recently, when I replaced my venerable old high-impedance headphones with a new pair of 8 ohm jobs, I learned why the manufacturer of my rig recommended high-impedance phones in the first place. With the new phones everything was way too loud. Attempting to lower the volume with the audio gain control resulted in all kinds of unpleasant hum and a side-tone that was loud enough to knock the "cans" off my ears. The hum resulted from the fact that the audio gain (or volume) control is two audio stages up from the output and does nothing to reduce the hum and noise originating in the final two stages.

What was needed was a way to reduce the audio output level after the final stage of amplification—outboard of the rig. That would reduce the hum in proportion to the signal. It had to be done while maintaining a low-impedance load (in the neighborhood of 8 ohms for my tube-type rig and for most other tube and solid-state receivers) for the receiver to drive. To ignore this constraint would result in severe audio distortion. (For a solid state rig, damage to the final audio amplifier could also result.)



S1 = 2-pole 6-position switch (Radio Shack 275-1386).
P1 = Suitable plug to mate with speaker jack on the rig.
J1 = Same type of jack as on the rig—mates with P1.
J2 = ¼-inch closed-circuit phone jack (Radio Shack 274-255).

Fig. 1– Schematic of the outboard volume control.

The simple circuit of fig. 1 does the job nicely and at very low cost—about $5. It provides two other advantages: it provides a place to plug-in the headphones where they completely cut off the speaker (the headphone jack in my rig simply puts the phones in series with the speaker); and it allows me to adjust the side-tone volume somewhat independently of the signal volume. The 10 ohm resistor assures the existence of a suitable low-impedance load for the output stage in all attenuating positions. Actually, the resulting load impedance varies from about 7 ohms in the −10 dB position to very close to 10 ohms in the −50 dB position. This range of load resistances should make any 8 ohm amplifier happy.

Resistor Value (ohms)	Attenuation (dB)	Resistor Value (ohms)	Attenuation (dB)
10	8.0	470	34.7
15*	9.8	560	36.2
22	11.8	680	37.8
27	12.9	1000*	41.1
33	14.1	1.2K	42.7
47	16.5	1.5K	44.6
68	19.1	1.8K	46.2
82*	20.5	2.2K	47.9
100	22.0	3.3K*	51.4
150	25.2	3.9K	52.9
180	26.7	4.7K	54.5
220	28.4	5.6K	56.0
270*	30.0	6.8K	57.7
330	31.7	10.0K	61.0
390	33.1		

**Values recommended in the text.*

Table I– Standard resistor values and corresponding attenuation levels when used in the circuit of fig. 1 (based on an 8 ohm amplifier output impedance).

The resistors selected are standard value and will give about a 10 dB step between any pair of adjacent switch positions. If you want coarser or finer steps, you can pick your own values from Table I. All gains are in decibels (dB) stated with respect to the straight through (0 dB) position. Remember that the ear perceives loudness in proportion to the number of decibels. That means that the reduction in loudness that occurs when you switch from 0 dB to −10 dB will seem the same as when you switch from −10 dB to −20 dB or from −30 dB to −40 dB. In my own experience, I have found that a change of less than about 10 dB is not perceptible and is therefore not worthwhile to wire into the switch.

I wired up my attenuator with a phono plug that plugs into the speaker phono jack on the rear apron of my rig. I plug the speaker into jack J1 on the attenuator. When I want to use headphones, I plug them into J2, a standard ¼-inch closed-circuit phone jack. That disconnects the speaker and gives total silence in the room for anyone not using the headphones. Most important, though, is that I then hear just the right amount of amateur radio in my phones.

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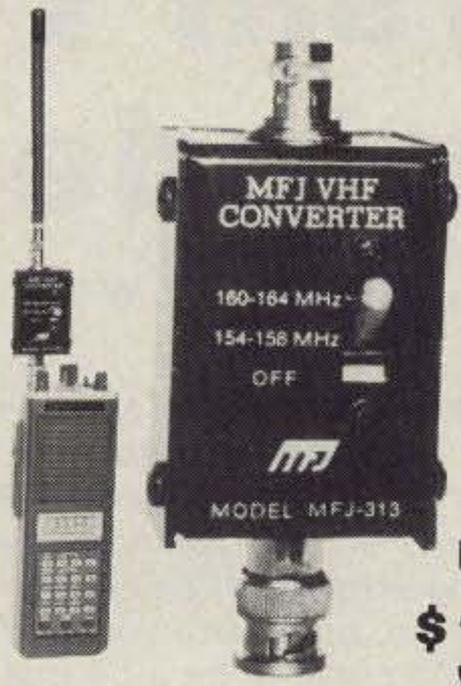

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Run 1 KW CW or 2 KW PEP for 10 minutes, ½ KW CW or 1 KW PEP for 20 minutes. Continous duty with 200 watts CW or 400 watts PEP. Complete with derating curve.

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Air cooled, non-inductive 50 ohm resistor in perforated metal housing with SO-239 connectors. Full load for 30 seconds, derating curves to 5 minutes. **MFJ-260** (300 W). **SWR: 1.1:1 to 30** MHz, 1.5:1 for 30-160 MHz. 2½x2½x7 in. **MFJ-262 (1 KW)**. SWR 1.5:1 for 30 MHz. 3x3x13 inches.

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CIRCLE 28 ON READER SERVICE CARD

The next best thing to a "no-tune" rig is having something to tell you when to tune. W4FA has come up with a simple add-on device that will remind you to retune when you change bands.

A Universal Tuning Reminder

BY JOHN J. SCHULTZ*, W4FA

Over the past few years the number of tuning controls on most transceivers has been dramatically reduced. Many modern solid-state transceivers are completely "no-tune" in both the receive and transmit modes. But there are still thousands of transceivers in use which require some sort of manual retuning when bands are changed. My experience with such transceivers has often been frustrating beause one lapses into making the "cockpit error" of forgetting the manual retuning required. For instance, a band sounds completely dead and one wonders what has happened and then suddenly remembers that a preselector control has not been peaked. Or one hears an interesting station, starts to transmit, and then notes there is hardly any output power because some low-level resonate control affecting the transmit chain has not been retuned. I doubt that anyone has missed making WAZ because of this situation, but I would bet that almost every owner of a "partial-tune" transceiver has, at times, forgotten to retune after switching bands.

Interestingly enough, my experience has been that this sort of "forgetfulness" increases more as the number of tuning controls on a transceiver decreases rather than the opposite. Apparently, if a transceiver has three or four tuning readjustments that must be done when switching bands, it becomes more of a routine discipline to make the adjustments. But, if a transceiver needs only one tuning readjustment per band, or perhaps two, one tends more and more to forget them.

*c/o CQ Magazine

Obviously, there are several solutions to this type of situation. Those with a Rube Goldberg sense of humor could probably have a field day thinking up mechanical tuning reminders (bells on the bandswitch?). But, an electronic type of reminder should prove to be a bit more practical to implement, less costly, and more reliable over a period of time.

The electronic reminder circuit described in this article was developed for application with a "partial-tune" transceiver, but it really can be used in almost any situation where one needs a reminder that some control function has to be accomplished.

The criteria set up in developing the circuit was that it had to be inexpensive, use readily available components, interface with most pieces of equipment, and require no controls of its own. That is, it was to provide a visual or aural reminder that a tuning adjustment was required after a bandswitch was rotated and then automatically deactivate the reminder after a set period of time.

Most readers after reading the foregoing probably expect to see some variation of a 555 Timer IC circuit. But, that is not the case as can be seen from fig. 1. The reminder circuitry uses a simple TTL 7400 IC for several reasons. The IC is almost universally available, very inexpensive (10–30 cents), can be connected for several modes of operation, and uses a minimum of external components. It does not, by far, represent the most sophisticated approach, but it works.

Basic circuit operation is as follows: In its quiescent state S1 is closed so inputs 1 and 2 are low. The output of the first gate, pin 3, is high and also therefore the input, pin 9, of the gate associated with pins 8, 9, and 10. The capacitor charges via the 1 K ohm resistor, but the resistor keeps inputs pin 4 and 5 of the gate associated with pins 4, 5, and 6 low. So, pin 6 is high, therefore also pin 10, and the output on pin 8 is low since both of its gate inputs are high. Now, if S1 is suddenly opened and closed, the capacitor starts to discharge, and while doing so the output on pin 8 goes high until the capacitor is fully charged again. The only real point of describing this sequence is to indicate the essential feature of the circuit—namely that even a *short, momentary* opening/closure sequence of S1 will cause the circuit to cycle such that the output on pin 8 goes low-high-low for a time period determined by the value of the 1 K ohm resistor and the capacitor.

The value used for the resistor, about 1.0 to 1.5 K ohm, is relatively inflexible if pins 4 and 5 are going to be positively kept low. However, the capacitor value can be varied over a fairly wide range and it is really the capacitor value that determines the "on" time of the reminder circuit once switch S1 cycles. A 100 mF value for the capacitor produces a short alert-type pulse for the LED, 500 mF produces about a 1–2 second illumination of the LED, and a 1,000 mF capacitor produces about a 2–4 second illumination of the LED. These values are, of course, approximate since the exact capacitance and leakage values of large value electrolytic capacitors vary very widely. But, if anyone doesn't get the idea to do some retuning after seeing an LED illuminate (or other device activated) for a few seconds after rotating a bandswitch, the idea of a reminder circuit is lost.

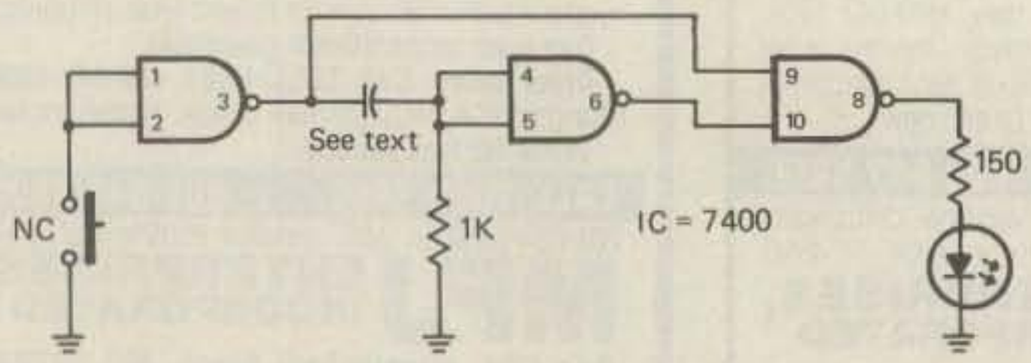


Fig. 1– The basic reminder circuit. Whenever the switch is opened, even momentarily, the LED will light for a time period determined by the RC values in the circuit.

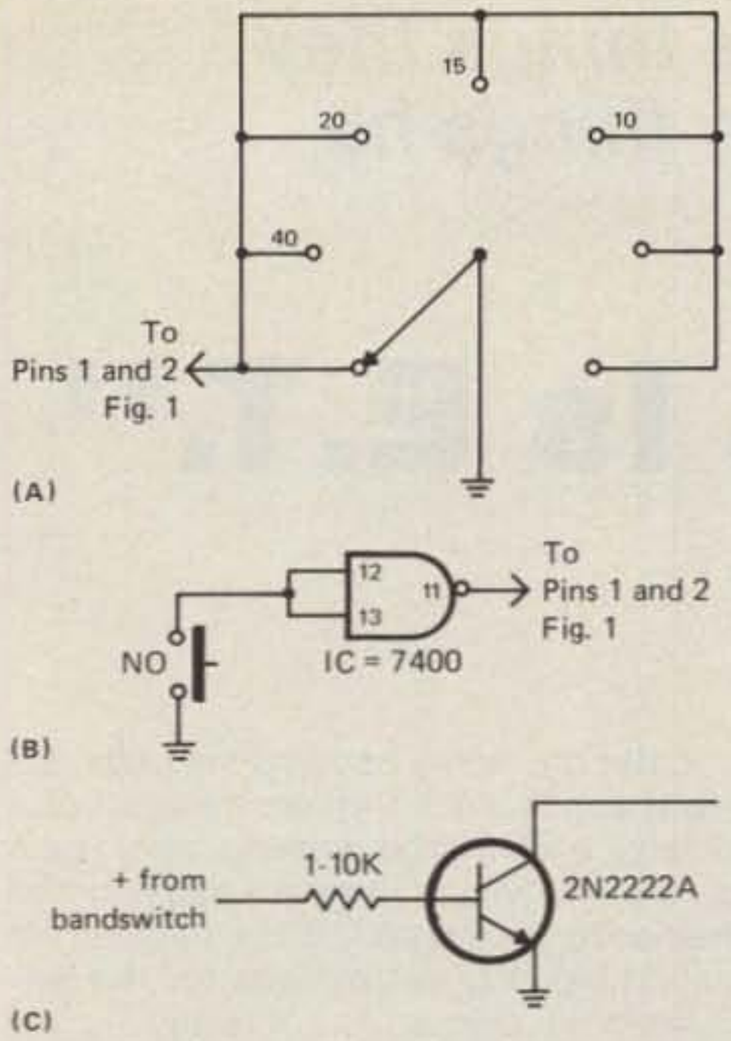


Fig. 2– Various interface ideas for driving the reminder circuit from a bandswitch in a transceiver. See text for details.

The circuit of fig. 1 is easy enough to "proof-out" as a test circuit. Its real application in most cases is also pretty easy, but one has to consider the interface with a given transceiver and the output options. Let's consider both of these items in order.

The absolute easiest way to interface the circuit to a transceiver is shown in fig. 2(A). One adds a switch wafer to a bandswitch on a transceiver so as to provide a momentary ground lead interruption each time the bandswitch is rotated. The switch wafer must, of course, be of the "non-shorting" type. Except on some of the ultra-compact transceivers, this idea can usually be implemented without too much difficulty. Usually one can add a shaft coupler on the end of the bandswitch shaft and drive any sort of miniature switch wafer which has the same number of contacts as the bandswitch and the same rotational spacing between contacts. Since most transceivers use quite standard type bandswitches, this is not as difficult a chore as it might sound. If one might find a mechanical arrangement easier to implement, where instead of a ground lead being momentarily interrupted each time a bandswitch is rotated the ground lead connection is established, this condition can also be accommodated. Fig. 2(B) shows how the unused gate in the 7400 can be used for this purpose. Many bandswitches have a metal shaft which is already grounded, and one can add a small spring contact to the end of the shaft which establishes a ground contact as the bandswitch is rotated.

Those who can do a bit of circuit analysis can find various ways to utilize the contacts on existing bandswitch wafers to activate the reminder circuit. For instance, many modern transceivers use diode switching for various circuit functions (e.g., to switch-in different crystals for local oscillator mixing functions on various bands). The controlling bandswitch wafer merely switches "in" for each band a positive control voltage. This control voltage can also be used, as shown in fig. 2(C), to control a transistor switch which would provide a ground connection when activated and which would have to be used in conjuction with the circuit option of fig. 2(B). Of course, one would need a transistor switch for each bandswitch position, but since the transistors can be obtained for 10–20 cents each, the idea is quite realistic.

The output or indicator options are pretty well up to one's imagination. The circuit of fig. 1 shows, of course, the 7400 driving an LED. The 7400 wasn't meant to be an LED driver, but in sustained tests any one of its gates performed consistently well in this application. For a bit more effect one might consider the use of an LED which has a built-in flasher. Such flasher-type LED's usually operate at a few Hertz. So, if one chose a 500 mF capacitor in the circuit of fig. 1, the LED would have time enough to go through a number of cycles and would provide a very attention-getting display. In any case, the LED should be mounted next to the transceiver control which has to be retuned.

If one does not care for the idea of having to drill a hole in the front panel of a transceiver to mount an LED, a "no-hole" approach can be used using an aural indicator. For instance, pin 8 of 7400 can be used to directly drive (without any series resistor) a piezo-type buzzer of the 1–24 volt type. Such buzzers are widely available and Radio Shack, for instance, sells such subminiature types for between $1.00 and $2.00 depending on voltage. An aural-type indicator probably does not provide the same immediate, attention-getting effect as an illuminated LED located right next to a control which has to be retuned, but it doesn't take too much

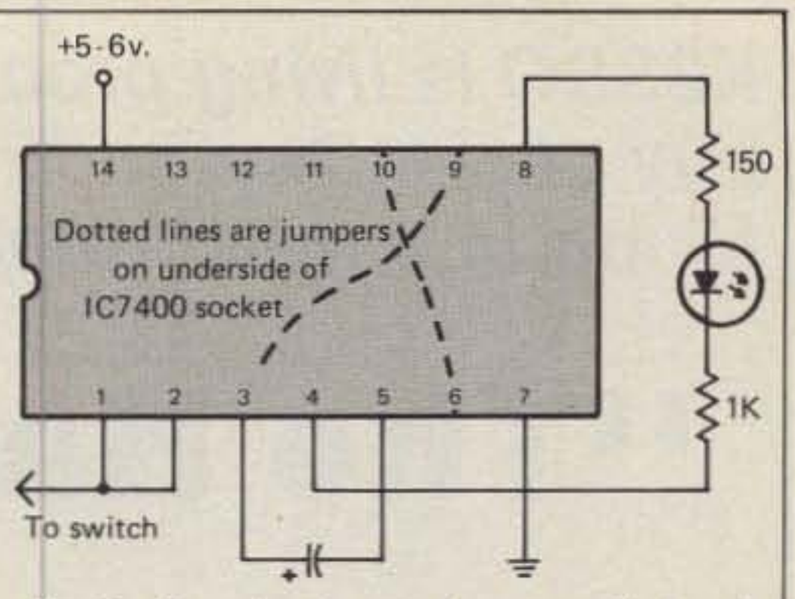


Fig. 3– One simple way to group all circuit components around the IC 7400.

time to associate the aural alarm with the idea that some control must be readjusted. Pin 8 of the 7400 can also be used to drive a low-voltage, sensitive relay which in turn can be used to turn on any visual or aural indicator one might like to devise.

Finally, fig. 3 shows a simple component layout that one might consider in building the reminder circuit using the LED option. One really doesn't even need any sort of mounting board. The components can be mounted directly between the pins on a socket which holds the 7400 IC. The 5–6 volts needed have to be borrowed from some point in a given transceiver. If such a point cannot be found and one has to utilize, for instance, a 12 volt bus, one can insert a series resistor to pin 14 of the 7400 calculated on the basis that the 7400 draws about 20 ma.

After reading thus far you might wonder about the value of expending the effort needed to add a tuning reminder circuit to a transceiver. Personally, I feel such indicators are a "must" and should be a standard feature in any manufactured transceiver. But, then again, most manufacturers these days don't like to advertise that their equipment requires any tuning, although it is perfectly reasonable to have tuning controls in some cases. In any case, if you miss a few QSO's the next time you forget to retune, consider the circuitry described.

K2SSQ is living proof that hams do use the things they buy at the Dayton Fleamarket. He used the things he found in a most remarkable way.

"The Handle Here Is E.T."

BY BILL PASTERNAK*, WA6ITF

If not for amateur radio, Steven Spielberg's *E.T.* might never have "phoned home." I'm willing to bet that most of you reading this article are familiar with the story of the alien visitor to Earth who gets left behind when his ship takes off, and who is forced to find some way of summoning the ship if he is ever to see his own world again. If you have seen the film *E.T., The Extra Terrestrial,* then you know the rest of the plot. If you have not, then I highly recommend that you do so, because after having viewed producer Spielberg's masterpiece, I fully concur with *Time Magazine* when they called it "Steven Spielberg's Magical Movie."

The fact is, that our friend *E.T.* is able to summon aid because with the "off-screen" help of an amateur radio operator he builds a microwave transmitter that reaches his ship. The amateur in question is never seen in the picture, and his name appears only for a moment in the closing credits. In fact, it's *only his name* you see, not his callsign: K2SSQ, the call of a New York City amateur named Henry Feinberg.

What you are about to read is really two stories. One deals with the *E.T.* communicator himself, and the other deals with yet another tale: the story of two people brought together through the magic of amateur radio, who became lifelong friends. Those two people are myself and K2SSQ.

I first met Henry back in the mid-1950s when we were both students at Lafayette High School in Brooklyn. In those days he held the Novice call KN2SSQ, and he was quite easy to spot since he was the only student in our school with an amateur radio callsign emblazoned across his loose-leaf notebook. A bit of prodding from Henry, and several other hams I met, eventually lead me into amateur radio.

Henry and his brother Jeff, then KN2MOT, lived with their parents on the second floor of a six-story apartment house on Bay Parkway in Brooklyn's "Bath Beach" area. The two brothers shared a room that totally amazed any non-ham—at least it did this "at that time non-ham." The two brothers had a Novice station consisting of a crystal-controlled Arc 5 transmitter, a National NC-98 receiver, and one of the longest "long-wire antennas" I had ever seen. It ran the length of two large apartment houses—from their roof to that of an adjacent building.

In the spring of 1959 Henry and I graduated from Lafayette, and later that fall he entered New York University, majoring in physics. A few years later he earned an Advanced Class ticket as well, but that's getting a bit ahead of our story. It was during his freshman year at N.Y.U. that K2SSQ landed a job as a production assistant to Don Herbert, a man better known to all the kids in his TV neighborhood as *Mr. Wizard.* It was to be the real beginning of Henry's career in the media, though I doubt if he realized this at the time.

While attending college, Henry stayed with the *Mr. Wizard* program throughout its tenure on NBC. He eventually changed his major to communications arts and sciences. For many years, it was the mind and ingenuity of K2SSQ that helped *Mr. Wizard* fulfill his promise of "showing kids the magic of science in everyday living." When NBC cancelled the show (the first time, as it made a one-season reappearance on NBC from their Burbank Studios in the early 1970s), Henry stayed with Don Herbert's Prism Productions as a producer on the award-winning *Experiment* series, which aired over National Educational Television.

Henry's next job was as a writer/director with the Public Relations Department of the Bell Telephone Laboratories in Murray Hill, New Jersey. During fourteen years with that branch of the Bell System, he wrote and directed films that won several international awards, including two highly coveted "Cine-Golden Eagles."

Probably the K2SSQ/Bell Labs film best known in amateur radio circles is *IC, A Shrinking World.* It's the story of how integrated circuits were developed at Bell Labs, and how they are manufactured. I've seen it over the years at numerous radio club meetings, although I doubt if anyone viewing it was aware that it was "one of our own" who conceived, wrote, and directed it.

Later on, Henry became the Labs' Exhibits and Science Demonstrations Coordinator, a job that his working many years on the *Mr. Wizard* program had him well trained for. In this position he traveled the nation working out exhibits for the Bell System in places as far away as my hometown, Los Angeles, at our Museum of Science and Industry in Exposition Park. He did this work until only a few short months ago when AT&T, the parent of the Bell System, requested that he take on the biggest exhibit they had ever conceived. It was to be at the EPCOT Center in Walt Disney World in Florida, and under Henry's guiding hand it was a true success. For those unaware, EPCOT, which is an acronym for Experimental Prototype City of Tomorrow, is a sort of permanent "world's fair" created by the Disney organization.

With a project as large as EPCOT on his hands, one might wonder why Henry would want to take on yet another project, especially something as intricate and demanding as developing part of the special effects for a science fiction/fantasy movie. When I asked my buddy this very question as he and his completed *E.T.* communicator sat in my suburban Los Angeles living room, Henry filled in a few of the blanks for me. I had known that he was involved. I had even spent some time at the Dayton Hamvention a few months earlier browsing through the Fleamarket for parts to be used in the project, but I had never asked him why.

He explained that slightly more than a year ago, he had received a telephone call at Bell Labs from Spielberg's co-producer, Kathleen Kennedy. She asked if Feinberg could devise a "communicator" for on-screen use in the film and work with screenwriter Melissa Mathison on its inclusion in the script. Henry had been designing items like this for the better part of his life, and after obtaining permission from his superiors at Bell Labs, he agreed to take on the project if it could be done in his spare time. In short order the design was completed and submitted. This brought another call from the Spielberg organization, asking if he would build the unit. Again, Henry agreed.

As luck would have it, this second request came just a few weeks before the

*28197 Robin Ave., Saugus, CA 91350

1981 Dayton Hamvention. As already stated, the two of us wandered the length and width of the fleamarket in search of what we might best call *E.T. parts.* Obviously, at this point Henry had to bring me in on the project if I was to be of any assistance in locating things that looked as though they might be of value in his new chore. This is when I became privy to the entire project that my high-school chum was involved in. After telling me about it, I was literally sworn to secrecy.

Until *E.T., The ExtraTerrestrial* hit the silver screen, Henry, many others, and I had to keep silent. That's why there was no prepublicity about K2SSQ's *E.T.* communicator appearing in this or any other amateur magazine. In fact, while I have my own amateur radio news services (*Westlink Report* and the *Westlink Amateur Radio News*) and literally had an "exclusive," I still waited for the film to reach general distribution before writing the first story about the ham who helped *E.T.* to "phone home." Now that *E.T.* is out, I can explain both the communicator and its concept in some detail.

Henry had three objectives he wanted to attain in the device. First, its design had to be plausible. That is to say, someone back at Bell Labs or NASA should sit back and say, "Hmm . . . that thing could work." Next, it had to be built using as many readily available materials as possible. To be more specific, these were to be items found around the average American home. Finally, and very importantly, these items, or as many as possible, had to fall within a child's realm. The idea was that while such a communications device would take work to build, at the same time it should appear fun.

Henry's final design was that of a "beacon transmitter" which would operate unattended in a forest clearing, yet be capable of directing a pinpoint microwave signal into space. He started with a Texas Instrument's "Speak and Spell" learning toy, and rewired the digital display to produce a new alphabet that "might" be used by an alien civilization such as the one from which our friendly *E.T.* had come. Obviously, if *E.T.* had the intelligence for space travel, he was smart enough to modify the circuitry to speak his language. This first step was accomplished by rewiring the display to produce a new, yet coherent alphabet. He made no modification to the unit's voice synthesis circuitry, since initial plans called for the audio track to be dubbed in post-production. In the final version, music was used instead.

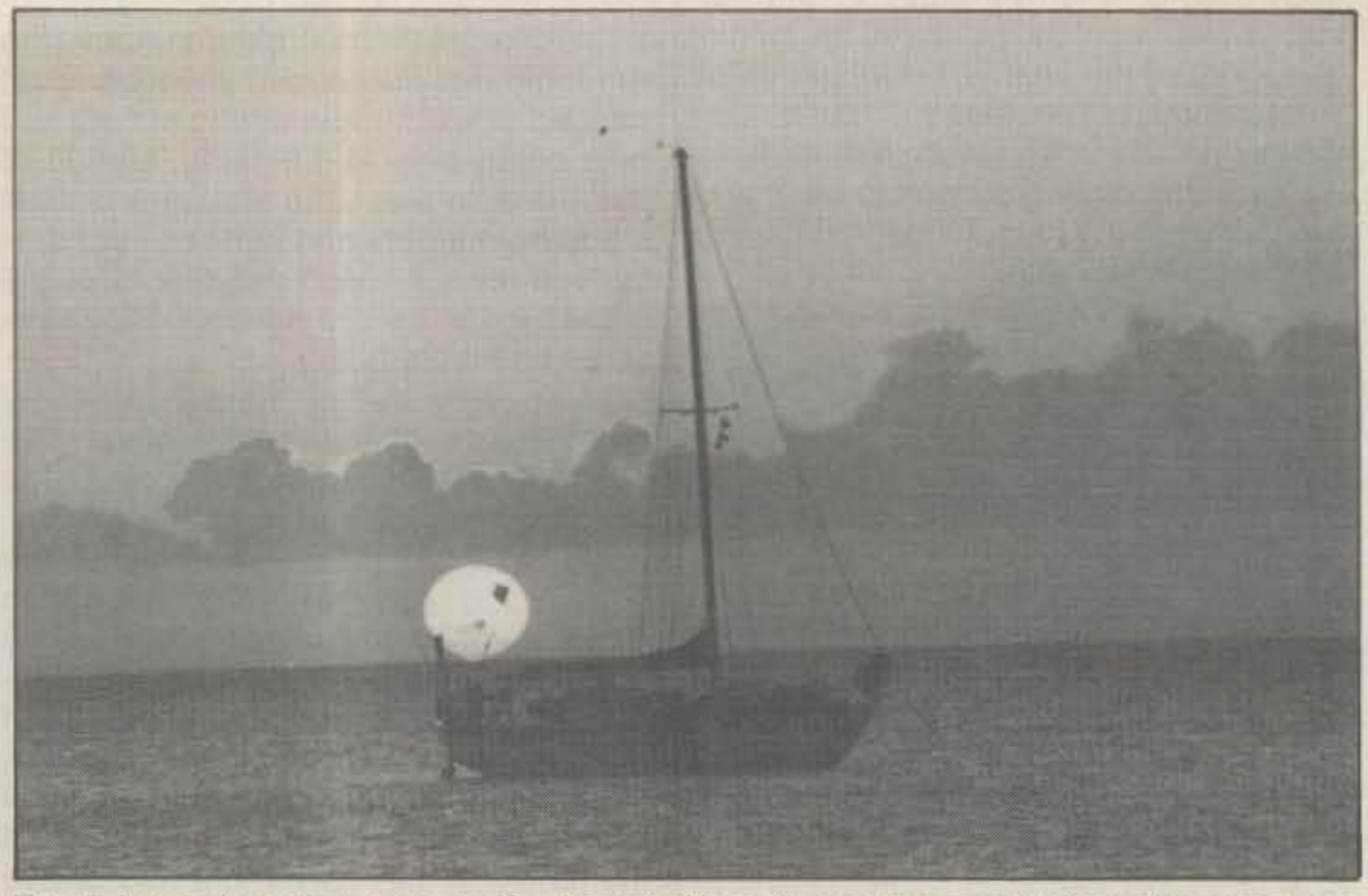
How do you remotely control a "Speak and Spell"? For this job, K2SSQ utilized a child's phonograph onto which he placed a blade from a circular saw. The blade was first sprayed with several coats of paint as insulation. He then carefully scraped away portions of the paint to "encode" a message on the "disc/sawblade." (I recently learned that part of the encoded message was actually Henry's name, and was his way of placing his artist's signature on his creation.) Above the turntable was suspended a wooden coat hanger, dowel stick drilled to accept and hold bobby-pins as contacts. Motion of the turntable was controlled by a ratchet made from a knife and fork tied to a nearby tree branch. Each movement of the branch in the breeze advanced the sawblade one more notch.

Next came the r.f. hardware. Henry took a child's CB walkie-talkie of the "five and dime store" variety. He took out the speaker/mic which was simply accoustically coupled to the speaker of the "Speak and Spell" toy. The mic was then wired back to the walkie-talkie with a piece of coaxial cable replacing the telescopic whip antenna. The other end of the coaxial cable was attached to a u.h.f. television tuner that *E.T.* had modified into a frequency multiplier. The "output" of the multiplier then went to a microwave resonator made from a coffee can, with a household funnel attached to the front of the can to act as a "wave-guide." A large golf umbrella lined with aluminum foil served as a parabolic antenna to direct the r.f. energy toward *E.T.*'s objective.

Did this gadget really work? For our friend *E.T.* in the picture it did, but in fact it does not really transmit any real r.f. Rather, Henry explains its operation as a modification of the well-known Walt Disney "plausible impossible" concept. The best explanation of this would be a cartoon character who runs off the side of a mountain into free air. The character does not begin to fall until he realizes that there is no longer any ground under him. Henry's *E.T.* communicator is something K2SSQ defines as the "plausible possible." This means simply that while it does not transmit any r.f. into space or anywhere else, there is the element that some super intelligence could make it work and allow *E.T.* to "phone home" as he says in the picture.

As this article is written, I have recently seen the film for the third time. Each time there is something new to see, and if you have not yet seen *E.T.*, then you are really missing out on something quite wonderful. For me, though, the film has a special meaning. I feel very proud and deeply honored to be in the position of relating the story you have just read. Mainly, I am proud to tell you that amateur radio played an important role in the creation of this cinematic classic. Even more important, I am proud of Henry's and my friendship born of amateur radio, which has withstood the tests of 3,000 miles separation and of time.

Alex Kasevich, VP2MM, in the garden of his home on Montserrat.



Everfair, *anchored at sunset off a deserted beach, was never out of touch as long as a 2 meter repeater was within range.*

Sometimes you may need more than a tall ship and a star to steer her by when you ply the ocean waters. KA4HAU fills us in on 2 meter shipboard activity.

TAKE TWO METERS TO SEA

BY BONNIE R. OWRA*, KA4HAU

With my general license mounted on the bulkhead and my first h.f. rig installed, my OM, Bill, and I set sail from Florida. It wasn't until St. Thomas in the United States Virgin Islands that I discovered 2 meters. Of course, I knew what 2 meters was, but I didn't *discover* it until then, and I couldn't wait to get a rig. Robby, KH6FMD, in Jacksonville, Florida, rushed off an Azden 2000 airmail, and it took only five days before I was on the very high wavelengths. We tried both of the marine v.h.f. antennas mounted aboard our 37 foot fiberglass sloop *Everfair*, one on deck and the other on top of the mast, and had good results with both. Of course, the greater height of the mast-mounted whip gave more range.

Range isn't a problem in the Virgin Islands, however. These northernmost of the Lesser Antilles are loaded with repeaters—repeaters on mountaintops. Puerto Rico (approximately 40 nautical miles between repeaters in San Juan and St. Thomas) has repeaters every 30 kHz or so, and there are repeaters in St. Maarten (110 nautical miles from St. Thomas but only 95 from the repeater on St. Croix) and Tortola in the British Virgin Islands (20 nautical miles from the St. Thomas repeater).

Being United States possessions, the U.S. Virgin Islands allows third-party traffic and an autopatch has been installed. Having a telephone at your fingertips while at anchor is great. Of course, business traffic is not permitted, but with St. John and St. Croix only local calls from St. Thomas, it's nice to be able to keep in touch with shoreside friends. When my h.f. rig was in the repairshop and my OM was in the States, I even used the 2 meter autopatch to call him collect. (Ma Bell seems to have instructed her Virgin Islands' operators not to respond to calls from phone booths.)

Two meters has many other advantages for sailors. Tony, KV4BA, in St. Thomas gave us daily weather reports, and communication was easier with amateurs on other boats. Marine v.h.f. has a limited number of channels for conversation, so 2 meter simplex or operating through a repeater allowed us to share information as to rendezvous times, sea conditions, anchoring methods, the lobster situation (when you take your food from the sea, that's important!), and deserted beaches not to be missed. You can talk to nearby amateurs without tying up the marine v.h.f. frequencies or the amateur h.f. frequencies. And, marine v.h.f., outside of the duplex marine telephone channels, does not have repeaters. Two meters is a great addition to a cruising yacht.

It's exciting to make friends on the many cruise ships calling at Caribbean ports when an enterprising amateur has remembered to take along his HT on vacation, or to be offered a tour of the naval ships calling at the port (whether it's a Canadian submarine, a British training vessel, or a U.S. aircraft carrier) just because you've become acquainted with a crewman or officer who gave a QRZ on his HT.

**c/o Lee Reed, Rt. 1, Box 668, Frogmore, SC 29920*

Bonnie, KA4HAU, operating under reciprocal call FG0GYU, gets help from an amateur ashore in guiding the Everfair *into Deshaies, Guadeloupe, F.W.I.*

In St. Maarten I met Mort, PJ8UQ, and his XYL, Claire, PJ8YL, via 2 meters, and if it hadn't been for that little Azden, we would never have seen the beauty of Statia (Sint Eustatius). We'd been told that the anchorage was poor (true) and that there was nothing to see (false) and had planned to bypass it, sailing straight for Montserrat, when Dave, PJ8DFS, and I had a 2 meter QSO. All that he reported of the history and beauty of Statia was true, and he was a most gracious host to us when we called there, taking us to customs and immigration before several days of touring his lovely island home.

Not knowing that there was a repeater in Montserrat, I put the Azden on scan soon after we anchored, and within two minutes I had met Alex, VP2MM, and Victor, VP2MQ. When we visited Alex's penthouse apartment with a view of the harbor so that we could be sure *Everfair* stayed securely at her anchor, he gave me many writing and amateur radio tips. At Victor's home we met his charming family. Later he took us on a tour to the local Soufriere, a live volcano with constant emissions of sulfuric gas and volcanic springs, accessible only with a native of Montserrat as your guide.

Two meters is also active in Antigua, where I met Mickey, V2AR, while I was still MM2. As Mickey is the licensing officer, he had my reciprocal operating permit ready when we arrived.

It's always a good idea to write to the countries you plan to visit well in advance and to try to obtain your reciprocal license before you arrive. For information on how to obtain your reciprocal operating privileges in foreign countries, write to the ARRL, International Services Division, 225 Main Street, Newington, CT 06111, U.S.A. Although you may talk to many amateurs on an island while you're out to sea, particularly if there is a repeater, as soon as you approach within three nautical miles of the country, you are no longer maritime mobile in international waters and cannot use your radios until you are licensed by the country whose waters you've entered. It's just at this point, when you are making an approach, that the help the amateurs on shore are so willing to give is most needed. Your new friends on the air will gladly guide you in through the reefs, give you information about the hours of customs and immigrations, and even offer to meet you on the wharf with a car to take you to get groceries, engine parts, or whatever you need after a long passage.

I'll never forget the help I've received from shoreside stations such as George, FG0BG (Beautiful Guadeloupe), or Robby, J73RM, in Dominica, or Bernie, J6LDZ, in St. Lucia. You'll find a lot of 2 meter activity in these islands and in Martinique (and it isn't necessary to speak French, although it helps). None of these islands has a repeater yet, but obliging amateurs whose QTH is atop a mountain have always been ready to relay my mast-high radiated signal to a friend I've made on another nearby island. Watch for repeater installations there soon as part of an emergency preparedness program funded after the devastation of Hurricane David.

By the way, when you discover a repeater frequency as you cruise, it is always courteous to ask permission of the amateurs in that country, who are subsidizing the cost of installation and maintenance, before using it.

Couples who are both amateurs will find a base rig aboard and an HT with the person on shore invaluable for communications:

"I'm approaching the dock with 50 pounds of ice. Come pick me up in the dinghy."

"I need some help—slipped on the rocks while beachcombing and cut my leg."

In many situations, two meter communications between boat and shore can be a lifesaver, if not merely a convenience. Boats cruising offshore near U.S. coastal waters regularly carry 2 meter rigs aboard to use in case of emergency. Getting help by bringing up an amateur on the closest repeater is faster and sometimes a more reliable means of summoning help than marine v.h.f. Two meters is also useful in notifying family on shore that the wind has died and the motor won't run or that you've run aground on a sandbar and must wait for the tide.

Whether you're embarking on a cruise or a day-sail, don't leave that 2 meter rig in your car. It will help you make new friends, give you "local knowledge" weather and navigation information, be an invitation to exciting adventure, and may help in an emergency. Take 2 meters with you to sea.

Repeater Frequencies in the Antilles

These are the frequencies on which you will receive the repeater. Unless otherwise noted, transmit down 600 kHz.

Puerto Rico: (frequencies in MHz) 145.30, 146.61, 146.64, 146.67, 146.70, 146.76, 146.85, 146.94, 146.97, 147.09, 147.15, 147.27.

St. Croix: (in MHz) 146.88 (autopatch), 146.91 (highest location), 146.955 (low power), 147.00 (up 600).

St. Thomas: (in MHz) 146.64 (autopatch) and 146.805.

Tortola, B.V.I.: 146.73 MHz.
St. Maarten: 146.76 MHz.
Montserrat: 146.97 MHz.
Antigua: 146.94 MHz.
Curacao: 146.76 MHz.

CQ World-Wide WPX/SSB Contest All-Time Records

By BERNIE WELCH, W8IMZ, Director, CQ WPX Contest

The contest is held each year on the last full weekend of March. The All-Time Records will be up-dated and published annually. The method of computing final scores changed several times since 1957. Data following the calls below are: year of operation, total score, and number of prefix multipliers.

WORLD RECORD HOLDERS

Single Operator

1.8	VE3MFT('81)	84,906	89
3.5	4M3AZC('80)	852,548	262
7.0	DJ4PT('82)	1,692,480	410
14	4N3ZV('81)	3,586,240	560
21	HC9A('81)	6,025,770	615
28	ZZ5EG('81)	4,868,780	581
AB	PJ2CC('80)	6,521,098	538

Multi-Operator Single Xmtr.

	9A1ONU('80)	13,362,486	723

Multi-Operator Multi-Xmtr.

	NP4A('82)	24,065,600	890

U.S.A. RECORD HOLDERS

Single Operator

1.8	W8LRL('82)	16,576	112
3.5	W1CF('77)	460,908	186
7.0	N6RO('82)	881,886	309
14	K8NA('82)	2,252,688	568
21	AI7B('82)	4,151,232	576
28	N5AU('82)	3,094,249	571
AB	AB0I('82)	4,107,378	578
QRPp	W8ILC('82)	1,044,012	459

Multi-Op Single Xmtr.

	KJ9W('82)	6,168,450	697

Multi-Op Multi-Xmtr.

	AI6V('81)	12,529,608	728

CLUB RECORD
YU DX Club ('81) 41,003,768

WPX (Prefix) RECORD
NP4A('82) 890

QRPp RECORD
W8ILC('82) 1,044,012

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	No Entrant		
3.5	CT3BD('80)	181,412	133
7.0	SM0GMG/CT3('82)	1,021,592	286
14	EL2AV('82)	1,720,456	436
21	EL2AV('81)	4,617,530	557
28	CN8CY('82)	2,947,811	487
AB	CN8CO('82)	3,594,374	511

ASIA

1.8	4X4NJ('81)	150	5
3.5	4X4DK('71)	478,950	155
7.0	JA2BAY('82)	611,544	249
14	4X4UH('82)	2,288,646	477
21	4X0U('81)	2,823,916	514
28	4X4UH('80)	2,718,760	440
AB	4X1X('82)	3,932,586	529

EUROPE

1.8	UP2BAW('81)	51,474	69
3.5	DJ4PT('81)	745,216	328
7.0	DJ4PT('82)	1,692,480	410
14	4N3ZV('81)	3,586,240	560
21	4N3EY('81)	3,634,755	501
28	YU3MY('80)	3,530,016	412
AB	Y24UK('82)	6,285,436	586

Multi-Op Single Xmtr.

AF	CT3/OH2BC('78)	4,377,450	385
AS	UK9AAN('80)	11,152,020	660
EU	9A1ONU('80)	13,362,486	723
NA	VP2EC('82)	11,805,261	719
O	AH2E('81)	8,021,376	528
SA	HK3AFD('81)	6,064,292	556

NORTH AMERICA

1.8	VE3MFT('81)	84,906	89
3.5	K0CS/VP9('82)	679,098	259
7.0	FG0DYM/FS('82)	1,497,096	348
14	K8NA('82)	2,252,688	568
21	AI7B('82)	4,151,232	576
28	FG0DYM/FS7('80)	3,304,752	484
AB	NP4A('81)	5,489,042	598

OCEANIA

1.8	No Entrant		
3.5	KH6XX('78)	305,080	115
7.0	VK3AKK('82)	380,380	190
14	VR3AH('79)	3,526,153	437
21	VK4QK('80)	2,592,216	396
28	KB7IJ/KH2('82)	4,743,144	504
AB	KH6XX('82)	6,242,967	531

SOUTH AMERICA

1.8	No Entrant		
3.5	4M3AZC('80)	852,548	262
7.0	YV3AZC('82)	1,371,214	341
14	YY2AMM('79)	2,751,776	452
21	HC9A('81)	6,025,770	615
28	ZZ5EG('81)	4,868,780	581
AB	PJ2CC('80)	6,521,098	538

Multi-Op Multi-Xmtr.

AF	9E3USA('69)	2,398,192	296
AS	UK9AAN('78)	10,702,776	532
EU	YT0R('81)	14,378,996	778
NA	NP4A('82)	24,065,600	890
O	KH6XX('81)	19,345,473	669
SA	ZZ5CA('80)	12,545,616	664

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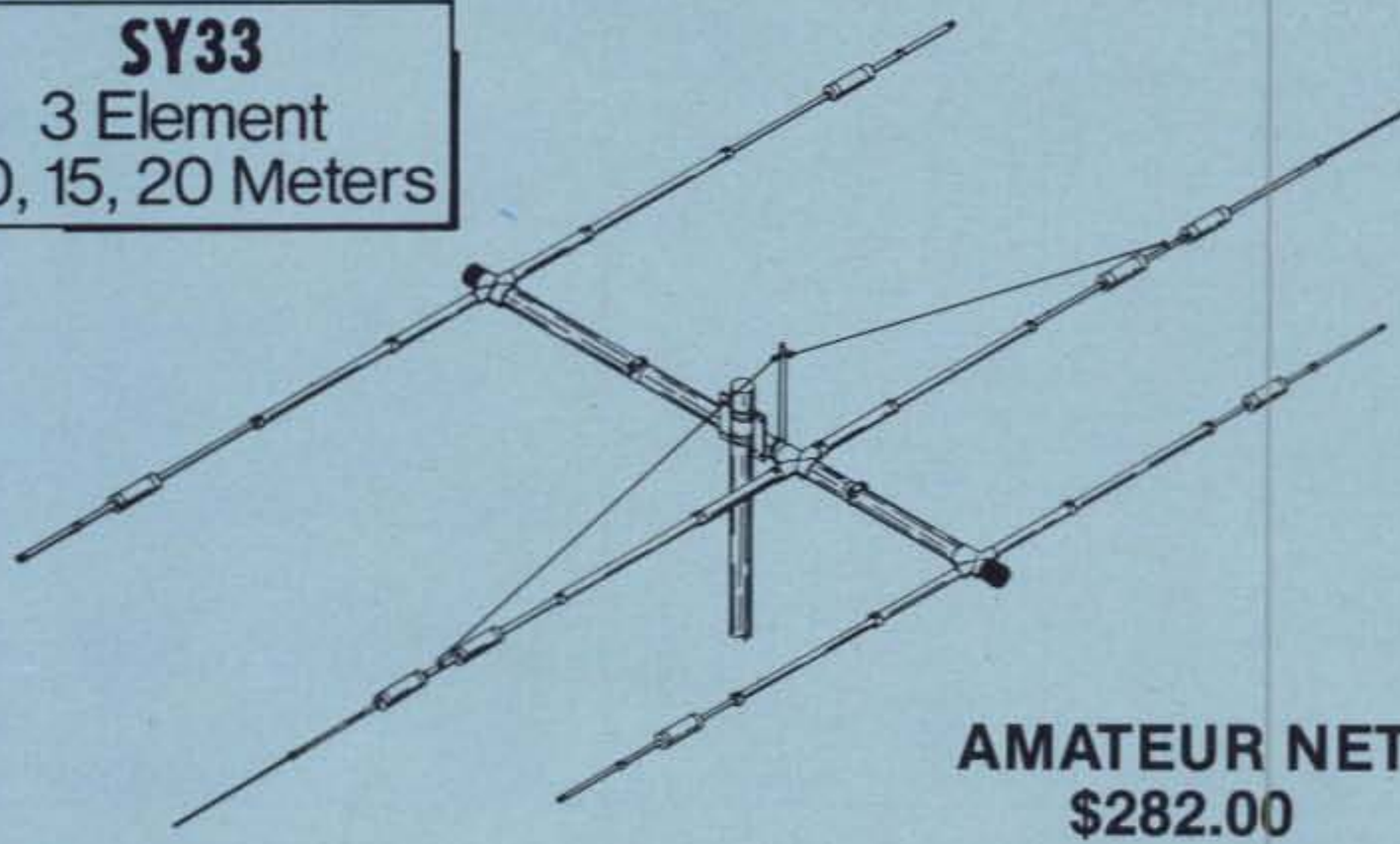
3 Element
10, 15, 20 Meters



AMATEUR NET
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Band MHz:	14-21-28	Longest element:	27'4"
Maximum power input:	legal limit	Turning radius:	15'9"
Gain (dbd):	up to 8 dB	Maximum mast diameter:	2" O.D.
VSWR at resonance:	1.3:1	Surface area:	5.7 sq.ft.
Impedence:	50 ohms	Wind loading at 80 mph:	114 lbs.
F/B ratio:	up to 20 dB	Assembled weight (approx.):	37 lbs.
Boom (O.D. x length):	2" x 14'4"	Shipping weight (approx.):	42 lbs.
No. elements:	3	Direct 52 ohm feed, no balun required	
		Maximum wind survival:	100 mph

SY36
6 Element
10, 15, 20 Meters

AMATEUR NET
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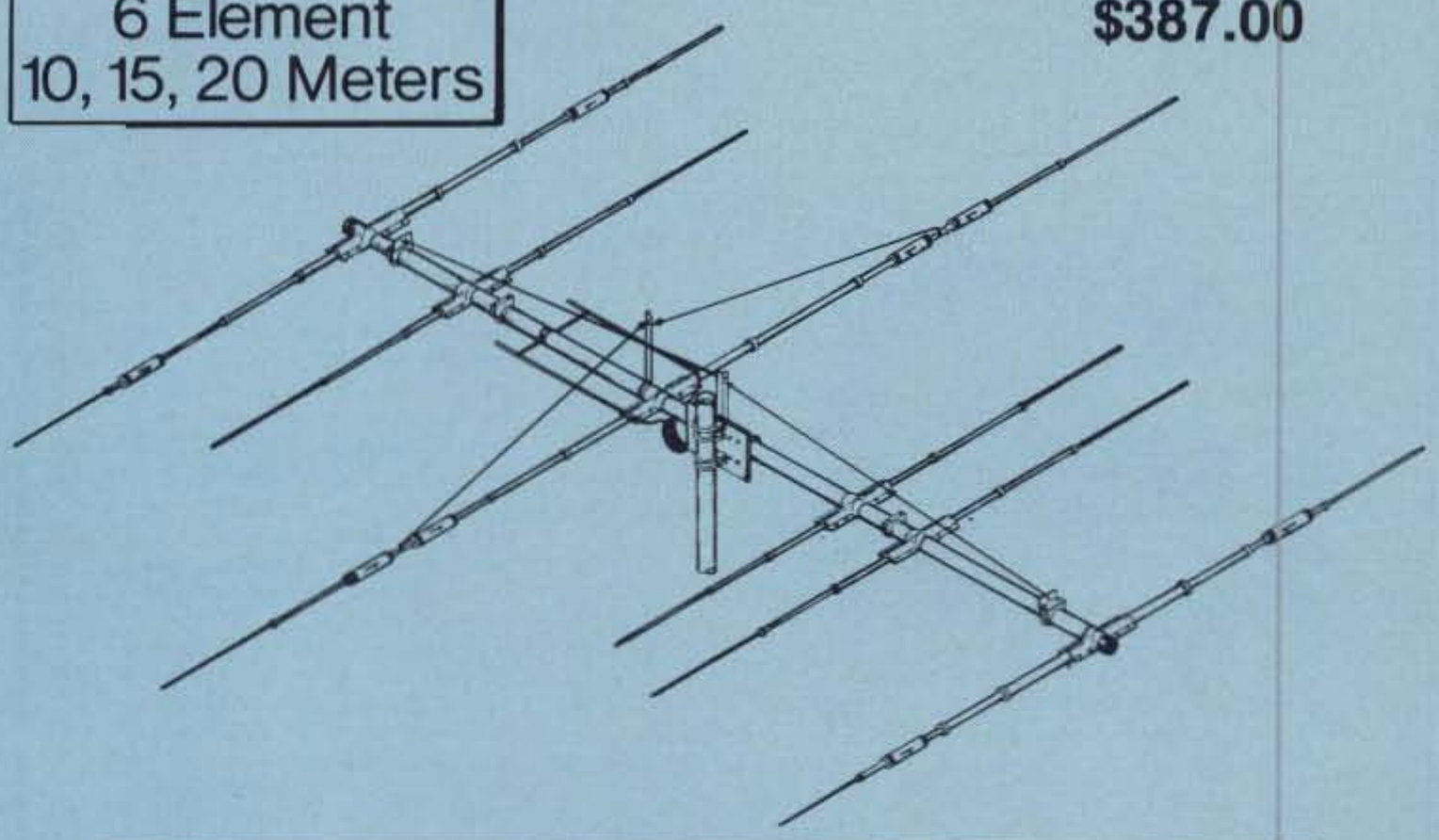

Band MHz	14-21-28	Longest Element:	29'6½"
Maximum power input	legal limit	Turning radius	19' 1"
Gain (dBd)	up to 9 dB	Maximum mast diameter	2" O.D.
VSWR at resonance	1.1:1	Surface area	8.6 sq. ft.
Impedance	50 ohms	Wind loading at 80 mph	215 lbs.
F/B ratio	up to 20 dB	Assembled weight (approx.)	53 lbs.
Boom (O.D. x length)	2" x 24' 2½"	Shipping weight (approx.)	62 lbs.
No. elements	6	Maximum wind survival	100 mph

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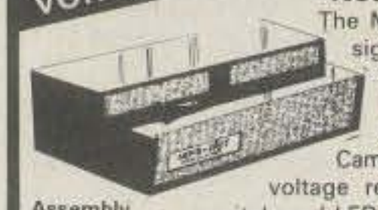

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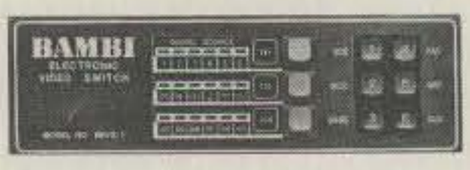

Bambi's front panel was designed with the user in mind. Computer styled construction, with soft-touch keyboard (rated for over 10 million operations), arranged in matrix form allows easy input/output selection without refering to charts. Functions selected through the keyboard are immediately displayed on the 18 LED status indicators.

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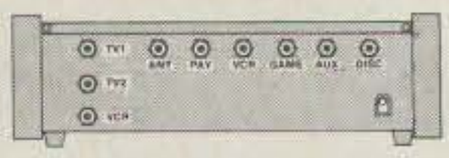

Bambi's Specifications:

Input/Output Impedance	75 ohm
Signal Loss	3dB ±1dB
Noise	4dB ±1dB
Input Return Loss	12dB min.
Isolation	65dB min.
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W0XI presents a new concept for computer-based Morse code that can be easily implemented.

Super-C.W.

Potentially Error-Free Morse Code

BY PHIL ANDERSON*, W0XI

Perhaps a year from now we'll look back and see that the home computer and its associated technology have transformed our mature hobby of amateur radio back into a vibrant and exciting computer-radio hobby. Signs of this are already on the horizon for those of us who take the time to see. In effect, part of the future is already here: code readers, computer rather than dedicated keyboards for c.w. and RTTY, split-screen displays supported by computer for c.w., RTTY, and ASCII send and receive, and dot-matrix printers that are quiet for hard-copy recording of QSO's.

Another exciting aspect of this technological revolution is that we, the U.S., are again in the driver's seat! Even six months ago many said that the home computers would go the way of the transceiver and be supplied by foreign sources. However, this has not happened, and we suspect that it will not! Our experience has put us far ahead on the experience curve relative to newcomers to the market. That experience is in hardware, processor chips, but particularly in software language development.

Many are calling the current technological revolution the new information age or the age of the knowledge worker. Buzz words that abound are telecommunications, word processing, robotics, high-technology, etc. Whatever, amateurs have a lot of new tools and equipment to rekindle interest in our hobby!

But what are we going to do with these new tools and equipment? We can replace the old teletype terminal and associated TU with a computer and interface, we can replace the keyer with the keyboard, we can read c.w. with a code reader that is microprocessor based, and so on. However, these are just different means of accomplishing the same end. What would be more fun, and perhaps useful, would be to use these new tools to improve communications accuracy, improve DX methods, raise the state of our art. But where can we obtain the ideas that lead to innovation? That is not at all clear, but we can adapt and improve on past systems as a start. That is how we coined the idea for Super-C.W. But before describing the concept of Super-C.W., let's examine some of the history of these systems.

*3005 W 19th, Lawrence, KS 66044

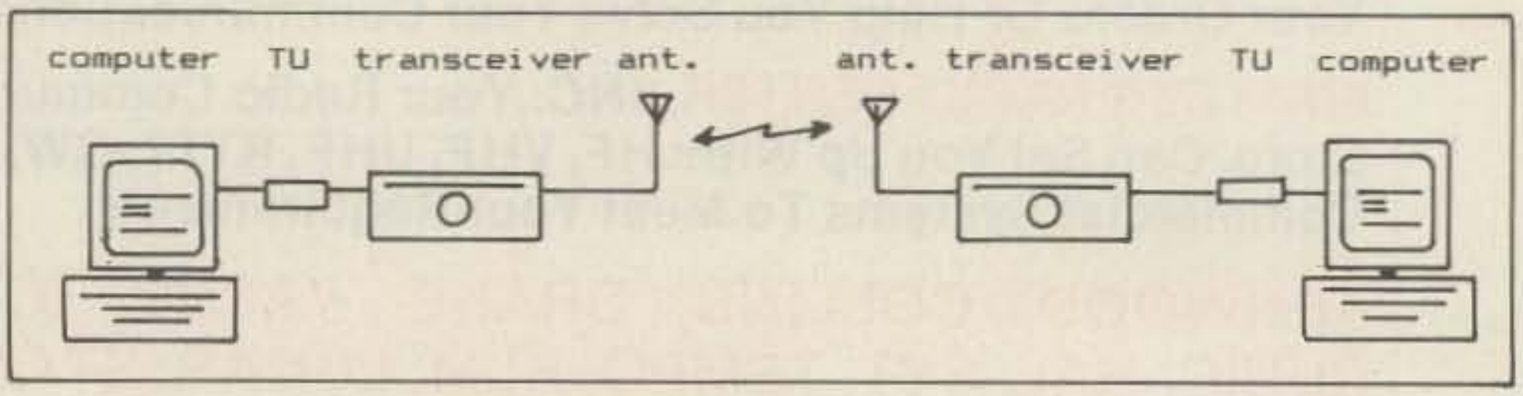

Fig. 1– A computer-based Morse communications channel.

On December 12, 1901, a young Italian named Guglielmo Marconi keyed his radio transmitter in Cornwall, England, and transmitted waves across the Atlantic.[1] The letter "S" was faint but heard by a coworker listening in St. John's, Newfoundland. While this ushered in the age of radio, it also planted more seeds for the information age now at hand! Marconi later formed a company and transmitted telegraphy for profit across the Atlantic.

As time went on, more sophisticated code forms emerged, such as the familiar 5-bit Baudot or Murray code. This form in turn was improved upon by using 7 bits in a constant ratio of 3 marks and 4 spaces.[2] The new Moore code aided in the detection of errors and increased the accuracy of transmissions needed for commercial work. Seven-bit codes were in use as early as 1947. However, these modes were not adopted in the amateur community; equipment cost was perhaps too high and only 5-bit Murray code was allowed.

By 1960[2], another improvement was added for commercial channels: automatic retransmission upon reception of error. Although the concept is not complicated, it did not take in the amateur community because several different frequencies were usually used: one or two for the originating station and another one or two to retransmit at the receiving station. This is similar to our standard 2 meter split in transmit/receive.

Then about 1975[3], a new system was proposed for maritime operation. The proposal solved the problem of not having enough space on a ship to have two different h.f. antennas! Imagine two 80 meter dipoles on one boat! The new system, called SPECTOR, allowed for simplex transmission on the same channel; that is, it was defined such that one station would transmit on the frequency and then the other station would respond on that same frequency to acknowledge correct receipt of the message. Just like our QSO's! However, they used 7-bit Moore and TOR codes for more accuracy. That leads to our idea.

Concept

First, we could propose to the FCC that amateurs be allowed to operate with Moore or TOR codes such as those used in the commercial services.[3] In fact, such a system has been proposed[4], called AMTOR. **S**tation **T**emporary **A**uthorization, STA, has been granted to a few to explore this possibility. However, it is unlikely that we could see such a form opened to all amateurs soon.

Some might suggest that we then use standard RTTY, Baudot-Murray, in an error correction or retransmission form. This will not work, however, because all codes would be legal; that is, errors would not be detectable.

So, the light comes on. Aha! Let's use Morse in a retransmission format. Illegal Morse codes are very detectable; hence, we can ask for a retransmission upon reception of illegal characters! Further, standard Morse can be transmitted now as an A1 emission type as long as we properly identify both parties involved. So, here is the concept in detail.

Glossary of Super-C.W. Terms

FEC: **F**orward **E**rror **C**orrection
ARQ: **A**utomatic **R**epetition re**Q**uest
SS: **S**tandard **S**peed
R: **R**oger, acknowledgement
doublet: Same word sent twice
A: Represents 1/2 second delay
B: Time to transmit 'R' letter
breakin: Transmit to receive transition
master: The CQ originating station
TOR: **T**eletype **O**ver **R**adio
AMTOR: **AM**ateur **T**eletype **O**ver **R**adio
SPECTOR: **SPEC**ifications for **TOR** (commercial version of AMTOR)
slave: Station sending doublets; the station receiving doublets, returning 'R'

Referring to fig. 1, a computer-based Morse communication channel would consist of a computer, interface (modem), transceiver, and antenna at each end. Further, we define it to operate at 75 or 50 w.p.m. standard Morse in three possible modes: FEC-C.W., ARQ-C.W., or SS-C.W. The protocol for each of these modes is explained in detail below, and the essence of these modes is multiple transmission of each word and/or retransmission on error and/or constant transmission speed. These modes dictate that computers must be present at each end of the channel and that they be programmed according to the specific protocol rules listed below.

Now what does this buy us? First of all, message accuracy should improve immensely.[2] Referring to fig. 2, we can see that typical noise bursts will tend not to interfere with correct reception of a message. These bursts tend to have an average duration of from 250 to 600 milliseconds. But since we have defined our systems such that they must transmit each word twice, one of the words will not get scrambled. If noise is occasional as this suggested, then the FEC-C.W. mode outlined below will improve reception. If noise is more persistent, then the second mode, ARQ-C.W., can be used. Here the transmitting station sends a word twice and waits for a "roger" from the receiving station. If an acknowledgement is received, transmission continues on to the next words. If not, the same word is transmitted twice again. Even with noise present 50 percent of the time, in bursts, messages should get through. At this point, let's review the rules (protocols) for these suggested modes.

Protocols

Protocol for FEC-C.W.:

1. When calling CQ, use CQ CQ CQ FEC de your call.

2. Transmit at 75 or 50 w.p.m.

3. Use the standard 3/1-dash/dot ratio.

4. Send each word twice—a doublet. Words must consist of at least three characters; combine smaller words (see example).

5. All the characters of each doublet must be sent without delay; that is, no extra spaces can be inserted. However, pauses are allowed after each doublet if necessary.

6. On receive, each word is received twice but is displayed only once. If an illegal Morse character is received within a word, then the word is rejected. Display the first word received that has no illegal characters. "Good" refers to a complete word with no illegal Morse characters and "bad" refers to a word with at least one illegal Morse character. Thus:

received1	received2	display
good1	good2	good1
bad	good2	good2
good1	bad	good1
bad	bad	display #

or for example:

name	name	name
bo##	bob	bob
rst	rs#	rst
hom#	h#me	#

where # represents an illegal Morse character.

Protocol for ARQ-C.W.:

1. When calling CQ, use CQ CQ CQ ARQ de your call.

2. Again, transmit at 75 or 50 w.p.m.

3. Use the standard 3/1-dash/dot ratio.

4. Again, each word must be sent twice as with FEC-C.W.

5. On receive, doublet words are displayed as with the FEC-C.W. unless both words are bad. If both are bad, see below.

6. If either word of the doublet is legal, also transmit an 'R' back to the transmitting station to acknowledge legal receipt. If neither word is legal, do not acknowledge—i.e., send nothing.

7. If the transmitting station does not receive an 'R', it must attempt to transmit the same doublet again. It must try up to four times but no more.

8. If the receiving station never receives a legal word on the four receptions, then it must display a '#' to so indicate.

Protocal for SS-C.W.:

1. When calling CQ, use CQ CQ CQ SS de your call.

2. Transmit at 75 or 50 w.p.m.

3. Transmit with the standard 3/1-dash/dot ratio.

4. Again, all words must be sent at full speed; that is, no extra inter-character spaces are allowed. Spaces are allowed between words.

5. Words are not sent in doublets as with FEC or ARQ-C.W.

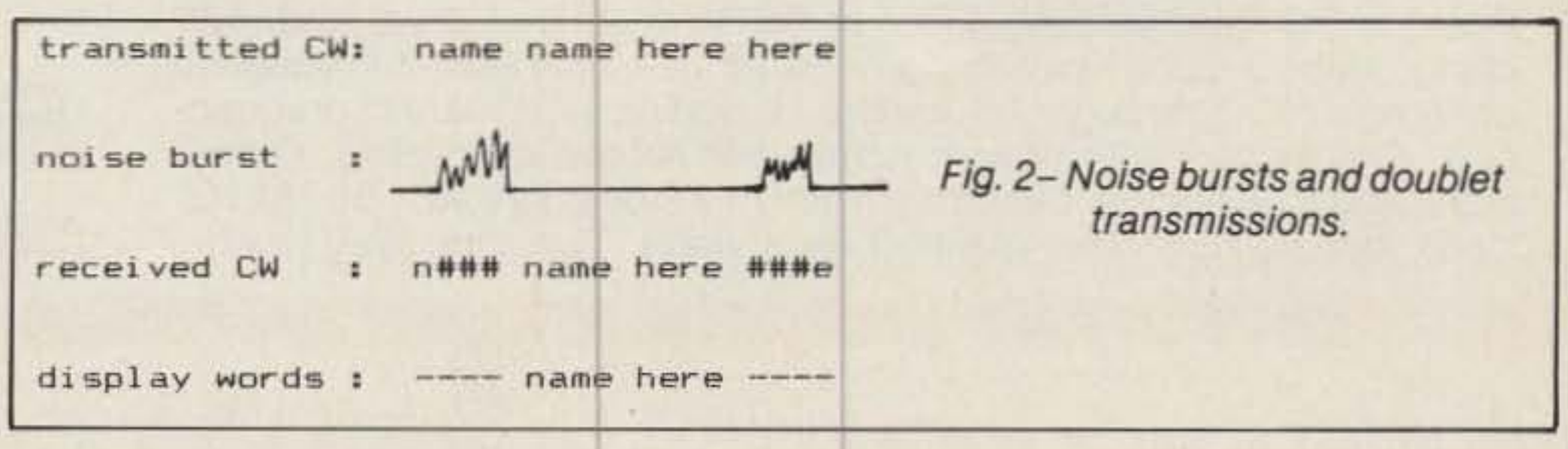

Fig. 2– Noise bursts and doublet transmissions.

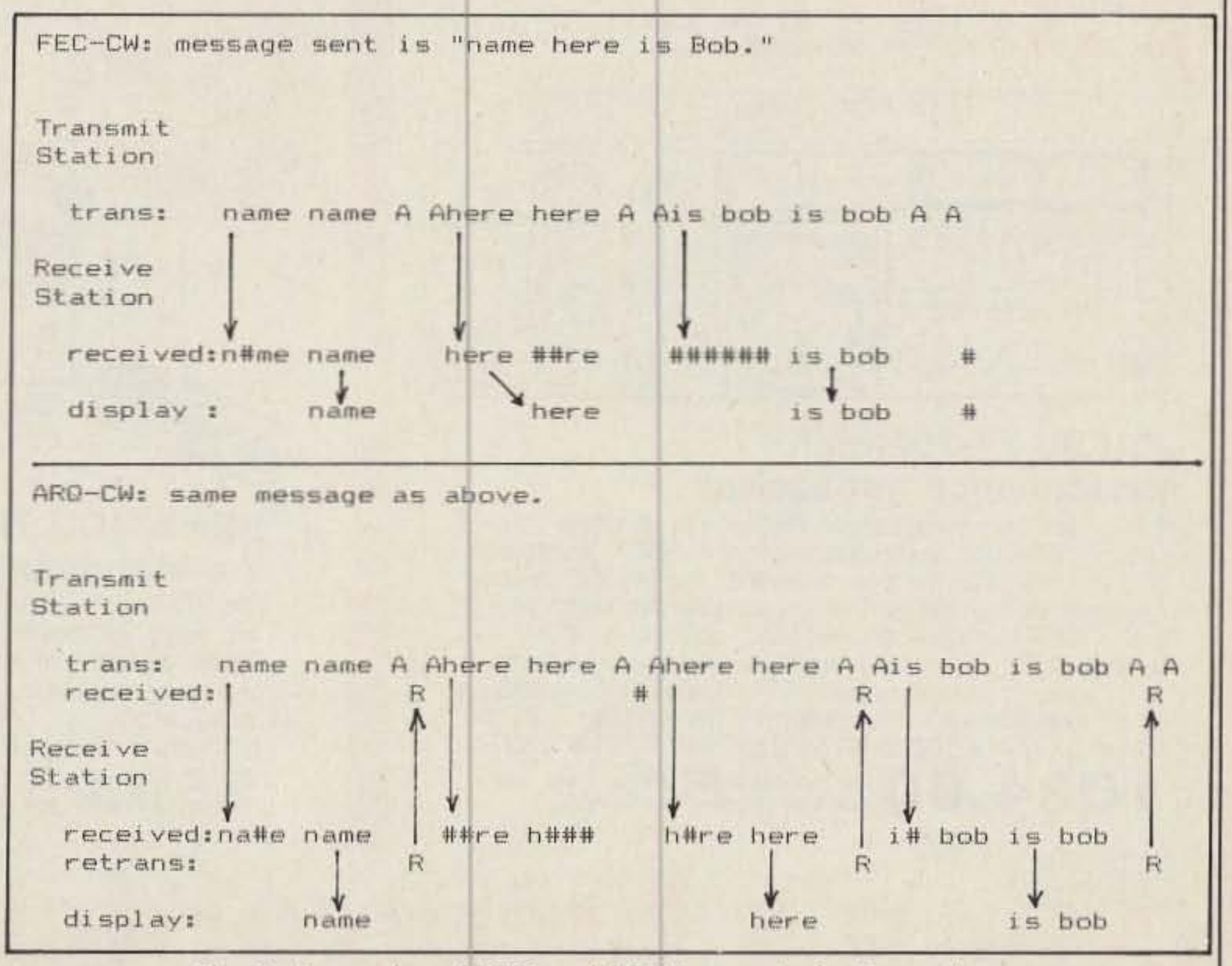

Fig. 3– Examples of FEC and ARQ transmission/reception.

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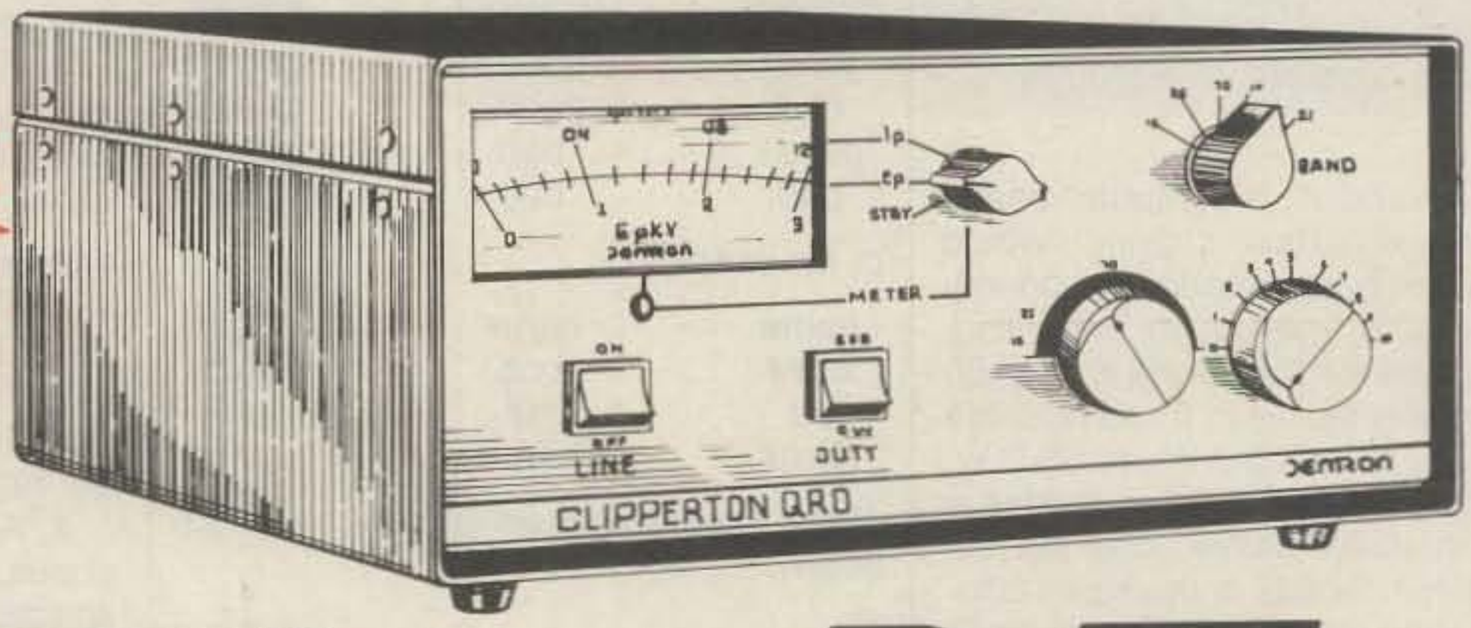

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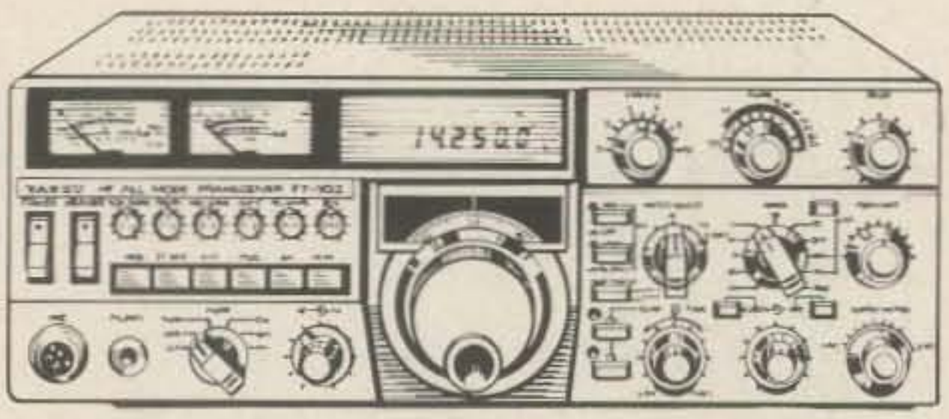

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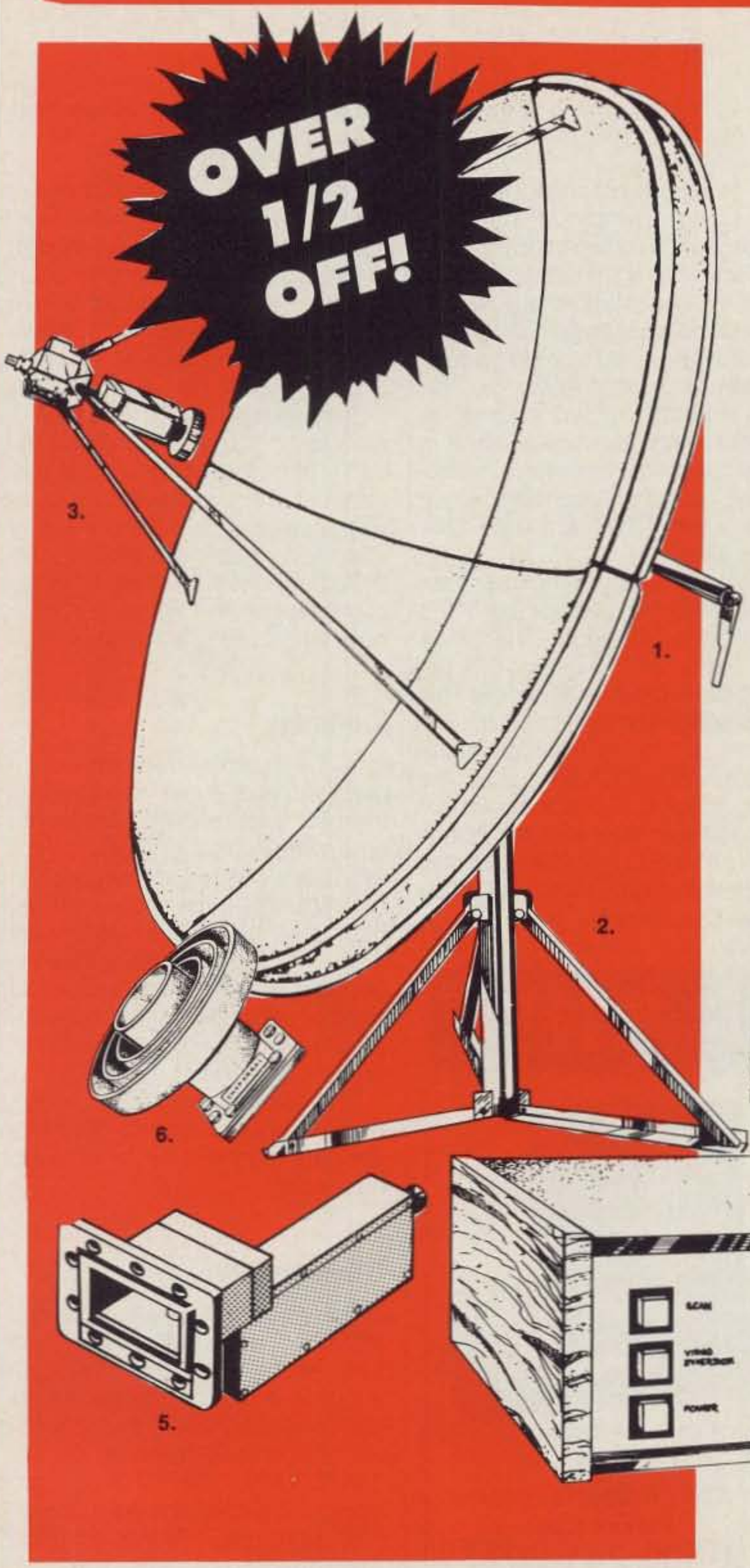

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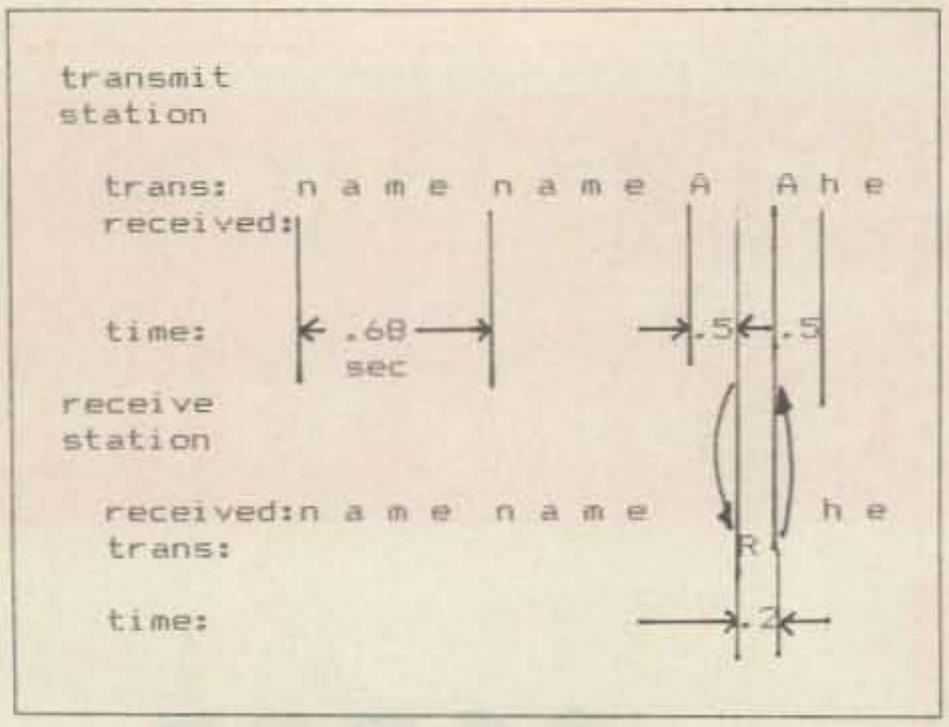

Fig. 4– ARQ-Acknowledgement timing (50 w.p.m.).

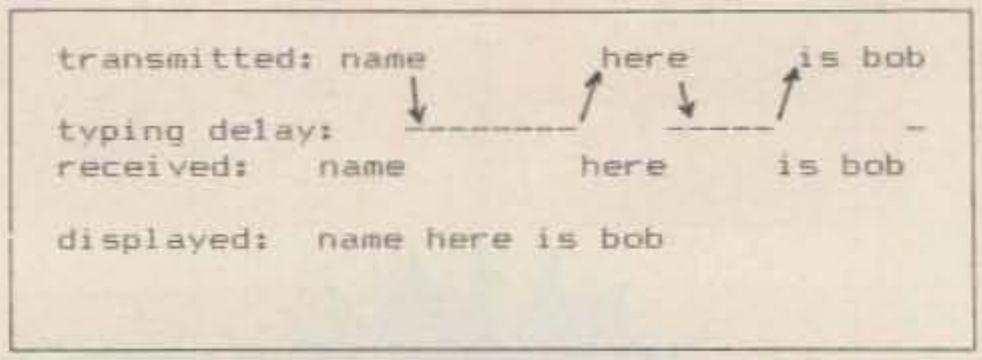

Fig. 5– Standard Speed (SS) c.w. transmission.

Examples

To further clarify the protocols, refer to the examples presented in fig. 3. The FEC example is first. Suppose that you are the originating or master station and that you want to call CQ. Do so but tag your CQ with FEC. Then the receiving or slave station will recognize that this is your mode and will receive accordingly. Fig. 3 shows the message "name here is Bob" being transmitted. Note that each word is sent twice and that a delay is then inserted at the end of those words labeled as A. This delay allows for computer time but also makes this mode receive compatible with the ARQ-C.W. mode.

Your computer will then examine both words received and throw out either if an error is detected. Note in the example that the first word had an illegal Morse character—n#me. That word would be rejected. In detecting standard Baudot, all codes are legal, but in decoding Morse, many codes are not legal. If noise disrupts the signal, your computer will most likely detect that.

If noise is heavy, we propose that ARQ-C.W. be used. An example of transmission and reception is shown at the bottom of fig. 3. Basically, the master station transmits as an FEC station, but will retransmit the same words again unless an "R" in Morse is received from the slave, meaning roger or "I got it AOK." To prevent lockup, the master will attempt to send the words only four times. Note in the example that the "here here" message must be retransmitted. Hence, we get the mnemonic ARQ—**A**utomatic **R**epetition on re**Q**uest.

Fig. 4 shows the detail timing for transition from send to receive for both the master and slave stations. The slave must wait a period of **A** seconds, 0.5, before sending the **R** for acknowledge. This allows for propagation time and for the master to break-in from transmit to receive. My Kenwood TS-520 makes the transition in about 0.4 seconds. In like manner, the master must wait **A** seconds after receiving the **R** so that the slave may revert to receive. If no **R** is received, the master must wait anyway.

The SS-C.W. format is shown in fig. 5. At first, it may appear that there is nothing special here. As with both modes above, these formats are asyncronous. But the key here is that the speed is fixed. With fixed speed, c.w. is much easier to detect, and it can be detected with greater accuracy. A good analogy to this is the viewing of a picture at a gallery. If you get too close, you see too much detail and can't tell who or what the painting is about. If you stand back some, and here you receive less data per square inch, you then "see" the picture. The same thing happens with code. If random noise is present on the signal, it is easier to ignore with fewer samples.

Summary

With multiple transmission, retransmission, and constant speed, it should then be apparent that Morse can compete with Baudot or TOR. In fact, it may even turn out to be more accurate and fun! While all three modes above seem to have their place, we suspect that ARQ-C.W. would be the most often used because it will have the most accuracy, in good or poor noise situations. In addition, FEC is a subset of ARQ as far as reception is concerned.

The great advantage of using Morse is that it is legal now and would allow for error detection and retransmission methods today!

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[5] P.N. Anderson, "Memo to file: Super-C.W.," Kantronics Inc., 12-82.

[6] "Super-C.W.," is a trademark of Kantronics Inc.

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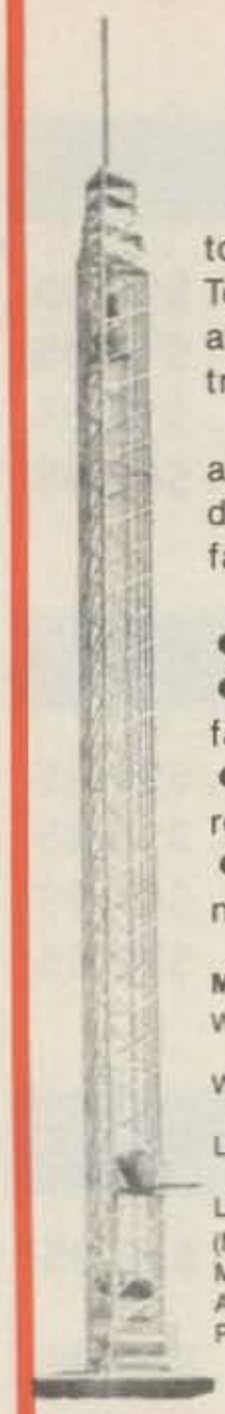

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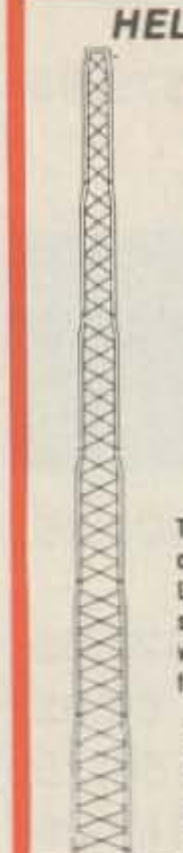

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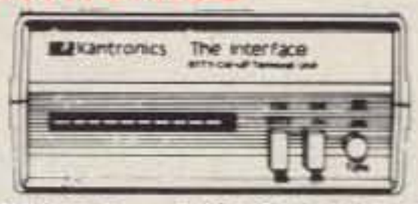

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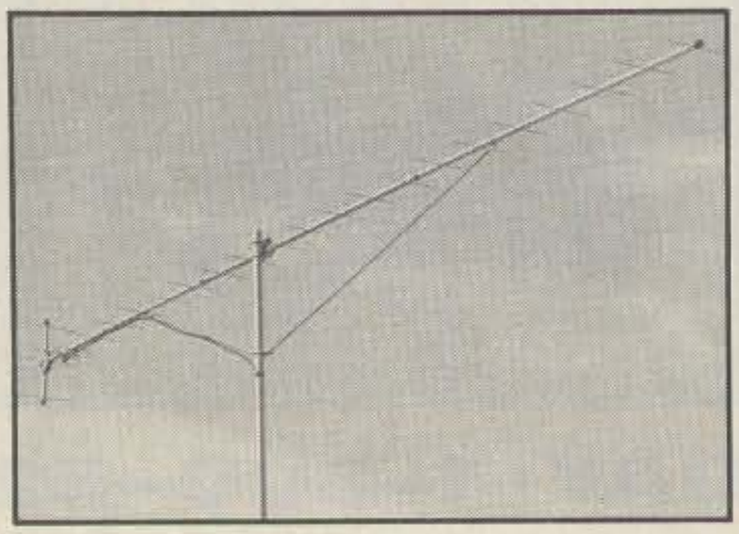
Cushcraft 424B Antenna

The 424B is the newest Cushcraft Boomer antenna. It is a 24 element, 70 cm Yagi exhibiting 18.2 dBd forward gain. The antenna's features include insulated elements, stainless steel hardware, N-type connector, T-match feed, and trigon reflector. Beamwidth is 19°, and length is 17.42 feet.



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HAL Communications Corp. has announced the MPT3100, a "software" expansion of the DS3100 ASR video terminal. The MPT3100 expands the features of the proven "mailbox" option and adds a separate mode for collection, editing, and relay of multiple message texts ("traffic"). The DS3100 ASR is a full-featured buffered terminal for use in radio communications using the standard Baudot (5-level) and ASCII (8-level) data codes, as well as the Continental Morse Code.

The MPT3100 software may be added to any DS3100 ASR with MSO3100 hardware package. All new DS3100/MSO3100 terminals shipped after January 1, 1983, will include the MPT3100 software package. A great deal of flexibility in message format is allowed in the MPT3100 so that the terminal may be customized for specific user applications. The addition of the MPT3100 package does not preclude continued use of the DS3100 as a buffered TTY terminal. Price of the MPT3100 factory update for existing DS3100/MSO3100 terminals is $125.00. For more information, contact HAL Communications Corp., Box 365, Urbana, IL 61801, or circle number 102 on the reader service card.

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The new CVR-1B Scanverter includes a built-in preamplifier for increased sensitivity. The CVR-1B allows complete coverage of the 225–400 MHz military/federal government aircraft band when used with a standard aircraft band scanner. The Scanverter makes it possible for

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Mirage Communications' pocket-size B23 (2 meters) and C22 (220 MHz) power amplifiers have been upgraded for greater versatility. A new "power" switch permits selection of full amplifier power or a non-energized bypass mode when only HT power is desired. The f.m./s.s.b. switch controls choice of rapid or delayed relay action. Power amplification is linear in either mode. The B23 produces 30 watts (minimum) for 2 watts in, 15 watts for 1 watt, etc. The C22 produces 20 watts (minimum) for 2 watts in, 10 watts for 1 watt, etc. Duty cycle of both amps is "continuous."

The B23 and C22 are made in the U.S. and carry a 5-year general warranty with 1 year for r.f. power transistors. For more information, contact Mirage Communications, div. KLM Electronics, Inc., P.O. Box 816, Morgan Hill, CA 95037, or circle number 104 on the reader service card.

No-69-70

Antennas

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

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

Antenna Accessories for the Hamshack: Part VI

In last month's CQ, columnist Thurber continued his discussion of in-line r.f. and antenna accessories. This time, he examines two accessories in the "off-line" or test-equipment vein: the antenna noise bridge and the grid-dip oscillator.

—K2EEK

In this series, we have taken a look at a wide variety of antenna and r.f. accessories. Most of these have been of an "in-line" nature—devices of the type that are inserted in series with the transmission line and generally left there. Last month, we discussed one in-line device, the r.f.i. (lowpass) filter, and one off-line device, the field strength meter. This month, we will continue our discussion with a look at two of the latter type: the antenna noise bridge (ANB) and the grid-dip oscillator (GDO). Let's take a look at the former device first.

The Antenna Noise Bridge

Another very useful and popular hamshack instrument is the antenna noise bridge (ANB), or r.f. noise bridge. This is a self-contained package that is quite helpful in adjusting an antenna system to resonance by using a receiver alone; no transmitter energy need be fed to the antenna in order to make measurements. And, as we shall see, the ANB can also be used for a variety of other impedance-measuring and related tasks. The ANB can be home-brewed without a great deal of difficulty, using popular *Handbook* or article designs, or a commercial unit can be purchased. MFJ, Radiokit, Heathkit, and Palomar Engineers, among others, make a variety of ANBs.

This unique r.f. measurement tool is actually an updated version of an earlier instrument, known variously as the Antennascope, antenna bridge, antenna null detector, impedance bridge, or Z-bridge. The big difference between the ANB and its predecessors is that it is not only an impedance-measuring bridge, but it also includes a broadband noise signal source. Because of this, it does not have to be driven by an external signal, such as that from a grid-dip oscillator or transmitter. When used with a reliable and stable communications receiver capable of tuning the desired frequency, both the antenna resonant frequency and the impedance at resonance can be measured easily and with good accuracy. These features make the ANB of particular interest to the shortwave listener, since he or she can "fingerprint" the antenna system over a wide range without need for a source of r.f. signal, and can also make precise adjustments to the transmatch. Practically any type of amateur mobile or fixed station antenna can be rapidly adjusted and tuned for optimum performance without the use of any additional equipment, other than the re-

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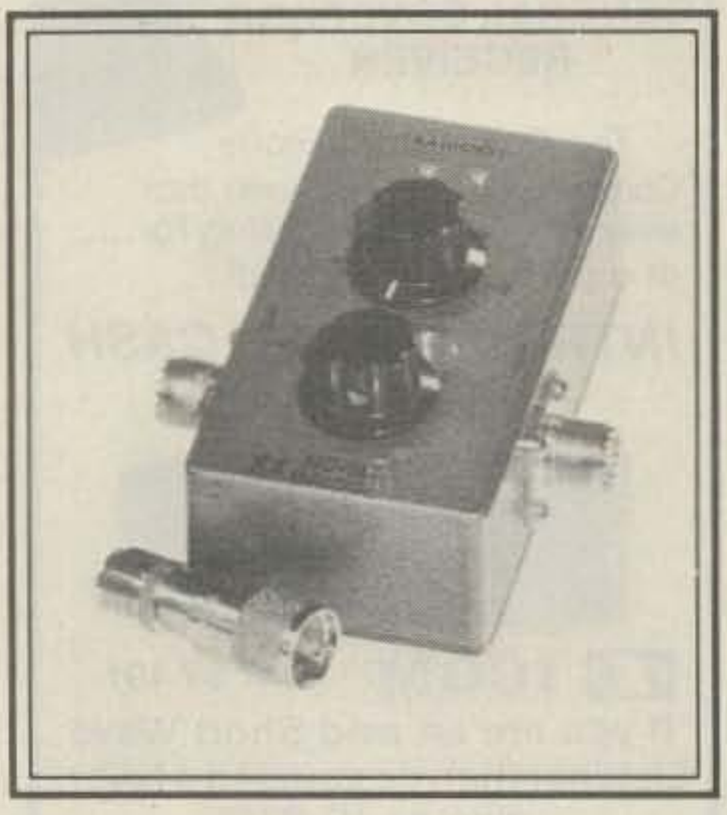
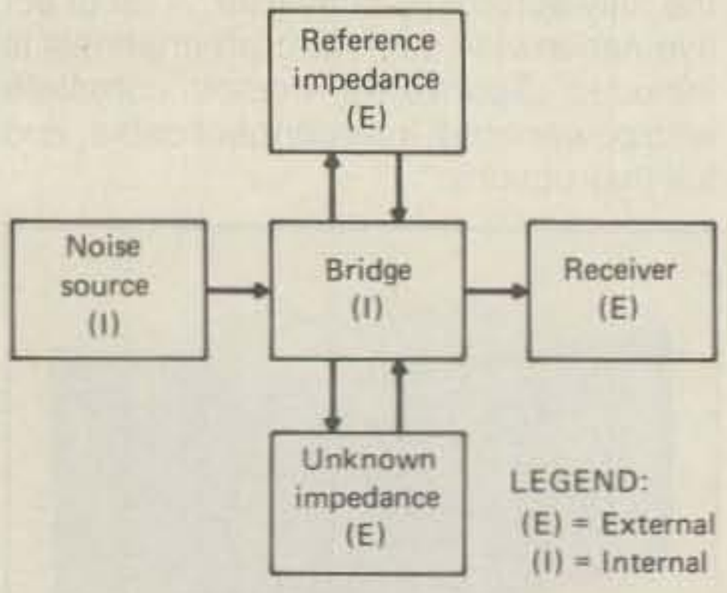


R-X Noise Bridge kit shown here measures both resistance and reactance. The self-contained unit uses the receiver as the detector and is designed to work over the range 1.5 to 30 MHz. Resistance limits are 0–250 ohms; reactance limits are ± 180 pF. Radiokit design is based on a February 1977 article in Ham Radio. *(Photo courtesy Radiokit)*

There is no reason why the antenna noise bridge can't be teamed up with an antenna tuner in a single package for tune-up without the need to apply transmitter power. The Palomar Engineers PT-3000 tuner shown here allows tune-up without going on the air, yet the built-in ANB lets the operator preset the tuner for a 1:1 s.w.r. without reference to the transmitter. Unit is designed for continuous coverage, 1.8–30 MHz, with a power rating of 2000 watts; coax, single-wire, and balanced-line antennas can be accommodated. A source of 9 v.d.c. at 50 ma is required in the tuneup mode. Although in the $400 price class and designed for high-power operation, this type of antenna tuner would likely be of interest to the serious shortwave listener, due to the precision antenna matching possible with such a combo. (Photo courtesy Palomar Engineers)



The antenna noise bridge system is more than just the ANB itself. Included are five major parts: two internal and three external, as shown above. The heart of the device is the bridge, which is excited by a broadband noise source. A reference impedance and the unknown impedance to be measured make up separate legs of the bridge. In operation, the reference impedance is varied until it equals the unknown impedance. When this happens, the bridge is said to be "nulled," and the output of the communications receiver goes to a minimum—usually indicated by a pronounced dip in S-meter reading.

ANB applications are many. Major ones include the determination of antenna resonance and impedance, transmission-line resonance, velocity factor of transmission lines, circuit impedance, r.f. amplifier and receiver impedance, balun characteristics, proper transmatch tuning, and many others. One big advantage of the ANB over other instruments is that calibration accuracy is largely a function of the frequency calibration of the receiver with which it is used.

Fig. 1– The antenna noise bridge (ANB) system.

ceiver used as the frequency-selective detector. The fact that no external signal source is needed makes the ANB especially good for use on the tower near the antenna, or for checking a mobile unit on the spot.

A little history: in the September 1950 issue of *CQ*, the late Wilfred M. Scherer, W2AEF, described an instrument that amateurs had been waiting for for a number of years—a compact package that would do a number of neat things, such as determining antenna resonance and impedance, matching transmission lines for minimum s.w.r., finding the input impedance of amplifiers and communications receivers, determining the reflective impedance of lowpass filters, and a number of other useful operations around the hamshack. This device, about the size of a grid-dip oscillator, was later marketed commercially by Eldico and several other firms. It was actually an r.f. impedance measuring meter which was designed to be driven by a "dipper" as the signal source.

In the Antennascope's original form, it could measure antenna impedance from 10 to 1000 ohms, and it could be used up to 200 MHz—not too shabby for 1950! Some of the things it could do for hams was to enable them, mostly for the first time, to accurately adjust the length of dipoles and verticals, prune mobile antenna loading coils, determine standing wave ratios, adjust beams and matching stubs, and accomplish several other tasks which either were just not possible before, or which were only roughly approximated using neon bulbs or r.f. ammeters.

Refinements and improvements of the basic Antennascope came on the market over the years under several names. These designs allowed amateurs to learn a great deal more about their antenna systems than just s.w.r. In fact, these devices brought home the fact that if you had been using *only* the s.w.r. meter to adjust your antenna, you had been severely handicapped, as though working with one hand tied behind your back. ANB-type instruments are, in fact, a great deal more useful because they allow you to determine capacitive and inductive reactance, and thus they tell you "which way to go" in adjusting the antenna. The s.w.r. bridge, of course, does not offer this feature.

The predecessors of the modern-day ANB had one major drawback: they required an external driving source, such as r.f. from a grid-dip oscillator, signal generator, or variable-frequency oscillator (v.f.o.); there was no internal source of r.f. That requirement made operation somewhat cumbersome, since two instruments were required to make measurements. And, regardless of how accurate the bridge was as an impedance-measuring instrument, it was dependent on the calibration of the grid-dipper or other signal source for overall accuracy of measurement. Unfortunately, the dipper and the signal generator were not usually the most accurately calibrated instruments, and their actual frequency could be "pulled" by the circuit or antenna under test. A further refinement, the antenna noise bridge, which includes a broadband noise source, eliminates the calibration problem. Overall accuracy is now limited mainly by the accuracy of the receiver used as a detector and the precision of the bridge components.

As indicated, modern ANBs contain a broadband noise generator and an r.f. impedance bridge. Without going into a great deal of technical detail, the known leg of the bridge has a calibrated variable resistor and a calibrated variable capacitor, both controlled by front-panel knobs. The antenna or circuit to be measured is connected to the unknown leg of the bridge, and a receiver, used as a detector, is tuned to measurement frequency.

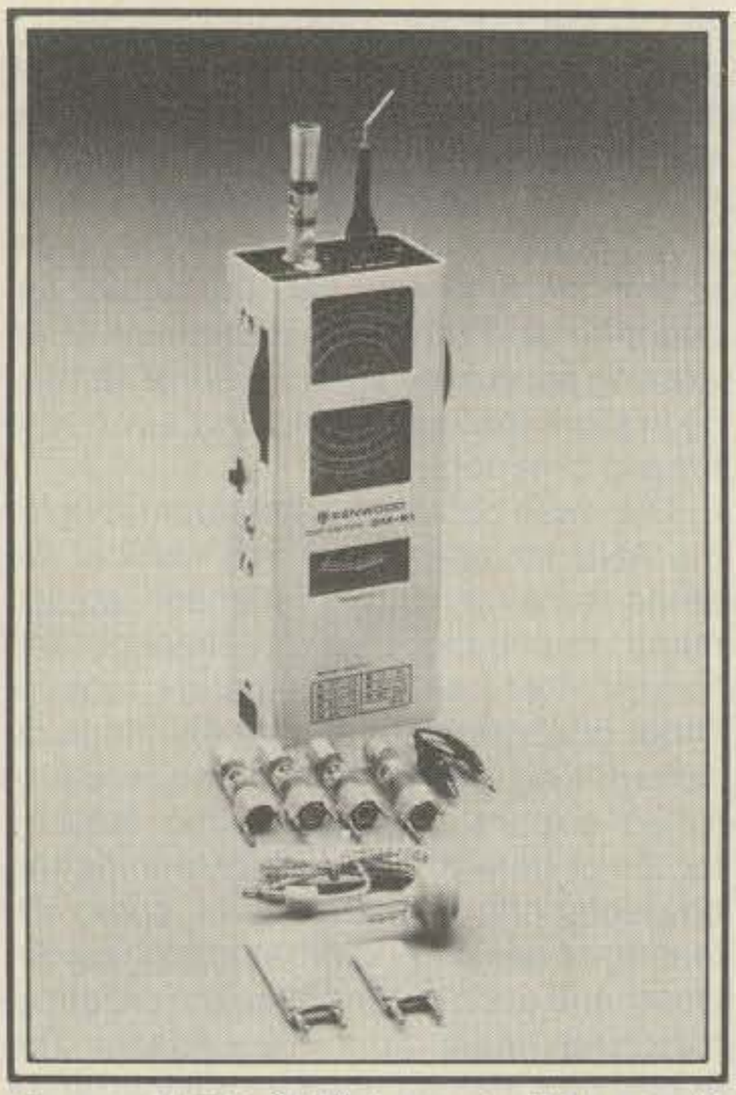
A loud noise from the noise generator is heard in the receiver when the ANB is first turned on. The "R" and "C" knobs, which control the variable resistor and capacitor, are adjusted for a noise null; the "R" knob reads the antenna resistance. The "X" or impedance knob, if it points to zero, indicates that the antenna is resonant. However, if it reads on the "X_L" side of zero, the antenna is inductive—meaning that it is too long; but if the knob reads on the "X_C" side, the antenna is capacitative—too short to resonate on-frequency.

In normal use, when adjusting the antenna system for a specific impedance and resonant frequency, the receiver is set to the desired operating frequency and the bridge is set for the desired impedance. The necessary antenna measurements are made that result in a distinct noise "null," as indicated by the receiver's S-meter or by ear. It's also possible to use the bridge to find the actual impedance and resonant frequency of an existing antenna—where a surprise may be in store for those using only s.w.r. as a tuneup criterion!

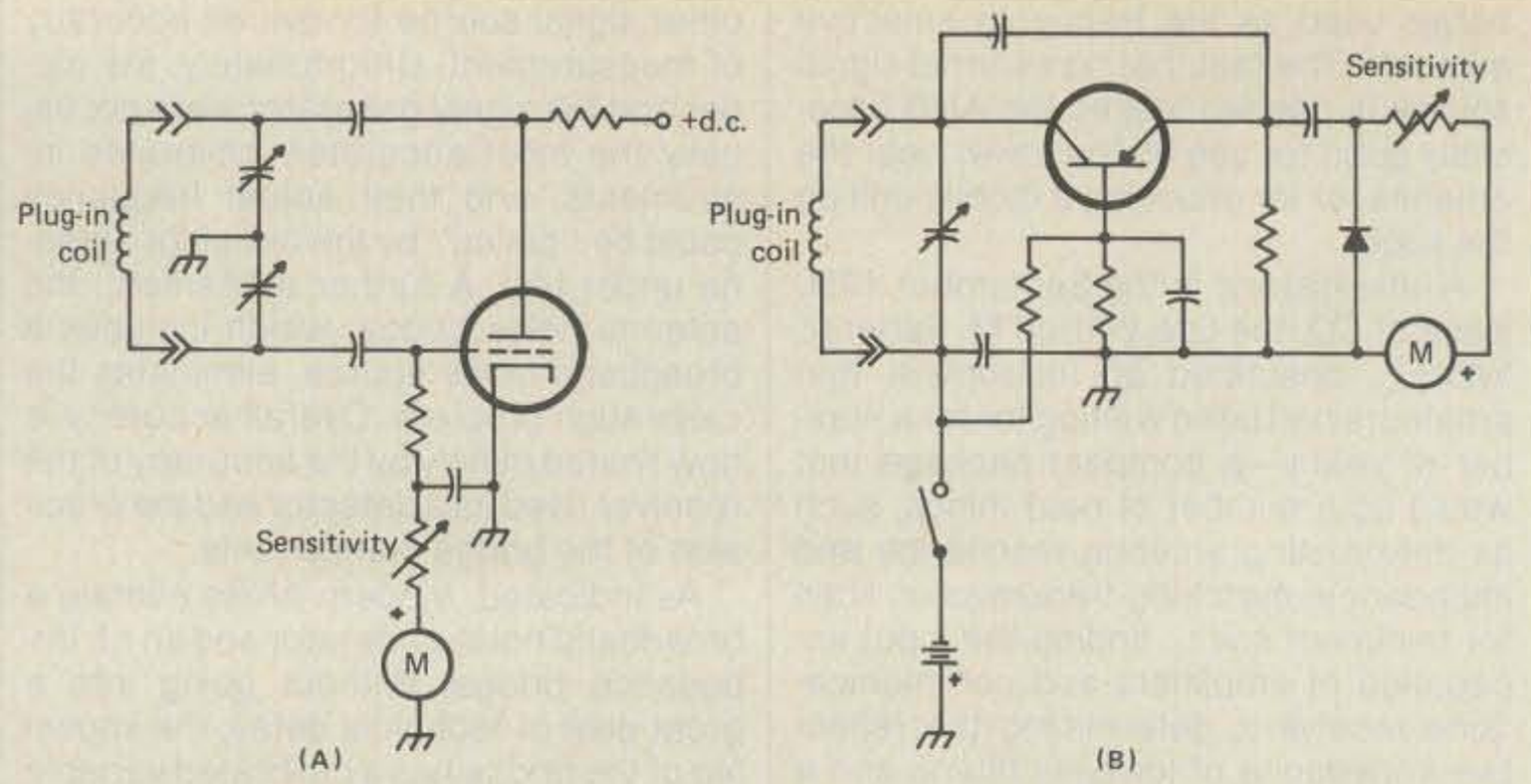
The more common hamshack uses for the ANB include dipole and vertical antenna tune-up, beam element adjustment, multiband trap resonating, and "transmitter-less" transmatch tuneup. Other practical uses for the ANB include determining the resonant frequency of tuned circuits, measuring the velocity factor of coaxial cable, determining the characteristic impedance of coax, r.f. testing of baluns and other matching devices, and even determining the practical matching limits of a transmatch. The bridge can also be used as a wide-range signal source for receiver alignment, adjusting bandpass filter circuits, and making r.f. gain measurements, since it can put out several hundred microvolts of broadband noise.

Most currently available commercial ANBs work over the range of about 1 to 100 MHz or so. Some are good up to 300 MHz or higher, meaning that they can be used to adjust 2 or 1¼ meter antennas. Their beauty lies in their high accuracy, which is limited not by the uncertain calibration of a grid-dip oscillator or signal generator, but by the accuracy of your station receiver or transceiver.

One disadvantage is that the ANB is a



Kenwood DM-81 "dip meter" is a self-contained, self-excited oscillator designed for external coupling to the equipment being tested. Both inductive and capacitive coupling are provided—the latter particularly useful for checking the resonant frequency of enclosed (shielded) coils. Handy features include a crystal-checker and marker-generator function, amplitude modulation capability, earphone monitor jack, and absorption frequency meter function. Frequency range is 700 kHz to 250 MHz in seven ranges. The solid-state unit makes use of one FET, three transistors, and three diodes, and is powered by a 9-volt transistor radio battery. (Photo courtesy Trio-Kenwood)



Above left is shown a classic GDO circuit using a triode vacuum tube. At right is a typical solid-state GDO using a PNP bipolar transistor with a separate diode detector.

The GDO has a number of hamshack applications, as described in the text. To check resonance of a center-fed antenna, a one- or two-turn loop is connected across the antenna's center insulator and the GDO is coupled loosely to it, while an end-fed antenna can be checked by capacitively coupling the GDO to it. A length of coaxial cable can be checked for its resonant frequency by connecting a short loop of wire to one end, coupling the "hairpin loop" to the GDO's coil; if the cable is shorted at both ends, the half-wavelength frequency will be indicated, while if the cable is shorted at one end only, the quarter-wavelength frequency will be observed by the GDO.

Generally speaking, the best way to use the GDO is to make use of inductive field coupling from the antenna or lumped constant circuit to be measured, to the GDO's coil. "Natural" or proximity capacitive coupling can also be used; the connecting lugs on each side of the unit's plug-in coils are generally good spots for capacitive coupling between the GDO and the circuit under test. However, to avoid false readings, and for safety's sake, no part of the GDO coil should come in contact with the circuit under test.

Fig. 2– Basic grid dip oscillator (GDO) system.

low-power device: it is not intended to be left in the line. Instead, the ANB is mainly suited for one-time use in adjusting antennas, transmatches, and resonant circuits. Once adjustments have been made, the in-line s.w.r. bridge is probably the best bet for continuous monitoring of performance.

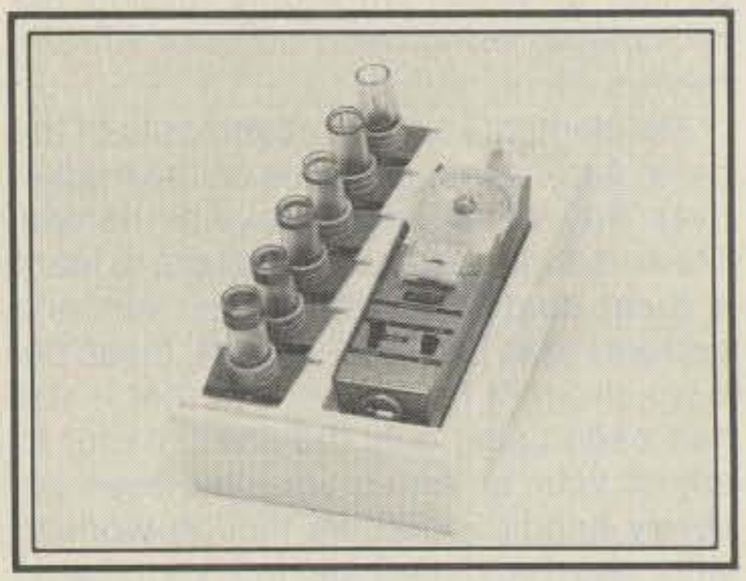
Another disadvantage of the ANB when antenna-checking is the need to mount it right at the feedpoint. Doing so is not always convenient, and in some cases may be impossible. Simply connecting the ANB at the end of the transmission line will not do the trick, unless the line is an *electrical* half-wavelength or a multiple thereof. Of course, there is just one frequency where the line is a half-wavelength, and all measurements must be made at that frequency. Lines other than one-half wavelength may be used, but readings taken at the end of the line must be converted to equivalent figures using a Smith chart. The procedure is complicated and is outside the scope of this article.

Nevertheless, for initial tune-up, the ANB is an invaluable device, since it tells one a good deal more about an antenna's characteristics than does the s.w.r. bridge. As such, it can compress the frequently long and tedious process of cutting and trying to get an antenna system properly adjusted. A handy and useful instrument, to be sure!

The Grid-Dip Oscillator

Of equal versatility is the Grid-Dip Oscillator (GDO), sometimes referred to as the Grid-Dip Meter (GDM), dip meter, "dipper," or "megacycle meter." The GDO uses a tuned r.f. oscillator and meter to indicate the absorption of energy from the unit's resonant tank circuit by the circuit under test. The frequency at which this indication occurs is the resonant frequency. The meter can be used in either an active or injection (oscillating) mode, or a "passive" mode (like a wavemeter). The name originated in the early days of radio, when it was found that the current in the control grid in a self-excited oscillator was quite sensitive to resonance in nearby tuned circuits. This current would decrease, or dip, as the external circuit was tuned to the frequency of the tube oscillator.

In the "old days," the GDO was a tube-type, class-C oscillator which had a sensitive meter inserted in its grid circuit. An external resonant circuit loosely coupled to the tank circuit caused a decrease, or dip, in grid current. Because the grid-cathode diode of the tube rectified r.f. voltage, the oscillator operated in a stable class-C mode; the rectified r.f. provided the d.c. grid current to operate a d.c. current meter for visual indication of the resonance dip. Tubes are, of course, no longer used in current GDO designs,



B&W 331A transistor dip meter is a portable r.f. signal generator, signal monitor, and absorption wavemeter. Unit covers 2–230 MHz in seven overlapping ranges with an accuracy of ± 3%. A 100 microampere meter is provided; meter circuit uses a d.c. amplifier with a potentiometer in the emitter circuit to control meter sensitivity. The dip meter is powered by a single 9-volt transistor battery. (Photo courtesy Barker & Williamson)

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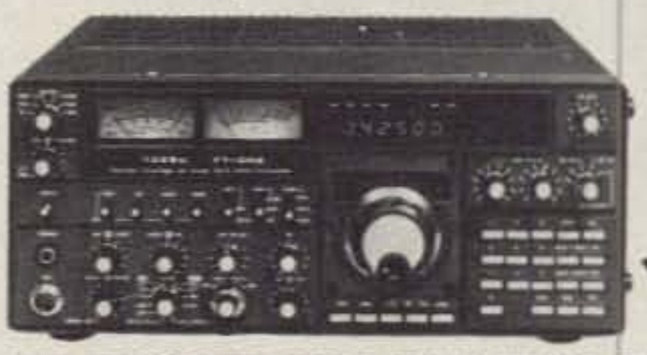

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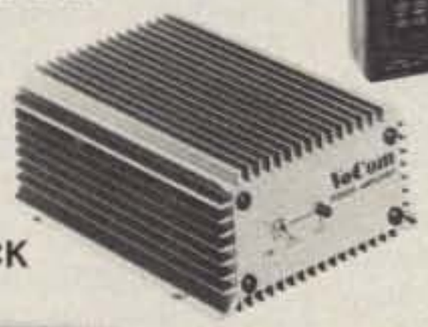

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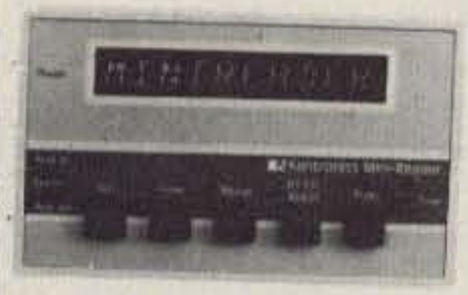

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Heathkit HD-1250 solid-state "dip-meter" can be used to determine the approximate resonant or operating frequency of either energized or de-energized circuits. Heart of the device is a Colputts oscillator covering 1.6 to 250 MHz in fundamentals, with a MOSFET amplifier and hot-carrier diodes for high detector sensitivity. Typical applications include checking resonant frequencies, adjusting traps, ferreting out parasitics, or using it as a signal generator. It operates from a 9-volt battery. (Photo courtesy Heath Co.)

so the original nomenclature is really a misnomer today, as there are no "grids" in transistors. Current designs make use of solid-state, battery-operated devices, such as bipolar transistors, junction field-effect transistors, and MOSFETS that generally behave in fashions analogous to the tubes which they replaced. A dip in the base current, rather than the grid, is indicated by the meter when an external resonant circuit is tuned to the oscillator frequency.

The origins of the GDO are not entirely clear, but it seems to have been introduced in commercial circles in the 1930s. The first known amateur reference to GDO's was by Bud Bane, W6WB, in the March 1947 issue of *CQ*. Bud's design used a 3A5 tube for battery operation, and it covered 80 through 10 meters with three coils. The late Wilfred M. Scherer, W2AEF, mentioned previously in connection with his ANB development work, also played a hand in the early development of the GDO. Working separately from Bane, he published his article "The Dipper," which appeared two months later in the May 1947 issue of *CQ;* it is also believed that he was responsible for several commercial versions of the instrument. Scherer's 1947 GDO made use of a 955 triode and was AC powered, using a 5Y3G rectifier and VR150 voltage regulator. The unit covered 3 to 250 MHz in six ranges using a set of plug-in coils.

Space doesn't allow cataloguing all of the capabilities of the GDO. However, suffice it to say that its primary job is to allow one to determine a circuit's resonant frequency; that circuit may be a coil-and-capacitor combination, a loading coil or trap, an antenna system, or whatever. Its other uses include checking capacitance, inductance, circuit "Q," bandwidth, crystal operation, transmission lines, and filters. It can also be used in radio alignment and pretuning equipment.

In addition to these main functions, when the GDO is used in its "active" or oscillating mode, it can double as a signal generator or marker oscillator for receiver alignment. Some amateurs, as well as shortwave listeners, not owning receivers with b.f.o.'s (necessary for tuning in c.w. and s.s.b. transmissions), have even used their GDO's as outboard local oscillators. This is done by coupling the instrument to the antenna to produce the carrier necessary for c.w. and s.s.b. reception. (Hopefully, though, these days are well past!)

When used in its passive mode, the GDO has all of the features of the old-fashioned absorption wavemeter. In this mode, the GDO becomes a tuned r.f. amplifier/detector. Current models, which usually have a broadband r.f. amplifier circuit, are quite sensitive, so the unit need only be placed near a "hot" circuit. While the unit's frequency readout is only approximate, and thus cannot be used to check *exact* frequency, the GDO is quite useful to detect parasitic oscillations and harmonics in transmitters, as well as to "neutralize" the final tubes of home-built amplifiers. If the unit has a small whip antenna, the signal pickup from the antenna generally allows it to be used as a relative field strength meter.

A measuring device is no better than its own calibration; the big problem with the GDO is the usually "piddling" calibration accuracy, particularly if home-brewed or kit-built, where coil construction variables may affect results. The calibration of most GDO's is, thus, only approximate—close enough for most purposes, but inadequate for split-hair applications. However, this is not an insurmountable drawback, in that the GDO may be used in conjunction with a well-calibrated communications receiver or frequency counter to significantly improve accuracy.

Interestingly, the GDO is, dollar-wise, one of the most "bang for a buck" and capable test equipment investments an amateur can make, yet it is one in which few amateurs make use of anywhere near all of the instrument's capabilities. The GDO is probably the least-expensive *single* test oscillator one can buy or build that covers the r.f. spectrum all the way from the low-frequency (l.f.) band up to u.h.f. in one package, and which also offers both the injection ("dipper") and absorption (wave-meter) modes or functions in one package.

If you are contemplating the purchase of a GDO, keep in mind that the most useful ones offer a relatively high calibration accuracy, cover a wide range of frequen-

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cies on fundamentals, make use of FET circuitry, and are battery-operated to enable them to be carried right to the antenna or mobile right where and when they are needed. Some include capacitive probes for probing "tight" areas, as well as a tone modulation feature, useful for locating the GDO's signal in a crowded band.

Several firms manufacture GDO's today, including Barker and Williamson, Heathkit, and Kenwood, among several others. And, of course, you can build your own. There have been several designs published in various handbooks and radio magazines; refer to the bibliography at the end of this column for some additional ideas on theory and construction.

The GDO is a great instrument for determining the resonant frequency of an antenna system and for checking the electrical characteristics of tuned circuits. Although it works on different principles, in many ways it is very similar in function to the ANB and can accomplish many of the same tasks. In any case, you'll find the GDO, like the ANB, both a good piece of test gear and a very practical antenna accessory.

Wrap-up

That's it for this month's column, in which we have examined the antenna noise bridge and the grid-dip oscillator. We have shown that both devices have widespread application for a variety of on-the-air and test equipment functions, particularly relating to antenna adjustment and tuning. You may find the bibliography which follows of interest should you wish to acquire a broader understanding of these two devices or to "roll your own."

Next month, we expect to conclude this series on accessories with a brief look at several other instruments having widespread hamshack application, as well as some interesting old-time instruments not likely to be found in today's solid-state hamshack. See you then.

73, Karl, W8FX

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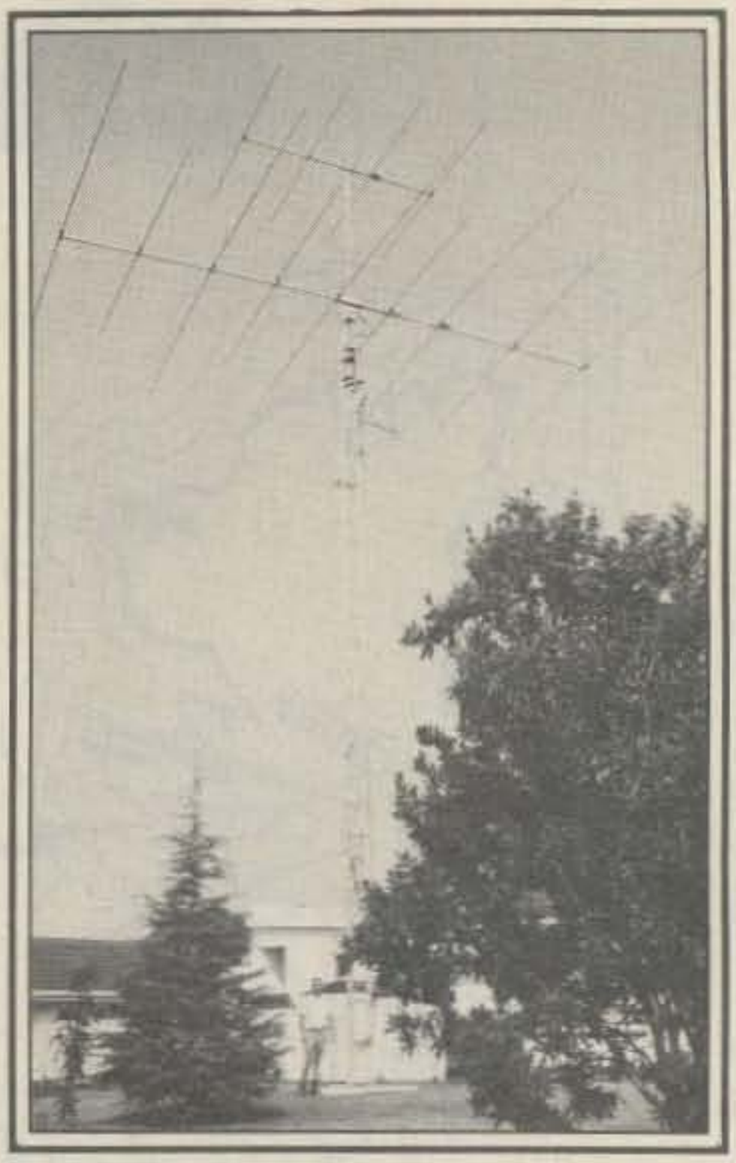
Antenna of the Month
Homebrew ZS6LF Interlaced Arrays



Homebrew ZS6LF Interlaced Array.

In this corner of the monthly Antennas column, we generally feature an interesting or unusual commercial antenna system or hamshack accessory. Occasionally, however, we receive correspondence from a reader who proudly provides us with information on his own antenna system that's well worth sharing.

This is the case this month, with Chris F. J. Goosen, ZS6LF, sending in a color photo and an interesting description of his homebrew antenna system. Referring to the photo, the topmost antenna is a 4-element Yagi for 10 meters; the bottom antennas consist of a 5-element Yagi for 20 meters interlaced with a 4-element 15 meter array. The 3 inch diameter lower boom is 41 feet long, and each antenna is fed using Omega matches. With a 12 foot spacing between the stacked arrays, Chris advises that interaction between the three systems is nil.

Chris designed and built the 20 meter system first. He then constructed the 15 meter system. Following that, he experimentally tied the two booms together and slid one along the other until s.w.r. readings were the same as when each antenna was first tested, to determine final interlacing arrangement.

Chris's antenna, rotated by a prop pitch motor, took two years in the testing stage. It's been up in its present form since December 1980, being mounted on an 80 foot telescopic tilt-over tower which extends from 40 to 80 feet, and which tilts at 20 feet. In the accompanying photo, courtesy Peter Carey, the tower is at the 40 foot position.

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The March Story of the Month is:

Arthur M. Labahn, WBØGRN All Counties #349 11-9-81

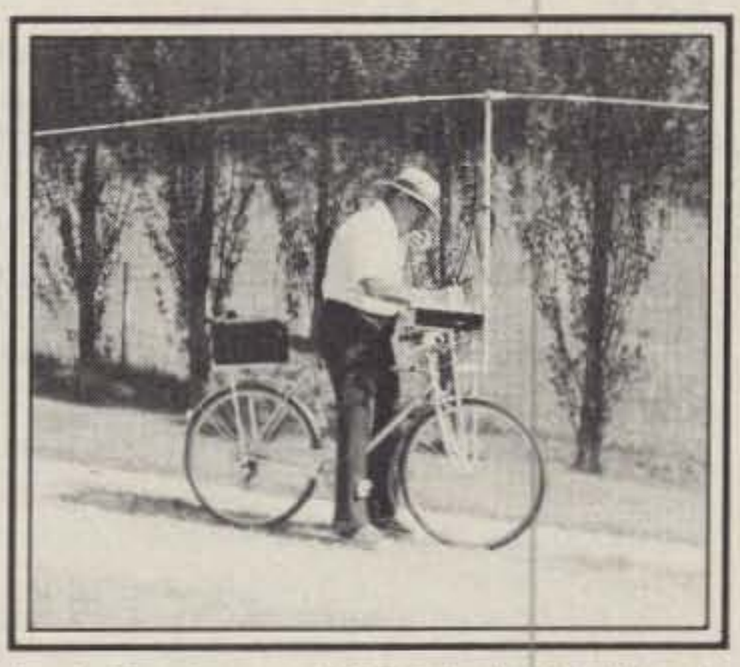
On November 9, 1981 All Counties #349 was issued to Art, WBØGRN. In the spring of 1976, Art saw a double-take antenna on an automobile in a parking lot. The owner of the antenna turned out to be Skip Skaptason, WAØWOB. Skip asked Art to join in on the County Hunters Net on 14.336.

In the fall of 1976, while on a business trip to the northwest, Art listened to the Net and became interested. The first County he ran for the Net was Box Butte, Nebraska. As of that moment, Art was hooked on County Hunting.

Art is in sales work and travels to many states. Up until April of 1978, he only gave out Counties. His XYL encouraged him to start collecting Counties and agreed to help with the paperwork. At that time he decided to try for the USA-CA Award. His goal was to work All Counties, Mobile to Mobile, QRPp. Using an Argonaut 509, that goal was achieved in November '81 and is the only award so endorsed!

In August, Art semi-retired, but he will still be traveling several states, giving out the Counties and going around the second time. (*Note:* There is a photo of Art and his XYL on page 98 of March '82 *CQ* at Mini-Convention, where Art was feted.)

Arthur M. Labahn, WBØGRN, and his Argonaut 509.



Arnie Bachmann, K9DCJ, with his bicycle mobile (a 12 volt battery, Atlas transceiver, and Hustler antenna) in Iowa County, Wisconsin. Hope he keeps off busy highways!

Herschel Bamford, W1APU, waited until he had them All before sending for USA-CA-500 through All Counties endorsed Mixed.

Donald May, KN5I (ex-N5AIY, KB5VZ), also waited until he had them All, and then did his paperwork for USA-CA-500 through All Counties endorsed All S.S.B.

Steve Buerg, KD6PY (ex-HL9VQ, WB5CHK, WA6PGB, WB6THT, and WB6ZGJ), got them All before applying for USA-CA-500 through All Counties endorsed Mixed.

Malkiel Webman, 4X4JU, added to his nice collection USA-CA-2500 and 3000 endorsed All S.S.B. (both #1 to Israel).

Jerry Burkhead, N6QA, added USA-CA-2500 endorsed All 2 × C.W. to his fine collection.

Alan Carpenter, WB8BMX, picked up USA-CA-500 and 1000 endorsed Mixed.

USA-CA-500 certificates went to:

Dr. Leopold Pomp, DL3DD, endorsed All A-1.

Roberto Massimo, I1ZQD, endorsed Mixed.

Joe G. Volpe, I1ZFT, endorsed All 2 × S.S.B.

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#408 Steven R. Buerg, KD6PY 12-3-82

Awards Issued

Earl Shobe, W7KOI, who received his USA-CA-500 in March 1964 and All Counties #16 in October 1969, upgraded his endorsement to read All YL, All Mobiles, All S.S.B. (The YL Mobile Award is issued by MARAC.)

Dick Peterson, W4KFA, added to his fine collection All Counties endorsed All S.S.B.

George Wosika, KCØMB (ex-KAØGTA), claimed USA-CA-1000 through All Counties endorsed All S.S.B., All Mobiles, and All 20.

P.O. Box 73, Rochelle Park, NJ 07662

USA-CA Honor Roll

3000		2000		1000	
4X4JU	433	KCØMB	548	KCØMB	750
KCØMB	434	W1APU	549	W1APU	751
W1APU	435	KN5I	550	WB8BMX	752
KN5I	436	KD6PY	551	KN5I	753
KD6PY	437			KD6PY	754
2500		**1500**		**500**	
N6QA	492	KCØMB	615	DL3DD	1787
4X4JU	493	W1APU	616	W1APU	1788
KCØMB	494	KN5I	617	I1ZQD	1789
W1APU	495	KD6PY	618	WB8BMX	1790
KN5I	496			KN5I	1791
KD6PY	497			I1ZFT	1792
				KD6PY	1793

Awards

The CWRJ Awards Program of the C.W. Group of Rio de Janeiro State: All awards are c.w. only. Information is from W5XW Associate Member #54, CWRJ U.S.A. Representative. CWRJ Operator Team Members as of October 1982 (PY1): AFA, AFG, AJK, ASI, BFZ, BGI, BMF, BOA, BQQ, BUG, BUL, BVY, CBW, CC, CCX, CCY, DCG, DEA, DFF, DGB, DIN, DJY, DN, DPG, DUB, DUH, DWM, EBK, EWN, FB, HQ, LG, MHQ, MKA, RJ, TCJ, UET, URQ, VB, VEC, VKA, VLR, VMV, VOY, WDS, WO.

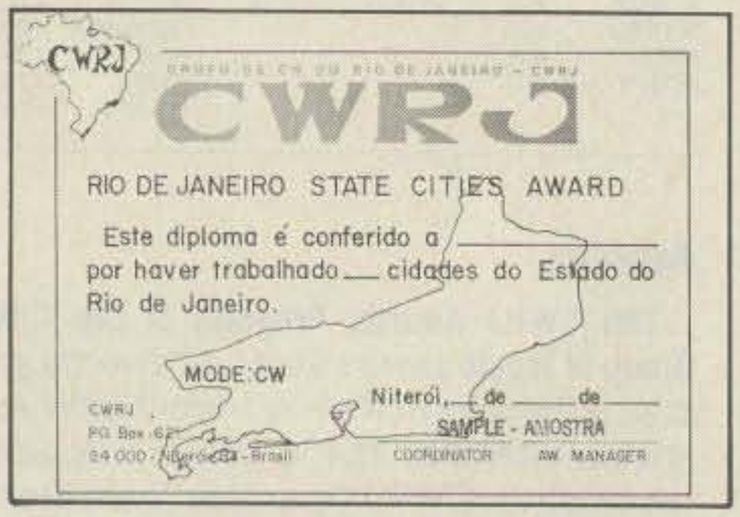
The Brazilian Worked CWRJ Award.

CWRJ Award—CWRJ: C.W. only. Work 20 different PY1 stations including 5 members of CWRJ Opr. Team. Endorsements: 6, total, each new 5 PY1 stations including 1 New Opr. Team Member. QSOs after December 16, 1980 valid. Send complete log data and 6 IRCs to manager: PY1EWN, P.O. Box 621, 24000 Niteroi, RJ, Brazil.

Brazilian Stations Award—BSAW: Work 75 Brazilian stations including 10 Federation Units (states/territories) and 2 CWRJ Opr. Team Members. C.W. only. Each state/terr. has different prefix: PY1, PT2. Endorsements 2. First: 50 additional Brazilian stations. Second: 25 additional Brazilian stations. QSOs after January 1, 1982 valid. Send full log data and 6 IRCs to manager: PY1EWM, P.O. Box 621, 24000 Niteroi, RJ, Brazil.

Rio de Janeiro State Cities Award—RJCAW: Work 10 cities of Rio de Janeiro

The Brazilian Stations Worked Award.



The Rio De Janeiro State Cities Award.

State (RJ) including 2 CWRJ Opr. Team Members. C.W. only. Endorsements: none** (see notes). QSOs after January 1, 1982 valid. Send full log data and name of the cities and 6 IRCs to manager: PY1DWM, P.O. Box 24039, 20522 Rio de Janeiro, RJ, Brazil.

Diploma Brasil Geografico—BGAW: Work 3 stations of each geographical region of Brazil. Fifteen total contacts, including one S.E. region CWRJ Opr. Team Member. Endorsements: none**. C.W. only.

Geographic Regions:

Norte (NO—North): PP8, PT8, PU8, PW8, PY8.

Nordeste (NE—Northeast): PP6, PP7, PR7, PR8, PS7, PS8, PT7, PY6, PY7.

Sudeste (SE—Southeast): PP1, PY1, PY2, PY4.

Sul (SU—South): PY3, PP5, PY5.

Centro Oeste (CO—Midwest): PP2, PT2, PT9, PY9.

Full log data. Fee 6 IRCs. QSOs after January 1, 1982 valid. Manager: PY1DFF, P.O. Box 1045, 24000 Niteroi, RJ, Brazil.

The Diploma Brasil Geografico.

Important Notes:

1. All awards C.W. only. Two way, or s.w.l. All bands mixed unless otherwise noted.

2. A single CWRJ Opr. Team Member may be used for more than one CWRJ award, but only if worked on other bands or on different date.

3. CWRJ Associate Membership is available to foreign amateurs—details next month!

4. **On initial application, any award will be endorsed "QRP" upon request and proof.

5. Endorsement seal fee: none. Send s.a.e. and one IRC for surface mail.

6. GCR—General Certification Rules apply.

5 Bands New Continent Award—5BNC: The Mexico DX Club is happy to offer this new award to all amateur radio stations and s.w.l.'s in the world under the following rules:

1. Three types of 5BNC awards are available: Mixed, C.W., or Phone. Contacts must be October 12, 1980 or after. (12-X: Discovery of America.)

2. Confirmation (QSL cards) must be submitted to the Mexico DX Club for countries claimed. Claims for 40 DXCC countries of America in each of 5 bands must be included with application, or photo-copies, with the official application form signed by a recognized club officer, verifying the possession of the QSLs of the applicant.

3. All contacts must have been made from the same "DXCC Country" on 28, 21, 14, 7, and 3.5 MHz only.

4. All contacts must be "land stations." Contacts with ships, anchored or otherwise, and aircraft cannot be counted.

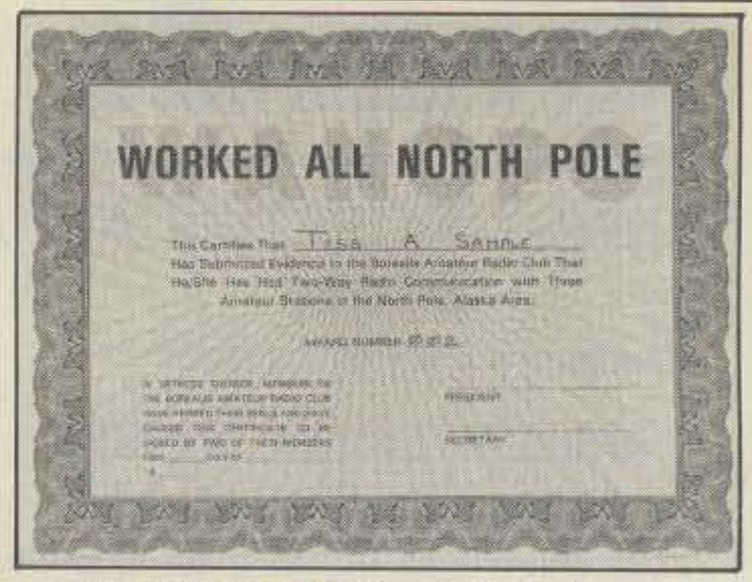
5. Endorsements for 225, 250, 275, 300, and each 10 up to 390 can be made upon request.

6. Any combination of DXCC countries of America using the mentioned 5 bands will be accepted. Mexico or Revillagigedo must be worked in all 5 bands.

7. Applications must be sent to the Mexico DX Club, P.O. Box 21-167, Coyoacan 04000, Mexico.

The official application form includes the list of 78 current DXCC Countries of America, and can be obtained from the Mexico DX Club with an s.a.s.e. or from Scott Douglas, KB7SB, P.O. Box IARS, Glendale, CA 91206-109; or Eberhard Warnecke, DJ8OT, Postfach 10-12-44, 5620 Velbert 1, West Germany; or Isidoro Ruiz-Ramos, EA4DO, El Paular 12, Puerta de Sierra 3, Majadahonda, Madrid, Spain.

The award is a beautiful gold acrylic plate with a four-color aluminum map of America and a personalized plaque with number of award, call sign, and date issued. The fee is $10.00 U.S. and includes return registered air mail of the award. For endorsements an s.a.s.e. will be appreciated. *(Thanks to XE1DX for info.)*



The Worked All North Pole Award.

Worked All North Pole Award: The Borealis Amateur Radio Club (formerly Eielson-North Pole ARC) will present this award upon receipt of a request with the call signs and dates worked of a minimum of three BARC members and $2.00. Operating time is normally from 0400Z to 0900Z, 30 kHz up from the lower edge of the Novice and General bands, plus or minus QRM. Apply to: Borealis ARC, c/o Wendell Keller, KL7OE, SR Box 80343, Fairbanks, Alaska 99701.

Worked All Scottish Districts Award: To encourage radio amateurs throughout the world to make contacts with Scotland, the Scottish Tourist Board launched a new scheme in Edinburgh on November 25, 1982. Certificates will be awarded to overseas radio amateurs who confirm two-way communication with amateurs located in Scottish districts. In addition, a special plaque will be awarded to the first station in each country and in each U.S.A. and Canadian call area to qualify for having worked all 56 Scottish districts. The award is open to all licensed amateurs.

Application forms and record books are obtainable from Mr. A.G. Anderson, GM3BCL, West Belfour House, Durris, Banchory, Kincardineshire AB3 3BJ, Scotland, who will deal with all correspondence in connection with the award. (*Note:* "Sandy," GM3BCL, has USA-CA-1500, and Alan, GM8VJV, is Chairman of the Scottish Tourist Board.)

The award is issued in three classes: gold for all districts, silver for 45 districts, and bronze for 30 districts. Endorsements are available for all bands, single band, and all mobile. QSL cards must be in possession of applicants and applications must be certified by two General class licensees. *(Thanks to GM3YOR for this data.)*

The European Community Award: This certificate will be issued by the "Reseau Luxembourgeois des Amateurs d'Ondes Courtes" to commemorate the 25th anniversary of the European Community. It may be obtained by all licensed amateurs and shortwave listeners. Each contact with a station from one of the member countries of the European Community, made on or after the day the country entered the European Community, counts one point.

1. Each station may be counted only once.

2. No more than 20% of the points may be obtained by contacts with one and the same member country.

3. A contact with special station LX0RL may replace a missing contact with any of the member countries.

4. Contacts made via active earth-bound reflectors or repeaters may not be counted.

5. There are no band nor mode restrictions.

6. European applicants must amass 100 points; each member country must be worked at least once; 5 LX stations must also be worked. No more than 10 contacts with stations from the appli cant's country may be counted.

7. Non-European stations must amass 50 points; each member country must be worked at least twice; 3 LX stations must also be worked.

Applicants shall submit a GCR list confirmed by two licensed amateurs or by one club official or by a notary. However, in case of doubt, the diploma manager may request the applicant to submit the QSL cards for checking purposes.

The application fee is 150 LFrancs (or 10 IRCs, 4 U.S. $, or 7 DM). Applications shall be sent to the awards manager: Reiff Mill, LX1CC, P.O. Box 1764, L-1017 Luxembourg.

Here is a list of the countries of the European Community and their entry dates:

March 25, 1957: DL, Federal Republic of Germany; I, Italy; ON, Belgium; F, France (including FC); LX, Luxembourg; PA, Netherlands.

January 1, 1973: EI, Ireland; G, United Kingdom (including GD, GI, GJ, GM, GU, GW).

January 1, 1981: SV, Greece.

Notes

A reminder that as of January 1, 1983, the All Counties Plaque cost went to $40.00. (Our cost went up November 1, 1982.) Also, as of January 1, 1983, 3 and 4 county lines are *not* acceptable for USA-CA. Mobiles in national parks, reservations, etc., should give out but one county and that should be in the state of that park.

Sorry to report the loss of another friend, Sherman Mallery, W2CJX, who I first met back in the early 1920s when I was 2CJA and he was 2CJX.

A letter from SV1IG indicates that he can no longer accept applications for any awards, as his mail is opened and only QSLs are forwarded to him.

Also, as of January 1, 1983, we have a new County in Arizona. The name is La Paz, and it was formed from the northern third of Yuma County. Parker is the county seat. Thus, applications for All Counties, as of January 1, '83, must have that county worked. "Mort," WB7VIZ, was to operate from there January 1st, and apparently he can help you.

73, Ed, W2GT

DX

This month by
JOHN A. ATTAWAY, K4IIF

NEWS OF COMMUNICATIONS AROUND THE WORLD

Oil and water don't mix, but DX and Contests do mix, and very well! Over the dozen or so years that I served as your DX Editor, I preached that theme constantly, and it's still true. If you want to increase your zone, prefix, and country score quickly, be active in the major DX contests, such as the *CQ* World Wide, the *CQ* WPX, or the ARRL DX tests. When conditions are good, you can qualify for WPX, the *CQ* DX Award, and DXCC, and be well on your way to WAZ in one weekend.

During the *CQ* World Wide Phone Contest last October, K4IIF operated portable from the U.S. Virgin Islands. We made no serious effort to look for multipliers, as we weren't in it for a trophy or for wallpaper. With the exception of an hour on Sunday afternoon when we worked DX only on 20 meters, we took them as they came. In other words, we spent most of our time working the U.S. pileups.

Despite this low-key approach, our zone and country totals for the various bands were as follows: *10 meters*—24 zones and 61 countries, *15 meters*—26 zones and 59 countries, *20 meters*—20 zones and 54 countries, *40 meters*—6 zones and 7 countries, *80 meters*—6 zones and 11 countries, and *160 meters*—5 zones and 8 countries. The grand total for all bands was 3200 QSO's, 90 countries, and 31 zones. We are sure that anyone making a serious, all-weekend effort to work as many countries as possible could have had his or her 100 countries plus. In fact, we understand that several well-equipped U.S. stations worked as many as 140 countries on 20 meters alone.

Others operating from various Caribbean islands had similar experiences. Kip, W6SZN, almost doubled our QSO total with 6,150 contacts single operator from VP5KP. Using only a tribander at 25 feet and wires for the low bands, Kip failed to make a contest-winning multiplier, but he did log 53 countries on 20 meters, 56 countries on 15 meters, and 60 countries on 10 meters.

Bill, N1GL/6Y5, made fewer QSO's than Kip—approximately 5800 single operator. However, he scored much better than either VP5KP or K4IIF/KV4 in the multiplier category, netting 18 countries on 160, 48 countries on 80, 58 countries on 40, 88 countries on 20, 93 countries on 15, and 89 countries on 10 meters. Bill will probably be in the running for another trophy. There were quite a few other DXpeditions, but we haven't talked to all of them yet.

P.O. Box 205, Winter Haven, FL 33880

Rasheed, YK1AA, in the photo on the left, and Michel, YK1AN, on the right, are both from Damascus, Syria. To our knowledge, Rasheed and Michel are the only two active amateurs now on the air from Syria. If you work one of the YK's, you're sure of a QSL, because their manager is Franz, DJ9ZB. (Photo via DJ9ZB)

A prime example of what can be accomplished DX-wise in the multi-operator/multi-transmitter category was shown by OHØW. This station was manned by 35 operators, including the cream of Finland's mighty DX corps. They worked 43 countries on 160 meters, 92 countries on 80 meters, 113 countries on 40 meters, 166 countries on 20 meters, 164 countries on 15 meters, and 155 countries on 10 meters. Can you imagine being only 8 countries away from 5-Band DXCC on *one weekend*! They worked all 40 zones on 15 and 20 meters, 39 zones on 10 meters, 35 zones on 40 meters, 24 zones on 80 meters, and 9 zones on 160 meters. All of this was despite a solar storm which almost rendered them "hors de contest" for the first 6 hours. Possibly a new European record here.

All in all, this was one of the best contests ever in terms of the number of islands activated. The Contest expeditions were too numerous to name them all, but VP2VDH, FM7CD, VP5B, HH2CQ, VP9AD, 9Y4VT, 9Y4W, and VP2EC were a few of those who stood out.

Hey, The DX Stations Don't Like Duplicates Either

One of the hardest jobs after a big contest effort from a DX location is rooting the duplicates out of the log. Even when you are "garden variety" DX like the U.S. Virgin Islands, there are those who will work you repeatedly for whatever obscure motive. Maybe they like the challenge of the pileup, getting through when their crosstown rival can't make it. Maybe they like to be macho and show they can crash the pileup any time they darn well please. If it's one of the above, what can I say other than it's selfish and poor sportsmanship, and let it go at that. However, there is a third category: the inexperienced contester who doesn't keep a "dupe sheet." Fortunately, there is hope for him.

I've been at both ends many times. I know that when you're operating stateside it's very frustrating to hear a pileup and not know the identity of the DX station immediately. You knash your teeth and say identify, darn it, identify, who are you! What is your call?!

At the DX end you're struggling to work down the pileup, and every time you sign your call it's one less report to give, particularly with a very long call such as K4IIF/KV4. I tried to sign every 60 seconds, which usually meant every third or fourth contact. That seemed reasonable, but apparently some thought not. You would be amazed by the number of contest exchanges that went something like this: "WHISKEY X BIG SIGNAL, WHISKEY X BIG SIGNAL" "WxBS you're 5/9/08 – 5/9/08 – Go." "Thank you; you're 5/9/05 – 5/9/05. What is your call? What is your call? BREAK – "

Your immediate reaction is uh oh, here's another probable duplicate. Near the end of the contest, as fatigue bore in and patience wore thin, I began to respond, "This is K4IIF/KV4. Have we already worked on this band?" The answers were interesting. Some said, "Oh, no, this is a good contact!" Some said, "Gosh, I don't know, maybe." Some said, "How would I know. I don't keep a dupe sheet." Others didn't respond. Probably they were already working another station and would try to find out who they had worked later.

The bottom line is that if you are going to operate in a contest, know the rules and keep a record of contacts to avoid duplicates. In other words, keep a "dupe sheet." This should be routine for a multi-operator station, which has plenty of manpower. It's harder if you are a single operator station. It's *hardest* if you are a single operator, multi-band station with

The WPX Program

Mixed

1020	AB1U	1024	EA1JO
1021	PT7WA	1025	K9BLY
1022	PY2DBU	1026	OK3CGP
1023	KC4IH	1027	WD4RAF

S.S.B.

1539	W1BWS	1547	JE1GBI
1540	VK3BRM	1548	EA8YK
1541	VE5XK	1549	VE2FSU
1542	AB1U	1550	W9DRL
1543	JH6SAK	1551	W7KWI
1544	4Z4DX	1552	ND4Y
1545	KB6YC	1553	N2BJ
1546	EA1JO		

C.W.

2182	JA4YQO	2185	4Z4DX
2183	W1BWS	2186	W2RUK
2184	AB1U		

Award of Excellence: W1BWS with 160 Meter Endorsement

Endorsements

Mixed: 450 AB1U, PT7WA, PY2DBU, EA1JO, WD4RAF. 500 VE5XK, AB1U, PT7WA, VE2PD, PY2DBU, EA1JO, WD4RAF. 550 VE5XK, AB1U, PT7WA, NI4Y, VE2PD, PY2DBU, EA1JO, WD4RAF. 600 VE5XK, AB1U, PT7WA, NI4Y, PY2DBU, I5HOR, EA1JO, WD4RAF. 650 VE5XK, AB1U, PT7WA, PY2DBU, I5HOR, EA1JO, K8HF. 700 VE5XK, AB1U, PT7WA, PY2DBU, I5HOR, EA1JO. 750 VE5XK, AB1U, PT7WA, EA1JO. 800 PT7WA, VE3FEA. 850 PT7WA, W9NO. 900 PT7WA, W9NO, AF7M, OK3IF. 950 N4IB, W1CNU. 1100 N6JM, KL7AF. 1150 OK3CGP, IT9HLO. 1250 KF2O. 1300 KF2O, WA4QMQ. 2100 W2NC.

S.S.B.: 350 KC4YY, W1BWS, VK3BRM, AB1U, NI4Y, 4Z4DX, EA1JO, WD5HEG, W9DRL. 400 W1BWS, VK3BRM, AB1U, NI4Y, 4Z4DX, WA8KMK, W9DRL, JR6LLN. 450 W1BWS, VK3BRM, AB1U, 4Z4DX, WD5ABG. 500 W1BWS, VK3BRM, VE5XK, AB1U, VE2PD, 4Z4DX, WD9FOE. 550 W1BWS, VK3BRM, VE5XK, AB1U, 4Z4DX. 600 W1BWS, VE3FEA, 4Z4DX, I2SYG. 650 W1BWS, WB5TKD, VE3FEA, W0ULU. 700 W1BWS, VE3FEA. 750 N4IB. 800 W9NO. 950 I1HAG. 1050 KF2O. 1100 KF2O, WA4OIB. 1250 WA4QMQ. 1400 W0YDB.

C.W.: 350 JA4YQO, W1BWS, AB1U, NI4Y, 4Z4DX, EA1JO. 400 W1BWS, VE5XK, AB1U, 4Z4DX, W9NO, EA1JO. 450 W1BWS, VE5XK, AB1U, N3KR, 4Z4DX, OZ5EDR, EA1JO. 500 W1BWS, VE5XK, 4Z4DX, EA1JO, WA2CNF, K8KPM, W0JIE, JA5SIX. 550 W1BWS, 4Z4DX, N4IB, EA1JO, WB2FFY. 600 W1BWS, 4Z4DX, EA1JO. 650 W1BWS, EA1JO, WA4QMQ. 700 AK9Z. 750 DJ1YH. 1200 W4VQ. 1250 W4VQ, W3TVB. 1300 W4VQ. 1350 W4VQ. 1400 W4VQ. 1450 W4VQ. 1500 W3ARK, W4VQ.

VPX: 1200 UB5-0683.

10 meters:	VE5XK, 4Z4DX, N2BJ.
15 meters:	PA0LUS, VE5XK, 4Z4DX, WD0AVG, JR6LLN.
20 meters:	W0JIE, I1POR, 4Z4DX, W3ARK, WB2FFY, VE3FEA.
40 meters:	4Z4DX.
80 meters:	4Z4DX, DK5WQ.
160 meters:	W6OUL, VE5XK.
Asia:	4Z4DX, JR6LLN, JA4YQO.
Africa:	4Z4DX.
Europe:	VE5XK, 4Z4DX, JA4YQO, N2BJ.
So. America:	4Z4DX, I2DMK.
No. America:	4Z4DX, WD4RAF.
Oceania:	4Z4DX, W0JIE.

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.

pileups on five or six bands. You can't work alone. Keep a dupe sheet and still make thousands of contacts.

Future Contests of Interest to DXers

The next major contests are the *CQ* WPX S.S.B. Contest in late March and the *CQ* WPX C.W. Contest in late May. This is the time to run up your prefix count, as prefixes are the key rather than zones. Check Frank's Contest Calendar column elsewhere in this issue for details.

We also like the IARU Radiosport Contest in July. Many people are engaged in summertime, outdoor activities, so participation is less, but there are always plenty of countries to be worked. We have operated this one as K4IIF/KP4 and also using our B.V.I. call, VP2VDG, and had a great time on each occasion. See Frank's Contest Calendar for details.

Here and There

Beacon Stations on 20 Meters. Eight strategically-located 20 meter beacon stations should provide DXers with valuable information on 20 meter propagation. Station locations and callsigns, shown in the sequence in which they will transmit, are New York (4U1UN), California (K6OPO), Hawaii (KH6O), Japan (JA2IGY), Israel (4X6TU), Finland (OH2B), Madeira Islands (CT3B), and South Africa (ZS6DN). The transmitter power levels of each beacon are adjusted in 10 dB steps. Transmissions will use the following format with the beacon set to repeat the message every 10 minutes:

100 watts—QST de *I.D.*
100 watts—9 second dash
10 watts—9 second dash
1 watt—9 second dash
0.1 watt—9 second dash
100 watts—SK de *I.D.*

The beacon frequency is 14,100 kHz.

Country Deletions. Serrana Bank, Bajo Nuevo, and the 8Z4 Neutral Zone have been deleted from the country list, leaving 315 countries on the list and 52 deletions. Future operations from Serrana Bank, Roncador Cay, and Bajo Nuevo will count as San Andres for DXCC and the *CQ* DX Awards.

DX Nets. Dieter, OE2DYL, has a new edition of his publication "DX Nets Around the World." Send s.a.e. and 5 IRC's to him at Bessarabierstrasse 39, A-5020 Salzburg, Austria.

Geoff Watts. After some 20 years, Geoff Watts (DX Hall of Fame) has given up compiling the "DX News-Sheet." Reports should now go to "DX News-Sheet," P.O. Box 146, Cambridge, England.

International DX Foundation. The IDXF newsletter reports on three DXpeditions sponsored all or in part by the Foundation. First, the Nepal expedition last Dec. 15 to Jan. 1 was by royal invitation to participate in the gala national celebration of the King's birthday. Operators were WB4NFO/9N1, W6OAT/9N1, W6YOU/9N1, and JI1VLV/9N1. KP2A had planned to make the trip but was forced to cancel his plans because of another commitment. QSL's go to W1GAY.

The job of sending QSL's for the 33,500 contacts generated by the Foundation's 1982 DXpedition to Navassa Island, KP2A/KP1, has been almost completed. If you haven't received your card, you should get it shortly.

The Heard Island DXpedition, VK0HI,

On a recent trip to Taipei, Taiwan, Ken Miller, K6IR, visited with Tim Chen, BV2B.

sponsored jointly by the Wireless Institute of Australia, the International DX Foundation, and the Northern California DX Foundation, included the following operators: Dave, VK3DHF (ex-VK9ZD), meteorologist; Alan, VK0CW/K8CW, engineer; and Chuck, VK0MD/N4BQW, physician. The IDXF and NCDXF each contributed $10,000 to the effort, and KP2A added a personal gift of $7,000.

Guinea. DL5DAB/3X will be in Guinea for about another six months. QSL to DL3FAB.

Iraq. The best times to listen for YI1BGD are from 1300–1500 and 0100–0300 GMT on 20 meter s.s.b.

Silent Keys. KA1KI, Norway's top Honor Roll DXer, passed away in late 1982 at the age of 40.

Bill Vette, K6TXR, a Life Member of the Northern California DX Club, died on Oct. 19, 1982.

Rare and Special Prefixes for WPX

BY8: BY8AA is the second station now active from China. Their QTH is Chengdu in southwestern China. He has been heard on 14040 at 0900–1000 GMT and on 21015–21055 from 0100–0300 GMT. QSL to P.O. Box 6106, Beijing, Peoples Republic of China.

DP0: DP0LEX is German amateur Sepp, DK6RK, operating from Atka Bay in the Antarctic. QSL to DL6NI.

EW6: EW6V was the call used by the UK2PCR Club in Georgia during the *CQ* World Wide Phone Contest last October.

1Z0: The Kaw Thoo Lei in Burma have adopted the prefix 1Z0. XZ5A is now 1Z05A.

4U37: This special prefix was used by the United Nations station in New York. The complete call was 4U37UN.

5N22: Nigerian (5N) stations used this prefix to celebrate the 22nd anniversary of Nigerian independence.

6C35: This prefix was used Dec. 25–26

5 Band WAZ

Standings as of December 1, 1982

All 200 zones worked:

1. ON4UN, John Devoldere (Belgium)
2. K4MQG, Gary Dixon (U.S.A.)
3. SM4CAN, Kent Svensson (Sweden)
4. AA6AA, Steve Orland (U.S.A.)
5. W8AH, Albert Hix (U.S.A.)
6. W6KUT, E. A. Andress (U.S.A.)
7. EA8AK, Fernando Fernande (Spain)
8. LA7JO, Stig Lindblom (Norway)
9. EA3SF, Fernando Blenert (Spain)
10. OH1XX, Hannu Nieminen (Finland)
11. EA8OZ, Julio Rosello (Spain)
12. W0SD, Edward Gray (U.S.A.)
13. K0ZZ, Gary Knutson (U.S.A.)
14. ON6OS, P. Michiels (Belgium)
15. OK3TCA, E. Melcer (Czech.)
16. K6SSS, Fred Capossela (U.S.A.)
17. ZL3GQ, Peter W. Watson (New Zealand)
18. OK3CGP, Stefan Melcer (Czech.)
19. SM0AJU, Leif Lundin (Sweden)
20. OZ3PZ, Preben Thomsen (Denmark)
21. I3MAU, Reno Mauri (Italy)
22. I2ZGC, Gianni Zillio (Italy)
23. 4Z4DX, Dov Gavish (Israel)
24. N4KE, Ron Blake (U.S.A.)
25. K5UR, Rick Roderick (U.S.A.)
26. K9AJ, Michael McGirr (U.S.A.)
27. SM3EVR, Tord E. Julander (Sweden)
28. LA5YJ, Bjorn Hugo Ark (Norway)
29. DL3RK, Walter Geyrhalter (W. Germany)
30. N4WJ, Frank McCormick (U.S.A.)
31. G3MCS, W.R. Hawthorne (England)
32. SM5AQD, Hakan "Hawk" Eriksson (Sweden)
33. W0MLY, George McKercher (U.S.A.)
34. I0RIZ, Gianni Rizzi (Italy)
35. ON5NT, Ghislain Penny (Belgium)
36. OH6JW, Antti Kiviuoma (Finland)
37. OK1AWZ, Milan Dlabac (Czech.)
38. IV3PRK, Pierluigi "Luis" Mansutti (Italy)
39. DJ6RX, Klaus Heintzenberg (W. Germany)
40. OH3YI, Ossi Lehvas (Finland)
41. I4RYC, Relli Claudio (Italy)
42. ZL1BIL, Mike Edwards (New Zealand)
43. I4EAT, Fausto Minardi (Italy)
44. ZL1BQD, R.J. Runciman (New Zealand)
45. TG9NX, Francisco Capuano (Guatemala)
46. XE1J, Joe Levy (Mexico)
47. F5VU, Jean Brunner (France)
48. W3AP, Norwood Lowry (U.S.A.)

The top contenders for 5 Band WAZ:

1. JA3EMU, 199
2. CT1FL, 198
3. W1NG, 198
4. N4RR, 198
5. W8UVZ, 198
6. EA8QL, 197
7. K1MEN, 197
8. K7UR, 196
9. W8GT, 195
10. VE7IG, 195

181 Stations have attained the 150 zone level

and Dec. 30-31, 1982 to commemorate 35 years of amateur radio in Syria (YK). Rasheed Jalal, YK1AA, whose photograph appears elsewhere in this month's DX column, was the first YK amateur licensed in 1947.

8J5: Special event station 8J5SUN was active Dec. 28, 1982 to Jan. 6, 1983 as part of the inaugural week ceremonies for one of the world's largest solar power plants. The plant is located near the city of Nio in Japan's Kagawa Prefecture on Shikoku Island. The solar collector covers about two square miles. Complete details appear on the 8J5SUN QSL card.

Here is the first photo released by the group who gave you 1A0KM. Left to right are Mario, I0MGM; Tony, I0DX; Al, I0AMU; Tony, I0IJ, at the mike; and Mario, I0MXM after the Oct. 2-3, 1982 operation which netted 3,076 QSO's during 29 hours of operation: 1,268 contacts (41%) were with European stations, and 1,808 (58%) with non-Europeans, mostly U.S. The total for all 1A0KM operations to date is 18,000. (Photo via I0MGM)

9I: Zambian (9J) amateurs used this special prefix to celebrate the 18th anniversary of their country's independence.

9N38: From Dec. 28-30, 1982, the International DX Foundation team signed 9N38 as part of festivities to celebrate the 38th birthday of the King of Nepal.

CQ DX Awards Program

S.S.B.

1195	CT1FL	1199	VE3CKP
1196	VE2JO	1200	HK3AFD
1197	HK1AHR/W3	1201	ZS6LF
1198	NA5W	1202	WB1EAZ

C.W.

562	W8QWI	564	K7ZR
563	W9BW		

S.S.B. Endorsements

310	I0ZV/317	275	NA5W/284
310	DJ9ZB/315	275	AI9R/282
310	W4EEE/314	275	VE3CKP/283
310	K9LKA/312	275	K4BYK/278
310	CT1FL/311	275	W6NLG/275
300	4Z4DX/309	250	WB1EAZ/264
300	W1NG/308	200	YS1GMV/200
275	WB1DQC/295	150	HK3AFD/154
275	K9UAA/295	28 MHz	CT1FL
275	W0KU/287	3.5/7 MHz	CT1FL

C.W. Endorsements

310	K9MM/311	275	W0IZ/295
300	DL3RK/309	275	K7ZR/280
300	W1NG/306	250	W8QWI/261
300	WA8DXA/304	200	N3KR/200
300	W9BW/304	200	AI9R/248
300	AA6AA/300	28 MHz	K2PK
275	AB4H/291		

The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply. Please make all checks payable to the awards manager. Effective with the next report, all totals will be adjusted to reflect the deletion of Serrana Bank, Bajo Nuevo and the Saudi Arabia/Iraq Neutral Zone. Total countries will be 315.

Sebastian, EA6DE, has given many a lucky DXer a new one from the Balearic Islands, and recently earned his own single band WAZ on 10 meters. He is 36 years old and an industrial electrician specializing in automation. Other awards Sebastian has earned include WAZ, single band WAZ on 15 meters, single band WAZ on 20 meters, 5-Band WAZ, WPX, the CQ DX Award, USA-CA 500, WAC, WAS, DXCC, and EA DX 100.

DX Stamp Service

All active DXers are aware of the necessity to send a self-addressed envelope (s.a.e.) and IRC's to DX stations for their QSL's. However, many are not aware that there is a less-expensive alternative to the IRC when air-mail return is preferred. This is particularly true for those countries which require 4 or 5 IRC's for air-mail return of an s.a.e. This alternative is to send the DX station a self-addressed, *stamped* envelope (s.a.s.e.) using the postage of his own country, and fortunately this does not require writing to post offices all over the world. It can all be done by George Robertson, W2AZX, owner and operator of the DX Stamp Service. An s.a.s.e. to George at 7661 Roder Parkway, Ontario, NY 14519 will get you the latest price list for stamps from almost any country on the DXCC list.

In scanning over the last price list we have from George, we note that the highest charge he has on his list is $1.30 for air-mail reply stamps from the Maldives, the Cook Islands, and Niue. Samples of some other air-mail rates include A2, $1.15; BV, 90¢; C6A, 75¢; EA, $1.15; FM, $1.05; G, 80¢; HC, 80¢; I, $1.20; J3, J6, and J7, 80¢; JA, $1.20; TF, $1.25; VP2V, 85¢; XE, 60¢; ZL, $1.00; 4X, $1.20; 5Z, $1.25; and 9V, $1.25. These prices are a real alternative to IRC's, and George will normally process your order within 48 hours. Give it a try.

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. This report reflects the deletion of Serrana Bank, Bajo Nuevo, and the SA/I Neutral Zone. Total countries are now 315. 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 endorsements involving the issuance of a sticker is $1.00. The basic award fee is now $4 for *CQ* subscribers and $10.00 for non-subscribers. Please attach your latest *CQ* mailing label to qualify for the $4.00 rate.

C.W.

W6PT	315	K9MM	311	W9BW	304	DJ7CX	297	W7CNL	283
DL7AA	314	N6AV	310	K4XO	303	N4MM	297	W0SR	282
ON4QX	313	K4CEB	310	W4OEL	303	K1MEM	297	K8PYD	281
W3GRS	313	K6JG	310	W2GT	301	K9QVB	295	K7ZR	280
W9DWQ	313	W4BQY	307	WA8DXA	301	W0IZ	292	N5DX	277
K6EC	312	N6CW	307	AA6AA	300	AB4H	291	W4BV	277
N4PN	312	W1NG	306	K3FN	298	W6SN	290	WB4RUA	277
W6ID	311	DL3RK	306	OK1MP	298	W1WLW	289		

S.S.B.

K2FL	315	W4SSU	311	N4PN	305	IV3YRN	295	XE1OW	283
W6EUF	315	K9LKA	311	W0SR	304	K9UAA	295	XE1OX	283
K6WR	315	OZ3SK	311	OK1MP	304	W1LQQ	294	VE3CKP	283
W3GRS	315	K4MQG	311	K9BWQ	304	XE1NI	294	AE5B	282
W3NKM	315	CT1FL	311	AA6AA	303	K4SE	293	CT1UA	282
DL9OH	315	EA4LH	310	XE1J	303	WD8MOV	293	WB3DNA	282
W9DWQ	314	OE2EGL	310	ZL1BIL	303	K9IW	293	AI9R	282
I0AMU	314	DK2BL	310	XE1KS	302	I6PLN	292	TG9EP	281
F9RM	314	W0SD	310	LU1BAR/W3	302	WA4LOF	292	K9HQM	281
VE3MR	314	K9RF	310	WA4WTG	302	AI5I	292	KB5FU	281
I8AA	314	W0SFU	310	VK3JF	302	W8ILC/QRPp	292	SM4CTT	281
VE3MJ	314	N4MM	310	G4CHP	301	W9RY	291	I2MQP	280
W4UG	314	VE3GCO	309	VE3FJE	301	WA4DAN	291	KB3OQ	280
W4EEE	314	K8LJG	309	WB4NDX	301	VE3IPR	291	W8IMZ	279
I0ZV	314	OE3WWB	309	WA4JTI	300	WD8MGQ	290	KK0C	279
XE1AE	313	K5OVC	308	9H4G	300	W2FGY	290	KC8JH	279
I4ZSQ	313	VE7WJ	308	W8JXM	299	YU1DZ	290	KA8T	279
I8KDB	313	K4XO	308	LA7JO	299	W6SN	290	I5BDE	279
W9KRU	313	I3LLD	308	AI8S	299	JA5PUL	289	EA3KW	279
ZL3NS	313	N6AW	308	N5FG	299	W7FP	288	AI8M	278
VE3GMT	313	W1NG	308	VE3MRS	299	I3OBO	288	K4BYK	278
YV1KZ	313	W9SS	308	W8PCA	299	K0GT	288	N9AMF	278
W3AZD	313	DL6KG	308	W7OM	299	KB8DB	288	VE3IUE	277
ZS6LW	313	YV5AIP	308	W6FET	298	EA9IE	287	WD0BNC	277
VE2WY	313	K6XP	307	K9SM	298	AB9E	287	KB8O	277
ZL1AGO	313	W0YDB	307	I8LEL	298	WB4UBD	286	I8KCI	277
K6JG	312	N2SS	307	W2CC	297	W4BQY	286	KP4EQF	277
DJ9ZB	312	VE4SK	307	HP1JC	297	YU2RTW	285	N2AQH	277
K6YRA	312	K8PYD	307	DJ7CX	297	WD9IIX	285	K1VHS	277
F2MO	312	W2SUA	307	K5DUT	297	K4CXY	284	AC0A	277
K9MM	312	N4KE	306	JH1VRQ	297	K8VFV	284	WA0TKJ	276
W3GG	312	N6AV	306	W6DN	297	NA5W	284	I0RIZ	275
W4DPS	312	VK4VC	306	K8CMO	297	W0KU	284	N7ASL	276
W9JT	312	4Z4DX	306	I0MBX	297	WB3HAZ	283	I8INW	275
N4WF	312	K1UO	306	I8ACB	295	WB6GFJ	283	JH4PRU	275
I8YRK	312	YV5DFI	305	WB1DQC	295	VP9CP	283	W6NLG	275
K6EC	311	W8ILC	305						

The WAZ Program

10 Meter Phone

224	JA1MDK	226	JK1PWQ
225	DF2RG		

15 Meter Phone

150	JA2NYT	151	K2PZ

20 Meter Phone

428 W6KZL/M
(First Mobile In U.S.A.)

15 Meter C.W.

81	HB9ALO	82	K6VL

20 Meter C.W.

181 HB9ALO

All Band WAZ

S.S.B.

2553	K1MIZ	2562	PY2JSF
2554	KO5G	2563	KM8Y
2555	KL7HFQ	2564	GM3TDS
2556	LA9ML	2565	EA1RT
2557	WA8ZDL	2566	W6DH
2558	K0HRF	2567	W2IIX
2559	WB0PVO	2568	W1BPM
2560	KL7BCS	2569	I2WZX
2561	N6AIT	2570	KB6BW

C.W. and Phone

5464	W6IHA	5474	JA2MYA
5465	DL2KL	5475	PA0INE
5466	DJ9HX	5476	LA9ML
5467	KB9H	5477	YU7CB
5468	NI4Y	5478	OK1ACT
5469	W6NLG	5479	KA1A
5470	K2JF	5480	EA2AA
5471	K6HY	5481	EA1JO
5472	JA4BLH	5482	WB3KAM
5473	JA2JFQ	5483	K9BLY

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (37 cents) size 4½ × 9½ to the WAZ Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is $4.00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application.

From the Mailbag

de Howard, W4HN: "Your article on Dick Spenceley, KV4AA, in the December issue of *CQ* was really great and very timely. I had visited Dick on St. Thomas for the past 5 years and, of course, worked him on the bands for many years. I dropped by to talk with Dick's son recently and asked if anyone was following up on Dick's application to the *Guiness Book of World Records.* The answer was indefinite, so I told him that I would be glad to help, as Dick had mailed the KV4AA Guiness file to both Hal, W5NC, and myself. Several weeks ago I mailed an update and supplemental verification data to Guiness which showed the final contact total to be 206,300. Neither Hal nor myself is optimistic about recognition, as Guiness demands a lot of verification. Your article was copied and forwarded to Guiness for inclusion in Dick's file. *Many thanks!* Hal will try to obtain additional publicity and forward it as it becomes available. Sure hope it works out for Dick's memory."

(Frank Anzalone, W1WY, our Contest Chairman, is also contributing to this effort. Perhaps the London-based International Shortwave League could help, as well as the RSGB and some of the other European radio societies.—K4IIF)

QSL Information

A4XX - to P.O. Box 981, Muscat, Oman.
A4XYF - to GM3ITN
A7XM - to DJ9ZB
A22GM - to N4FD
A71AD - to P.O. Box 4747, Doha, Qatar
AH8AB - to JA2VUP
BY1PK and BY8AA - to P.O. Box 6101, Beijing, Peoples Republic of China
CE9AT (South Shetlands) - to WB6WOD
CE8ZAD - to WB6WOD
CN8EA - to N2AFW
CQ60F - to WA3HUP
CR9T - to WA4IKZ
CT2DL - to G4KJF
CX1BBL - to CX2CS, P.O. Box 5063, Montevideo, Uruguay
DL5DAB/3X - to DL3FAE
DP0LEX - to DL6NI
EA4LH/CE3 - to EA4JF
ED6MDX - to EA6BE
ED9CM - to EA9JV
EP2TY - to JR3WRG
ET3PG - to DL9ZB
FB8XAB, FB8ZQ, and FB8ZR - to F6GXB
GD5E00 - to DK9ZL
H44SH - to AD1S
H80B0E - to DJ9ZB
HD8GI - to W3HNK
HH2CQ - to K4JPD
HH2WW - to N4WW
HH2CB - to K9WJU
HP1XEK - to DL1HH
J20LN - to N2KK
J6LIR - to WB6FCR
J88AB - to W2MIG
K1XA/6Y5 - to AB1U
K4IIF/KV4 - to W4KA
K60J/C6A - to K6OJ
K9LA/VP2A - to N0DH
KC4BH/KH8 - to JA2VUP
KC6LQ (E. Carolines) - to KD6LQ
KC6YA - to W9GW
M1Y - to I0MWI
N1GL/6Y5 - to K1AR
NP4A - to W3HNK
OA4DW - to Box 35, Bristol, VA 24203
OA8CW - to N4CQ
OD5JP - to DJ9ZB
P42E - to WA2SPL
P47N - to W5AT
RG6G - to UK2BAS
SV8AU - to WA3WIY
TR8JD - to F6AJA
VD3GCO - to VE3GCO
VK8JS and VK8NL - to Heard Island DX Association, Box 90, Norfolk Island, Australia 2897
VP2KBU - to KC0FW, Box 719, Parker, CO 80134
VP2VDH - to N6CW
VP5KP - to W6SZN
VP8AIC - to WA4TWS
VP8APQ - to G4LPQ
VP9AD - to W3HNK
VQ9WB - to WD9GIG
VS5MK - to P.O. Box 2191, Bandar Seri Bangawan, Brunei
XT2BM - to WD4RHL
YB9VA - to KD7EC, P.O. Box 1051, Safford, AZ 85546
YI1BGD - to P.O. Box 5864, Baghdad, Iraq
YK1AA and YK1AN - to DJ9ZB
YS1X - to DJ9ZB
YT4I - to YU4EBL
YZ1E - to YU1EXY
ZF2FL - to N6RJ
ZF2GI - to W4OWY
ZK1BM - to W6KNH
ZP5XDW - to Box 35, Bristol, VA 24203
3C1AB - to EA1QF
3D6AK - to G3WPF
4U1VIC - to OE3OLW
5H3BH - to SM0DJZ
5R8AL - to WA4VDE
5W1DM - to KB6JK
5W1EE thru 5W1EH - to W6OUL
5Z4JR - to OH2BAH
6E5MX - to N6ND
9M6WW - to W9GW
9N1A, 9N1YOU, and 9N3B - to W1GAY
9Y4LL - to K2QIE
9Y4VT - to WA6KZI
9Y4W - to N2MM
9Y50NP - to W3HNK

73, John, K4IIF

Glen Tillack, W6KZL, recently qualified for single band WAZ mobile on 20 meters. He is the first U.S. DXer to earn WAZ mobile and only the second world wide. Glen is a mobile DXer of long standing and is a prolific writer on mobile operating. He was formerly the chief engineer for Master Mobile before retiring 15 years ago. His second hobby is growing hydroponic vegetables in the greenhouse.

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HENRY 2K-4 Power Transformer	$175.00
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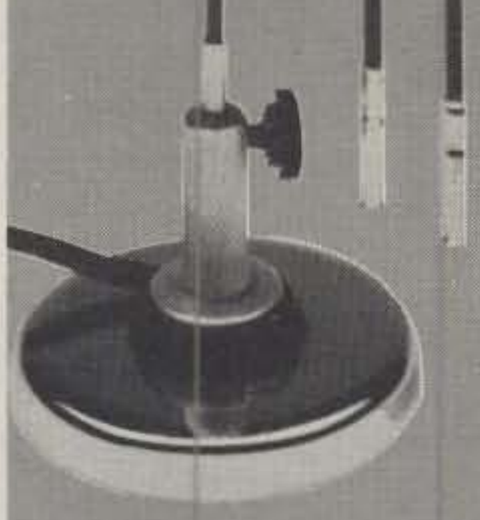

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dateline... Washington, D.C.

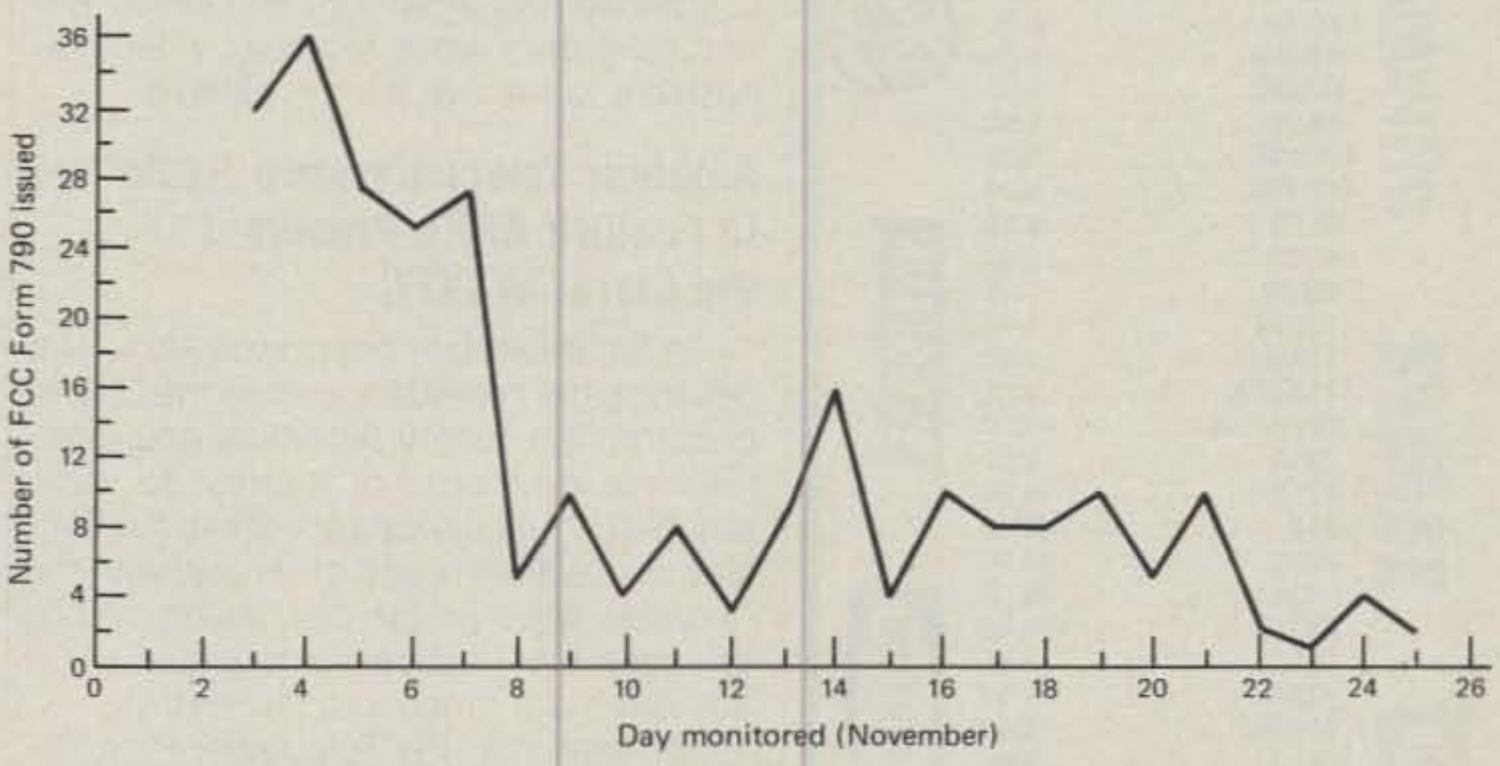
a regular feature by
THEODORE J. COHEN, N4XX

THE INS AND OUTS OF THE WASHINGTON SCENE

CQ Carries Exclusive Interview with the President and the Senior Director of Marketing of Fairchild Space Company

Elsewhere in this issue is an exclusive *CQ* interview with Dr. Jack Townsend, W3PRB, Vice President of Fairchild Industries and President of Fairchild Space Company, and with Mr. Mort Cohen, K3EH, Senior Directing of Marketing—Space, Fairchild Space Company. In the exchange, you'll learn of Townsend and Cohen's concerns relative to today's college graduates, their views on the much-debated shortage of engineers in the U.S. today, and the areas in which Fairchild is currently seeking professional employees. You'll also be introduced to Fairchild's Leasecraft, a new concept for taking satellites up or down from the Shuttle parking orbit, and for providing for in-orbit servicing of payloads. It's even possible that future amateur satellites in the OSCAR series will be placed in orbit and serviced by Leasecraft!

For more information on one of the newest developments in the area of space systems, don't miss the exclusive interview with Dr. Jack Townsend and Mr. Mort Cohen in this issue of *CQ* magazine.



This graph shows the number of violating notices issued by the FCC to amateur operators observed transmitting in the restricted portion of the 30 meter band. The graph covers November 3 through November 25, 1982.

FCC Cracks Down on Violators in New 10 MHz Band

Violations of the prohibition on amateur operations in the spectrum between 10.109 and 10.115 MHz were sufficiently high late in 1982 to require a significant level of enforcement activity on the part of the FCC. And while the violations at one time were so numerous as to cause the Department of Defense to file a formal complaint against the Amateur service with the Commission, John Hudak, Chief of the Monitoring Branch, Enforcement Division, Field Operations Bureau, FCC, now feels that "... things are pretty good!"

To stop the violators, the Commission took to the telephones, advising those using the restricted sub-band that they were in violation of the Rules. Such calls were followed up with an Official Notice of Violation, although no response was required on the part of those cited. In one case, however, a violator who had previously been warned in this manner was cited for a second violation and fined $300.

Amateurs are again warned to operate *only* between 10.100 and 10.109 MHz, and between 10.115 and 10.150 MHz. Remember: use only c.w. or RTTY with a maximum input power level not to exceed 250 watts.

FCC Considers Two Important Amateur Matters

By the time this is read, the FCC will have considered and possibly acted on two matters of importance to the Amateur service.

The first, according to James McKinney, Chief, Private Radio Bureau (PRB), FCC, is the consideration and release of a Notice of Proposed Rule Making (NPRM) on the procedures to be used by volunteer examiners when conducting licensing exams (code and theory). The NPRM, developed by the PRB, takes into account the comments and recommendations contained in an ARRL Petition for Rule Making in this matter as well as relevant comments and recommendations submitted to both the Commission and the ARRL by the Capitol Hill Amateur Radio Society. The real impetus behind the NPRM, of course, is the recently passed "Goldwater Bill," which was signed into law in September 1982, and which provides for amateur participation in licensing and enforcement activities.

The Commission was also to have considered an Order which would extend the term of both the amateur operator and station licenses. While the specific details of the Order are not known at this time, one possibility is that the term of both licenses would be extended to ten years (following your next renewal). It is also possible that the grace period in which to renew a lapsed license will be extended to two years, and that on renewal, you may be reassigned your former callsign. Now the grace period is only one year, and if you renew during that period, the Commission will assign you a new callsign.

Cable Industry Warned That It Could Lose Channels E and K

Cable TV operators, meeting late last year in Atlantic City, NJ, received a stern warning from the FCC that they were on the verge of losing channels because of chronic signal leakage problems.

Speaking for the Commission, Clifford Paul told the operators that documented "horror stories" of signal leakage on frequencies assigned to the Amateur service could result in the industry losing channels E and K. The cable industry, ac-

Media-Tech, 8603 Conover Place, Alexandria, VA 22308

cording to Paul, must take the responsibility for correcting leakage problems. Further, he said that the Commission considers an operator's responsibilities to extend right up to the back of the customer's TV set.

In commenting on the $6,000 fine recently levied on a cable operator in California for inattention to cable leakage problems, Paul stated that the FCC is now taking a tough stand on those operators whose systems are not in compliance with the Commission's Rules.

Finally, recognizing that the task of locating and correcting leakage problems could overwhelm some operators, Paul suggested that amateurs and cable system operators work together whenever possible to resolve such problems.

Amateur Teleconference Radio Net to Feature ARRL President Vic Clark, W4KFC

An Amateur Teleconference Radio Net ties together repeaters across the U.S. to present high-quality technical and informational programs of interest to radio amateurs. All participants are in full two-way contact with each other and with the featured speaker for discussion and to ask questions. Typically, more than 1,000 amateurs are tuned into the Net.

For example, the Teleconference Radio Net, on Thursday, 3 March 1983, at 1915 CST, will feature a presentation by Vic Clark, W4KFC, ARRL President. The subject of Mr. Clark's presentation will be "The Future of Amateur Radio."

Repeaters that usually tie into the Net include the following:

Long Island, NY, WB2NHO/R 147.375
Cherry Hill, NJ, WB2NQV/R 147.375
Washington, DC, WD4IWG/R 147.21
Phoenix, AZ, WB7AAC/R 147.36
Beaverton, OR, W7LJN/R 147.32
Billerica, MA, WR1ABP 147.12
Minneapolis, MN, W0TN/R 146.64
Wichita, KS, WR0ABB 146.82
Dallas, TX, K5JD/R 146.97

The repeaters are tied together by dialing into a teleconference bridge. Each repeater group must bear the cost for the long-distance calls (although several of the current participants have arranged for a local business to pick up the tab for the call).

A hallmark of the Net is the superb audio quality to and from all locations which is provided by the Darome "Co-Convenor" bridge. This device is made available through the generosity of Darome, Inc., by Vic Appel, K0IUQ. The Darome bridge is the most sophisticated multipoint teleconference bridge available to the public today.

The Teleconference Radio Net is organized and directed by the Honeywell Amateur Radio Clubs of Minneapolis, Billerica, and Phoenix as a public service for all amateurs.

Readers having questions about the Net are encouraged to call Mr. Rick Whiting, W0TN, National Net Manager, at (612) 870-2071 during business hours.

Molecule-Size "Biochips" Are On The Way

According to *The Washington Post*, the Small Business Administration has begun a new funding program which will funnel federal funds into a small firm which is developing molecule-size biochips for microelectronic data processing. The firm, EMV Associates of Rockville, MD, has already demonstrated some of the steps which will be taken to replace today's silicon chips with biochips composed of proteins. To gauge the benefits of using the new technology, EMV noted that silicon chips typically store up to about 500,000 bits of data, while a biochip could store more than a billion bits in the same area.

The first biochips are expected to be on the market within a few years. Each will consist of a layer of protein molecules over which thin threads of a circuit will be laid. The material used for the circuit (a metallic chemical) will bind directly to the protein molecules.

Future experiments will examine the use of bioelectronic switches which are interconnected with long, string-like molecules. The latter would be used to conduct electricity in much the same way as does a conventional conductor.

According to the *Post*, EMV believes " . . . that the jump from silicon chips to molecular chips would be as large as the leap from the vacuum tubes of the 1940s to the chips of today." Some scientists even believe that it may be possible to store all of the information ever recorded by man on a single, "relatively small" chip made of molecules.

Amateurs Take Top Awards from Radio Club of America

The Radio Club of America's annual awards for excellence cited a number of amateurs and ex-amateurs for their contributions to the fields of communications and electronics. Among the recipients of this year's awards are:

- Col. Julian Z. Millar (callsign unknown, but operated as a radio amateur before World War I); recipient of the Sarnoff Citation "For Significant Contributions in Electronic Communications."
- William Fingerle (ex-W1JMV); recipient of the Allen B. DuMont Memorial Award "For Important Electronic Contributions to the Science of Television."
- Louise Ramsey Moreau (W3WRE); recipient of the Ralph Batcher Memorial Award "to the member who is considered to have contributed to ensuring a permanent place in history of important radio and communications activity."
- Keith Henney (K1AC); recipient of

the Pioneer Award "to a senior member who has contributed substantially to the success of the Club and to the art of radio communications."

The Club also awarded citations to the following new Fellows (among others): Charles J. Affelder, N3AYU, Willard D. Andrews, WB2LCF, Joseph A. Banos, WA5PHO, Trevor John Dearn, VK3GL, Max C. De Henseler, HB9RS/W2, Irving I. Emig, W6GC, Frank L. Gronert, WBOKXX, A.K. "Kenny" Guthrie, WA4JXY, Jan David Jubon, K2HJ, David E. Kass, WA2LKJ, Bernard E. Keiser, WA4BNC, Ferrer Levin, W2EZQ, Donald R. Nelsch, K8EIW, I. Otto Rhoades, W9KPT, and Marc B. Wiskoff, WA2JDK.

The Radio Club of America, founded in 1909 and based in New York City, was organized for the interchange of knowledge of the radio art, for the promotion of good fellowship among its members, and for the advancement of the public's interest in radio.

FCC to Stay in Washington on M Street

Over the past few years, there have been at least two proposals to move the FCC from Washington, D.C., to northern Virginia. The impetus behind these proposals was an FCC-sponsored move to consolidate the Commission's staff into one new building (currently, the Commission's staff occupies offices in five leased buildings).

With the change of administrations in Washington, however, came a change in the FCC's position on the move. Chairman Fowler, unlike his predecessor, opposed the move. Fowler argued that to move the Commission to northern Virginia would have a bad impact on the FCC's employees and would work a hardship on the groups and individuals (many of whom have offices in Washington) who daily do business with the Commission.

Given the Chairman's position, and the General Services Administration's belief that industry trade groups and attorneys would indeed be severely impacted by a move to Virginia, the GSA has renegotiated the FCC's lease for 1919 M St. NW, Washington, D.C.

TV Networks Vie for Shuttle Trip

According to "Amateur Satellite Report," AMSAT's newsletter for the Amateur Space Program, the three major U.S. TV networks are "furiously" vying for the opportunity to place a top science reporter aboard a Shuttle flight. The action centers around flights in the 1985–86 time frame, with the intent being for the selected individual to report "live" from space on what Halley's Comet looks like from orbit. Reliable sources expect CBS, NBC, and ABC to name Cronkite, Neal (K6DUE), and Bergman, respectively, to be the first journalists in space.

Congress Approves Funding to Search for Extraterrestrial Intelligence

Following years of bitter debate, and even one "Golden Fleece" award from Sen. William Proxmire, Congress has finally approved funds to be used in the search for extraterrestrial intelligence (SETI). This fiscal year, the National Aeronautics and Space Administration budget will include $1.5 million for an instrument that attaches to a radiotelescope. The instrument, a signal analyzer, will eventually study 10 million radio frequencies simultaneously in the search for a message from intelligent beings elsewhere in the universe.

Searches conducted to date have been disappointing, but many scientists believe that a concerted effort should be undertaken as soon as possible. Carl Sagan, for example, lobbied long and hard for SETI funds, and he was finally able to convince Sen. Proxmire, among others, that the search was scientifically important and relatively inexpensive.

Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Looking over the results of our 160 Meter Contest, I was impressed to see that Don McClenon, our 160 Contest Director, has estimated that almost 3000 stations participated in the C.W. section of the contest. However, I was not too happy when I figured out the low percentage of returns out of that total.

By actual count, only 360 submitted a log, which figures out to about 12%. Returns from stateside were even more disappointing: less than 8% took time out to submit an entry.

We realize that hundreds of overseas stations are limited to very low power and probably did not report the few local contacts they made (except for the Czechs). That, however, is not the case over here. Here in my own state I had at least 10 Connecticut QSO's in my log, some with a higher contact total than I had made, but only two of us appeared in the results.

A lot of time, work, and expense goes into running this activity for your enjoyment. Give us a break, fellows. Show your appreciation by submitting a report of your activity, even if you only put in limited time. It's no disgrace ending up "low man on the totem pole."

The returns in the S.S.B. section of the contest were even more disappointing—only about 5%, both worldwide and stateside. It was not because of a lack of activity. Don estimated that about 2900 participated worldwide, 1800 of which were from this side of the "pond."

This was only the second time around for our 160 meter S.S.B. section, so perhaps I should not be that critical. Hopefully, we will get a better return for this year's contests. A lot of awards went unclaimed last year.

The deadline for submitting your C.W. logs will be expiring about the time you read this, so get them down to N4IN in a hurry. You have until the end of this month (March) for your S.S.B. entries. Logs go to Don McClenon, N4IN, 3075 Florida Avenue, Melbourne, FL 32901.

The Morton ARC of Morton, Illinois will be active March 12th and 13th on all bands, both phone and c.w. Listen for them up from the bottom edge of the General portion of each band. Exchange will be a signal report and your state, province, or country. No indication was given of whether or not Morton stations would identify themselves in the exchange. Anyway, if you work 5 or more club members, send your log information with an s.a.s.e.

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Calendar of Events

*	**Feb.**	**25-27**	**CQ WW 160 M. SSB Contest**
*	Feb.	26-27	YL-OM CW Contest
*	Feb.	26-27	RSGB 7 MHz CW Contest
*	Mar.	5-6	ARRL DX Phone Contest
*	Mar.	12-13	QCWA Phone QSO Party
*	Mar.	12-13	YL ISSB CW QSO Party
	Mar.	12-13	RSGB Commonwealth CW
	Mar.	12-14	Virginia QSO Party
	Mar.	12-14	Idaho QSO Party
	Mar.	13	Wisconsin QSO Party
	Mar.	19-20	Bermuda Contest
	Mar.	19-20	Tennessee QSO Party
	Mar.	19-20	G-QRP Group Activity
	Mar.	19-21	BARTG Spring RTTY
	Mar.	**26-27**	**CQ WW WPX S.S.B. Contest**
	Apr.	6-7	DX-YL to N.A.-YL CW Party
	Apr.	9-10	CARF Commonwealth SSB
	Apr.	13-14	DX-YL to N.A.-YL Phone Party
	Apr.	16	Holiday-in-Dixie QSO Party
	May	**28-29**	**CQ WW WPX C.W. Contest**

** Covered last month.*

to Jim Jones, WD9AEU, 701 Columbus Ave., Morton, IL 61350. You have a certificate coming, and you certainly earned it on this very busy weekend.

If you were looking for any Hungarian contest activity on December 11–12 as I had indicated in the December calendar, you just didn't hear any. They had switched the dates to January 15–16, but didn't announce it in time to make the correction, so you probably missed out on the new dates, too.

All this confusion would have been avoided if the deadline date had been observed. It's always at least three months prior to the date of the event. That makes it March 15th for the June issue and April 15th for the July issue. Please send material to my home address.

73 for this time, Frank, W1WY

RSGB Commonwealth CW Contest

1200Z Sat. to 1200Z Sun., March 12–13

Only RSGB members residing in the United Kingdom and radio amateurs licensed to operate within the British Commonwealth and British Mandated Territories are eligible to participate.

Contacts between stations in the same call area are not permitted. All the British Isles prefixes count as one call area.

Activity will be on c.w. only, and it is requested that operation be confined to the lower 30 kHz of each band, 3.5 through 28 MHz (except for Novice contacts).

Exchange: RST plus a three-figure QSO number starting with 001.

Scoring: Each contact is worth 5 points. In addition, a bonus of 20 points may be claimed for the 1st, 2nd, and 3rd contact with each call area on each band.

Entries: May be single or multiband.

Each band is scored separately and totaled for the final all-band score. There is no multiplier. Just add the total QSO and bonus points from each band.

Multiband scores cannot also be used for single-band awards. You can request that a single band be judged for awards. Only single-operator entries will be accepted.

There is also an s.w.l. section with rules and scoring same as above. If both stations in contact are heard, they can be reported as separate entries for credit.

Awards: Certificates to the 1st, 2nd, and 3rd place winners in all areas, both multiband and single band, and three Rose Bowl Trophies for the overall winners.

Use a separate log for each band, a summary sheet showing the scoring, and a signed declaration that all rules and regulations have been observed.

Logs must be received by May 16th and go to: D.J. Andrews, G3MXJ, 18 Downsview Crescent, Uckfield, East Sussex TN22 1UB, England.

Virginia QSO Party

1800Z Sat. to 0200Z Mon., March 12–14

This party is again being sponsored by the Sterling Park ARC of Virginia.

The same station may be worked on each band and each mode. Virginia stations may work other in-state stations for QSO and multiplier credit, and VA mobiles in each county change.

There are four categories: Fixed, single operator and multi-operator, mobile, and QRP (5 wats or less).

Exchange: QSO no. and QTH. County for Virginia; state, province, or country for all others.

Scoring: One point per QSO. VA stations multiply total QSO's by the sum of states, provinces, DX countries, and VA counties worked.

Others multiply total VA contacts by the number of VA counties worked (maximum of 95).

Frequencies: C.W.—60 kHz up from low end of each band, and Novice sub-bands. Phone—3930, 7230, 14285, 21375, and 28575. Also 160 meter band. (The new 10 MHz band was also indicated for c.w. However, I would advise that 10 MHz *not* be used for contest operation.)

Awards: Four plaques as follows: Top VA single operator, Top VA mobile, Top out-of-state single operator, and Top QRP

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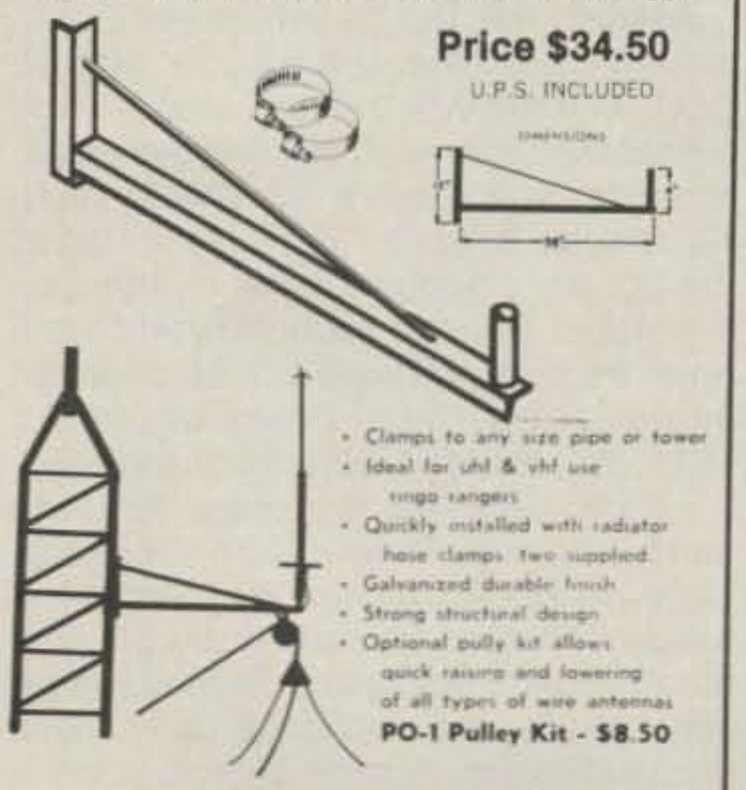

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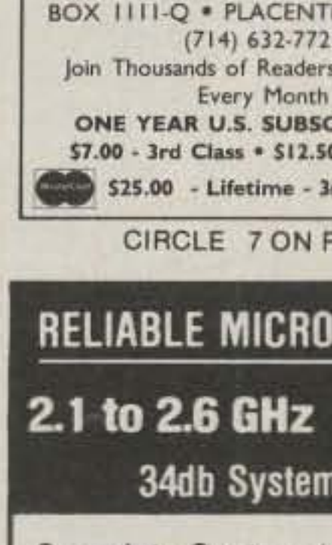

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SD1416	(F)	80W	130-175	30.00
SD1477	(F)	125W	130-175	37.00
SD1441	(F)	150W	130-175	83.50
2N6081	(s)	15W	130-175	7.75
2N6082	(s)	25W	130-175	9.75
2N6083	(s)	30W	130-175	9.75
2N6084	(s)	40W	130-175	13.50
MRF644	(F)	25W	430-470	21.50
MRF646	(F)	45W	430-470	24.50
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station if 5 or more entries are received. (Certificates for area winners were not mentioned, but I'm sure they will be awarded.)

Indicate each new multiplier in a separate column as it is worked. Include a summary sheet with your log, and an s.a.s.e. if results are desired.

Mailing deadline is April 15th to: Virginia QSO Party, c/o Barry Pybas, KW4I, 313 W. Derby Ave., Sterling Park, VA 22170.

Idaho QSO Party

0000Z Sat. to 2359Z Mon. March 12, 13, 14

This is the first time around for this Party sponsored by the Kootenai ARS of Northern Idaho.

Exchange: RS(T) and QTH. County for Idaho stations; state, province, or country for all others.

Scoring: One point per QSO. Idaho stations multiply total by (Idaho counties + U.S. states + VE provinces + DX countries) worked.

Others multiply total Idaho QSO's from each band times the number of Idaho counties worked (maximum of 44).

Frequencies: C.W.—50 kHz up from lower edge of each band. Novice—25 kHz up from lower edge of their bands. S.S.B.—3920, 7260, 14250, 14325, 21325, 21380, 28550. Avoid Net frequencies.

Awards: Certificates to top scorers in each Idaho county, each U.S. state, VE province, and DX country.

Mailing deadline for all entries in the U.S. is April 16th, and May 1st for DX countries and Canada. They go to: Vladimir J. Kalina, KN7K, South 1555 Signal Point Road, Post Falls, ID 83854.

Wisconsin QSO Party

1700Z to 2400Z Sat., March 13

This is a shorty (only 7 hours) 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.

Exchange: RS(T) and QTH. County for Wisc.; state or province for others.

Scoring: Phone QSO's count 1 point, c.w. 2 points. Wisc. stations multiply total by (Wisc. counties + U.S. states + VE provinces) worked for their final score. (DX contacts count for QSO points only.)

Others, total Wisc. QSO points times number of Wisc. counties worked (maximum of 72).

Wisc. mobiles can add a bonus of 500 points to their final score for each county they operate from, outside their own (minimum of 15 QSO's per county).

Frequencies: C.W.—3560, 7050, 14060. Phone—3990, 7290, 14290 (three bands only). Novice?

Awards: To the highest scorers in each state and province, and to the highest aggregate club score.

Logs with more than 100 QSO's must include a dupe sheet with their entry.

Mailing deadline is April 15th to: Wisconsin QSO Party, c/o West Allis Radio Amateur Club, P.O. Box 1072, Milwaukee, WI 53201.

Bermuda Contest

0001Z Sat. to 2400Z Sun., March 19–20

Activity in this contest has increased each year since its inception in 1959. The inclusion of the United Kingdom and West Germany, and that guest trip to Bermuda, have been a big factor in increasing its popularity.

Stations in the U.S. and Canada may work the U.K., W. Germany, and Bermuda. The U.K. and W. Germany may work the U.S., Canada, and Bermuda.

The same station may be worked once per band, phone or c.w., not both. Cross band or cross mode not permitted. On 40 meters phone contacts are not permitted between U.S., U.K., and Germany.

You are limited to 36 hours out of the 48-hour contest period. Off times must be no less than 3 consecutive hours and must be clearly indicated on the log.

Participation is for single-operator stations only, and operation must be from own residence.

Exchange: RS(T) and QTH. State for W/K, province for VE, county for the U.K., DOC no. for DL, and parishes for VP9.

Scoring: Each completed QSO is worth 5 points. Multiply total QSO points by the number of different VP9 stations worked on each band, 3.5 through 28 MHz (no 10 MHz) for your final score. (*Note:* It's each different VP9 on each band, not different parishes.)

Awards: The top station in each U.S. state, VE province, U.K. county, and DL DOK will receive printed awards. The overall winner in each of the above areas, however, will 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 by the Society. (*Note:* Trophy winners for 1979, '80, '81, and '82 are not eligible.)

Use a separate log sheet for each band and a dupe sheet if 200 or more contacts are logged. A penalty of 3 contacts will be deducted for each duplicate contact for which points are claimed. An excess of claimed duplicates may mean disqualification. A signed declaration is also requested.

Entries must be received no later than May 31st by the Radio Society of Bermuda, P.O. Box 275, Hamilton 5, Bermuda.

Tennessee QSO Party

2100Z Sat. to 0500Z Sun., March 19–20
1400Z to 2200Z Sun., March 20

There have been some rule changes in this year's party sponsored by the Tennessee Council of Amateur Radio Clubs.

The same station may be worked on each band and mode, mobiles in each county change. Tenn. stations may work in-state stations for QSO and multiplier credit.

Exchange: RS(T) and QTH. County for Tenn.; state, province, or country for others.

Scoring: C.W. contacts are worth 1½ points, phone contacts 1 point.

Out-of-state stations multiply total QSO points by sum of Tenn. counties worked (maximum of 95).

Tenn. stations multiply total QSO points by sum of (states + VE provinces + Tenn. counties worked). (DX contacts count for QSO points only, no multiplier.)

Mobile and portables can add 500 bonus points to their final score for each county operation outside their own county (minimum of 10 QSO's per county).

Frequencies: C.W.—1815 kHz and 50 kHz up from bottom of each band. Phone—1860, 3980, 7280, 14280, 21380, 28580. Novice—3725, 7125, 21125, 28125 (minimum of 10 mins. for each band or mode change).

Awards: Certificates to winners in each state, VE province, DX country, Tenn. Novice, out-of-state Novice, and Tenn. phone and c.w. only. Also to each station submitting a log with 25 or more contacts. Plaques to the top Tenn. and out-of-state scorers, and Tenn. mobile and portable winners.

Use a separate log for each band and a dupe check sheet if you make over 100 contacts per band and mode. Combine phone and c.w. score or each mode only. Include a large s.a.s.e. with your entry.

Mailing deadline is May 1st to: Oak Ridge ARC, P.O. Box 291, Oak Ridge, TN 37830.

B.A.R.T.G. Spring RTTY Contest

0200Z Sat. to 0200Z Mon., March 19–21

Sponsored by the British Amateur Radio Teleprinter Group, this contest is open to all amateurs and s.w.l.'s. There are three categories: single operator, multi-operator, and s.w.l.

Use all bands, 3.5 through 28 MHz. Operation is limited to 30 hours out of the 48-hour contest period. The 18 hours off may be taken any time but not in less than 3-hour periods. (No 10 MHz permitted.)

Shortwave listeners are now only required to log the message from the station heard.

Exchange: RST plus a three-figure contact number, and time in GMT (full four figures).

Points: Contact with stations within own country 2 points. With stations in other countries 10 points. A bonus of 200 points for each country worked on each band including 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 counted once only).

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.

Awards: Certificates to the top stations in each of the three classes, in each continent, and each W/K, VE/VO, and VK call area.

Final position will be valid for entry in the World RTTY Championship. There are also awards for working all six continents. (Get additional info from G8CDW.)

Indicate on/off times in your log and include a summary sheet showing the scoring, etc. Log forms are available from G8CDW by sending a large s.a.s.e. and 2 IRCs.

Logs must be received by May 31st and go to: Ted Double, G8CDW, 89 Linden Gardens, Enfield, Middlesex, England EN1 4DX.

G-QRP Club C.W. Activity

Saturday & Sunday, March 19 & 20

The G-QRP Club announces the following schedule for 1983. March 19–20 for c.w., May 7–8 for s.s.b., and September 10–11 Open House.

The following times (GMT) and frequencies will be used for the C.W. Activity March 19 and 20:

3560 kHz—1200–1300, 1400–1500, 2100–2200.

7030 kHz—1100–1200, 2000–2100.

10106 kHz—1300–1400, 2000–2100.

14060 kHz—0900–1000, 1730–2000, 2200–2300.

21060/28060 kHz—1000–1100,1500–1730.

This is not a contest, but QRPers are invited to participate and report activity to: Christopher J. Page, G4BUE, Alamosa, The Paddocks, Upper Beeding, Steyning, West Sussex, BN4 3JW England.

CQ WW WPX Contest

S.S.B.: March 26–27 C.W.: May 28–29
Starts: 0000Z Sat. Ends: 2400Z Sun.

Complete rules were published in the January issue. Basically, the format is the same as in previous years. However, we call your attention to the following:

Par. IV. A multi-operator, single-transmitter station is defined as follows: Only one transmitter and one band may be used during the same 10-minute period. Picking up new multipliers on another band is not permitted.

The physical boundaries of a multi-multi station are defined as within a 500 meter diameter area.

Par. VIII. A station may be worked once on each band for QSO point credit. A prefix multiplier, however, is counted *once* only regardless of how many bands it is worked on.

Par. XI. Several new Trophies have been added. The two-year eligibility clause is still in effect. This does not apply to QRPp, Club, Expedition, or Special awards.

Stations that are World winners will not be considered for a sub-area award. It goes to the runner-up of that area.

Par. XIII. An alphabetical/numerical check list of claimed Prefix multipliers is now a definite requirement and must be included with each log entry.

Everything else remains the same: the exchange, the QSO point value, double on the three lower bands, etc. (*Note:* Contacts in the new 10 MHz band are not permitted.)

Logs go to the new Contest Director, Steve Bolia, N8BJQ, 7659 Stonesboro Dr., Huber Heights, OH 45424, or to *CQ* Magazine, WPX Contest, 76 N. Broadway, Hicksville, NY 11801.

Mailing deadline for S.S.B. is May 10th, and July 10th for the C.W. entries. Be sure to indicate S.S.B. or C.W. on the envelope.

Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

The present sunspot cycle, *Cycle 21,* continues to decline slowly. The smoothed sunspot number, upon which the cycle is measured, dropped five points from April to May 1982. This is based upon a monthly mean sunspot number of 98.5 reported for November 1982 by the *Royal Observatory of Belgium,* the world's official keeper of the sunspot cycle index. This results in a smoothed sunspot number of 119 centered on May 1982, as compared to the 124 level recorded for April 1982. A smoothed sunspot number of approximately 95 is forecast for March 1983.

March Propagation

As discussed in last month's column, equinoctial propagation conditions are expected to continue through the month of March and into early April. The experts generally agree that overall DX conditions are usually optimum during the equinoctial periods. Improved DX conditions expected during March should be most noticeable on long circuits between the United States and the southern hemisphere—for example, to Australia, South America, southern Africa, southern Asia, Antarctica, etc. Grey-line DX propagation conditions, both at dawn and at sunset, should peak during March because of the similar conditions that are expected to exist at these times in both hemispheres. Conditions should also be optimum for long-path openings as well. Improvement due to equinoctial propagation conditions should be observable on all h.f. bands.

While considerably fewer east-west openings are likely during March on the *10* meter band, fine inter-hemisphere openings should be possible from an hour or two after sunrise, through the daylight hours, and into the sunset period.

Good world-wide DX conditions, including fine inter-hemisphere openings, are expected on both *15* and *20* meters during most of the daylight hours. Daytime openings on *10, 15,* and *20* meters should follow the sun, first opening towards the east and south after sunrise, peaking towards the south and north during the afternoon hours, and towards the west and south during the late afternoon and sunset period. As you go lower in frequency, the bands stay open longer, so plan to work from *10,* through *15,* to *20* meters.

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for March 1983

	Expected Signal Quality			
Propagation Index	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 4, 11, 18, 23	**A**	**A**	**B**	**C**
High Normal: 1, 3, 5, 10, 19, 24, 28-29, 31	**A**	**B**	**C**	**C-D**
Low Normal: 2, 9, 12, 16-17, 20-22, 26-27, 30	**A-B**	**B-C**	**C-D**	**D-E**
Below Normal: 6, 8, 13, 15, 25	**B-C**	**C-D**	**D-E**	**E**
Disturbed: 7, 14	**C-E**	**D-E**	**E**	**E**

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

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

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good (B) on the 1st, good-to-fair (C) on the 2nd, good (B) on the 3rd, excellent (A) on the 4th, etc. Conditions during the CQ WW WPX S.S. B. Contest are expected to be Low Normal on March 26th and 27th.

For updated information, subscribe to bi-weekly MAIL-A-PROP, David D. Meisel, Editor, 54 Westview Crescent, Geneseo, NY 14454.

Between sunset and midnight, expect DX openings on all bands between *15* and *160* meters, with some also possible on *10* meters when conditions are High or Above Normal. Both *15* and *20* meters should be open towards the south and the west during this time period. Conditions on *40, 80,* and *160* meters should favor openings towards the east and the south. These bands should peak for openings to Europe and Africa near midnight. An occasional *10* meter opening towards the south and the west should also be possible during this period.

From midnight to sunrise, expect optimum DX conditions on *40* and *80* meters, with openings also possible on *160* meters. Conditions should favor openings towards the west and the south. Remember, signals peak on *40, 80,* and *160* meters when it is *sunrise* on the *easterly* leg of a path. Some fairly good *20* meter DX openings may also be possible towards the south and the west during this time period.

All in all, this March should be a very good month for world-wide DX propagation conditions on all of the h.f. bands. For more detailed information, refer to the DX Propagation Charts which appeared in last month's column. This month's column contains Short-Skip Propagation Charts which are valid through March and April, as well as Propagation Charts centered on Alaska and Hawaii. The Short-Skip Charts contain band-opening predictions for predominantly one-hop paths, ranging in distance between approximately 50 and 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.

For optimum short-skip openings between approximately 50 and 250 miles, try *80* or *40* meters during the day and *80* or *160* meters at night. Between 250 and 750 miles, *40* meters should be best during the day and *80* or *160* meters at night. Try *20* meters for optimum conditions during the day between 750 and 1300 miles, and either *40* or *80* meters at night. For openings between 1300 and 2300 miles, either *20* or *15* meters should be best during the daylight hours, with *40* meters the band to use at night.

V.H.F. Ionospheric Openings

March can be an unusually good month for v.h.f. ionospheric propagation openings. Some *6* meter *F*-layer propagation is expected, along with increased chances for trans-equatorial, sporadic-E, and auroral-type openings.

Although solar activity is declining, it is expected to be high enough in March to permit some *F*-layer propagation between North America and the deep southern hemisphere, including southern Africa, the south Pacific area, and South America. The band won't open every day, but do look for openings when conditions are expected to be High or Above Normal. If the band is to open at all, it will open towards the southeast by mid-morning. Noontime should be best for openings towards South America. During the afternoon hours skip should extend further into South America, and also shift towards the west and southwest.

Trans-equatorial, or TE, propagation conditions usually peak during equinoctial periods. Improved openings should be possible during March from the southern tier states to countries located in the southern half of South America. Most TE openings occur on *6* meters, but some may also be possible on *2* meters. TE

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) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

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; 3 hours in the MST zone; 4 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 quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level for each 10 dB 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, 1983
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, 1983
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)*

ALASKA
March & April, 1983
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.

openings must cross the magnetic equator at or near a right angle, and signals are at best very weak, and often with heavy flutter fading. The best time to check for TE openings should be between 8 and 11 p.m. local time. TE openings do not occur very often, and when they do, you may have to really dig for them.

Auroral activity generally occurs more often during equinoctial periods than at other seasons. Intense ionization associated with auroral displays can be responsible for auroral-scatter openings on the v.h.f. bands and for short-skip openings up to approximately 1200 miles. While ionospheric openings resulting from auroral ionization are usually marked with a distinctive flutter-fading pattern, they can at times be clear and exceptionally strong. Look for auroral activity on days that are expected to be Below Normal or Disturbed during March.

March is a month of little meteor activity. No major showers are expected, but some meteor-scatter-type openings may take place during minor meteor activity which is expected between March 11–14 and 21–23.

CQ World Wide DX Contest Critique

Conditions during the Phone section of the *CQ* World Wide DX Contest on October 30 and 31, 1982 varied between Low and Below Normal. The Solar-Flux/A-Level index was 169/25 on October 30, or in the Low to Below Normal range. An index of 168/30 was observed on the 31st, which is mainly in the Below Normal range. A moderate radio storm began at approximately 1400 GMT on the 31st. Most observers report that the *CQ* band predictions held up fairly well except for *10* meters. The *10* meter band was hardest hit by the depressed conditions, and it did not open for as long, nor to as many areas of the world, as during the past several Contest periods. The forecast in the October column that some radio storminess was expected during part of the Contest period, with conditions varying between Low and Below Normal, seems to have been borne out. On the other hand, the somewhat improved conditions mentioned in the November column did not materialize.

The C.W. period, held on the weekend of November 27 and 28, produced a Solar-Flux/A-Level index of 163/16 on the 27th for High to Low Normal conditions, and a level of 171/24 on the 28th for Low Normal conditions. A moderate radio storm began at approximately 2000 GMT on the 28th, depressing conditions somewhat towards the end of the Contest period. The November column called for High Normal on the 27th and Low Normal on the 28th.

All in all, while conditions during the 1982 *CQ* World Wide DX Contest period dropped noticeably from the exceptionally good conditions observed during the past several Contest periods, conditions were still good enough in general to provide exciting DX openings to most areas of the world on most h.f. bands.

32nd Anniversary

This month's column marks my 32nd year as Propagation Editor for *CQ*. Special recognition is due the Editors and Publishers of *CQ* for recognizing the importance of propagation forecasts for radio amateurs, and for taking the lead in publishing this information on a regular basis, almost from the first issue of the magazine. There are a great number of interesting propagation events coming up in the years ahead on the h.f. bands, and I expect to continue to report them here on the pages on *CQ*!

73, George, W3ASK

Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

"Novice Bible"

If you read these Novice columns regularly, you know that I often refer to previous columns for additional information about specific subjects. I receive many letters requesting help, and I answer most of them by enclosing copies of items printed in previous Novice columns. A letter from ARRL President Vic Clark, W4KFC, included the suggestion that I update past Novice columns and include them in a book for Novices and prospective Novices. I accepted this suggestion and *CQ* should be publishing the first edition of my "Novice Bible" sometime this year. This book is divided into three major sections: Introduction, Licensing, and Operating.

The introduction segment consists of the following items: A Letter of Introduction to Amateur Radio, Comparisons Between Amateur Radio and CB, Advantages of Starting as a Novice, How to Get Started in Amateur Radio, Sources of Aid for Prospective Amateurs, Getting Technical Help From Experts, Code, Code is Not C.W., The Demise of Marine Radiotelegraphy, and Assignment of Radio Station Callsigns.

The licensing segment covers everything the aspiring Novice should know to pass existing and future examinations. Material is presented in a sequence that makes it easy for beginners to quickly and easily acquire a good understanding of all required knowledge. The material is grouped into the following eight categories to expedite learning: Rules and Regulations, Operating, Parts and Fundamentals, Circuits, Systems and Modes, Antennas and Propagation, Feedlines, and Test.

The above coverage is followed by a unique set of four self-check examinations that are to be completed in sequence. Each test is more difficult than the preceding one. The student is advised to complete the first test, to mark it per the supplied answers, and to go back through the study material to acquire a better understanding of each question (subject) that gave him trouble, whether or not he answered correctly. After resolving all such matters in the first test, the student completes the second test. The results of the second test are reviewed in the same way that the student reviewed questionable items in the first test. The third and fourth self-checks are conducted in the same manner as the first two tests, resulting in the student having a good understanding of all required subject matter. Since one must be able to copy code to pass the Novice test, the licensing segment also includes an item about hand printing.

2814 Empire Ave., Burbank, CA 91504

Junie A. Noguera, Jr., DU1RU/4D1RU, of Quezon City, Philippines, has been licensed since February of 1981, but it took a year for Junie to get a station on the air. His rig is an ICOM IC-730 transceiver with a locally manufactured power supply. He used a dipole antenna until he built the 3-element Yagi-Uda beam antenna described in the February 1982 issue of CQ. Unie credits CQ Novice columns with helping him select, install, and properly use a good station. He is a student and his operating time is limited to vacations and holidays. He has voice and code privileges, but is almost always on code. He finds code more of a challenge than s.s.b., and it is less likely to disturb his parents when he operates late at night. Junie expects to have upgraded in license by now, and he hopes to install a rotator to let him aim his beam to contact DX (distant) amateurs.

The operating segment of this book contains information that is useful to all classes of amateur radio licensees. This segment includes the following items: Amateur Radio Station Installation Tips, Amateur Radio Station Grounding, Headphones and Amateur Radio, Military Radio Frequency Transmission Lines, VSWR and Output Power Loss, Operating Tips, Terms and Abbreviations, Temperature Conversion, Phillip's Code—Amateur Radio's Version, General Frequency Allotments, Novice Band Nets, QSL Cards, Contests and Awards, DX List, Third-Party Traffic Agreements, and Reciprocal Operating Agreements.

The front matter includes a detailed table of contents, list of figures, and a list of tables, plus the usual preface, acknowledgements, and introduction. The index makes it very easy for readers to locate specific items, even when subjects are covered at two or more points in the book.

If you are a licensed amateur, you will find that the "Novice Bible" goes far beyond the coverage that has been presented in other Novice license manuals. You can make it easier for beginners to get a good start in amateur radio by letting them know that this book is available to help them get a Novice license, set up a station, and operate their station correctly. Written suggested changes will be welcomed, if they are based on facts.

A Canadian Amateur's Comments

Vivian Levensohn, VE6CQG, frequently operates in the U.S. Novice bands to provide contacts with Alberta, Canada. She has been the first Canadian QSO (contact) for many American Novices. As is true with most DX (foreign) amateurs, she has almost been driven off the Novice bands by QRM (operator interference), and she urges Novices to be more courteous on the air. The single poor operating habit that bothers her most is failure to make sure a frequency is not in use before sending a CQ (general call to all stations). Before using a frequency, it is advisable to find out if it is in use by others. The correct way to do this is to send "DE KB6ABC QRL? K" (as an example). Since QRL? asks "are you busy?" this is an acceptable way to ask if the frequency is already in use. If you hear this question asked on a frequency you are using, simply answer "QRL, YES, or C." Do not just send QRL? to find out if a frequency is in use because this is an unidentified and illegal transmission. Also, Q is the only letter that is not the first letter of the callsign prefix issued to any country; there is no such a thing as a legal Q-call

Vivian also advises that there is no reduced postal rate in Canada for mailing postcards; each one costs 35 cents to mail. Consequently, cards are sent via the DX QSL bureau. Mailing cards via the bureau also eliminates the need to look up names and addresses and to write them on outgoing cards. It is unreasonable to expect our Canadian friends to

David Melvin, Z21DL, is often heard in the American Novice bands. This picture was taken in the shack of John Schwandke, KJØH, in June of 1981. If you want to contact Zimbabwe, listen for Dave on 10 and 15 meters.

mail cards directly, and you are advised to not make this request. You are also advised against wasting time by sending your mailing address. Also, do not send a self-addressed envelope with American postage stamps if it is to be mailed in Canada.

I hope you will be very considerate of others when you are operating. Check each frequency to ascertain it is clear before you use it. Do not ask (or expect) DX amateurs to mail cards direct. Send a few self-addressed and stamped envelopes to the ARRL Incoming DX QSL Bureau serving your area. Remember that you do not have to be an ARRL member to use the League's incoming DX QSL bureau. Last but not least, when you hear good people like Vivian operating in a Novice band to help new amateurs, please tell them that their help is appreciated.

The August through November 1981 Novice columns contain a detailed article about correct operating practices. You are advised to read that article to help yourself become a better operator.

Malta Contacts

Fred Caruna, 9H1FN, lives on the island of Malta. His QSL manager is Jerry Jordan, KA1K. Jerry noticed a request for regular Novice bands operation by DX stations in a recent Novice column, and he asked Fred if he would help. Fred has often worked the American Novice bands, but not on a fixed schedule. He has agreed to be on 28,195 (plus-or-minus 3) kilohertz from 1430 to 1530 UTC (ex-GMT) Sundays. When 10 meters drops off, he will switch to 21,195 kHz on the same schedule.

I hope you will take advantage of this chance to contact Malta. Remember that he wants to work as many amateurs as possible during each hour-long stint. Please do not send anything except the RST report, and keep identification to an absolute minimum. Your cooperation should allow him to contact 50 to 100 stations each Sunday. If amateurs persist in sending their name, location, rig, weather, and other normal information, they will probably cause Fred to quit the schedule.

Remember that the Novice bands are not the exclusive domain of Novices. They are called the Novice bands because they are the only frequency segments in which Novices are allowed to operate. They are actually the Extra, Advanced, General, Technician, and Novice bands. Do not be perturbed if you hear Technician through Extra class licensees contacting Fred. I am sure he will give precedence to Novice-type callsigns over all others, but other classes of licensees also have a right to contact Fred. There are thousands of higher class licensees who have never contacted Malta, and many of them read this column. They are welcome to take advantage of this opportunity to work a rare one.

Once you have contacted Fred on a band, please do not call him for repeat contacts on that same band; let him work as many different amateurs as is possible. Do not waste time telling him that you need his QSL card, because that fact is known. Do not send your mailing address because he will not be mailing direct. If you want to send your QSL directly to Fred, his address is 4 Balbi Street, Marsa, Malta, Europe. If you mail a card to him, include your self-addressed envelope and a few International Reply Coupons to cover postage costs. IRC's can be purchased at your local post office. The best way to get confirmation of your two-way radio contact with Fred is to send your QSL with a self-addressed and stamped envelope to Jerry Jordan, KA1K, RFD One, West Kingston, RI 02892. Jerry is Fred's QSL manager, making it possible for Fred to spend more time on the air working amateurs. Fred passes QSL data to Jerry every Sunday at about 1530 UTC on 29,210 kHz.

Saint Croix Contacts

Russ Russell advises that he will be operating his HW-8 QRP (low power) rig with a kite-supported antenna from Saint Croix (Santa Cruz) Island between April 5th and 15th. Russ will be operating in the Novice bands as N9DLU/KP2 from the largest of the U.S. Virgin Islands. If you contact him, send your QSL to 7530 West Lawrence Avenue, Harwood Heights, Illinois 60656. Russ will be there on his honeymoon, so the Novice band QRP operation indicates real dedication.

Zimbabwe Contacts

Dave Melvin is a senior technician at the electrical power generation plant in Salisbury, Zimbabwe. His callsign is Z21DL, and he is frequently heard on the American 10 and 15 meter Novice bands. His daughter is Les, KAØMZG. When Dave is finished talking with Les, he likes to contact as many other Novices as pos-

sible. He asks that you keep station identification to a minimum and limit your exchange to the RST report plus your name and state. He sometimes operates cross-mode, listening to Novice code transmissions and answering on voice (s.s.b). It is legal for you to work DX stations this way, and this is not rare on 10 and 15 meters. The address of Z21DL is 12 Surrey Road, Avandale West, Salisbury, Zimbabwe. QSL cards can be mailed directly to Dave using the procedure previously detailed for getting cards from Malta. However, it is again preferred that you send your QSL and s.a.s.e. to his QSL manager, John Schwandke, KJ0H, 1515 Lucas Street, Muscatine, Iowa 52761. John was thoughtful enough to furnish this information for the benefit of those who read this column.

Solar Cell Data Source

If you are interested in the possibility of using photovoltaic (solar) cells to power amateur (or any other) equipment, you could obtain information regarding many sources of related data by requesting a copy of "The PV Network News" from Joel Davidson, Star Route 2, Pettigrew, Arkansas 72752. There is no price for a single copy nor is a subscription fee indicated. I just sent a buck to help defray his printing and mailing costs. The 8-page issue I received is in the same format as "Worldradio News," and it is crammed full of solar cell news and data sources.

Open-Wire Feedline

If you want a little more efficiency (less loss) in your transmission line than coaxial cable provides, you could switch to an open-wire feedline. This ladderline is rather hard to find because very few amateurs use it now. Three sources are:

Kilo-Tec, Box 1001, Oak View, CA 93022

Madison Electronics, 1508 McKinney, Houston, TX 77010

RadioKit, Box 411, Greenville, NH 03048

Texas Towers, 1108 Summit Avenue, Suite 4, Plano, TX 75074.

It must be understood that open-wire feedline requires a lot more effort than coax to be installed correctly. It cannot be twisted, and it must be kept clear of metallic surfaces. Also, the characteristic impedances of ladderlines are higher than the output impedances of typical modern amateur radio equipment. Consequently, an impedance matching device (balun) is needed if ladderline is to be used.

Photographs Wanted

Black-and-white photographs of Novices in their shacks are frequently included in this column. The size of the submitted photograph is unimportant, but it must have reasonably good definition, contrast, and subject matter. Color pictures can be used, but black-and-white photographs are preferred. A brief summary of operating activities and achievements plus a personal self-introduction are needed with each picture. Photographs are not returned unless they are accompanied by a request for their return, plus a self-addressed and stamped envelope. A free one year *CQ* renewal or new subscription (please state which) is awarded to the amateur who sends the picture I select as the winner for the month. If you are a current *CQ* subscriber, please state that this is the case and enclose the mailing label taken from a recent issue of *CQ*, or a copy of the exact information on that address label. One award is made each month, no matter how many photographs are printed.

I have never received a photograph from a Novice in Arkansas, Connecticut, Hawaii, Louisiana, Montana, Nebraska, Nevada, New Hampshire, Oregon, Rhode Island, South Carolina, Tennessee, Utah, Vermont, Washington, or Wyoming. If you are an active Novice in one of the 16 states listed in the preceding sentence, I hope you will take the time to send a good photograph. Photographs and accompanying captions provide a greatly appreciated introduction to a few of the newer amateurs.

73,Bill, W6DDB

There's still some very interesting surplus out there, interesting in terms of price and what you can do with the gear. WD8DAS points out a bargain shortwave receiver.

THE AN/GRR-5 RECEIVER SHORTWAVE FOR A SONG

BY STEVEN JOHNSTON*, WD8DAS

Many amateurs would really like to have a compact, sensitive, stable, general-coverage receiver in their shack but relatively few are willing to pay the price for the digital dreams offered today. An alternative is to scour the hamfests and auctions in search of an older receiver of the National, Hammarlund, or Hallicrafters variety and risk straining your back carrying it to the car! In addition, these battleships rarely survive the test of time (or misguided alignment tools) and usually require work to be put into service.

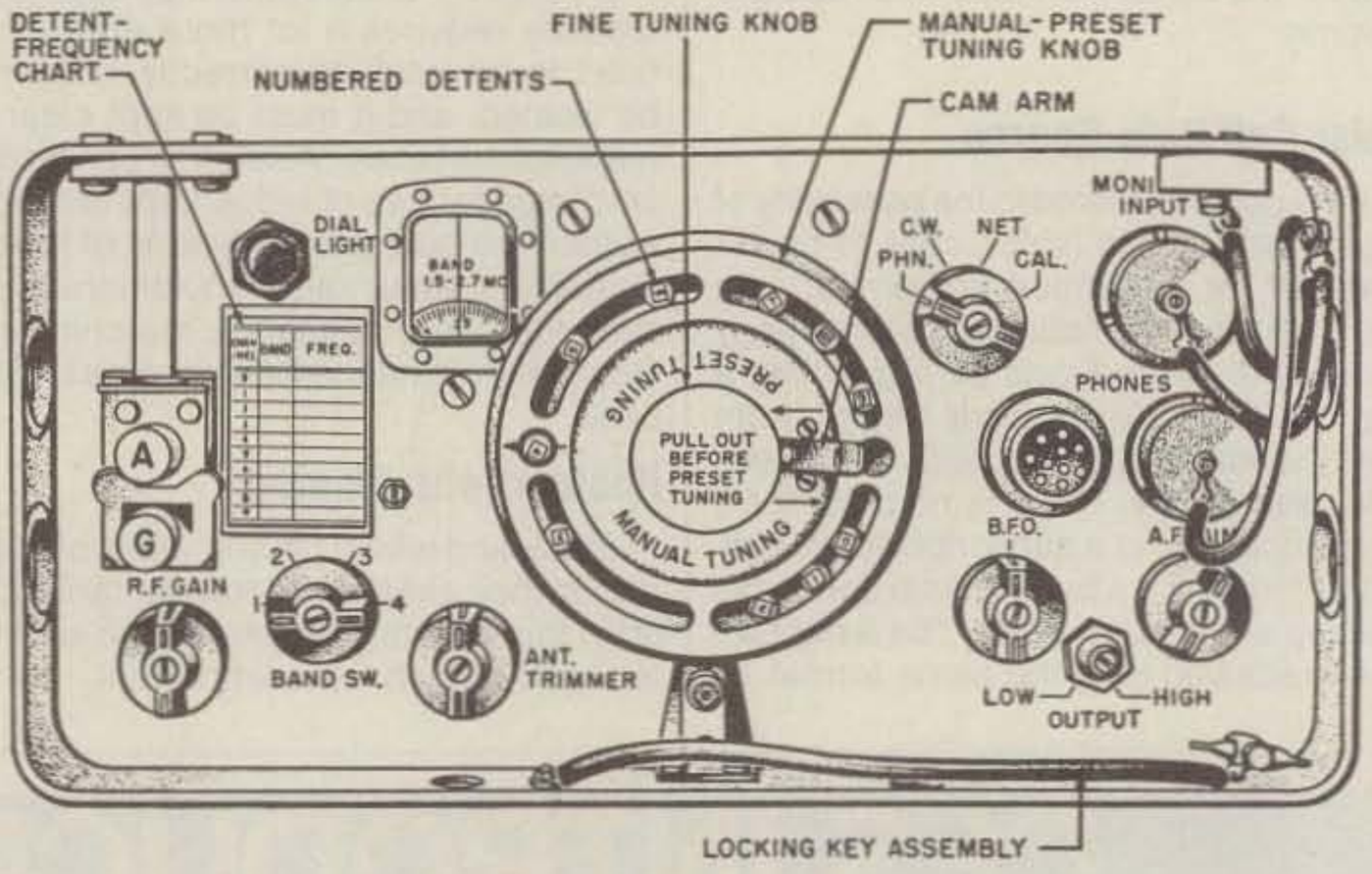
In my case, my pocket has never been full enough to afford any of the new receivers, but my shack has provided a berth for quite a number of the old battleships. In spite of the blood, sweat, and tears shed over the old commercial rigs, they truly can't compare to the one receiver I enjoy the most: the U.S. Army Signal Corps Radio Receiving Set AN/GRR-5.

The AN/GRR-5 is a mobile radio receiver that was used for tactical communications by the U.S. Army and Air Force in the 1950s and 60s. It covers the frequency range from 1.5 to 18 MHz and is capable of copying a.m., s.s.b., and c.w. signals. The front view of the receiver is shown in fig. 1.

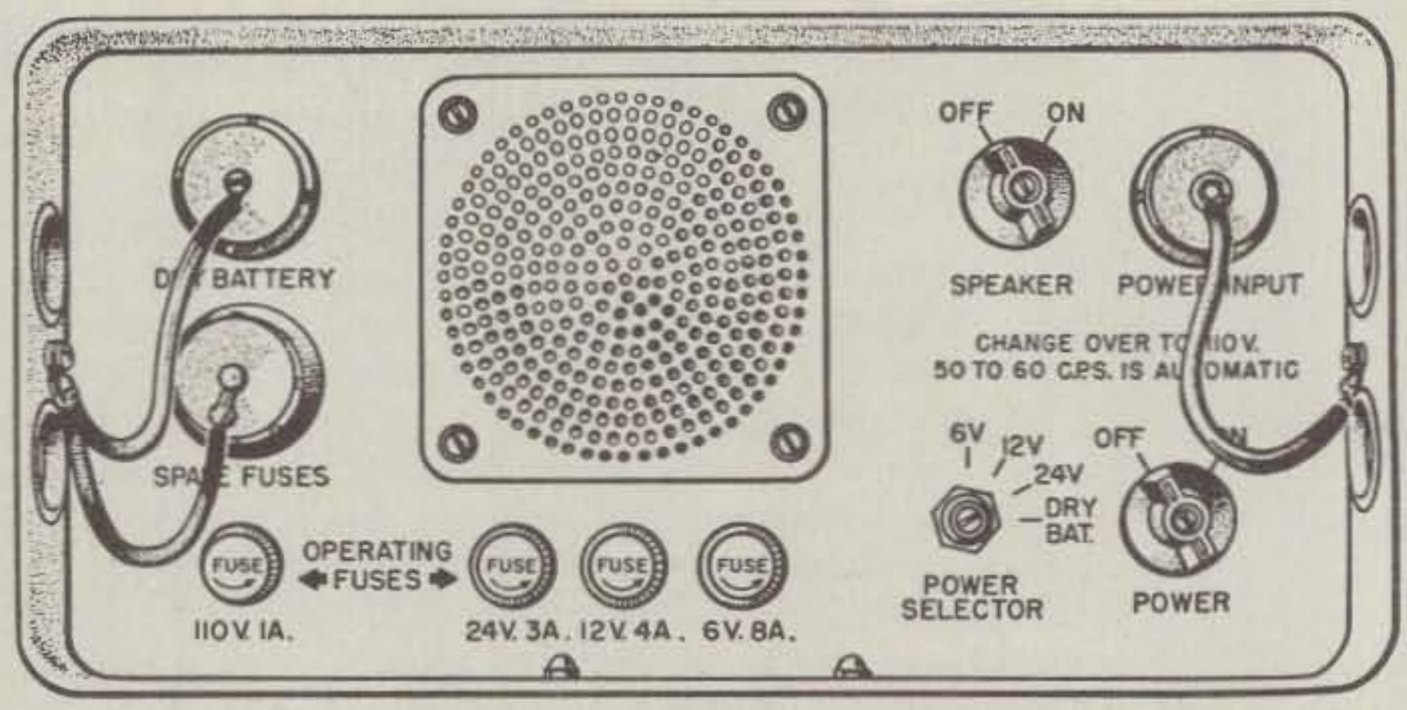
The AN/GRR-5 is actually composed of two main assemblies: the RT-174/URR receiver and the PP-308/URR power supply. These are fitted into a water-tight cabinet (which, of course, has its own designation: CY-615/URR) and interconnected by means of a cable in the case. While I personally have never tried it, legend says that this set will float quite well if "accidentally" dropped into a lake or stream. There aren't many Hallicrafters or Nationals that can make that claim!

Since this receiver was made to operate with a whip affixed to the top of the case, or at best a pull-out reel antenna, sensitivity was a must in the design of this set, and sensitive it is! The r.f. gain control is perhaps the most important control on the receiver in this world of high-power transmitters and good propagation. A hand on the gain will make up for the lack of automatic gain control, and the extra sensitivity often will make the difference when trying to copy Radio Lower Slombovia or a military transport over the Pacific Ocean.

The AN/GRR-5 tunes continuously or on ten preset frequencies. The frequency range is divided into four bands: 1.5 to 2.7 MHz, 2.7 to 5 MHz, 5 to 9.5 MHz, and 9.5 to 18 MHz. If you've never had the opportunity to tune the dial outside of the amateur bands, you're missing some of the most exciting action there is. As I write



Radio Receiver R-174/URR, front panel.



Power Supply PP-308/URR, front panel.

Fig. 1– Front-view drawings of the AN/GRR-5 receiver combination.

*823 Irvington NE, Massillon, OH 44646

this, I'm monitoring McDill Air Force Base on 11.246 MHz, and a little later I'll tune down and listen to the Princess Lines (of "Love Boat" fame) for some quite amazing phone patches.

Some of the other features of the GRR-5 are a 200 kHz calibrator, a wide choice of power-supply operating voltages, and practically drift-free operation—amazing for a tube receiver. In less than a minute the receiver is on frequency to stay. I can tune-in a single sideband station, set the b.f.o. for nice audio, and listen for an hour without retuning. The 1.5 volt filaments in the tubes generate only a small amount of heat, and the sealed cabinet tends to keep the internal components at a constant temperature.

The PP-308/URR power supply is quite interesting as well. It was designed to supply the 90 volts and 1.5 volts to operate the RT-174/URR and to house the loudspeaker. Power input to the set can be any of the following: 115 volts a.c., 6 volts d.c., 12 volts d.c., 24 volts d.c., or dry cell batteries (90 and 1.5 volts d.c.). See fig. 2 for input connections. The PP-308 makes the set quite versatile and fun, especially if you haul the receiver into the wilds and operate with the receiver atop a pile of dirt and power supplied by batteries. At our last Field Day site the Sunday morning c.w. crew was awakened by the beautiful strains of "Waltzing Matilda" on Radio Australia (thanks to the GRR-5 and convenient pile of dirt)!

All this considered, the GRR-5 still would not be such an amazing receiver if it were not for one factor: the price. The AN/GRR-5 is usually priced in the $20.00 range at hamfests, and quite a few are floating around. The Fair Radio Sales Company (P.O. Box 1105, Lima, OH 45802) at one time offered the AN/GRR-5 receiver/power-supply combination for $49.50, but the 1982 catalog listed the

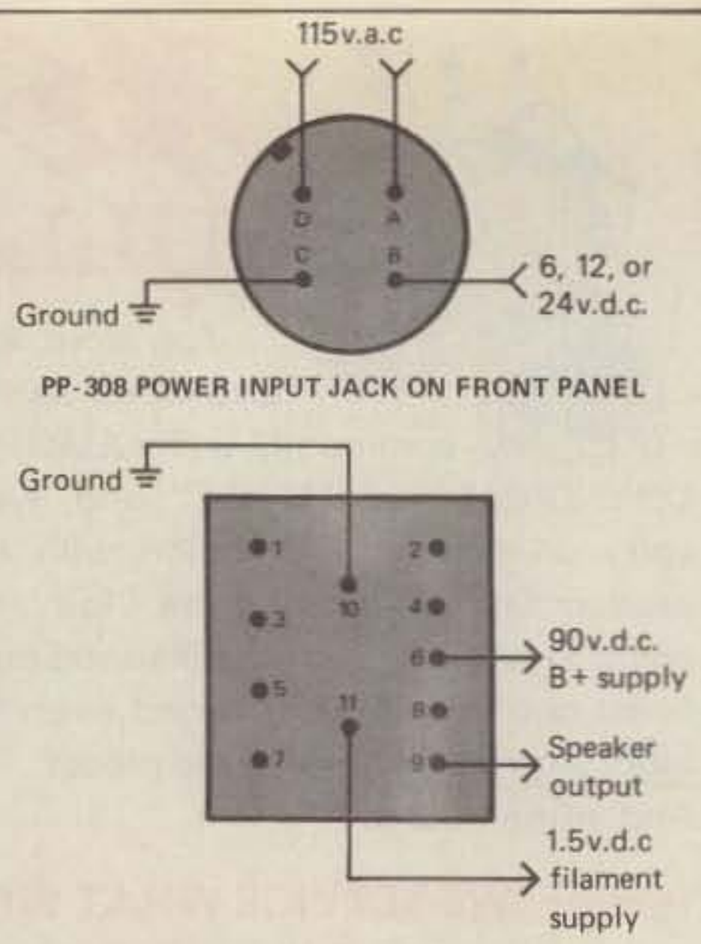


Fig. 2– Power connections for the RT-174 receiver and PP-308 power supply.

power supply as unavailable and the RT-174 receiver for sale at $18.95. I don't believe I've ever seen such a nice general-coverage receiver for such a low price.

Of course, if you purchased the receiver alone, a power supply would be necessary. One alternative is to obtain the power supply offered by Fair Radio; it allows operation on 115 volts a.c. only and contains a loudspeaker. It is offered for $30.00 and would probably do the job. A more economical solution would be to build a supply from junk-box parts. Since the RT-174 requires only two voltages for operation, the supply would be fairly simple to construct. The audio and power connections are made through an 11-pin connector on the rear of the chassis. This connector is also available from Fair Radio should you choose to buy the receiver alone, but the supply could just as well be wired directly to the RT-174. The arrangement of the pins is shown in fig. 2.

Once you get the set in operation, the question of antennas arises. Successful reception can be had with just 10 feet of wire strung around the room, since the GRR-5 has amazing sensitivity. For the die-hard operator, an outdoor antenna is the way to go, but it is important to remember to ride the r.f. gain control to keep the receiver from overloading. A good policy is to keep the a.f. gain set midrange and use the r.f. gain to set the sensitivity.

Overall, the GRR-5 receiving set is quite a nice general-coverage receiver for casual tuning around the shortwave bands. It would make a nice receiver to begin exploring the world of radio *outside* the amateur bands and an interesting conversation piece for the shack. At $18.95 or so you can't go wrong. One thing to watch for: you might catch the "green fever" and become addicted to these old moisture- and fungus-protected radios. I hope your family can stand it! CQ

World of Ideas

a monthly feature by
DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

Highlighting OSCAR Satellites

There are so many, many activities transpiring in the full h.f. and v.h.f. spectrum that it simply doesn't seem logical to confine oneself to a single aspect or mode of amateur operations. These are truly outstanding times, and the vehicles of excitement are everywhere. As you read this column, OSCAR amateur satellites are whizzing overhead, RTTY and ASCII communications are flourishing as never before (on both amateur and shortwave broadcast frequencies), clandestine and underworld activities are peppering various h.f. "hotspots," 10 meter f.m. repeaters are relaying talkie-generated signals to distant lands, new frontiers are being pioneered in microwaves, QRP, natural power, and radio astronomy are rising in popularity, new generations of equipment with truly useful functions and capabilities are being readied for introduction in coming months (Kenwood TS-780 432/144 MHz duoband satellite rig, Robot color SSTV, a 2 kw linear amplifier from MFJ, etc.), and those areas are only the "tip of the iceburg" in this ever-expanding world!

During coming months, we will look into many of these areas in a "straight talk" manner. Our specific direction(s) will be determined by your requests, interests, and buying trends. Also by request, we will keep discussions as simple and nontechnical as possible.

While computerized RTTY/ASCII systems and hand-key compatible RTTY units are quite popular at this time, their skyrocketing sales indicate that many amateurs are acquainted with their general use. These setups were also highlighted in recent issues of *CQ*. Thus, let's divert our first couple of discussions to another very "hot" yet possibly overlooked area: OSCAR satellites. We'll return to RTTY, natural power, underworld radio, DXing techniques with today's gear, etc., in following months.

Overview: OSCAR Satellites

The first OSCAR (Phase I) was launched into orbit on December 12, 1961. This 10 pound satellite's 2 meter "HI" was heard by amateurs in over 25 countries, thus proving the ability to receive signals from space with conventional gear and moving us into the age of space communications. More OSCARs followed during subsequent years. Through a launch mishap, OSCAR IV was placed in a highly eliptical orbit (1965). This craft, however, provided the first USSR/US QSO (and possibly gave first inspirations for later eliptical crafts, such as Phase III).

OSCAR 6, 7, and 8 were Phase II satellites, their basic purpose being low orbit-relaying of amateur s.s.b. and c.w. signals. The "fun of the chase" with these easily utilized birds presently continues with OSCAR 8 and the Russian "RS" satellites.

The Phase III series of satellites will be highly eliptical orbit crafts boasting gain antennas, wide transponders, extended operating times (10 to 12 hours a day!), and, conservatively speaking, half-world coverage.

Even at this early date, plans for Phase IV OSCARs are being prepared. These SYNCART units will be situated in a geostationary orbit similar to present commercial TV satellites. Through ground-based interlinking and proper uplink/downlink frequency selection, one will be able to pick up appropriate (Phase IV) satellites and communicate with any area of the world at will. Although excitement over the planned launch of Phase IIIb on April 21, 1983 is already mounting, let's hold that area of discussion until next month. This time we'll consider another very special Golden Age Era which may be drawing to a close: Phase II OSCARs.

ICOM's new IC-290H all-mode 2 meter transceiver is an ideal unit for both present and future OSCAR satellite operations. The transceiver produces 25 watts output for transmitting on mode "A" or "J," and it can also be used for reception of upcoming Phase III mode "B" satellite-relayed signals.

Phase II: Joining the Action

The Phase II satellites—OSCAR 8, RS5, 6, 7, and 8—are an absolute operating blast which shouldn't be overlooked at this time. Having survived their period of adjustment, these spacecrafts' transponders are relatively clear of power freaks and signal chasers (amateurs who AGC-clamp weak signals or spend the whole pass calling CQ and looking for their downlinked signals). The mode "A" capability of these satellites (2 meter uplink, 10 meter downlink) permits operations with presently popular gear, and you can also monitor Phase III progress with your 2 meter receiver. Since this month's column is introductory, we'll sidestep mode "J" until the next issue.

Operating via OSCAR 8's mode "A" requires transmitting a 50 to 100 watt *Effective Radiated Power* signal between 145.850 and 145.950 MHz. A 25 watt, 2 meter, all-mode rig and 3 or 6 dB antenna are quite sufficient. A relatively "hot" setup is suggested for receiving 10 meter downlinked signals. This might consist of any fairly new h.f. transceiver, a high-gain low-noise preamp, and sloper on crossed dipoles cut to 29.400 MHz (see any recent ARRL handbook). Downlink signals can be received with a TS-530, IC-730, triband beam, etc., but weak signal reception may be difficult (others may hear your signal when you can't receive it—the "alligator syndrome"). Inexpen-

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

sive preamps are available from many magazine advertisers, such as Hamtronics, Janel, Henry Radio, etc.

Operating via RS satellites is essentially similar to OSCAR, except a noticeably *lower ERP* is used. A 50 watt uplink is the absolute suggested 2 meter maximum. Higher levels cause AGC clamping and possible spacecraft shutdown. Reduce power, use an omnigain antenna, or turn your beam off the satellite to avoid overloading its transponder (f.m. relays are called repeaters; s.s.b. or c.w. relays are known as transponders).

Satellite operations can be simplified to being on the correct frequency at the proper time. These uplink/downlink relations can be preplanned by checking the OSCAR page in *QST* and using that information to make a frequency relation chart similar to Table I. Place the chart by your setup and use it to avoid "signal hunting." Next, use daily orbital predictions (also shown in *QST*) and an OSCAR-locator for preparing a "pass plan" similar to Table II. Let's say you have now prepared the two operating aids, have a 10 watt 2 meter rig feeding a 10 dB gain antenna, and a fairly good 10 meter receiving setup. According to calculations, OSCAR crosses the Equator, but you hear nothing. Remember: Satellite times are in GMT and all satellites are "off" Wednesdays. Try Sunday, Monday, or Thursday evening passes. Two more hints: (1) If 10 meters is "open" and the satellite is in that direction from your QTH (westerly during evenings), mode "A" downlinks may fade or diminish. Monitor the beacon and, if necessary, catch opposite direction passes (easterly; one pass earlier). (2) During reference orbits, OSCAR satellites may not be switched "on" until over mid-USA. Be ready; follow the "invisible bird" with antennas and use the frequency chart for quick zeroing onto CQ's. The resultant success ratio will be high!

OSCAR 8 Mode "A" (All frequencies in MHz and ± Doppler)	
OSCAR 8 beacon 2	29.400
145.870	29.412
145.880	29.422
145.890	29.432
145.900	29.442
145.910	29.452
145.920	29.462
145.930	29.472
145.940	29.482
145.950	29.492

OSCAR 8 Mode "J" (All frequencies in MHz and ± Doppler)	
145.900	435.200
145.910	435.190
145.920	435.180
145.930	435.170
145.940	435.160
145.950	435.150
145.960	435.140
145.970	435.130
145.980	435.120
146.990	435.110
OSCAR 8 beacon	435.095

Note: Never use f.m. with any amateur satellite. Accepted modes are c.w. and s.s.b.

Table I– Frequency relation chart for successful and easy operations via OSCAR 8. This chart eliminates "signal chasing."

Time(pm)		Beam Position
732	EQX	SSW
734	AOS	SSW
736		SW
738		W
740		W
742		NW
744		NNW
745	LOS	LOS

Table II– Outline of a hypothetical "pass plan" as discussed in text. Similar information can be hand-drawn minutes before a pass and used to guide activities.

The RS Satellites

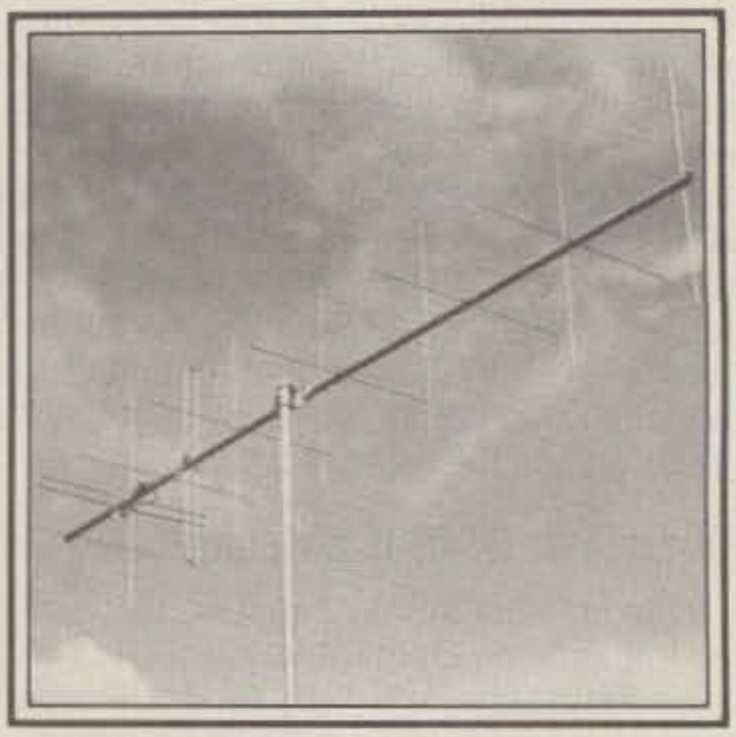
The Russian amateur satellites are strict mode "A" birds of high sensitivity. The previously described operating techniques apply, plus there are a couple more considerations. (1) Keep uplink power low (below 40 watts ERP). (2) Different frequencies are used for each satellite, requiring several frequency relation charts. (3) Pass times can be accurately "guesstimated" using their parameters of 2 hours per orbit and 30 degrees west-progression for each orbit. Simply subtract times and degrees from reference passes until an orbit falls in range. *Note:* the calculations are approximate. Use daily orbital charts for this technique. (4) Passes are approximately 30 minutes in length. Calculate beam antenna movements accordingly (AOS SSW, pass middle W @ 15 minutes, LOS NNW) or use an omnidirectional antenna.

RS6 and RS8 have the best transponders; one or the other may be off, so check both. RS5 and RS7 include Robot operators which conduct automated QSL's, give QSO numbers, etc. Resultant QSL's are sent from Russia. USSR amateurs have truly outdone themselves in design of these Robot operators; contacting them requires skill, cunning, cleverness, and a little luck. When transmitting on the proper uplink frequency (see Table III), your approximate 18 w.p.m. c.w. will load into the onboard computer. You can hear this "loading" on the downlink frequency. All callers within the Robot's uplink are relayed with the same tone. *Please do not* call if another station is calling the Robot. Two or more simultaneous callers "jam" or misload both calls. A single extra dash causes a constant downlink tone, or series of confused dashes. The Robot *is not malfunctioning*. It is being QRMed. Have patience. Try "odd time passes," use a programmable keyer, and be ready for either RS5 or RS7, depending on which one "shows" at any particular time (sometimes the two travel within a few minutes of each other; one will be "off" and the other "on").

Satellite Gear

There is a wide variety of equipment presently available to OSCAR enthusiasts. However, your final selection should include future expansions and capabilities. This month's discussion has centered around mode "A" simply because you probably possess the required "barebones" gear: namely, an h.f. transceiver, a 2 meter all-mode transceiver, and a small 2 meter Yagi. A "Twist," or "crossed" Yagi array, with associated phasing harnesses for right-hand or left-hand circular polarization (causing signal to spiral to match satellite roll) is the next step up in system design. This antenna will reduce the heavy fading noticed during satellite operations. Slopers or crossed Yagis for 10 meter downlinks work quite well. If the 2 meter antenna is mounted on a mast tilted approximately 30 degrees from the ground, only one rotor will be required (azimuth).

Future operation on OSCAR 8's mode "J" or Phase III's mode "B" will require a mating 432 MHz all-mode transceiver and high-gain "Twist" antenna (or equivalent array). ICOM, Kenwood, and Yaesu recently introduced such rig "twins," and KLM produces suitable "Twist" antennas for both 2 meters and 70 cm. An approximate 800 watt ERP uplink on 432 MHz will probably be required for Phase III, so you might also allocate funds for a



KLM's 143-150C "Twist" antenna is a top-notch performer for OSCAR satellite operations on mode "A," "J," or Phase III's "B." A mating phasing harness and coax switcher will permit selection of RHCP or LHCP, as required. A 10 watt signal into this 11 dB gain array will produce an approximate 100 watts ERP.

RS6	Mode "A"	RS8	Mode "A"
145.900	29.400	145.960	29.460
145.910	29.410	145.970	29.470
145.920	29.420	145.980	29.480
145.930	29.430	145.990	29.490
145.940	29.440	145.995	29.495
145.945	29.445	beacon	29.450
beacon	29.450		
uplink	downlink	uplink	downlink

Note: All frequencies are in MHz.

Table III– Frequency relation chart for the RS amateur satellites. Allow ± 2 kHz on downlinks for Doppler shifts.

Satellite	RS5 Robot	RS7 Robot
Uplink	145.826	145.835
Downlink	29.331*	29.341*

** ± Doppler*

QSO Format:
Robot . . . CQ de RS7 QRU on 145.835 MHz AR
You . . . RS7 de (your call) AR
Robot . . . (your call) de RS7 R QSO nr—RST589 opr Robot. (your call de RS7 AR, etc.

Table IV– Frequency relation chart and QSO format for RS Robot contacts.

40 or 100 watt amplifier when joining this activity in a couple of months. Additional information on Phase III systems and antenna designs will be presented next month. I might also add that even at the rapid pace of this column it's impossible to tell every aspect of satellite operations. If you're really "hooked" on this area, pick up a copy of my book *OSCAR: The Ham Radio Satellites* from TAB Books (#1120) or Long's Electronics.

AMSAT's Role

It should be obvious that an operation with the overall proportions of the OSCAR program couldn't be accomplished without a spearheading body. That organization is AMSAT of P.O. Box 27, Washington, DC 20044. Enough can't be said about this outstanding group. They are worldwide. They design, develop, construct, and instigate use of amateur satellites. They are responsible for securing launch rides, for assembling satellite program funds, and for almost everything else involved in making OSCARs available for amateur use. We urge you to join AMSAT (especially if you reap OSCAR's benefits) and to follow activities in their magazine, *Orbit*. If you would like to charge card your membership, purchase an *Orbit* sample, and so on, you can phone AMSAT at (301) 589-6062. A super OSCAR calendar containing piles of orbital information on OSCAR and RS birds is also available from Project OSCAR, P.O. Box 1136, Los Altos, CA 94022. Additional and late-breaking AMSAT/OSCAR news and information is also presented during the AMSAT Net which meets on 14,282 kHz at 1900 GMT. Merely listen in. The weekly coverage is superb.

Summary

Although generally sidestepping more advanced mode "J" satellite operations, technical details of antenna designs, and lengthy orbital calculation procedures, this month's column has presented a "nutshell" overview of OSCAR communications. We'll delve further into satellite activities and the exciting new Phase IIIb spacecraft next month. Stay with us, and keep these columns on file. They'll prove to be vital references when the "New World of OSCAR" soon opens. Satellite communications are the wave of the future. If you haven't yet joined the activity, we urge you to do so this month!

73, Dave Ingram, K4TWJ

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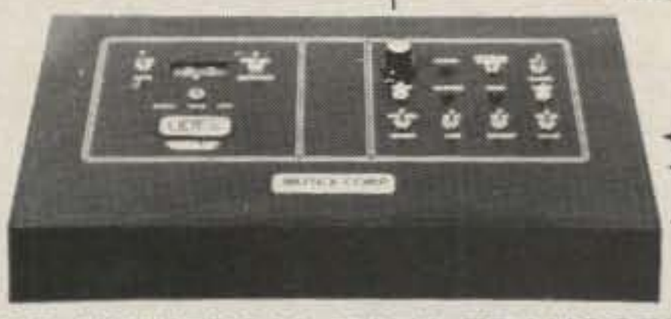

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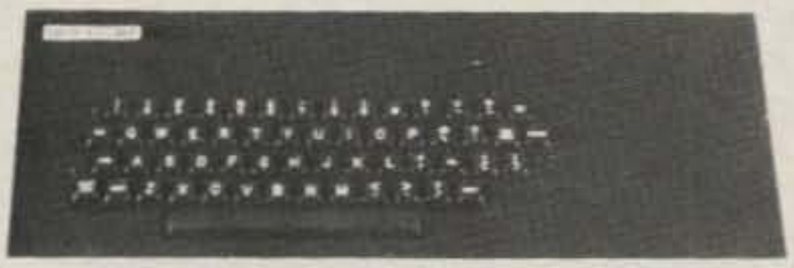

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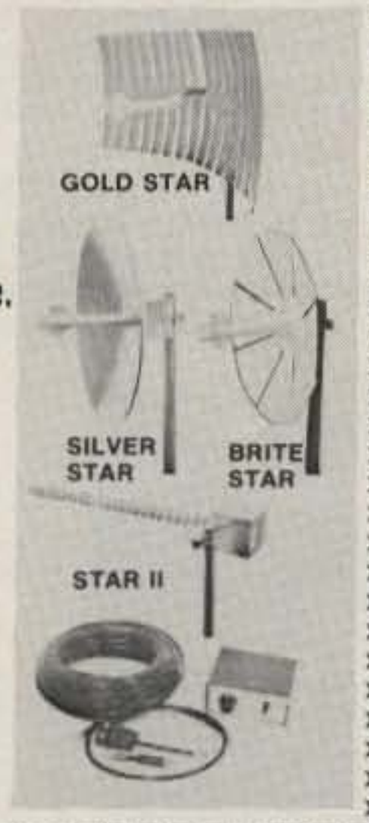

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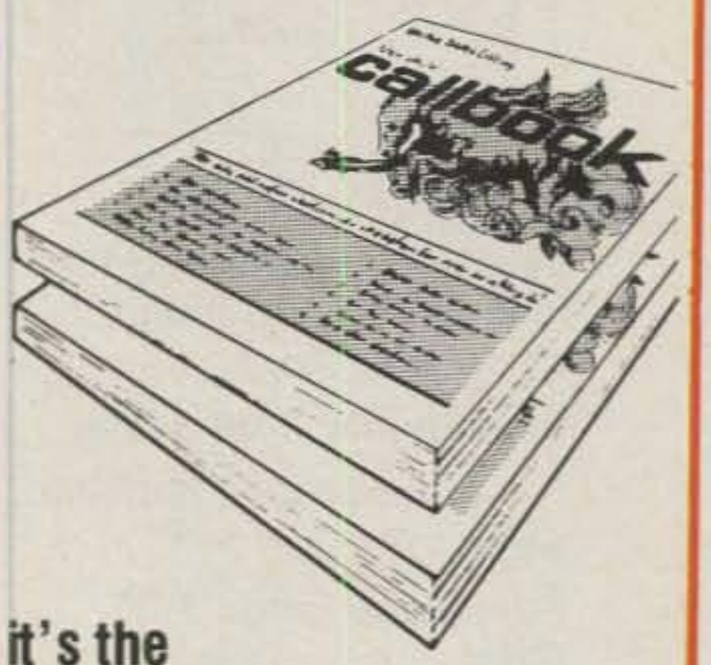

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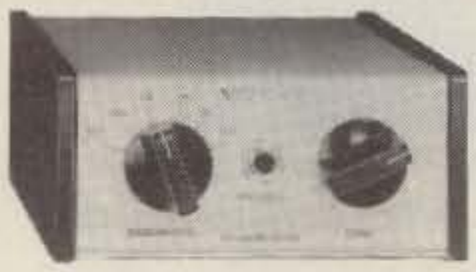

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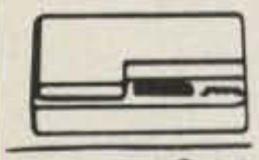

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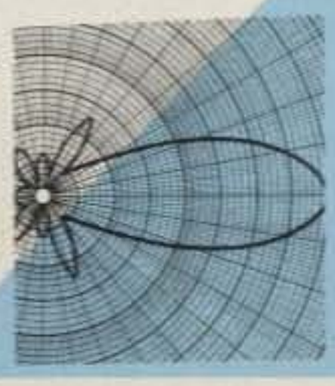

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