CQ

June 1974
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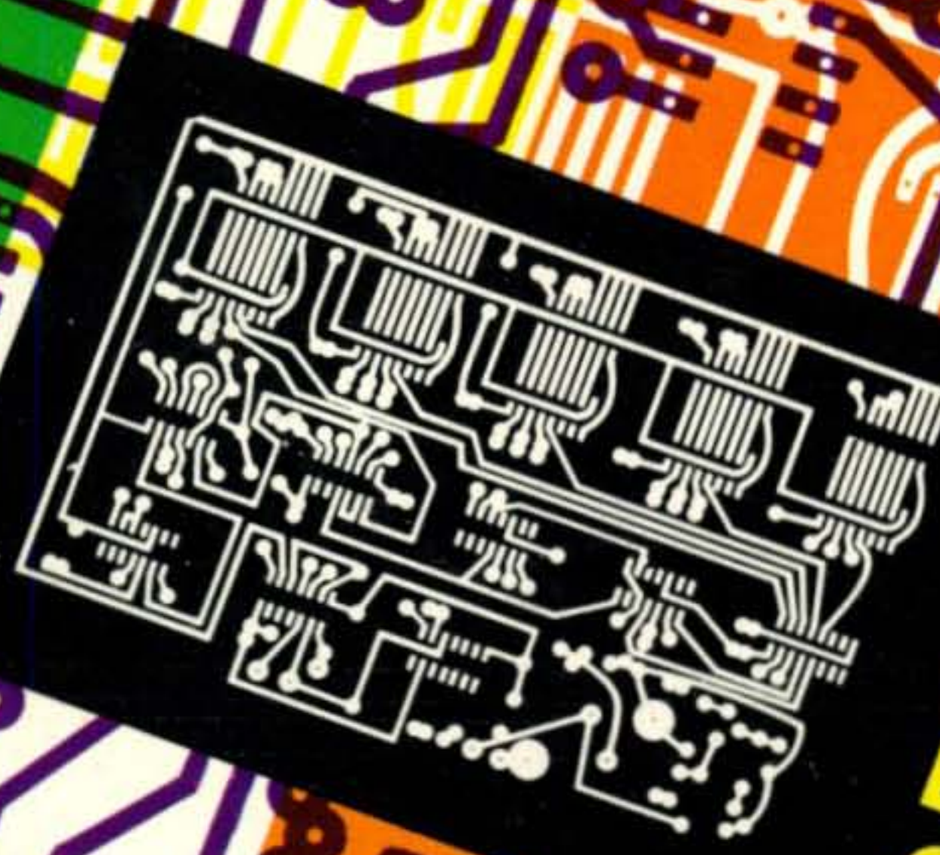

A Morse Code Digital Encoder for C.W.

see page 16

08240

The Radio Amateur's Journal

More 2-Meter Action for your money-- Heath has it!

Build the Heathkit "202" Series and run with the best money can buy — at a fraction of the cost.

HW-202 shown above with Tone Burst Encoder installed.

Push-to-talk mike included

Start with the HW-202 2-Meter FM Transceiver. It's an all solid-state design that you can build and completely align without special instruments. And this compact little beauty gives you 36 channel capability with independent pushbutton selection of 6 transmit and 6 receive crystals. 10 watts minimum output into an infinite VSWR without failure. And for the ultimate in convenience there's the optional tone burst encoder for front panel selection of four presettable tones. The HW-202 kit includes two crystals for set-up and alignment and simplex operation on 146.94; push-to-talk mike; 12-volt hook-up cable; heavy duty clips for use with temporary battery; antenna coax jack; gimbal bracket, and mobile mounting plate.

Kit HW-202, 11 lbs, mailable **179.95***

Kit HWA-202-2, Tone Burst Encoder, 1 lb. **24.95***

Kit HWA-202-1, AC Power Supply, 7 lbs. **29.95***

Kit HWA-202-3, Mobile 2-Meter Antenna, 2 lbs. **17.95***

Kit HWA-202-4, Fixed Station 2-Meter Antenna, 4 lbs. **15.95**

HW-202 SPECIFICATIONS — RECEIVER — Sensitivity: 12 dB SINAD (or 15 dB of quieting) at .5μV or less. **Squelch threshold:** 3 μ or less. **Audio output:** 2 W at less than 10% total harmonic di tortion (THD). **Operating frequency stability:** Better tha ±.0015%. **Image rejection:** Greater than 55 dB. **Spurious r jection:** Greater than 60 dB. **IF rejection:** Greater than 75 d **First IF frequency:** 10.7 MHz ±2 kHz. **Second IF frequenc** 455 kHz (adustable). **Receiver bandwidth:** 22 kHz nominal. **D emphasis:** −6 dB per octave from 300 to 3000 Hz nomina **Modulation acceptance:** 7.5 kHz minimum. **TRANSMITTER — Pow output:** 10 watts minimum. **Spurious output:** Below −45 d from carrier. **Stability:** Better than ±.0015%. **Oscillator fr quency:** 6MHz, approximately. **Multiplier factor:** X 24. **Modul tion:** Phase, adjustable 0-7.5 kHz, with instantaneous limitin **Duty cycle:** 100% with ∞ VSWR. **High VSWR shutdown:** Non **GENERAL — Speaker impedance:** 4 ohms. **Operating frequen range:** 143.9 to 148.3 MHz. **Current consumption: Receiv** (squelched): Less than 200 mA. Transmitter: Less than 2.2 ar peres. **Operating temperature range:** −10° to 122° F (−30° +50° C). **Operating voltage range:** 12.6 to 16.0 VDC (13.8 VD nominal). **Dimensions:** 2¾" H x 8¼" W x 9⅞" D.

*SINAD = $\frac{\text{Signal + noise + distortion}}{\text{Noise + distortion}}$

. . . and here's 40 watts out for your 10 watts in

The Heathkit HA-202 2-Meter Amplifier works with any 2-meter exciter delivering 5-15 watts, while pulling a meager 7 amps from any 12 VDC system. No additional power supplies are required. All solid-state components mount on a single circuit board for easy two-evening assembly. Manual shows exact alignment procedures using a VOM or VTVM. Connecting cable and antenna cable are included.

Kit HA-202, 4 lbs. **69.95***

HA-202 SPECIFICATIONS — Frequency range: 143-149 MHz. **Power output:** 20W @ 5 W in, 30W @ 7.5W in, 40W @ 10 W in, 50W @ 15 W in. **Power input (rf drive):** 5 to 15W. **Input/output impedance:** 50 ohms, nominal. **Input VSWR:** 1.5:1 max. **Load VSWR:** 3:1 max. **Power supply requirements:** 12 to 16 VDC, 7 amps max. **Operating temperature range:** −30° F. to +140° F. **Dimensions:** 3" H x 4¼" W x 5½" D.

. . . then there's this perfect 2-meter tune-up tool

The Heathkit VHF/SWR Bridge tests transmitter output in power ranges of 1 to 25 watts and 10 to 250 watts ±10% of full scale. 50 ohm nominal impedance permits placement in transmission line permanently with little or no loss. Built-in SWR bridge for tuning 2-meter antenna for proper match, has less than 10-watt sensitivity.

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HM-2102 SPECIFICATIONS — Frequency range: 50 MHz to 160 MHz. **Wattmeter accuracy:** ±10% of full-scale reading.* **Power capability:** To 250 W. **SWR sensitivity:** Less than 10 W. **Impedance:** 50 ohms nominal. **SWR bridge:** Continuous to 250 W. **Connectors:** UHF type SO 239. **Dimensions:** 5¼" W, 5 1/16" H and 6½" D, assembled as one unit.

*Using a 50 Ω noninductive load.

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Hallicrafters' all-american made FPM-300, Mark II "Safari" SSB/CW transceiver is Q5... from the Mauritania solar eclipse expeditions to a famous raft adventure in the Atlantic.

Proven design in the tradition of the HT-37 and solid-state dependability are combined in this compact transceiver featuring state-of-the-art FET's, hot carrier diodes and bi-polar transistors for peak, reliable performance for only $625.

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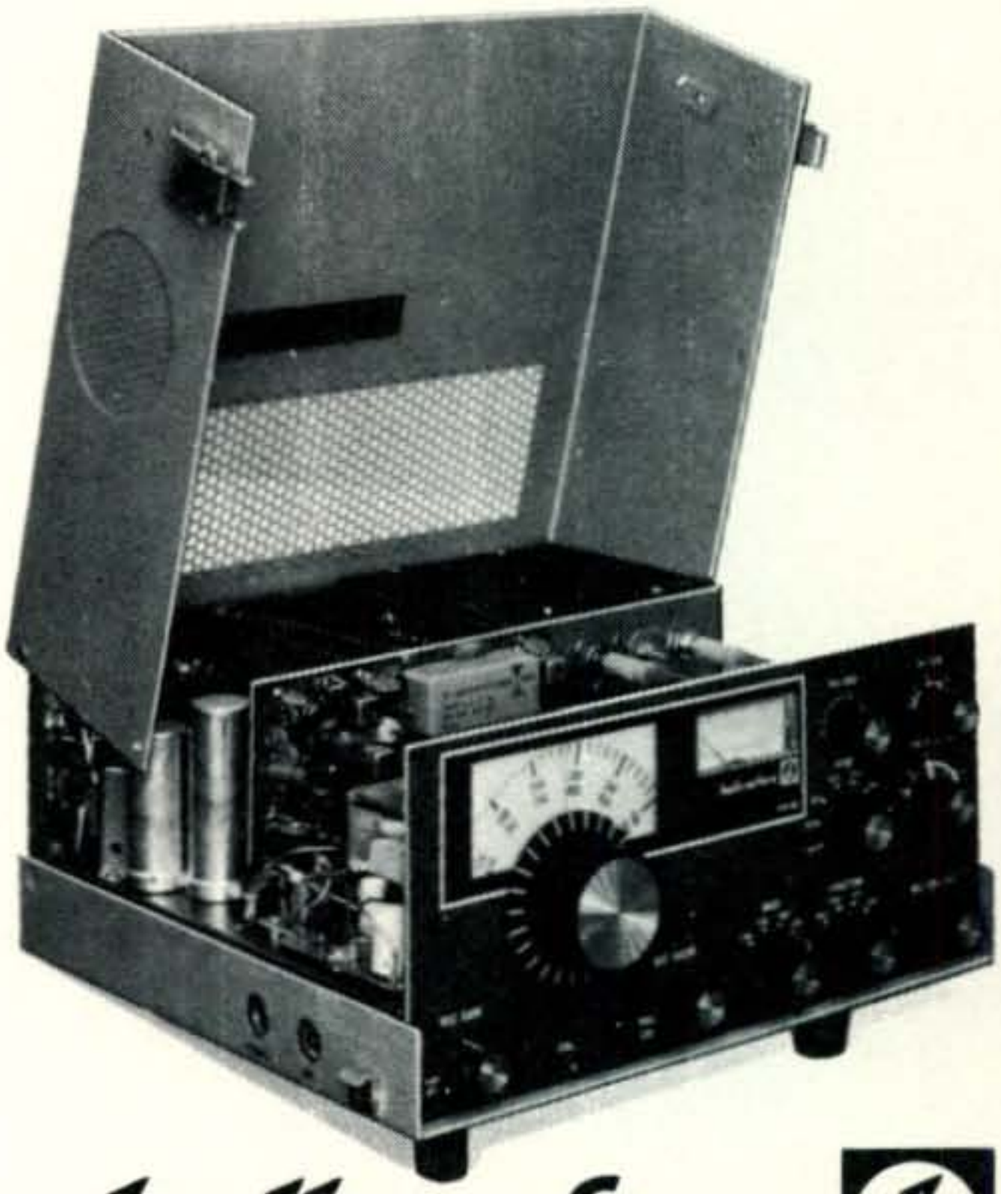
- Designed for fixed, portable and mobile use
- Equipped with a self-contained Universal AC and DC power supply system
- Compact dimensions (HWD) 5½ x 12 x 11 inches
- Weight: 25 pounds
- Tuning ranges: 8-600 kHz Bands, 80-10 meters
- Built-in speaker
- Power requirements: 117 V or 234 V 50/60 AC; 13.4 VDC negative ground
- Modes: Selectable Upper or Lower Sideband-CW or RTTY
- Type of service: continuous operation with 2-tone S SB-CW-RTTY (50% duty cycle)
- Power Output: 125 Watts P.E.P. (Nominal) into 50 ohms
- Receiver Sensitivity: Less than 1 uV for 15 db SN Ratio
- Selectivity: 2.0 kHz
- Receiver IM: 60 db below 2 equal 10MV signals
- Receiver Image and IF Rejection: Greater than 60 db.
- Internal Receiver Spurious: Less than equivalent 1 Microvolt Signal
- Transmitter IM: 30 db below P.E.P. (26db below one of two equal tones)
- Adjacent Channel Desensitizing: 3 db with greater than 10,000 MV
- Sideband Suppression: -50 db minimum @ 1 kHz
- AF Power Output: 2 watts
- Stability: 100 Hz after warmup. Max. 100 with 10% line voltage change
- Frequency Readout: Within 1 kHz ± 100 kHz of Cal. Point not more than 3 kHz across entire 500 KC Band
- Break-In CW: Semi-Automatic
- CW Sidetone
- Audio Frequency Response: 500-2500 Hz Nominal
- AALC: 12 db Compression
- AGC Figure of Merit: 60 db minimum
- Crystal Calibrator: Provides 25 kHz Calibration Signals
- Optional Accessories: MR-300 Mobile Installation Kit; HA-60 Blower Fan Kit, works on AC or 12VDC



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Noise Level – In excess of 40 db below single tone carrier.

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Receiver Selectivity – 2.1 KHz with 1.8 shape factor for SSB or 300 Hz sharp selectivity with optional CW filter.

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Back Lash – Not more than 50 Hz.

Output Impedance – Variable 50 ohms nominal capable of matching up to 2-1 SWR (30-100 Ohms).

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ZERO BIAS

Our April Zero Bias on lawsuits and W2OVC's legal dilemma drew mail response beyond our expectations, almost entirely supportive and informative. For this month, therefore, we're turning over the podium to our readers who have taken an embryonic idea and run with it. Leading the sampling of letters is one from Lenny Mendel W2OVC.

Legal Defense

Editor, *CQ*:

I read your Zero Bias editorial with great interest. A copy was sent to my attorney and he was most impressed with the article and felt it was very well done.

I sincerely hope that the ARRL will take proper note of your editorial and follow up on your recommendations and suggestions. I would also suggest that the ARRL conduct a survey among its members and prepare a listing of hams that are lawyers who, for a fee, would be willing to fight lawsuits, such as the one against me. In this way, any ham confronted with a lawsuit would be in a better position having a ham attorney who is already familiar with all the technicalities.

As you know, the cost of this lawsuit is running into the thousands and I must fight it all the way as it is a precedent-setting case and can affect all hams. There is a great deal of anguish in a matter such as this and of course even though I am confident of the outcome, it still costs money. Your suggestion relative to the insurance policy would give hams "peace of mind" for which there is no price tag.

The Harmonic Hill Radio Club is handling a "legal fund" and any contributions can be sent direct to them at Box 73, Katonah, New York, 10536...they will be greatly appreciated.

Lenny Mendel, W2OVC
Yorktown Hts., NY

Editor, *CQ*:

As an attorney with the practice devoted almost entirely to defending damage suits for various insurance companies, I read with particular interest your editorial proposing insurance coverage for legal defense of radio amateurs.

I want to compliment you on the sound and well-reasoned editorial and I agree that such insurance coverage will be both inexpensive and practical.

There should be no problem if the program includes not only the cost of defending the case, but also protection against damage awards up to a given policy limit.

However, if the insurance coverage is limited only to the cost of defending up to, say $5,000, the ARRL should be aware of some possible protection against an exorbitant legal fee for defending a very minor lawsuit. If the policy provided only for legal defense costs, and the insurance company had no financial exposure for the ultimate outcome of the lawsuit, there would be a great temptation for them to retain an inexpensive lawyer rather than a skilled trial lawyer. The ARRL should insist on some protection against that possibility.

One suggestion would be a requirement that the insurance company select an attorney who primarily defends damage suits and pay the normal fee in the community for such representation. With that agreement, the company would quite likely use its regular defense counsels and no problems should arise. I am sure there are other problems inherent in this type coverage which haven't occured to me so in any event, the ARRL should consult with some attorneys experienced in defending damage suits for insurance companies in order to properly evaluate the proposed insurance before recommending such coverage to its members. There is one other matter which should be called to the attention of your readers. Normally, homeowners' coverage (fire, windstorm, etc.) also contains C.P.L. coverage (comprehensive personal liability) which in most instances would cover up to the policy limit any damage suits against the policy holder regardless of its connection with amateur radio. This coverage is inexpensive and readily available, even to non-homeowners. The amateur should check with his insurance agent, most likely he will find he already has such insurance coverage. While insurance policies differ, it would normally cover most damage suits based on the alleged negligence of the amateur.

The type of coverage in your editorial is still needed because many legal problems of the radio amateur involve injunctions, zoning and similar problems which don't necessarily involve a lawsuit for damages.

Stephen C. McAliley, WN4FUM
West Palm Beach, Florida

Editor, *CQ*:

Your recent Editorial concerning the plight of Len, W2OVC, is a sign for all radio amateurs to come to his aid. A TVI lawsuit is the concern of all of us and must remain our cause until such time as television manufacturers are forced to include circuitry that will not receive our signals. We know it's usually not our fault, but it's pretty hard to convince Joe Doaks when he hears our signal on his TV set in the middle of the World's Series. Let's all get behind Len and send him some bucks to fight OUR cause. In the meantime perhaps its time to dust off some of the old club TVI committees and reprint articles on avoiding TVI, to assist the newcomers to amateur radio.

Al Smith, WA2TAQ
Lynbrook, NY

Editor, *CQ*:

I read with interest "Zero Bias" in the April issue of *CQ*.

The insurance which you suggest as necessary or desirable for the amateur is already readily available. The policy is known in most insurance companies as the Personal Umbrella Liability Policy. It is generally issued in the amount of $1,000,000 and is excess over Comprehensive Personal Liability insurance and Automobile Liability insurance and in those areas where no primary insurance exists

NEW Drake DSR-2 Communications Receiver

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- **All solid state**
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there is a self-insured retention of $250.

Defense costs are covered from the ground up under most policies and the coverage is what is known as Personal Injury Liability which includes, but is not limited to, the invasion of privacy, among other things, which would take care of the situations indicated in your editorial.

For the average family having one home and one car, the annual premium for the $1,000,000 limit is $50.00 or less.

I would suggest that you speak to a professional insurance agent or broker about such coverage which is readily available whether on an individual basis or, in some cases, in a group basis through a person's employer.

Should you be unable to get satisfactory information on such coverage, please let me know and I will be most happy to fill you in.

Best personal regards.

L.D. Fowler, Jr., WA3TCE
Philadelphia, PA

Editor, *CQ*:

In reply to your April editorial, I agree that group insurance would be a good thing to pursue- and maybe ARRL should become more involved in lawsuits.

However, your bias in favor of W2OVC is questionable, for while I agree he should be able to pursue his hobby, he can only do so if it does not interfere with his neighbors rights to the quiet enjoyment of their property. This is fundamental. It applies not only to ham radio but to almost everything else. FCC regs make provision for this.

Kenneth D. Stein
Merrick, NY

Editor, *CQ*:

Just finished reading "Zero Bias" in the April issue and being in the pre-legal position somewhat similar to that of W2OVC, I concur with your suggestion that ARRL, or some organization pick up the ball and carry it toward providing legal defense insurance.

In my case, a home owner's committee with deed restrictions giving it the power to make arbitrary decisions, which I was not aware of when I purchased the home about a year ago, has decided to take me off the air to solve the problem. As a result, my neighbors refuse to do anything for themselves, even though I have offered to cooperate.

Lynn V. Hull, WB6PEF
Tustin, CA

Editor, *CQ*:

I have just completed reading "Zero Bias" in your April issue. I strongly feel that someone or some organization should make proposals to insurance companies to cover hams in case of a lawsuit or to cover the costs of a lawyer if they are brought to court by neighbors who make more QRN than the man's rig.

Many people don't realize that ham radio is not just another hobby. Due to the vast systems of communication these days, no man is isolated anymore. Ham radio is one of these systems. People do not understand the importance of a ham in the community. The same operator . . .they will take in court. . .may very well be the person who will save their lives some day.

Bill Baronowsky, WN2TKG
Freehold, NJ

New Additions

Editor, *CQ*:

You are to be commended for returning the Novice column and adding the monthly department on QRPp. In the former, I find that after 16 years as a ham, one is never too far on to acquire some new and valuable information or operating advice. As for the latter department, the efforts of QRP operators indicate there are still amateurs interested in challenging experimentation - - as opposed to easy DX with the now widely-available desk-top appliances. In short, it takes limited skill and knowledge to produce a blockbusting signal with a mass-produced kilowatt and a store-boughten beam (even if both are maladjusted). Some degree of operator proficiency and just plain initiative ought to be recognized in the amateur who runs only a few watts to a less costly and ostentatious display of backyard hardware. Myself, I have operated with as little as two or three-hundred milliwatts on 40 c.w. into a dipole. My best DX was about 35 miles away but I still recall that QSO six years ago, while the memory of other foreign DX contacts has gone down the drain. Presently, I'm experimenting with four watts on 160 meters! And there's a band more people should get into. Do any of you realize they still operate some straight a.m. down (up) there?

A couple of years back, I was out of the hobby for a while as family considerations took precedence and I was moving around quite a bit. In the interim, SSTV, 2-meter f.m., and a number of other innovations arrived. Now, what with c.w. deyboards, ultra-modern radio, I feel really buffaloed - - at least from the standpoint of technical understanding. (I'm far from a technician or engineer I might add, as I'm a former high school German teacher and now work as a radio newsman.) But, how about reviewing some of these concepts from time to time (perhaps in the Novice column or in a feature-length when I get into each month's issue of *CQ*. But, judging from the majority of hams I chat with on the air, I'm not alone by a long shot. These days, it seems the tendancy is in this direction: It dosen't make any difference how much you know, because even if you're dumb, you can spend enough money and find machinery and equipment (right on all the ad pages of *CQ*) to make up for all your ham radio ignorance. And these people are easily recognized: They're the same ones who have nothing at all substantive to contribute to a QSO excepting the usual name, rank and serial-routine, perhaps coupled with the weather report if they're really imaginative. Then, it's on to another mindless QSO, a new state, county, endless week-end contesting or just too much aimless bull-throwing that smacks strongly of the sort of patter one might hear on 11 meters. There are still substantial numbers of amateurs who are apparently afraid they might actually get to know somebody on the air. It's an easy trap to allow this miraculous privilege of amateur communication become mundan, just like the television or the telephone.

One of the things I've discovered since I've been a ham is that poverty breeds inventiveness. One finds himself acquiring new knowledge not because he wants it really, but because one has to if he is to compete from the often less-than-equal footing that comes with a limited ham radio budget and even more limited equipment. Offhand, I'd say amateur radio - - keeping in the direction it's going - - is fast

becoming a rich man's pastime. VK7RG was right in suggesting ham radio's participants start defining the hobby's direction(s). In any event, there must be other amateurs who find themselves with a shack full of relatively (or wholly) obsolete gear (at least by the standards being foisted off on us by the big equipment manufacturers to the tune of 350 dollars and up.) And such hams are also forced to come up with alternative "life-styles," make modifications, experiment, or abandon the hobby altogether as too costly. For my own part, I have probably spent no more than a total of 600 dollars for all the equipment I have ever owned, including parts for homebrew gear. That tidy sum would hardly buy me an adequate transceiver, which I'm sure the equipment manufacturer has predestined to become an anachronism before it's hardly paid for. It appears the American ham is going the way of the American motorist, and that's no way to go in my estimation. It pleases me to see there are some in the hobby (Cop MacDonald for example) who have put their brains into gear, and it's a joy to see their words on the pages of your magazine.

Eric R. Lindquist, K1YHK
Newport, Maine

Announcements

Willow Springs, Illinois

The Six Meter Club of Chicago, INC., will hold its 17th Annual Hamfest on Sunday, June 9 1974. It will be held at Santa Fe Park in Willow Springs, Picnic grounds, and refreshments will be available. For more information contact Val Hellwig, K9ZWV 3420 South 60th Court Cicero, IL 60650.

Oglesby, Illinois

The Starved Rock Radio Club's Annual Hamfest will be on Sunday June 2, 1974, at the Bureau County Fairgrounds in Princeton, Illinois. Food & refreshments, free swap shop, camping and trailer space for a nominal fee, and excellent parking facilities will be provided. For further details, write: G.E. Keith, W9QLZ, RFD 1, Box 171, Oglesby, IL 61348.

Detroit, Michigan

The Jewish Community Center Radio Club's 2nd annual Swap'N'Shop is Sunday, June 16th, 1974 at the Main Branch Jewish Community Center, 18100 Meyers Rd., Detroit, MI. For more information write to 12702 Talbot, Huntington Woods, MI 48070, or call Phil, WB8MLD, (313)-548-7295.

Salina, Kansas

The Central Kansas Amateur Radio Club, Inc., will hold their annual Hamfest, Sunday, June 2, 1974. It will take place at the 4-H complex, Kenwood Park, Salina, Kansas. Lunch and beverages supplied by the club; for more information, write: WB0BCL, Al Grahm, 827 Merrill, Salina, Kansas, 67401.

Huntington, West Virginia

The Tri-State Amateur Radio Association is holding their Twelfth Annual Hamfest on June 2, 1974, at 11am, at Camden Park, U.S. Route 60 West, Huntington, West Virginia. For ticket information, write: Tri-State Amateur Radio Association, P.O. Box 1295 Huntington, WV 25175.

Chadron, Nebraska

The Pine Ridge Amateur Radio Club will hold its 20th annual Hamfest on Sunday, June 2, 1974.

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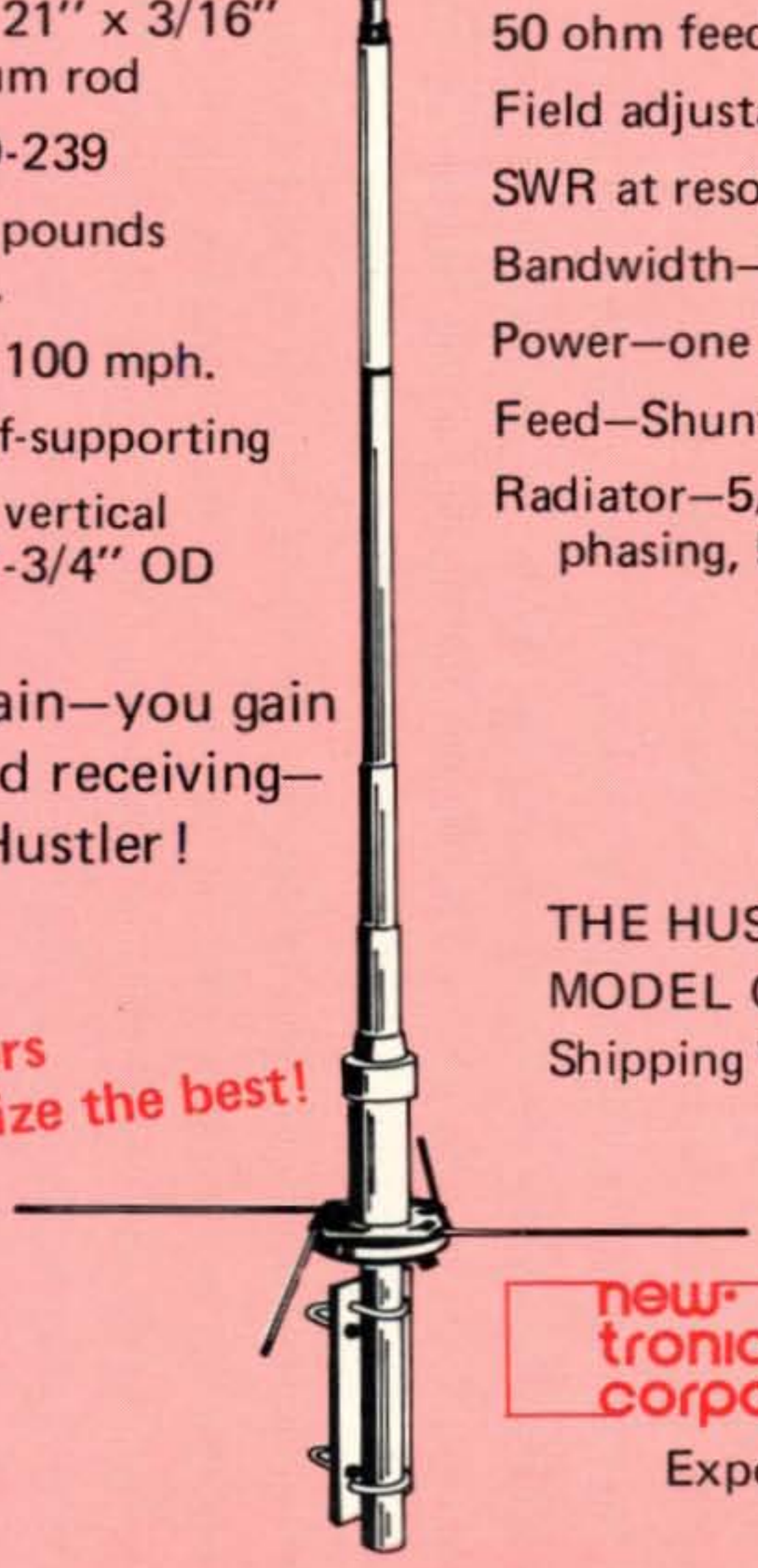

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Activities will take place at Chadron State Park-Camp, 10 miles south of Chadron, Nebraska. Beverages will be provided and registration is Free. For more information, contact the Pine Ridge Amateur Radio Club, 234 Main Street, Chadron, Nebraska 69337.

Flushing, New York

The Hall of Science Radio Club presents its Flea Market/Auction/Picnic, on Saturday June 8th, 1974, in the Hall of Science Parking Lot, 111th St., Corona-Flushing Meadow Park. For additional information, call (212)699-9400.

Pueblo, Colorado

The 1974 ARRL Rocky Mountain Regional Convention will be held June 7th, 8th and 9th at the Ramada Inn in Pueblo, Colorado. Meals and accomodations will be available. For additional information, write: Convention Committee, P.O. Box 92, Pueblo, Colorado 81002.

Arnold, Maryland

The Maryland Mobileers ARC Hamfest is June 16, 1974 at Anne Arundel Community College, Arnold, Maryland. Refreshments, contests and an auction are planned. For further information contact Ted Redick, K3UPU, 2 Acton Place, Annapolis Maryland, 21401. (301)269-5577.

Granite City, Illinois

The Egyptian Radio Club INC. will hold its annual Hamfest on Sunday, June 9, 1974 at the picnic grounds, 700 Chouteau Slough Road, Granite City, Illinois. Food, prizes and games. For more information contact Everett Anderson, K9KXP, 1712 Keebler Street, Collinsville, IL 62234.

Winfield, Pennsylvania

The Williamsport and Milton Club's Eleventh Annual Penn-Central Hamfest will be held Sunday, June 2, at the Union Township Volunteer Firegrounds on Route 15 in Winfield, PA. Auction, flea market and free parking. Write: Clair Yeagle, 714 N. Main, Watsontown, PA, or call (717)-538-9292.

Rome, New York

The Rome Radio Club sponsors its 22nd consecutive Ham Family Day on Sunday, June 2, 1974. at Beck's Grove, west of Rome New York Contests, flea market and equipment displays will be available. Send your reservation to Rome RC Box 721, Rome, NY 13440.

Jefferson City, Missouri

The Missouri Single Side Band Net will have their annual picnic at Memorial Park in Jefferson City, MO, Sunday June 9, 1974. Dinner and refreshments will be provided and door prizes given. For more information contact, Benton C. Smith, K0PCK.

Jacksonville, Illinois

The Jacksonville Area Amateur Radio Club Hamfest will be held Sunday June 30, 1974, at the Morgan County Fairgrounds in Jacksonville, Illinois. For Advenced information, write: Box 571, Jacksonville, IL 62650.

West Lafayette, Indiana

The Antique Wireless Association, Midwest Region - I.H.R.S. Meet will be held at Stewart Center, Union Building, Purdue University, West Lafayette, Indiana on Saturday, June 22, 1974. Adress all inquiries to I.H.R.S. Secretary, Ross Smith, 1133 Strong Ave., Elkhart, IN 46514.

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There has never been an amateur linear amplifier like the new 2K-ULTRA. Small and lightweight, yet rugged and reliable . . . all that the name implies. The ULTRA loafs along at full legal power without even the sound of a blower. Its anode heat is silently and efficiently conducted to a heat sink through the use of a pair of Eimac 8873 tubes. In fact, all of its components are the very best obtainable. The price . . . $895.00

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Small but powerful, reliable but inexpensive, this amplifier is another top value from Henry Radio. Using two 8874 grounded grid triodes from Eimac, the Tempo 2001 offers a full kilowatt of output for SSB operation in an unbelievably compact package (total volume is .8 cu. ft.). The 2001 has a built-in solid state power supply, a built-in antenna relay, and built-in quality to match much more expensive amplifiers. This equipment is totally compatible with the Tempo One as well as most other amateur transceivers. Completely wired and ready for operation, the 2001 includes an internal blower, a relative RF power indicator, and full amateur band coverage from 80-10 meters.. . . $595.00

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The Tempo 6N2 joins the Henry Family of fine HF amplifiers, bringing the same high standards of performance and reliability to the 6 meter and 2 meter bands. Using a pair of advanced design Eimac 8874 tubes, it provides 2,000 watts PEP input on SSB or 1,000 watts input on FM or CW. The 6N2 is complete in one compact cabinet with a self-contained solid state power supply, built-in blower and RF relative power indicator. Price . . . $695.00

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A high quality linear amplifier designed for commercial and military uses. The 3K-A employs two rugged Eimac 3-500Z grounded grid triodes for superior linearity and provides a conservative three kilowatts PEP input on SSB with efficiencies in the range of 60%. This results in PEP output in excess of 2000 watts. In addition, the 3K-A provides a heavy duty power supply capable of furnishing 2000 watts of continuous duty input for either RTTY or CW with 1200 watts output. Price . . . $1150.00

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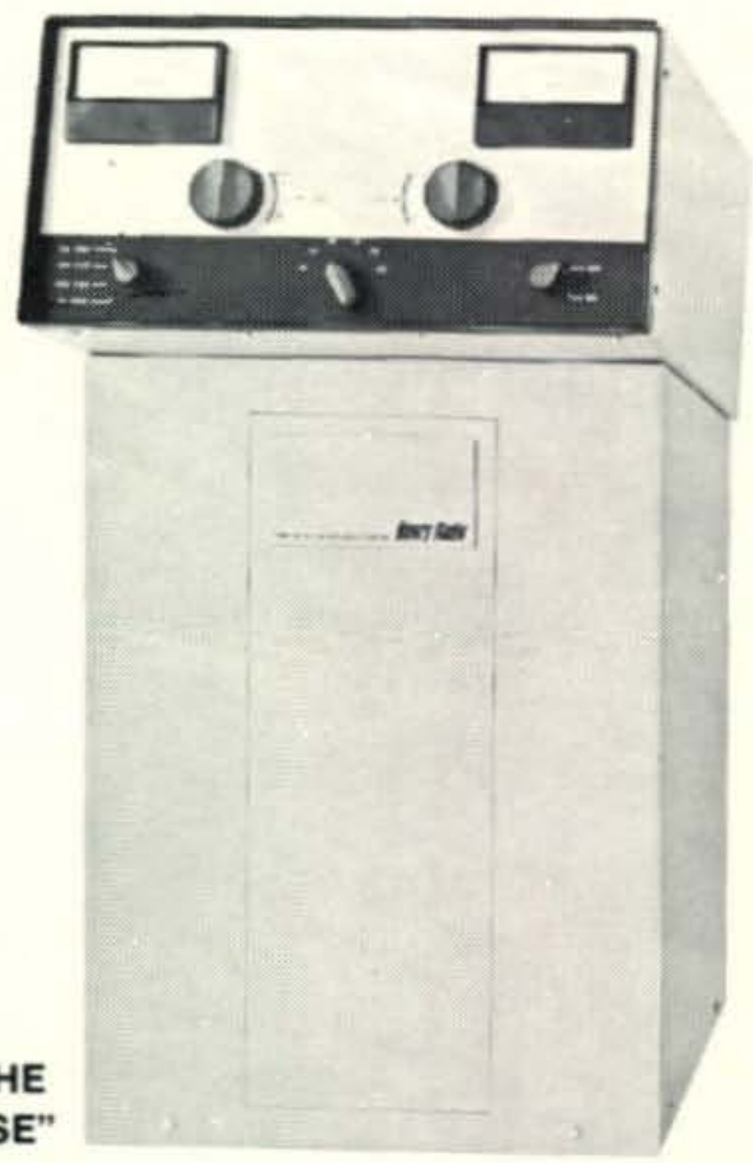

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The 2K-4 linear amplifier offers engineering, construction and features second to none, and at a price that makes it the best amplifier value ever offered to the amateur. Constructed with a ruggedness guaranteed to provide a long life of reliable service, its heavy duty components allow it to loaf along even at full legal power. If you want to put that strong clear signal on the air that you've probably heard from other 2K users, now is the time. Move up to the 2K-4. Floor console or desk model . . . $895.00

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Q AND A

BY CHARLES J. SCHAUERS,*
W6QLV

Power Generator Failure

"I have a small gasoline driven a.c. generator, 500 watts, and it has worked well without incident for over 2 years. Now, however, I only have about 80 volts output, where I used to get more than 115 volts. I hate to take the unit apart for I'm not a very good generator mechanic. What should I do?"

Get the generator back to the manufacturer for an overhaul. The first thing that comes to mind is a shorted winding or a slipping shaft.

Intermittent NC-183-D

"I have had my old NC-183-D receiver for over 10 years and it has given me wonderful service. I installed a product detector in it and have had good service, but now, as hard as I have tried I cannot find an intermittent. The set will be going along fine and then suddenly cut out. Flipping the ON-OFF switch brings the sound back. What do I look for?"

An intermittent coupling capacitor between the detector and the audio stages or between the audio stages themselves. Suspect any interstage coupling capacitor.

Noise on 2M Mobile

"I operate on 2 meter mobile and have had my set in my car for over a year. Operation has been great and *quiet* but during the last few weeks something like ignition noise appears. I have resistor plugs and the ignition-electrical system seems to be working ok. What should I check?"

If your car does not use a transistorized voltage regulation system then suspect the electromechanical voltage regulator. Next, check the bolts that hold the fenders on and any other critical bolts that could create a "floating ground." Check for tight battery connections. Look for a loose coax connection and antenna intermittent. Last but not least take the set out of the car and inspect all components—especially if the set is transistorized. Vibration can and does cause lead mounted components to shift position so that contact shorting could take place.

*c/o *CQ*, 14 Vanderventer Ave., Port Washington, N.Y. 11050

Thank you QST
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"has to be the pace setter for the '70s"

See product review in the July 1973 issue of QST or send to Henry Radio for a complete reprint.

KENWOOD'S TS-900

NOW THE PROMISE OF THE TRANSISTOR HAS BEEN FULFILLED. HERE IS THE TRANSCEIVER YOU WILL WANT TO OWN AND CAN AFFORD. FOR YEARS AMATEURS HAVE WAITED FOR THE NEW GENERATION GENERAL PURPOSE SSB TRANSCEIVER. NOW THE WAIT IS OVER. WHATEVER TRANSCEIVER YOU OWN GET READY TO TRADE.

FEATURES: Break-in CW with sidetone provided ★ Built-in 100 KHz and 25 KHz crystal oscillator ★ The receiver incremental tuning control can vary the receive frequency ±2 KHz or more ★ RTTY — Built-in frequency shift circuit for FSK operation. The frequency shift is factory set at 850 Hz ★ Built-in noise blanker designed to reduce impulse type (ignition) noise ★ Built-in VOX circuit with adjustable VOX gain and delay ★ All major electronic circuits are built on modular (plug-in) circuit boards

SPECIFICATIONS: *Frequency range*: 80 meter band — 3.5 to 4.0 MHz; 40 meter band — 7.0 to 7.5 MHz; 20 meter band — 14.0 to 14.5 MHz; 15 meter band — 21.0 to 21.5 MHz; 10 meter band — 28.0 to 28.5 MHz, 28.5 to 29.0 MHz, 29.0 to 29.5 MHz, 29.5 to 30.0 MHz; WWV — 15.0 MHz (receive only) ★ *MODE*: SSB, CW, or FSK ★ *POWER OUTPUT*: 150 watts nominal into 50 ohms for SSB, 125 watts nominal into 50 ohms for CW, 50 watts nominal into 50 ohms for FSK ★ *RF INPUT IMPEDANCE*: 50 ohms ★ *FREQUENCY STABILITY*: Within 100 Hz during any 15 minute period after warmup ★ *CARRIER SUPPRESSION*: Carrier better than 45 db down from output signal ★ *SIDEBAND SUPPRESSION*: Unwanted sideband better than 40 db down from the output signal ★ *HARMONIC RADIATION*: Better than 40 db down from output signal ★ *RECEIVER SENSITIVITY*: 0.5 microvolts for a 10 db signal + noise/noise ratio ★ *RECEIVER SELECTIVITY*: SSB and FSK — 2.2 KHz bandwidth (6 db down), 4.4 KHz bandwidth (60 db down). CW — 0.5 KHz bandwidth (6 db down), 1.5 KHz bandwidth (60 db down) (with optional CW filter installed) ★ *TUBE & SEMICONDUCTOR COMPLEMENT*: 3 tubes (6LQ6 x 2 and 6GK6), 3 IC's, 16 FET's, 57 transistors, 70 diodes ★ SIZE: 12.6"W x 5.5"H x 12.6"D The TS-900, unquestionably the best transceiver of its kind ever offered.

PRICES: TS-900 . . . $795.00, PS-900 (AC supply) . . . $120.00, DS-900 (DC supply) . . $140.00, VFO (External VFO) . . . $195.00 Also, Kenwood's TS-520 five band SSB & CW transceiver . . . a superb value at $629.00. If you prefer separate units, Kenwood's R-599A solid state receiver at $459.00 and the T-599A transmitter at $479.00 are the best available.

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Maritime Mobile QRM

"I'm an MM operator as well as a ham. My ship is a tanker. When I operate I cause interference to the SW and BC sets of crew members. A community antenna is used to therein lies a part of my problem. I use a vertical and seem to get out well. Any suggestions?"

The first thing that comes to mind are filters but these do not always cure the problem, especially if SW listening is done on 15 mHz and other SW bands. Because you are at such close quarters you have a lot of r.f. and saturation is simple. This is a headache as it is on most small ships, but there are solutions. In order to come up with the correct one takes some experimenting. A high-*Q* rejection filter (tuned for the frequency you operate on) may be a partial solution to the BC SW problem. I'd like to hear from those MM operators who have licked the problem.

SB-401—SB-303 Problem

I am having a problem with my SB-401 and SB-303 rig from Heath. I don't have the crystal pack in the SB-401 so am using the SB-303 with it as a transceiver. My basic problem is this. When I am set at say 14.184 mHz I am also putting out an l.s.b. signal on 14.027. This shoves me into the c.w. band. But using the SB-220 linear and a 10 db antenna gives some punch to the l.s.b. signal. Heath has no immediate answer but say that 55 db suppression at rated output is good suppression, and I agree with them, but there is something going on. Any ideas?"

There is little doubt that some of the output of 14.184 mHz is mixing with the v.f.o. output of 5.316 and a difference frequency of 8,868 mHz is being produced which can get past the bandpass filter (8,395 to 8,895 mHz) and this mixes with the 22,895 mHz crystal frequency producing 14.027 mHz, as you have suggested. This is a big problem. A trap can be used effectively in this situation as well as better shielding. An r.f. probe can be used to detect the feedthrough. A good Millen grid-dip meter is the best instrument I can recommend for you to find your trouble. That 22.895 crystal frequency bothers me. Let me know your results. Heath engineers are working on the problem.

73, Chuck, W6QLV

A Morse Code Digital Encoder for C.W.

An inexpensive digital CQer for contesters.

BY ANTHONY CARISTI*

HERE is a novel circuit, consisting of 13 to 18 TTL IC chips, which can send a coded message of 39 to 79 dots, dashes, and spaces before repeating itself. Hams working the bands on c.w. can find this useful when calling CQ, when it is desireable to repeat the station call letters several times such as in a DX contest or sweepstakes.

Encoding the circuit to the desired message is accomplished by wiring inexpensive jumper plugs and placing them in sockets provided for this purpose. Each group of eight dots, dashes, and spaces requires one jumper plug. Of course, there is no necessity to use jumper plugs. This is merely a convenience to allow changing the message without rewiring the unit.

All TTL chips used in this encoder are available from Poly Paks, P.O. Box 942, Lynnfield, Massachusetts 01940. Total cost for 13 chips is only $12.55. The regulator chip, LM309K, is manufactured by National Semiconductor Corporation, and may be purchased from regular electronics supply houses.

Decoder Operation

It is assumed that the reader is familiar with the operation of such logic circuits as OR, NOR, NAND, inverters, and binary counters. This information is available in any introductory text on logic circuits. This encoder utilizes several SN7442N and SN7445N 4 line decoders. The following is a description of the operation of these chips.

The SN7442N and SN7445N decoders are identical except that the SN7445N type has "open collector" outputs. This means that when an output terminal is at a logic state of one, the output is electrically open to the inner circuitry of the chip, and an external resistor is required to bring the output voltage up to logic one level. The advantage of open collector outputs is that any number of such outputs can be connected in parallel, and a logic zero state on any one output will pull all outputs connected in parallel down to logic zero. It is not permissable to parallel outputs of the SN7442N decoders.

The decoders have four input and ten output terminals. The input terminals, usually fed from a binary counter, represent a 4 bit binary number ranging from zero to fifteen. Those terminals are identified as A, B, C, D inputs with A being the least significant bit. The output terminals each represent a number from zero to nine. (Do not confuse the pin numbers of the IC with the decoded output numbers.) It is the function of the decoder to indicate which binary number, from zero to nine, is fed to the input by causing a zero logic state at one of the outputs. All other outputs remain at a logic state of one. If the input information represents a number from ten to fifteen, all outputs of the decoder remain at a logic state of one. Note that the schematic shows "zeros" at all output terminals of the

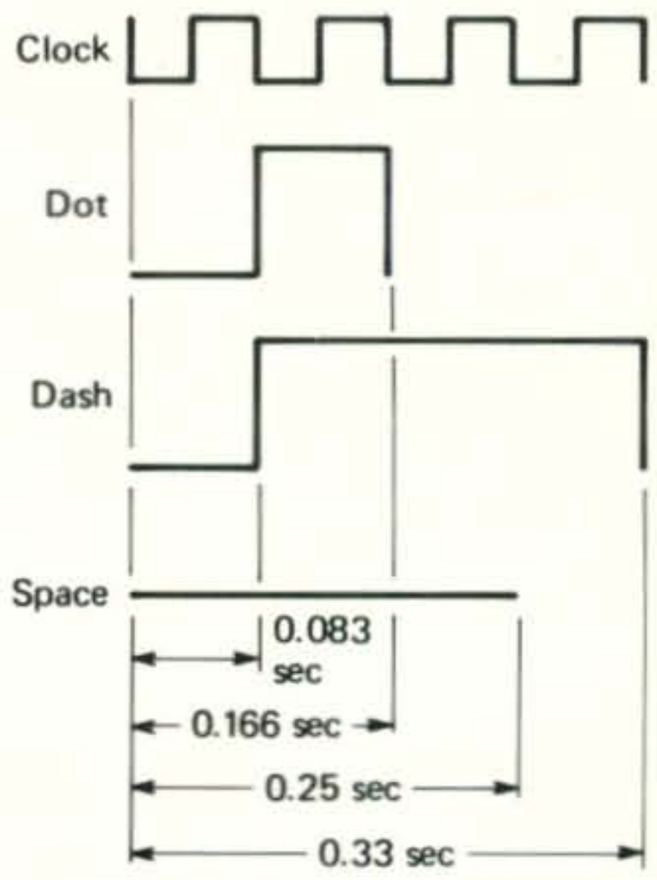


Fig. 1—Timing diagram showing automatic placement of spacing between dots and dashes.

*69 White Pond Road, Waldwick, NJ 07463.

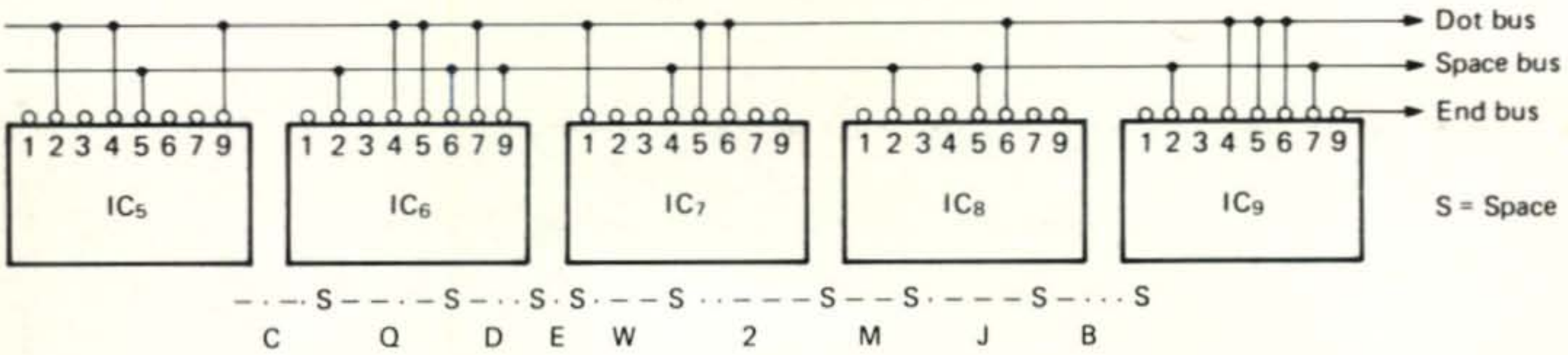


Fig. 2—Simplified wiring diagram showing connections to the dot, spaces and end busses necessary to produce the message "CQ DE W2MJB". Connections are made by means of jumpers in IC plugs inserted into sockets S_1 through S_5 in fig. 4. Longer messages may be generated by adding as many as five additional SN7445N decoders jumpers sockets. The total message length = (8N — 1) dots, dashes or spaces where N equals the number of decoders.

decoders. This is to indicate that when any output terminal is activated, the logic output state is zero.

The outputs of IC_5 through IC_9 represent up to 39 characters in the encoded message. Each additional decoder adds capability for 8 more characters. A character is defined as a dot, dash, or space between letters. The digital circuitry automatically provides the proper spacing between dots and dashes, as shown in the timing diagram, fig. 1. Encoding a message is accomplished by connecting jumper wires from the outputs of IC_5 through IC_9 decoders to one of two bus wires marked "dot" or "space." If a dash is required, no connection is made to that particular output.

The first eight characters are wired at outputs zero through seven of IC_5. Similarly IC_6, IC_7, IC_8, and IC_9 are wired in sequence for dots or spaces. At the end of the message one wire is connected from the next unused output terminal to the end bus. This stops the encoding process and resets counter IC_{10} & IC_{11} to zero.

The delay between the end of the message and the start of the next one is controlled by how many spaces are wired in before the connection to the end bus is made. As an example fig. 2 is a simplified wiring diagram for the message CQ DE W2MJB. Only one space was available at the end of this particular message to separate the last letter from the first. If a longer dead time for this message was desired, a sixth SN7445N decoder could be added to the circuit.

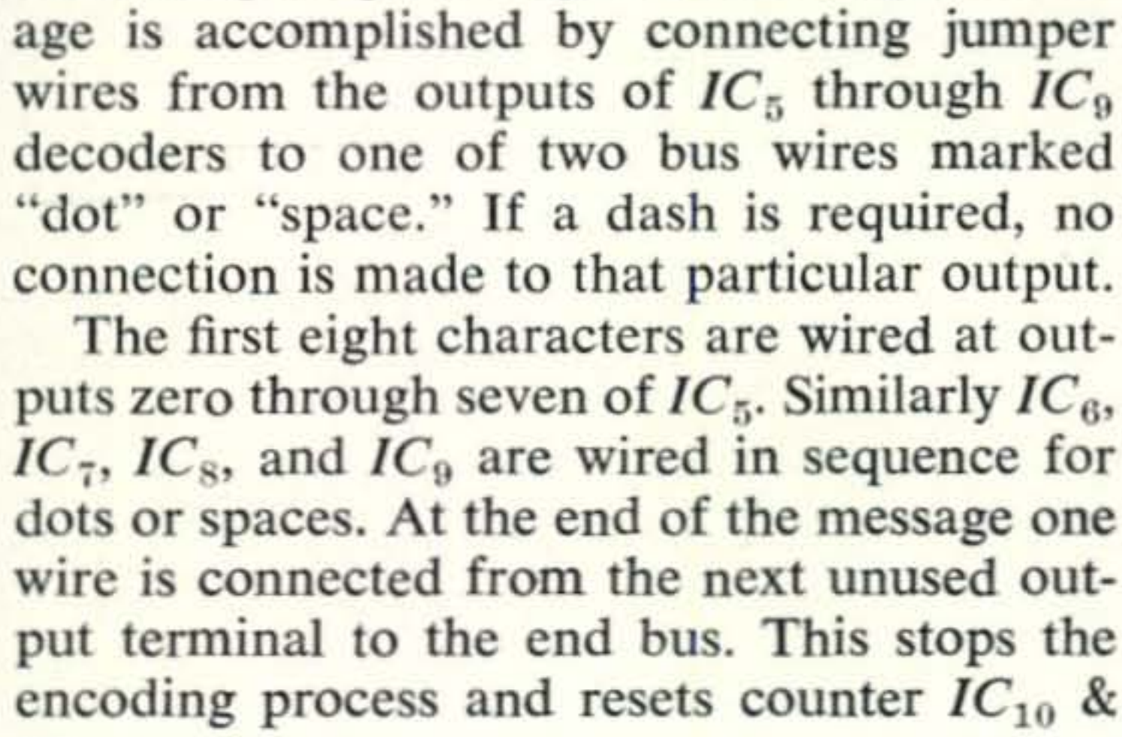


Fig. 3—Timing diagram showing logic states at the outputs of IC_4. A dash is shown being produced.

Timing Sequence

The heart of the encoder is a unijunction transistor oscillator circuit, operating at a frequency of about 6 to 12 Hz, driving a three bit binary counter IC_4. Pins 9, 8, and 11 are the A, B, and C outputs of the counter respectively. This counter is wired with several OR and NOR gates connected from its output terminals back to the reset terminals so that it counts 0, 1, reset for a dot or space, or 0, 1, 2, 3, reset for a dash. The absence of a connection to the dot or space bus allows the counter to reset itself through the dash bus. Reset occurs when there exists a logic zero state on the dot or space bus, or a logic one on the dash bus. Reset is accomplished by a logic one state at the reset terminals, pins 2 and 3.

Figure 3 is a timing diagram showing the logic states of the outputs of IC_4. The diagram shows the counter producing a dash. Note that the C output, through OR circuits IC_3B and IC_3C, resets IC_4 to zero at the count of four. Thus, only a momentary pulse appears at the C output terminal instead of the normal binary pulse shape. If a logic zero exists at the dot or space bus, the inverted B output, through NOR circuit IC_1A or IC_1B results in IC_4 resetting itself at the count of two. Note that the OR of the A and B outputs becomes the desired output waveshape for dots or dashes.

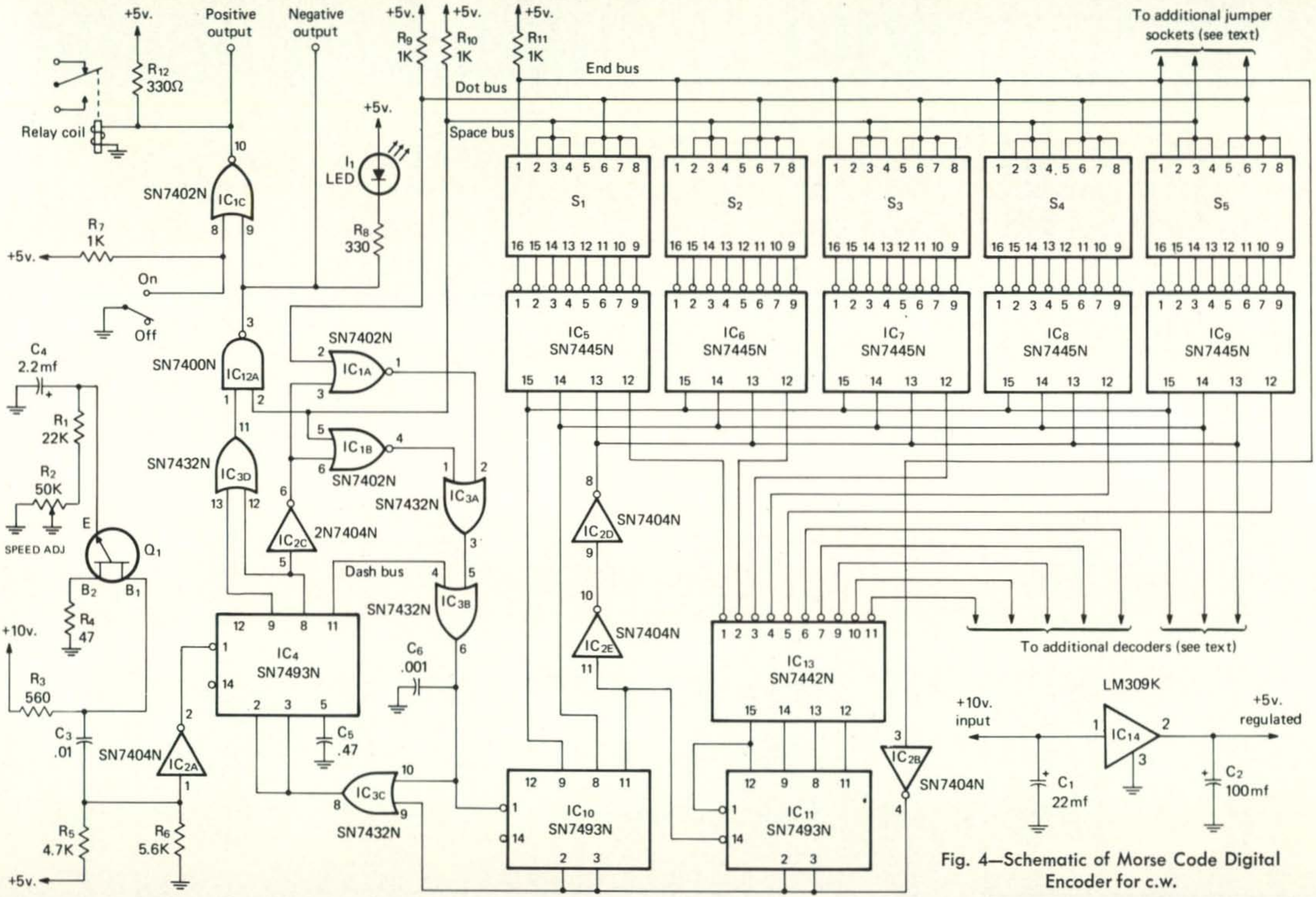
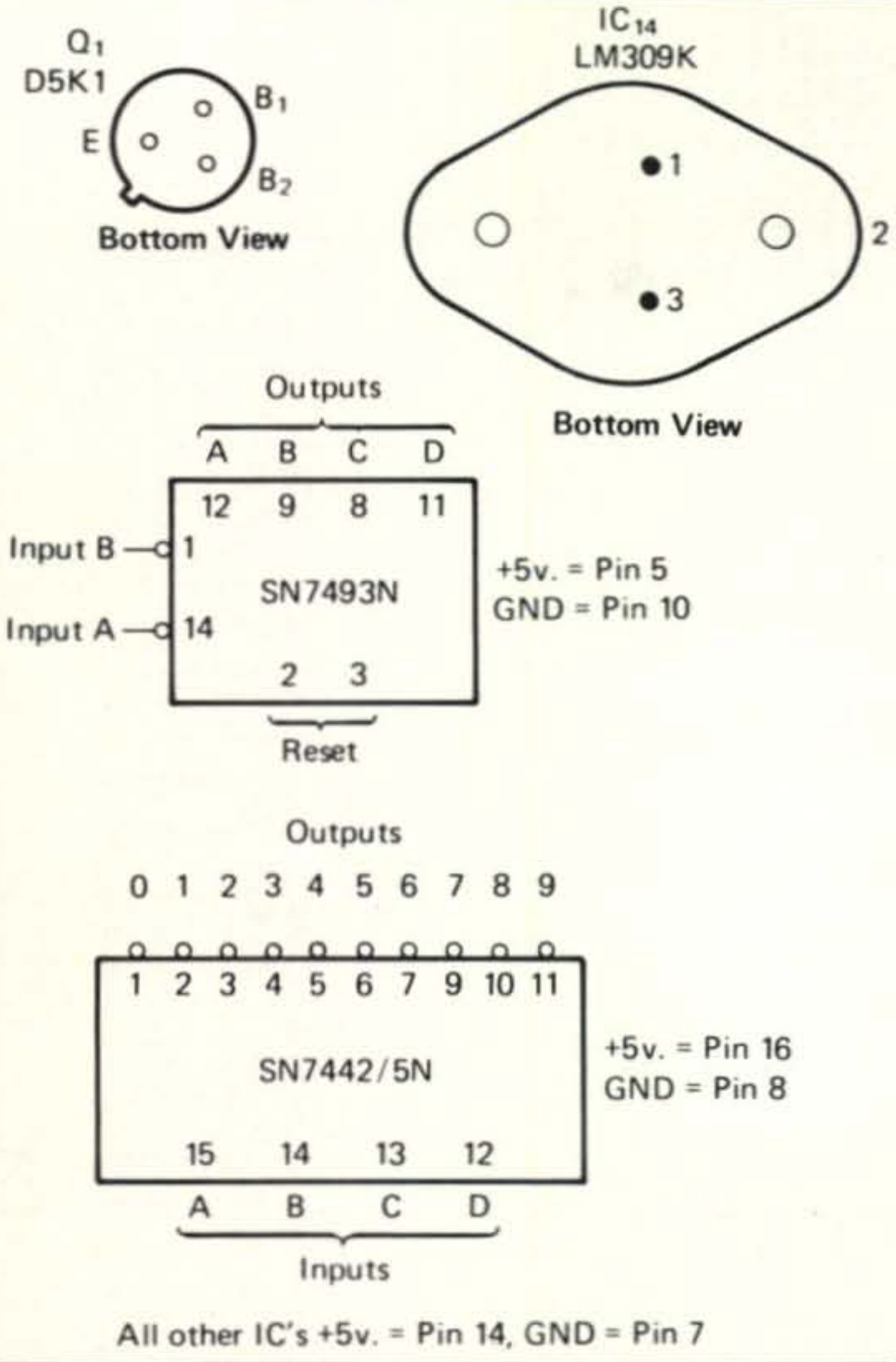


Fig. 4—Schematic of Morse Code Digital Encoder for c.w.



Each time the counter is reset a clock pulse is applied to a second binary counter IC_{10} and IC_{11}. This is a seven bit counter with the three lowest significant bits fed to the A, B, and C inputs of IC_5 through IC_9. The remaining four bits are fed to another decoder, IC_{13}, whose outputs feed the D input of IC_5 through IC_9. Since only one output terminal of IC_{13} can be at logic zero at a time, it can seen that the D input terminal of IC_5, IC_6, IC_7, IC_8, and IC_9 is used as an "enable" input. That is, any decoder with a logic one at its D input sees a number eight or greater. Since only outputs zero through seven are used, all decoders except one have logic one levels at output terminals zero through seven.

At the start of the sequence counter IC_{10} and IC_{11} is set to zero by means of a logic one level at reset pins 2 and 3 from the previous message end. This causes a logic zero level at zero output (pin 1) of IC_5. A connection in jumper socket 1 to the dot or space bus will cause counter IC_4 to count off a dot length or space length before being reset. No connection allows IC_4 to count off a dash length and reset itself. Reset advances counter IC_{10} and IC_{11} one count, and pin 2 of IC_5 shifts to logic zero level. This action is repeated until a logic zero from decoders IC_5-IC_9 is fed to end bus through one of the jumper plugs. When this occurs, counters IC_4, IC_{10}, and IC_{11} are reset to zero and the message is repeated.

The coded message is the "OR" of the A and B inputs of counter IC_4. When a space is required the output is kept at zero level by the zero logic level of the space bus and NAND gate IC_{12}A.

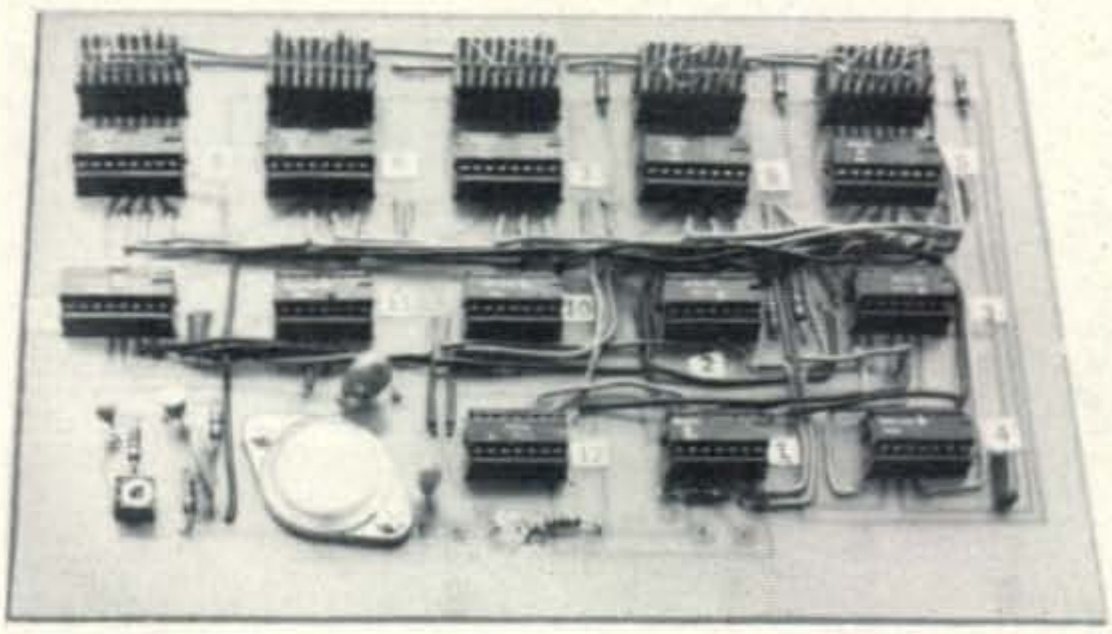
An LED has been provided for a visual indication of the code. A s.p.d.t. switch provides a means to turn the code off.

Power Supply

Power for this circuit, 5 volts at about 0.4 amperes, is provided by IC_{14}, a fixed 5 volt regulator. If the input to IC_{14} is held to under 12 volts, no heat sink is required. The oscillator transistor Q_1, a D5K1, does not need a regulated supply, since it is fairly frequency stable over a wide range of supply voltage levels. Frequency of the oscillator, and thus code speed, is controlled by a *R-C* time-constant in the emitter circuit of Q_1.

Construction

Figure 5(A) is the printed circuit layout used in construction of the unit. Sockets were used for all digital IC's. They add small expense to the unit and are well worth it. Most of the wiring of the circuit is provided by the printed circuit, but several jumper wires are necessary due to the complexity of the circuit. Most of the jumper wires are in the +5 volt and ground circuits. From the +5 volt regulated supply, jumpers to $IC_{1, 2, 5, 6, 7, 8, 9, 10,}$ and $_{13}$ are required. Double pads marked "+" have been provided to allow jumping from one IC to the next. Ground return wires are required for $IC_{2, 3, 4, 5, 10, 11, 12,}$ and $_{13}$. These pads are



The entire digital Morse Code generator is constructed on a single P/C board.

Component side (65% of full size)

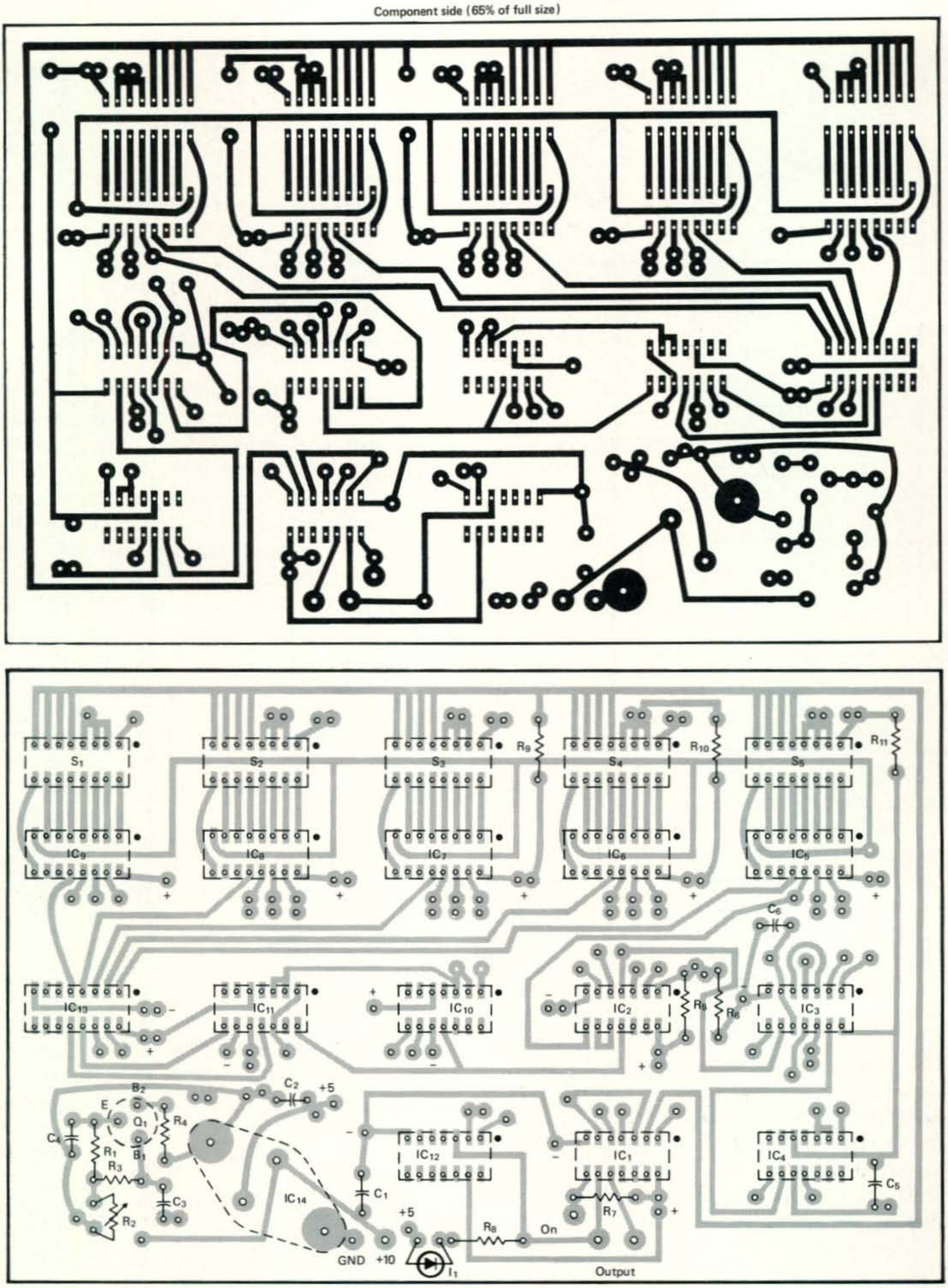


Fig. 5—(A) Printed circuit layout of foil side of Morse Code Encoder. (B) Component layout. All double foil pads not used for discrete component mounting are for jumper wires used to complete wiring shown in fig. 4. Note that these layouts are 65% of actual size and must be enlarged to 100% for P/C board use.

marked "—." It is recommended that four separate paths be used to provide ground returns, so as to avoid ground loops. All IC sockets are marked with a dot which identifies terminal number one.

Refer to fig. 5(B) for the parts layout, viewed from the component side of the board. After all components are mounted, the proper jumpers can be connected by

[*Continued on page 77*]

Phantom Copying
A Transitional Step To QRQ

BY AL D'ONOFRIO,* W2PRO

'tis a goal fervently sought by novice and crusty old timer alike—discovering the arcane secret of true armchair copying of high-speed c.w. Is there really a secret way to "no-hands" copying? Is there really some magic key that will unlock the golden door to QRQ?

Read how old salt Harv tells young Ernie about the mysteries of phantom copying and entrusts him with the magic key.

THOUGH it had been raining off and on for the past two days, and looked as if it would continue for another thirty-eight, young, dewy pink-cheeked Ernie didn't mind the chilly wet weather at all. He thought it was great, for he had a spanking new General ticket tucked into his denim jacket, and this June weekend was his very first official Field Day—rain or no—and fifteen-year old Ernie was somehow a part of it all. Gosh, was he proud.

During the slack periods, Ernie had taken the key and proved himself on eighty at speeds that tested his limit of about sixteen words a minute. He handled the key while his more worthy fraternity brothers savored the more active bands with their higher-powered commercial rigs, or while they sacked out on some cots to recharge their batteries, or while a select happy bunch visited the chow tent to crack open a few refreshing Rheingolds on ice.

Ernie liked this kind of hamming, with new and exciting things happening all around, with a gentle, brisk raining falling to baptize his first Field Day; he liked all the guys in the club; the competitive spirit and camaraderie; all this was fun—he liked Field Day.

He surveyed the lazily drooped dipole overhead and remembered all the horseplay that went on while they were trying to decide on the best winning direction, and later, all the rooting-about trying to locate those antenna insulators and hardware for guying the wires. But not real problem there: they quickly located the material—somebody had packed it with the beer.

Above the steady drone of the big generator, he caught the pleat of someone's mighty tired and sleepy voice...CQ Field Day, CQ Field Day...anybody man...K please.

His rest-period reverie was broken by a screeching yellow sportscar sprouting a long vibrating whip from its rear bumper. Glancing at his wristwatch, he saw that it was almost seven-thirty—Sunday already—and decided that he'd better start making himself useful again. He knew that little by little the more seasoned campaigners would start showing up—those who had opted earlier for a comfortable sack at home instead of a spartan cot under a damp army-surplus tent.

"Hey, Ernie," came an authoritative voice from the main tent—the only tent that didn't leak, command headquarters of the elite, "give me a hand with the logbook." It was Harv, unquestioned senior operator and bossman of the group. He wanted Ernie to handle the log while Russ, who had been with Harv all through the night, returned home for a pair of dry socks and, as he expressed it, to kiss his child bride good morning before she started to file papers for desertion. After waving their goodbyes, Ernie took the co-pilot's seat next to the grand master and awaited the next order of business, his ballpoint pen and logbook both poised for action.

With a deft hand, Harv swished the receiver dial back and forth through the bottom 100 kHz of twenty. His dial snuffling generated dive-bomber crescendos of heterodynes that undoubtedly cleared the area for a mile of all wildlife. Harv liked his code loud and fast—the faster the better.

Ernie sat silently, trying to size up this c.w. giant beside him—a man in his forties

*1537 Central Park Ave., Yonkers, New York 10710

or so, with a slight pot developing, receding hairline, rumpled clothes. He was big, too: a formidable person in days past; and far from a pushover even now. His face looked weather-beaten, especially with all that grey stubble. In a way, Ernie thought that Harv looked a little like his own father, though Ernie's father—a certified public accountant—was always neat and clean shaven. In any event, Ernie liked and respected Harv; besides, everyone knew that he was the best c.w. man this side of Walla Walla, bar none.

In addition to his c.w. track record, Harv took charge of the club's field day activities. Whatever the club needed for the big day, Harv would finagle it for the cause—a phone call to city hall or to the local CD or armory outfit—and presto, all the stuff the club needed delivered on site in a 2½ ton Army truck. He even had a local newspaper gal there to take their picture.

In an attempt to thaw the conversational frost, Ernie, in a thin voice, asked Harv what band they were working. Harv, without turning his attention from the receiver, brusquely told his to keep quiet and ready the log for action.

Harv fingered the Vibroplex with his right hand, as though limbering up before going on the air, while with his left hand, he repeatedly switched through the FWD and REV positions of the Johnson Matchbox s.w.r. bridge, touching up the coupling as necessary.

"That's Joe, across town—said he'll be over later," said Harv, pointing at the log book. "He's number 320."

"Who's 320?" asked Ernie, eyes wide and innocent.

"I said that was Joe . . . W2NHV . . . you helped him set up the beam yesterday . . . number 320 for the book." Harv scratched lightly at the stubble on his chin: "You didn't copy Joe, did you? Yeah, Joe's fast, too."

Ernie looked at Harv, only half believing that a *QSO* had just taken place. The whole exchange sounded like two amorous crickets getting to know each other. He sheepishly apologized for his goofing off and dutifully filled in the log with his customary neat penmanship.

As Harv continued operating, Ernie annoyingly strained to write down on the adjacent blank page whatever the other cricket was saying. But it was to no avail: the stuff was just too confounded fast; just a pack of idiotic crickets, thought Ernie, talking to other idiotic crickets; He pensively started biting his lower lip.

Poor Ernie; here he was valiantly struggling to conquer a once respectable solid sixteen words per minute, and this "person," now puffing contentedly on a smelly old pipe, his two big feet propped up on an empty carton, was copying QRO signals up and down the scale. And what was really humiliating to Ernie was that Harv wasn't bothering to write down so much as a word of it on paper—he was copying all of it in his head. Ernie was beginning to feel more and more insecure.

The short QSO's seemed to blend together, punctuated only by Harv's terse directives: "Put it down, Ernie."

"Who? Put who down, Harv?" Then Harv, somewhat annoyed, but with a definite haughtiness in his replies, would rattle off the log information. Then Harv would quietly chuckle and puff on his pipe.

Ernie said little but thought much. His one all-consuming thought was "Oh, how I wish I could copy c.w. like that." This was the stuff of Ernie's dream.

Another old timer, about Harv's age, popped into the tent and good naturedly commanded: "Ok, hot shots; wrap it up for a while; your far more eminently qualified second string will take over; grab yourself some breakfast before it corrodes the pot."

As the two left the tent, tired, stiff, and yawning, Ernie chirped that the rain was slackening; he could now just see the green-grey of the Hudson Palisades, and to the southwest, the silver glint of the George Washington Bridge.

Harv turned up his collar against the cold drizzle: "Yeah . . . thrilling. Let's get something to eat," laying his big hand on Ernie's shoulder and gently pushing him away from his salute-to-sunrise reflections.

Smelling the freshly brewed coffee, Harv poured himself a large cup and helped himself to three sugar doughnuts. He motioned to Ernie with a nod: "There's some kind of hot cereal in that pot . . . oatmeal, I think." On that, the two were of one mind: Ernie made a face and scooped up two glazed doughnuts and a container of chocolate milk. They sat down outside the chow tent on a slightly damp picnic bench, half-protected from the weather by a makeshift canopy.

Ernie munched on a doughnut and sipped his chocolate milk, neatly tidying up with his freshly ironed white handkerchief. Harv, meanwhile, furtively withdrew a small,

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slightly curved label-less brown bottle from his jacket and splashed a small amount of the amber liquid into his cup. He poised momentarily in contemplation, and gingerly splashed in a little more, swirling the cup gently to effect a more homogenous consistency of the liquids; he deftly returned the bottle to its safe berth without spilling a drop. Then he sipped the elixir, eyes pinched in contentment, and smacked his lips: "Mmmm, good."

By way of explanation, though not turning to look at Ernie directly, Harv dry-coughed twice, measuredly and loudly. "Touch of Pacific bronchitis," he whispered, tapping his chest weakly. With genuine concern, Ernie—though he didn't have the foggiest notion of what Pacific bronchitis was—instinctively expressed sympathy for Harv's affliction and wished him a speedy recovery; that's the way Ernie was brought up. Harv smiled and thanked him for his solicitude: "You're a good kid, Ernie," and promptly removed half of his sugar doughnut in one lusty chomp, wiping the smeared white powder from his mouth with the back of his hand.

For a moment they just sat there, with their thoughts, quietly enjoying their sumptuous repast. Ernie wondered if other young hams across the Hudson were similarly having their doughnuts and milk; he thought of Harv's uncanny ability to handle that QRQ without strain.

Harv had his private thoughts, too, as he reflectively scanned the general area. It tired him just to envision taking down and packing up "all this junk," what with all the rain and mud. He turned to Ernie, addressing him as "ole buddy," and shared his thoughts. Well, to ole buddy Ernie, he never entertained any other thought; but a personal request from Harv was like a royal command: "You know you can count on me, Harv." Contentedly, the old wise owl sipped his laced coffee: "You're a good kid, Ernie. You'll make a first-rate radioman one day . . . first rate."

Ernie liked that idea very much; he'd like to become a first-rate radioman, just like Harv was. Then Ernie, emboldened by all this zesty ole-buddy fellowship, posed the one question that had been gnawing at his insides for the past hour. "Harv, I'd like to be a good c.w. operator, just like you, someday. How do you copy c.w. so fast . . . and without your writing any of it down on paper? Could you teach me how I could learn to do that . . . the way you do?"

"So you think I'm pretty good, eh?" silently sipping his coffee and beginning to purr.

"The best . . . no kidding . . . and you never had to write any of it down. I'd appreciate it very much, Harv, if you would tell me how I could learn to do that . . . the way you do."

"Comes with practice, my boy . . . plenty of time and plenty of practice, from Hoboken to Hong Kong, around the Horn. You're reading the mail all the time," he reminisced, a touch of melancholia in his voice.

Then Harv turned and looked straight at Ernie's ingenuous, clean face with its clear blue eyes, but not saying a word. He studied that guileless face, recalling another youngster of many years ago and a similar plea, spoken in very much the same open, honest way. He vividly recalled that big helping hand that he received from that old timer, of being grateful for his kindness and patience and instruction, when that old timer didn't owe Harv a solitary blessed thing. But that old timer did take the time and the trouble, and Harv was mighty glad that he did. With firmness of resolve, he swilled the rest of his coffee and tossed the empty container over his right shoulder: "Cast thy bread upon the water," he intoned, drying his mouth on his sleeve.

Ernie nodded, though not knowing why, and waited for his mentor to continue.

"How are you practicing now to build up your speed? By copying W1AW regularly and putting it all down on paper, right?"

"Sure, and regular QSO's, too," thinking the question somewhat odd.

Harv scratched the stubble on his chin and then, pointing his right index finger upward to emphasize his pronouncement: "Look, if you ever expect to develop into a good c.w. man someday, I mean a real good c.w. man, you've got to master the trick of copying behind. By copying behind I mean the ability to hold in your mind's eye for a second or longer the letters being sent. This ability is the foundation for the whole business of high-speed copying, and it's as valid whether you're putting it all down on paper or mill, or whether you're just leaning back, relaxing, and reading the mail."

He let that soak in for a minute while he tested his briar for clearance, filled it with coarse-cut tobacco from a zippered red pouch, and struck a match. Ernie watched his puff out a long black column, followed

[*Continued on page 69*]

CQ Reviews:

The Heath HW-202 2 Meter FM Transceiver

BY IRWIN MATH,* WA2NDM

AFTER a long, cautious delay the Heath Company finally entered the 2m. f.m. market last summer with an f.m. transceiver called the HW-202. The unit is quite small, only 2¾" × 8¼" × 9⅞" (weight—2¼ pounds) and is fully solid state with the exception of the dial lamp. Six transmit and six receive crystals are chosen by front panel push buttons and a panel meter indicates received signal strength as well as r.f. output when transmitting. Also included are push-to-talk microphone, a versatile mobile/fixed station mounting bracket assembly, 146.94 mHz transmit and receive crystals and an internal speaker.

Technical Details

The HW-202 employs four printed circuit boards, one for the transmitter, one for the power amplifier, a receiver board and a hash filter/regulator board. A block diagram of the unit is shown in fig. 1. The transmitter employs 6 mHz crystals, multiplying by a factor of 24 to get to 2 meters. All stages are conventional and quite easy to align using the "built-in" procedures outlined in the assembly manual. Phase modulation is acheived in the oscillator section by applying audio to a variable capacitance diode. A novel pre-emphasis network and limiter in the transmitter audio chain allow for excellent audio.

The 2 meter modulated f.m. signal is fed to a power amplifier stage consisting of two v.h.f power transistors which raise the signal level to the specified 10-15 watts output. Both amplifier transistors are heat sunk to the rear panel of the cabinet. Finally, the r.f. output is fed through an antenna relay to the phono type antenna connector.

*5 Melville Lane, Great Neck, N.Y. 11023

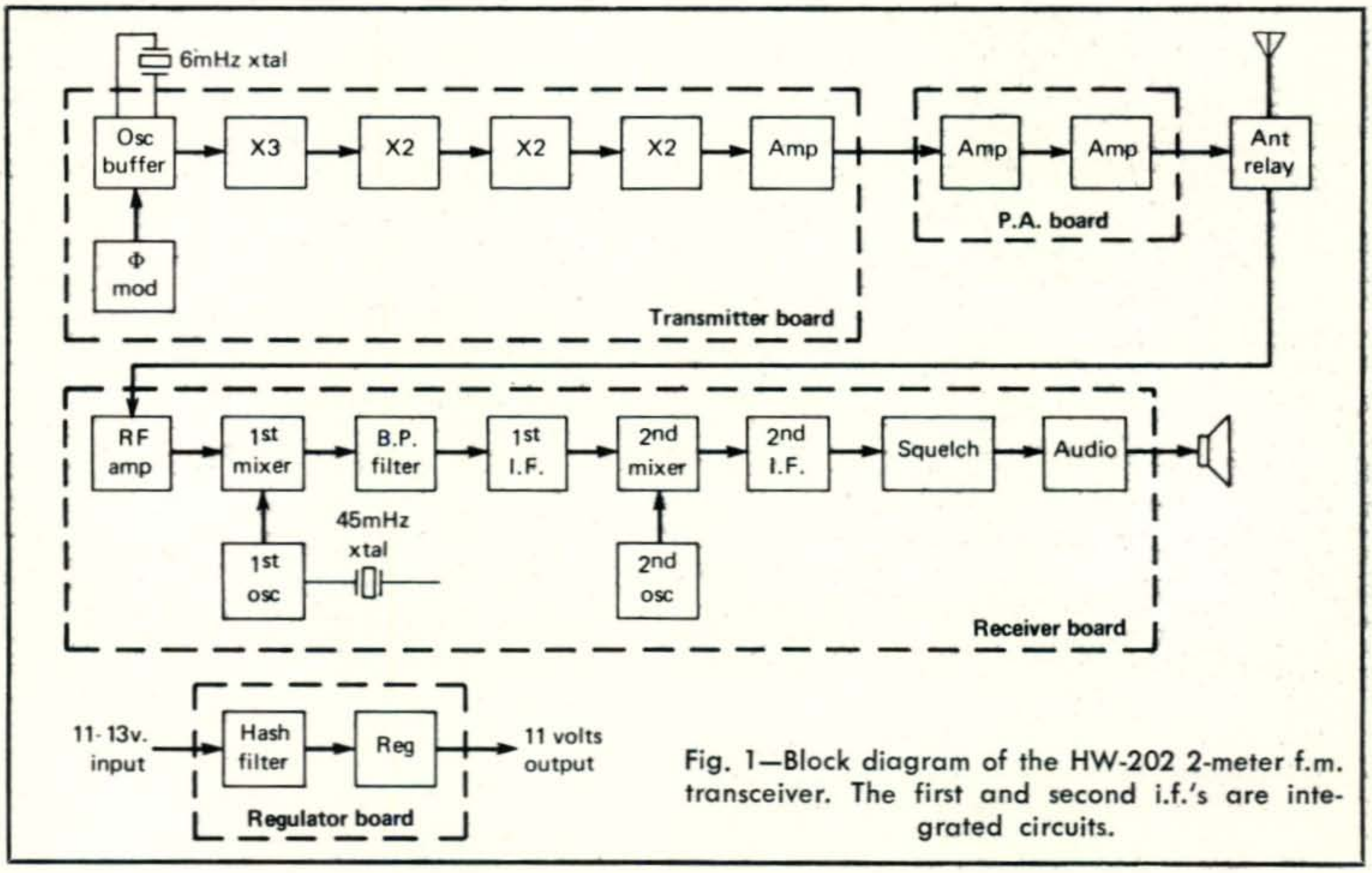
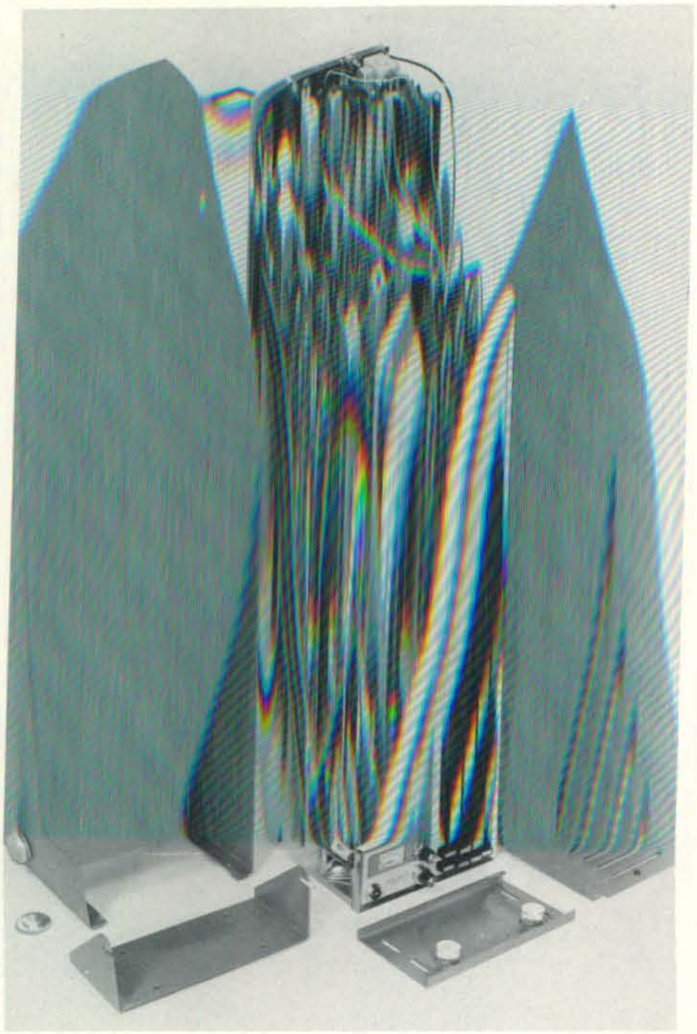


Fig. 1—Block diagram of the HW-202 2-meter f.m. transceiver. The first and second i.f.'s are integrated circuits.



This "field-stripped" view shows the various items of cabinetry and mounting devices which are part of the HW-202 package. The gimbal mount atop the transceiver supports the transceiver on the desk top or when used with the mounting plate shown in front of the transceiver, hang the HW-202 beneath the auto's dashboard. Other mounting options are possible.

In the receive mode signals from the antenna go through the antenna relay to a single MOSFET stage of r.f. amplification and into the first mixer which is also a MOSFET. Here a 135 mHz local oscillator signal, derived from a 45 mHz crystal oscillator and tripler, mixes with the incoming signal producing a 10.7 mHz i.f. signal. This signal passes through two double pole crystal filters producing a 22-kHz-bandwidth i.f. signal which is then amplified by an integrated circuit i.f. amplifier. At the output of this amplifier is another MOSFET which acts as the second mixer, combining the 10.7 mHz i.f. signal with a crystal-generated 10.245 mHz signal producing a second i.f. frequency of 455 kHz. This signal is then amplified, limited and detected by an integrated circuit f.m. detector. The resulting audio is de-emphasized, passed through squelch circuitry and finally fed to an audio power amplifier. Here it is raised to a level suitable for driving an internal or switch-selected external speaker.

The Heathkit Model HW-202 2-meter f.m. transceiver sits on its universal gimbal mount atop the optional HW-202-1 a.c. power supply. The top row of push buttons selects any or none of four different repeater access tone bursts when the mic button is pressed (optional at extra cost). The second row of buttons selects any of six transmit crystal frequencies, while the bottom row similarly selects any six receive crystal frequencies. Knobs control squelch and volume. The push-to-talk microphone is included. Pressure sensitive metallic labels are provided for application to the appropriate push buttons.

Crystal Switching

The HW-202 employs a novel diode switching scheme to select crystals for both transmitting and receiving, and fig. 2 shows the details. In this case, the receiver oscillator is shown. When the crystal selector switch S_1 is not engaged diode D_1 is reverse biased through the 100K resistor and effectively presents an open circuit, causing the crystal to be disconnected from the circuit. When S_1 is closed the 1.2K resistor is returned to ground, forming a voltage divider with the 100K resistor, thereby removing the reverse bias voltage. Now the diode becomes forward biased and the crystal can operate. This circuit works quite well with absolutely no detectable interaction between crystals.

Construction

About 25 hours or so were taken by this author, an experienced electronics engineer, to build the HW-202 and I must state that while the directions are straightforward, it is a long, and at times tedious, job. The transmitter and receiver printed circuit boards are literally packed with components and it is advisable to go slowly to avoid mistakes. It

[*Continued on page 77*]

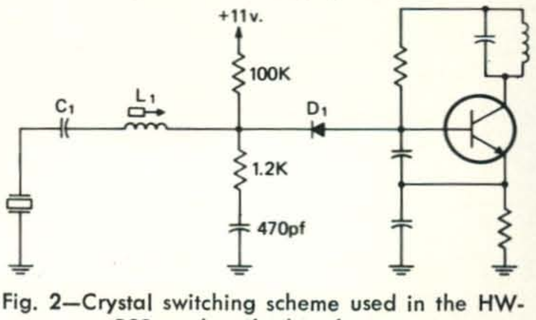


Fig. 2—Crystal switching scheme used in the HW-202 as described in the text.

OSCAR News

BY RANDALL SMITH,* VE2BYG

THE OSCAR-6 radio amateur satellite routinely continues its journey in space, crossing the earth's equator 28.75 degrees further to the west every 115 minutes.

Some new activity through the satellite is reported this month from VU2UV who has heard JA6DSG, JA1AC, VK6HK and DU6EG on several orbits. That's a nice lot of Asian DX. Suby also reports hearing an SSTV signal through OSCAR on 29.510 mHz downlink, possibly coming from a 4S7 station in Sri Lanka.

Also from India comes word that VU2QQ, located at the Indian Institute of Technology, is now communicating through OSCAR-6. This should give European, Japanese and Australian amateurs a better window with India.

In New Zealand, ZL1WB reports working KH6IHP on both s.s.b. and c.w. for what is believed to be the first KH6-ZL contact via satellite.

CN8HD is now active through the satellite from Morocco. TI2WD and TI2RC can be found around 29.491 mHz with high speed c.w. KG6JAN is still fairly active from the far Pacific.

K4TI leads the parade at present with the greatest number of Continents worked through OSCAR-6, with a score of 5. Twelve radio amateurs have so far earned their WAS certificate through the satellite.

W2GN reports that he is conducting extreme distance satellite propagation tests with KH6IHP, via OSCAR-6.

W1BIH has returned from another stint as PJ9JT. Anyone contacting him through the satellite can get a QSL card for an s.a.s.e. to his stateside QTH, which is okay in the Callbook.

Several new stations are operating through the satellite from VE1-land, including VE1WL, VE1PL and VE1YZ. We still need some activity from VE8, VO1 and VO2 before we can start thinking about a WACA-VE satellite award.

Speaking about awards, there are two new ones available for working through OSCAR-6, so attention award hunters.

The first is the *Hawaiian Satellite Communications Award.*

In order to be eligible for this award an amateur radio station must meet the following requirements:

1. Must have confirmed contact or contacts via OSCAR with the required number of Hawaiian amateur radio stations, as listed below:

a. All of DX Zone 5, plus W8, VE3, ZL and VK must have at least one (1) confirmed KH6 contact;

b. Stations in DX Zone 4 (except W8), Zones 6 and 7, and Zone 25 must have two (2) confirmed KH6 contacts;

c. All other DX Zones must have three (3) confirmed satellite contacts with KH6 stations.

2. All claimed contacts must be confirmed by submitting QSLs showing proof of contact.

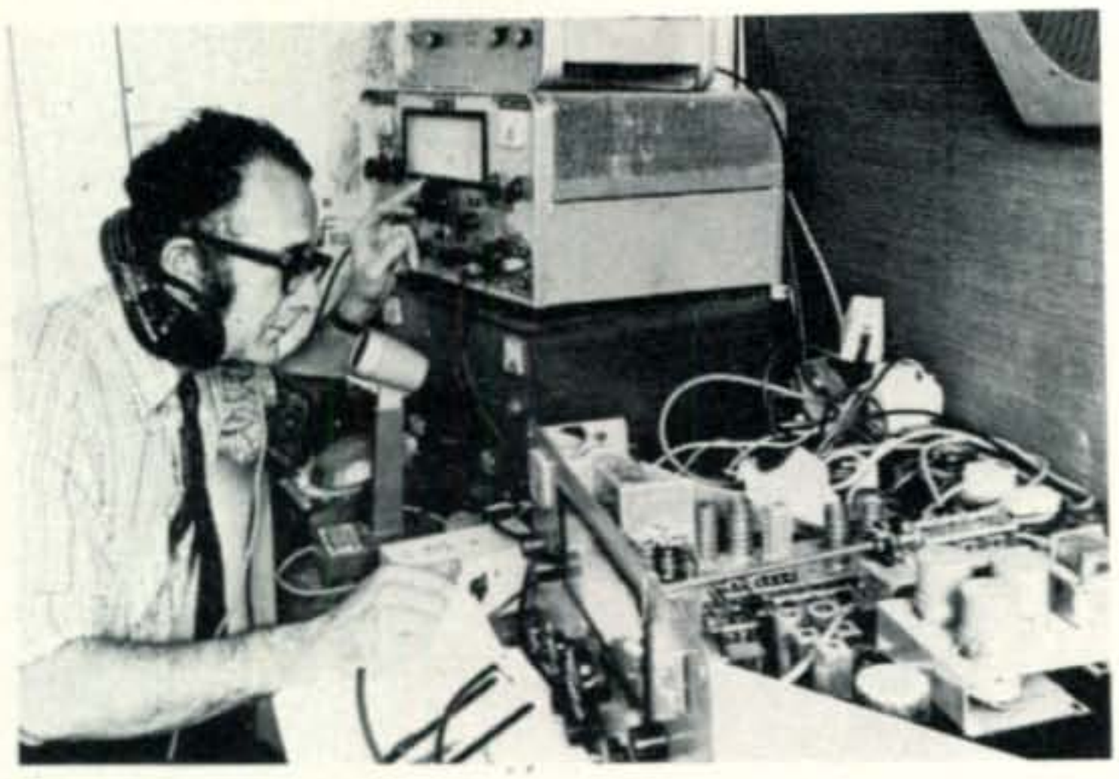
3. Effective date for the start of the award is 10 January 1974. All QSLs must indicate this date, or later.

4. There is a charge of $1.00 for this award, which is to be submitted with the QSL cards. This will cover the cost of the award, handling and registration fees for the return of the QSL cards and the award.

5. Award requests should be submitted to

VE3CUA relaxing after a hectic pass. Roy's neat, relatively simple station is typical of many used for communicating through OSCAR-6.

*P.O. Box 73, Alouette, Quebec, GOV 1AO, Canada.



Here's the layout at G3IOR. Pat's a real old-timer through OSCAR-6, and he can usually be heard on most mid-Atlantic orbits looking for North American contacts.

KH6IHP (ex-W7EOT), the award coordinator, as follows:
Stephen M. Carson, KH6IHP
1624 Kaweloka St.
Pearl City, Hawaii 96782

The second new award is the *Washington Satellite Award.*

The award is available to any licensed amateur under the following conditions:

1. Contacts must be with stations in the State of Washington, on any mode via an amateur satellite;

2. Only contacts made after March 1, 1974 will qualify for the award;

3. Stations in the USA and Canada must contact five (5) stations in the State of Washington via an amateur satellite;

4. Stations in all other countries must contact three (3) stations in the State of Washington via an amateur satellite;

5. There is a $1.00 charge which must be submitted with the QSL cards for the contacts claimed. The charge is to cover the cost of the award and for return registered mail of the QSL cards.

6. Requests must be submitted to:
Tim Blair, WA7FVT
Apt. 610
431 Broadway
Tacoma, Washington 98402

On March 13, 1974 AMSAT NEDERLAND was founded with PAØWLB as Chairman. The foundation is sponsored by V.E.R.O.N., a Dutch radio amateur society. It will work very closely with AMSAT, USA and the recently formed AMSAT organization in Germany, to promote, foster and build amateur radio satellites.

We received a note from Marc Tonna, F9FT. Marc has been one of the top European operators using OSCAR-6. He reports that he has been off the air for the past several months, rebuilding to get ready for OSCAR-7.

OSCAR-7

Speaking of OSCAR-7, the project is progressing very well and there is a good chance that it will be launched later this summer, or during the early fall.

DJ4ZC and DJ4AU from AMSAT DEUTSCHLAND were in Washington during March, to help install the 432-to-146 mHz repeater that was built in Germany. Also aboard OSCAR-7 will be another AMSAT 2-to-10 meter repeater similar to the one on OSCAR-6, but with a power output of 2 watts p.e.p. Canadian amateurs have built the 435.1 mHz beacon that will be a part of OSCAR-7. A 2304.1 mHz beacon, built by the San Bernardino Microwave Society may also be included, if permission can be obtained from the FCC. The satellite will also contain telemetry and other equipment developed from similar gear now operating so successfully on OSCAR-6.

OSCAR-7 is expected to be launched into an orbit similar to OSCAR-6's, so that stations already working through OSCAR-6 should have no trouble locating the new satellite, once it is in orbit.

Operating Schedule For OSCAR-6

Since April 1, OSCAR-6 has been available for general communications during the evening orbits over North America, on *Wednesdays, Fridays* and *Sundays,* local daylight time. This corresponds to *Thursdays, Saturdays,* and *Mondays,* GMT.

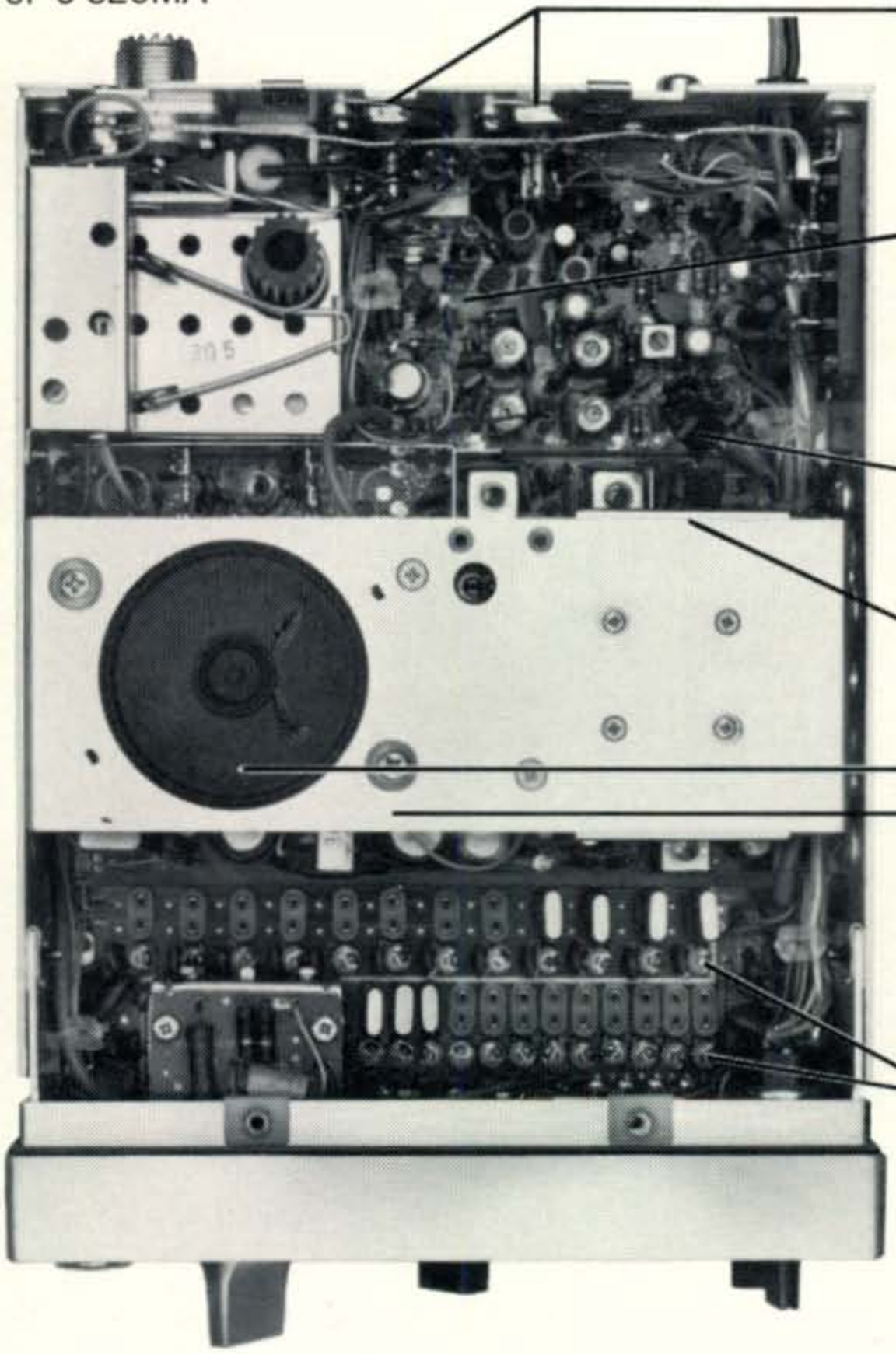
At least three consecutive passes should be visible over the United States and Canada when the satellite is operating, and it will be travelling in a south-to-north direction.

During all other days of the week, the satellite will be off during the evening orbits, except during the reference orbit. This is the first orbit of the GMT day, and it corresponds to the evening orbit that passes over the United States sometime between 8 and 9 P.M. EDT. Official AMSAT and ARRL Bulletins are given on each reference orbit, on s.s.b., by W2GN on a downlink frequency of 29.49 mHz and K1HTV on 29.50 mHz. However, the satellite *is not* available for

[*Continued on page 80*]

ANATOMY OF A GREAT 2-METER RADIO

sr-c 826MA



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JUP on FM

BY NORM STERNBERG,* W2JUP

ABOUT two weeks ago, suitably equipped with one each wife, younger daughter, seventeen suitcases and my trusty 2 meter handie-talkie, I dashed off to Paris via the "world's most experienced airline." While waiting to board the Giant Aluminum Cloud at New York's slightly obsolescent Kennedy Airport, I tried to exercise the HT from inside the terminal building. Much to my astonishment, I was able to get into one of the Nassau County repeaters located some thirteen miles east of the airport terminal What hath God wrought?, I asked myself. With only a bare watt and a half, yet! Eventually I cleared with the gang and filed the HT in my attache case under "Try It In Paris."

Some forty five minutes later, as the great silver bird lurched into the air from the lumpy pavement of runway 4R, the thought occured to me . . . "why not whip out the HT and snow the troops on the repeater with my aeronautical ego trip?" I thought about it for at least thirty seconds and suddenly my left elbow began an infernal itching, which is always the signal that my conscience wishes to speak upon me. This is more or less the way the conversation went:

CON—"Hey, JUP, you better not turn that HT on!"

JUP —"Get lost! Meathead."

CON—"Remember you are supposed to be a rated pilot?"

JUP —"Yeah, so what?"

CON—"Well, do you remember Part 91 of the FARs?"

JUP —"What's the FARs?"

CON—"You know, the Federal Air Regulations!"

JUP —"Oh, sure, I remember them. I even read them all the way through, once."

CON—"Well you obviously didn't read them very well if you are seriously considering using that HT on this airplane."

JUP —"I sincerely wish you would get bent!"

CON—"Need I remind you that there are one hundred and ninety two bodies on this flugzeug flying machine, not counting the flight crew and the six stews, two of which you have been staring at for the past fifteen minutes?"

JUP —"OK, let's keep my dirty mind back on the HT thing."

CON—"Sir, I respectfully call to your somewhat besotted attention the fact that Federal Air Regulation 91.19 specifically prohibits, enjoins, constrains, and in short says . . . turning that HT on will be a king-size Federal BOO-BOO!"

JUP —"How so a boo-boo?"

CON—"I see that I have no alternative but to perform a memory dump in your skull, before all that fine Bordeaux leads you down the path of no return."

JUP —"Knowing me, and since you are my Conscience, I realize I have no choice in the matter, so lay it on me, brother!"

CON—"Federal Air Regulation 91.19, sir. I will take the liberty of quoting it, verbatim, and in it's poetic entirety. dig this . . .

a) Except as provided in paragraph (b) of this section, no person may operate, nor may any operator or pilot in command of an aircraft allow the operation of, any portable electronic device on any of the following U.S. registered civil aircraft:
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   (2) Any other aircraft while it is operating under IFR.

b) Paragraph (a) of this section does not apply to:
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c) In the case of an aircraft operated by an air carrier or commercial operator, the determination required by paragraph (b) (5) of this section shall be made by the air carrier or commercial operator of the aircraft on which the particular device is to be used. In the case of other aircraft, the determination may be made by the pilot in command or other operator of the aircraft."

JUP —"Beautiful! It touches my very soul!"
CON—"Do you understand it?
JUP —"What's an air carrier?"
CON—"An airline, regular or charter, or an air taxi, or in plain english, any aircraft being flown for pecuniary purposes."
JUP —"That's plain english?"
CON—"It means for bucks!"
JUP —"So what's IFR?"
CON—"Instrument Flight Rules. Any time that the base of the cloud layer covering more than sixty percent of the sky is less than one thousand feet above the ground surface and the visibility is less than three miles horizontally.
JUP —"Yeah, so . . . ?"
CON—"Well, under those conditions or worse, you should be operating on instruments and therefore under Instrument Flight Rules. If you are instrument-rated, that is. If not, you had better get your butt back down on the ground!"
JUP —"But, I thought that the Captain could give me the OK if I chatted with him for a minute . . ."
CON—"Read paragraph (a). He would be just as much in violation of the rules for authorizing you when he has no authority to do so, as you would be in violation of the rules for operating the HT."
JUP—"But what if I went to the airline itself and asked them for their permission to operate the HT?"

CON—"Under the rules, the 'air carrier' itself would be held responsible for testing your specific HT on the specific airplane that you intend to use it on. Do you really think they have the time for this kind of thing?"

JUP—"Well, what if I don't go on an airplane but am riding on my buddy's private plane?"

CON—"That would be cool, if your buddy is flying visually, not on instruments, and he, as pilot in command, authorizes you to so operate."

JUP—"What in the name of Hertz is all this connection with instruments?"

CON—"You must be, without a doubt, the stupidest rated pilot in the skies! Don't you realize that the HT has oscillators that may radiate?"

JUP—"Oh, come on now! You don't mean to tell me that my dinky peanut-whistle HT is capable of lousing up something on one of these huge metallic missiles and creating a problem?"

CON—"It is not without the realm of possibility."

JUP—"Convince me, meathead! I am an infidel and an unbeliever!"

CON—"Let me call to your attention the fact that the principal source of navigational information during flight overland or near the continent is the VOR system. Do you remember the frequencies on which VOR works?"

JUP—"Sure . . . lessee now . . . 108.00 to 117.95 megs, right?"

CON—"Right on! You are not as much of a total loss as I had imagined."

JUP—"So, OK, those are the frequencies and I am no dummy.

CON—"Do you care to recall how the VOR data is displayed to the pilot?"

JUP—"Of course, the info reads out on a vertically-oriented needle on a meter. The needle swings from left to right and you are dead on the selected VOR radial when the needle is centtered on the dial. If you are off the radial or the airway that the radial follows, then the needle will be off to the side of the meter, and to get back on the beam, so to speak, one merely flies toward the needle."

CON—"I don't mean to agitate your ulcer, sir, but do you remember the time you were ferrying that Cherokee

down to Brazil and you lost your VOR while you were groping around the Caribbean looking for Puerto Rico?""

JUP —"Oh God, the Pain . . ."

CON—"Exactly! Do you recall that when your VOR receiver decided to contract a severe case of the bends, something showed on the meter?"

JUP —"Yeah, I remember. The little flag came out and said 'OFF', and never came back on again.

CON—"Quite so, and do you recall what you found after two days of electronic surgery in Puerto Rico?"

JUP —"Hmmmmm . . . oh, yeah . . . the i.f. was oscillating a wee bit!"

CON—"Precisely! Your VOR receiver was bombed out by an internally-generated spurious signal, which caused it to poop out, and you hit the panic button."

JUP —"I did not hit the panic button! I was merely acutely concerned."

CON—"Then who was it that bit all the buttons off the upholstery?"

JUP —"Get back to the point!"

CON—"Would you kindly pop the case off of your HT and make note of the crystal frequencies that you have in there?"

JUP —"Just a minute . . . let me see, now . . . whatdye want . . . transmit or receive?"

CON—"Both."

JUP —"OK, now . . . we have a bunch of receiver crystals on 45 megs, third overtone types, I think . . . and transmitter crystals on 12 megs, working up multiplying by twelve to the operating frequency."

CON—"Exactly . . . I see your eyes have not gone totally bad."

JUP —"So about the crystals . . ."

CON—"You operate 146.94 quite a bit, don't you?"

JUP —"Of course I do, yoyo . . . that's still the so-called national simplex frequency, or at least, one of them."

CON—"Pardon me for asking what is perhaps an indiscrete question, sir. I realize you are on your way to visit your daughter and enjoy the sights of Paris . . . but did you possibly bring along your pocket calculator?"

JUP —"Naturally. I never do anything without my faithful HP45. That's how I'm gonna tell what all them francs are all about when my wife keeps saying, 'buy me, buy me! . . ."

CON—"Would you be so kind as to punch the appropriate keys to determine the ninth harmonic of the crystal used for 146.94 transmit?"

JUP —"OK. The crystal is on 12.2450 megs and the ninth harmonic comes out to be 110.2050 megs."

CON—"Does that latter number strike a familiar note in your skull, sir?"

JUP —"Yeah . . . thats only five kilowhattsis off the Glen Falls VOR or I should say VORTAC for that one."

CON—"Do you think that you should operate your HT while flying into Glens Falls using the VOR instrument landing approach?"

JUP —"But man, that's the ninth harmonic and . . . "

CON—"And you are seated only a few feet from the receiver, right?"

JUP —"I see your point, and if you wear a hat we can cover it!"

CON—"But, you are ready to say that you are sitting well back from the cockpit and the driver is going to Paris and not to Glens Falls."

JUP —"True, I was about to ask that . . . "

CON—"May I ask if you know what this aircraft has for a routing?"

JUP —"Of course I don't. I can probably guess that he was given the Hampton Departure or maybe via the Tuna Intersection but . . .

CON—"But must hams who would like to operate their HT on the airplane haven't the foggiest notion of how the airplane will be routed to get where it is supposed to go, and furthermore, take a look at the possible combinations of crystals used and their ninth harmonics, starting from 146.01 up to the end of the band. You have repeater inputs on both ends, you know."

JUP —"Yeah . . . lets see. 146.01 . . . the crystal would be 12.1675 and the ninth harmonic works out to be 109.51. For 147.99 . . . the crystal would be 12.3325 and the ninth harmonic works out to be 110.9925 . . . which must be somebody's VOR frequency."

CON—"Definitely . . . there are now over

[*Continued on page 79*]

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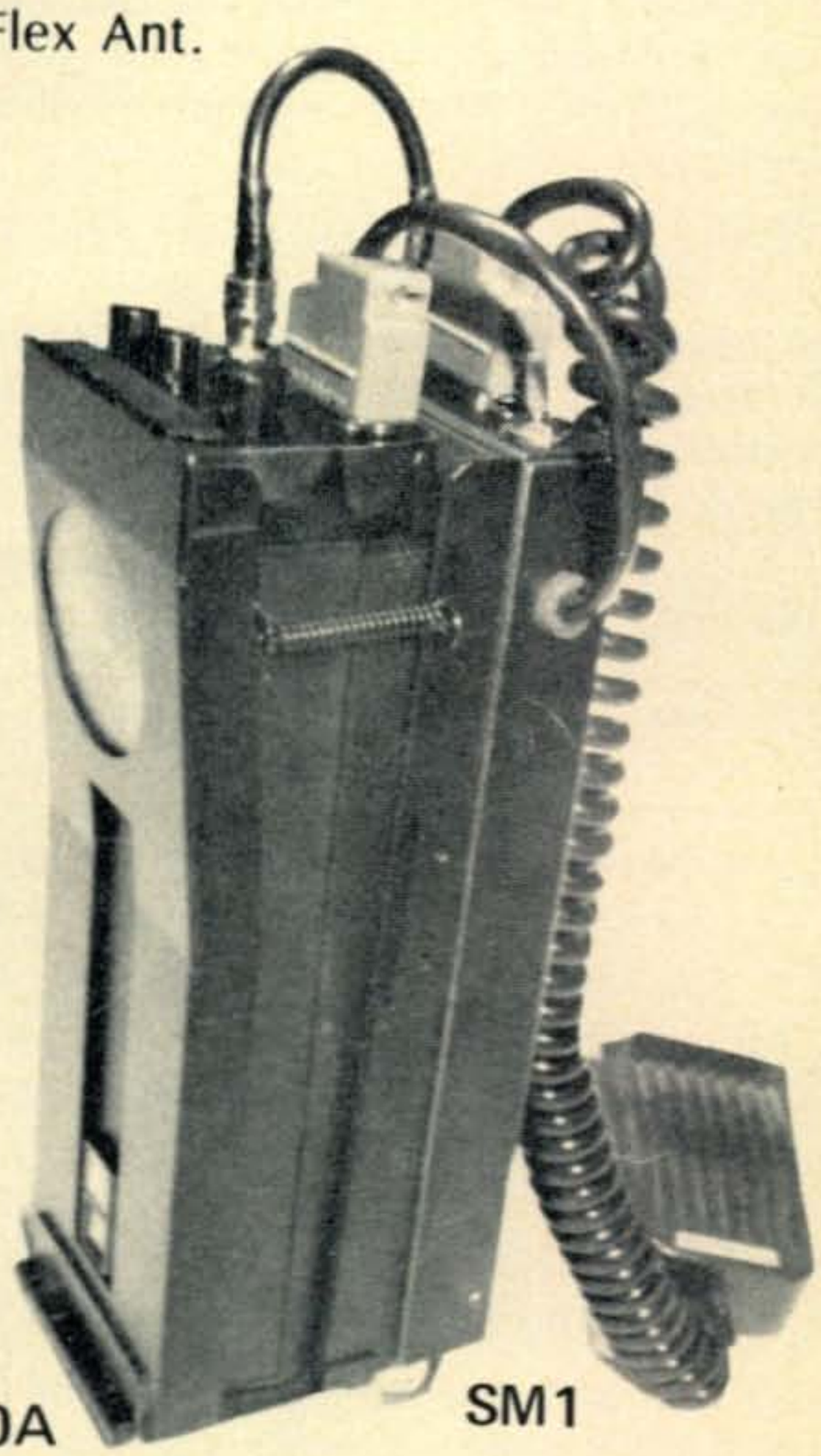

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COP's COLUMN

BY COPTHORNE MACDONALD,* W0ORX

Re-Thinking Public Service

Periodically, Amateur Radio must justify to the world its right to exist, an attempt to renew its "ticket" for another decade or two. Unlike our individual ham tickets, this renewal doesn't come automatically. The nations of the world sit in judgement on whether the Amateur Service lives or dies, expands or contracts. Our next moment of truth is the frequency allocation conference scheduled for 1979. Recent reports have indicated that the present image of amateur radio in many parts of the world—particularly the developing countries—is very poor. There is also the question of how valuable the Amateur Service appears in the eyes of our own officials. (When it comes down to the inevitable nitty gritty of compromising and horse trading on issues, will the Amateur Service be what our officials are fighting for, or will it be a sacrificial concession that buys our negotiating team something else that this country wants?) These are crucial matters and it is already pretty late to start dealing with them.

We hams are all familiar with our proud heritage. Many of the technical advancements during the development of radio were made by hams. We have been there with emergency communication time and again when it was needed; and since the earliest days of radio we have provided a free message handling service for the general public. Our world is changing, though, at a dizzying rate. Any institution these days that rests on its laurels and doesn't adapt to changing circumstances thrust upon it is doomed. Ham radio is no exception.

Many of the ground rules have changed over the years. At the time when amateur traffic handling started, the cost of sending telephone and telegraph messages was quite high. Today it takes less than one inflated dollar to buy three minutes of coast-to-coast telephone time. For years we hams had the only emergency radio system. Nowadays, the telephone system is more reliable thanks to emergency powered microwave links, and today there is CB, CAP, CD, and the local taxi and concrete truck equipped with two-way battery-operated radio. While a few hams still contribute to advancing the radio art, most purchase ready-built equipment. Obviously, we should continue to do what we can in these areas. My point is that we must add activities in entirely *new* areas if our value to the public is to go up instead of down. I am suggesting that we continue what is worthwhile from the past, honestly face the realities of the present, and create a renewed and revitalized public service program that will win Amateur Radio a more solid backing here and abroad. Let's use ham radio to do more things for more people. While we should certainly publicize the good things that are going on, what's needed is not a new public relations program, but a real *increase* in the quantity and quality of ham activities that are helpful to fellow human beings. We need to sell ham radio, but the buyers are savvy, and the sale will be made only by delivering more solid value, not a slick sales pitch.

In spite of the fact that there are now

*P.O. Box 483, Rochester, MN 55901.

New Directions Roundtable Upcoming Sessions

Sunday, June 9—A talk by Don Marier, Editor of *Alternative Sources of Energy* magazine on solar heated houses, wind generators, etc. (Illustrated with single slow-scan frames, so get your "frame snatcher" working. See last month's column for details.)

Sunday, June 16—Guest-of-the-Day will be Nicholas Johnson, former FCC Commissioner, and author of *Test Pattern for Living*. Time: 3 P.M. EDT Frequency: 14253 kHz ± the QRM

New participants are always welcome.

groups able to provide some of the communication services that were exclusively ours in the past, in no way is the world's need for communication saturated! We are surrounded by communication needs that we hams can help to meet. We tend to be blind to them because we've grown up in ham radio thinking of it in certain ways. The possibilities can be seen if we just stop thinking about what we have been doing, and open up to the needs of people in the here and now. I bet you have some ideas. I do too. Let's get them out for viewing, either through this column or any other avenue that's open. Let's build on each other's ideas, and try them out. Let's fine tune them until we've matched, in optimum fashion, amateur capability and people's needs. Here are a few thoughts to start the process.

Making Ham Radio More Valuable Abroad

The surest way to sell ham radio to all those other governments is to make it *valuable* to them. If we can succeed in getting some activities going which are of *significant benefit* to those countries, then it will be in their self-interest to keep ham radio alive and well. And self-interest is the name of the game. As the oil embargo graphically proved, small nations can wield tremendous power. A frequency allocation conference is one of those situations where that power *will* be wielded.

We've got to find ways to cooperate with our neighbors on this earth. This is no longer the cry of a humanitarian few, but is also the cry of us practical self-seeking ones who would like gasoline to run the car, copper wire for antennas, and all our operating frequencies when 1980 rolls around.

Getting a handle on this isn't going to be easy, even with the best of intentions and a willingness to work at this end. I doubt if there is any massive "universal" program that we can launch, though it will no doubt turn out that many individual countries have similar needs. Going to other countries and telling them what we think they need is not the way either! We can think about our general range of capabilities, but the specifics must originate in the other country, based upon its own needs. If the particular country has a group of active amateurs, this is the obvious

Slow-scan is ham radio's unique tool for bringing separated people together in an audio/visual way. In this early experiment Jackie Oakley in Colorado exchanged words and pictures with her husband, Rev. Donald Oakley in Antarctica.

place to start. They are our allies in trying to preserve ham frequencies, and would presumably have some feel for the local political realities. Other possible "feet in the door" are friends who are residents of the country, those involved in "service" activities in the country (Peace Corps, VISTA, AID, missionaries, etc.), or individuals in the U.S. diplomatic mission to the country.

What are the ways in which we might be helpful? The first involves the learning exchange idea (which also has a lot of possibilities right here in the U.S.). The basic idea is establishing direct communication links between those who want to learn about a particular thing, and those who want to share what they know about it. It can involve two people or a small group,

George Cummings, WØQPO/7, lives on his remote homestead in Northeastern Washington and welcomes the contact with the outside world which ham radio provides. Here he is talking with another homesteader 160 miles to the north—Norris Hyde, VE7AIC.

and there doesn't even have to be a "teacher" and a "pupil" as such, since in many cases everyone involved has some background in the subject matter. I can envision many mutually beneficial learning exchange situations. A physician doing research on tropical diseases here, for example, might be in contact with a physician treating tropical diseases in Brazil. "Back to the land" people here might share ideas for wind generators and water systems with workers involved in "village technology" projects in the Andes of Peru or Bolivia. Along these lines it might be possible to establish a technical advice hotline, where incoming radio requests could be phone patched to volunteer "experts" who had agreed to participate. (All these links don't necessarily have to extend to the U.S., by the way, since the most knowledgeable experts might be in the country next door). There are potential problems with third party traffic restrictions in some countries and when some types of subject matter are involved; but if their government is convinced that the activity is beneficial, it could remove those restictions.

The Alden 400 hard-copy SSTV recorder as it reproduces the output of a Robot camera.

A second area which might bear fruit is helping various countries to expand their internal "bush telecommunication" activities by donating some of that ham gear now gathering dust in the attic or cellar. Whether the old a.m. gear ends up on the ham bands, or operating on government frequencies doesn't matter a whole lot. If a country should want to connect its rural villages together by radio, and we hams can help, we will probably have won a friend at conference time.

Exploration of what is possible along these lines is already underway in one Caribbean country. Why don't you discuss the problem with some of your DX friends and find out what they see as possibilities in their own countries? Then, as things start to jell, let's get the word out.

Making It More Valuable Here

As uncomfortable as it may be to think about, there is no guarantee that ham radio's interests will be high on the priority list of even our *very own* negotiating team at the next conference. This team will have the telecommunications interest of the entire nation to defend, and everything can't have top priority. Since the negotiating positions are firmed up well in advance of the conference, the next three years or so is going to tell the tale. Will amateur radio be seen as a service that is increasing its value to the public; or as one of those institutions into its "second watershed," whose value is declining? As I see it, the potential for increasing our value is great; but it will take a lot of forward looking creativity, and a lot of very hard work.

There are a number of ideas that excite me, and I'll be getting into them in future columns. As a starter, though, how about simply bringing a greater number of separ-

[*Continued on page 76*]

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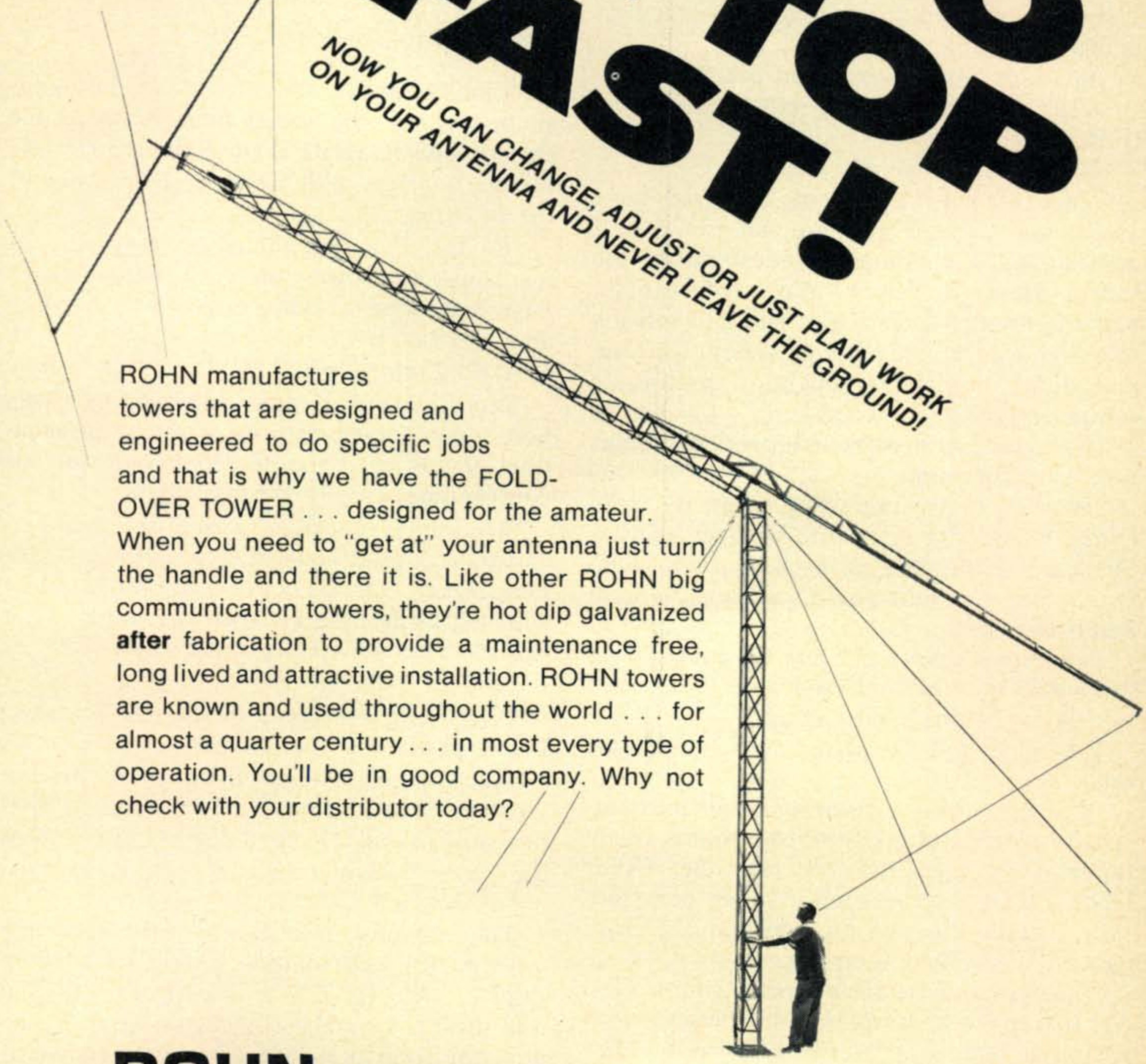

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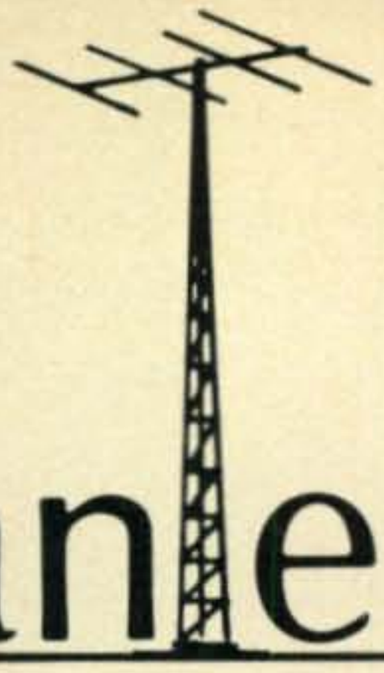


antennas

BY WILLIAM I. ORR,* W6SAI

"How ya doin', Buddy?" asked Pendergast, as he booted open the shack door and slouched down into the operating chair. With a sigh he planted his feet atop a stack of unanswered QSL cards.

"Reading your fan mail?" he asked.

"Yes," I replied. "These letters have come from readers of my *CQ* column."

"How do they like it?" he asked.

"They love it," I replied. "Did you have any doubt?" Pendergast did not reply, so I continued, "You should read some of the letters. Here's a fellow who wrote me six pages in unintelligible handwriting, wants me to design a complete antenna system for him, and didn't bother to enclose a stamp for return postage."

"I suggest you toss the letter in the circular file," said my friend.

"Here's a really interesting letter. It's from Chris, WBØCXM in Prairie Village, Kansas. He sent me the data on a poor man's Delta Quad that he built for 15 meters. A real dandy design."

Pendergast's feet came down from the desk top with a thump. "A 15 meter Delta Quad?" he asked. "Let me see the letter."

I handed him the letter, and Pendergast read:

"I am enclosing a drawing of an inexpensive 15-meter Delta Loop beam that is easily made, very light and very durable. Other Delta Loops require such massive construction. I made this one on a weekend 2 years ago and it is still going strong.

"Construction details are really simple (fig. 1). Just make it sturdy! I fed it directly with a simple matching transformer, and didn't even use a balun. Guys are attached to a slip ring to allow hand rotation of the whole assembly in a pipe sleeve set in concrete. There's an aluminum plate bearing at the bottom of the hole. It's easy to turn!

"The crossarms are made of bamboo strung with wire, but they could easily be made out of light, telescoping aluminum tubing, I suspect. Dimensions were taken from the ARRL *Antenna Handbook*.

"I pushed the TV-mast up by myself, but should warn you that the push-up mast I used can slip and come cascading down and might nip your fingertips or the skin between thumb and forefinger! That nearly happened to me. A little care and common sense in erecting the mast is recommended.

"I used this antenna for over 18 months and found out that, although the bottom boom is only about 35 feet off the ground, the antenna was competitive with triband Yagis as high as 70 feet! The s.w.r. ran about 1.5 or less, across the 15 meter band.

"Finally, unlike the square, or diamond-shaped Quad, the metal mast between the elements of the Delta Loop design apparently doesn't interfere with the correct operation of the antenna.

"So far, I've thought of no easy way of mechanically rotating the mast. Some friends have suggested a motor drive with a chain and sprocket. But it is so easy to turn by hand, I just do it that way."

"Very clever," I said. "I'm sending Chris a complementary copy of my new publication, the *Wire Antenna Handbook* for his contribution. I really like his design."

"He might consider giving the bamboo spreader a good coat of spar varnish," said Pendergast. "Or, he could wrap the bamboo with electrical tape between the joints. That helps to lengthen the life of the wood."

"Right," I agreed.

"What else has come in the mail?" asked Pendergast.

"Well, here's a letter from an Australian amateur who unfortunately forgot to sign his name or call. He enclosed a clipping from the *South Australian Wireless Institute Journal* of October, 1972.

The clipping describes a nifty receiving antenna for 160 meters. It is a tuned loop (fig. 2) used for DX tests between VK-land and the USA on the 160 meter band. Basically, the loop is a large, parallel tuned circuit coupled to a low impedance link. The link is attached to the receiver via a coaxial line. The only adjustment that needs to be made is to peak the trimming capacitor for maximum background noise.

"The nice thing about a receiving loop is

*48 Campbell Lane, Menlo Park, CA, 94025.

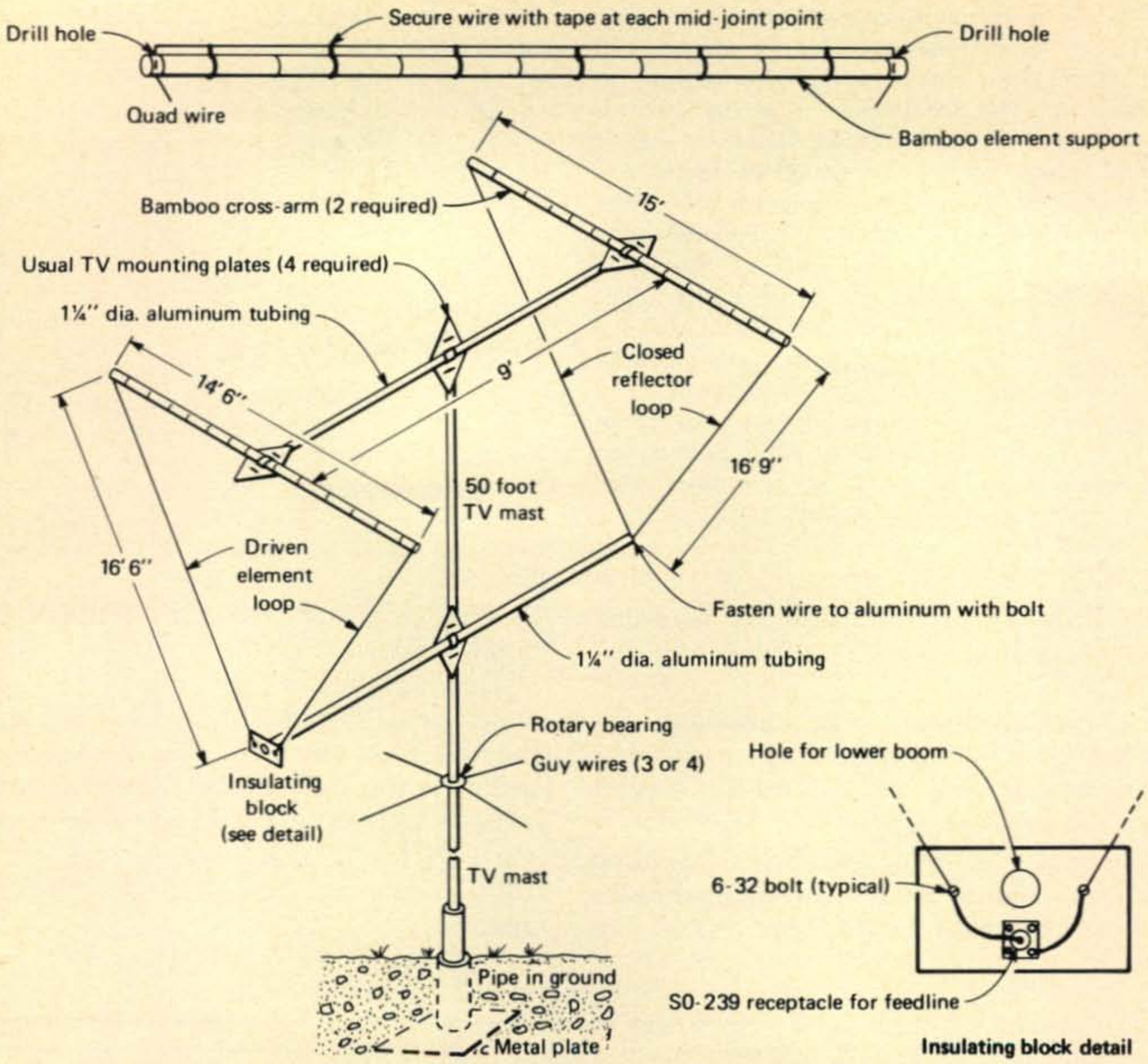


Fig. 1—Detail of the WBØCXM Delta Quad for 15 meters. The two Delta loops are suspended from bamboo cross-arms supported by a 9-foot length of aluminum tubing. The bottom points of the loops are held in position by a second 9-foot aluminum boom. The two booms and the cross-arms are fastened together by means of TV-type mounting plates and U-bolts. The bottom of the closed reflector loop is directly fastened to the aluminum boom with a bolt. The bottom of the driven element is fastened to a phenolic block, insulating the wires from the aluminum boom. The beam is fed with a quarter-wavelength section of 75 ohm line (RG-11/U) which is 7'7" long. The transmission line is RG-8/U. The Delta Quad is supported on a heavy-duty 50 foot TV-style "slip-up" mast held in position with 3 guy wires. A rotary bearing is used so that the mast may be turned by hand. The mast is held in a pipe buried in the ground. A metal plate is placed beneath the pipe to provide a simple bearing for the mast to sit on. The coaxial feedline is brought back along the lower boom and taped to the rotating mast.

that you can null out strong interfering signals. Here on the West Coast, the Pacific Loran chain is very strong at night and often overloads the receiver. The loop helps to knock out the Loran. Unlike smaller loops, this one has plenty of pickup and puts a good signal into the receiver.

"It is a little too big to go into the operating room, but it is small enough to be turned by a TV rotator, so it could be placed in the backyard, or atop your garage."

"Not bad", said Pendergast. "I just wish I knew who sent you the clipping and who designed the loop!"

"So do I," I replied. "Sometimes the name of the sender is on the envelope and not on the letter. If the two get separated, it is hard to tell who the writer is."

Pendergast picked up the next letter and his face broke into a smile. "Aha," he said. "Here's a letter — and another letter, too — chewing you out for mixing up the drawings

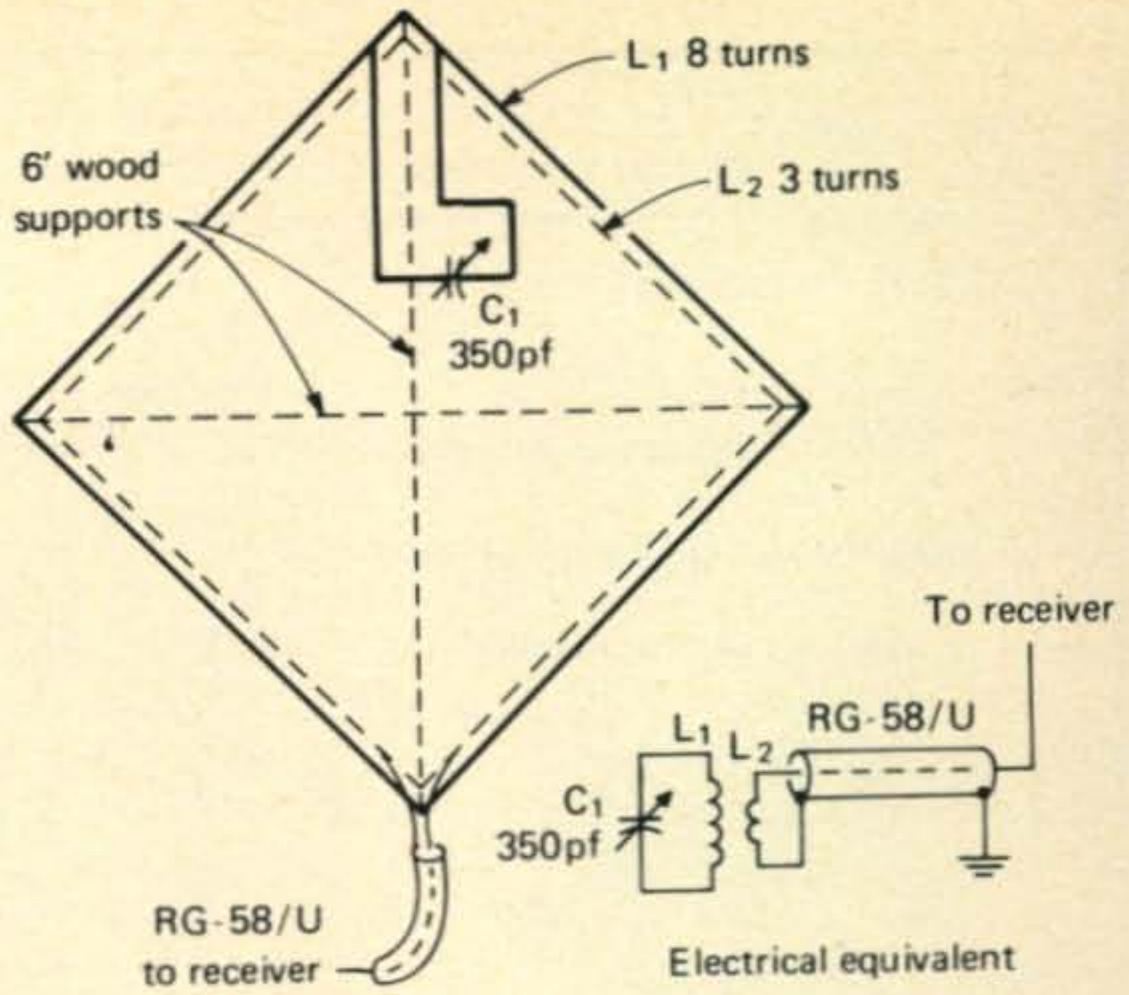


Fig. 2—160 meter receiving loop. The main loop (L_1) is a resonant cicrcuit tuned to either the low or high frequency portion of the 160 meter band. It is link coupled via loop L_2 to the receiver. The framework is made of two 6-foot lengths of lumber held together with a plywood plate at the center. The loops are wound of #20 enamel or insulated wire. Four pieces of wood dowel, about 1" diameter and 6" long are nailed to the ends of the wood frame to provide a surface to wind the loops on and to terminate the ends of the windings. The small broadcast-type tuning capacitor is mounted close to the top of the loop framework in a waterproof box. The 8 turn loop requires about 136 feet of wire. The loop may be peaked on background noise or tuned to resonance with a grid-dip meter.

of the Swiss Quad Beam and the so-called Birdcage beam in your *CQ* column of January, 1974."

Yes," I admitted. "The drawings got switched. I was talking about one antenna, but the illustration was of the other. Several sharp-eyed readers caught that one".

Pendergast frowned, thought a bit, then remarked, "I know what a Swiss Quad looks like, but what's with the Birdcage? Is that like the HB9CV beam? Or is the HB9CV beam the Swiss Quad?"

"Don't get me caught in an international jurisdictional dispute," I replied. "My understanding that the difference between these designs is the feed system. There is a great series of articles in the Japanese ham mazazine *CQ-Ham Radio* covering the so-called HB9CV antenna. Too, bad you don't read Japanese."

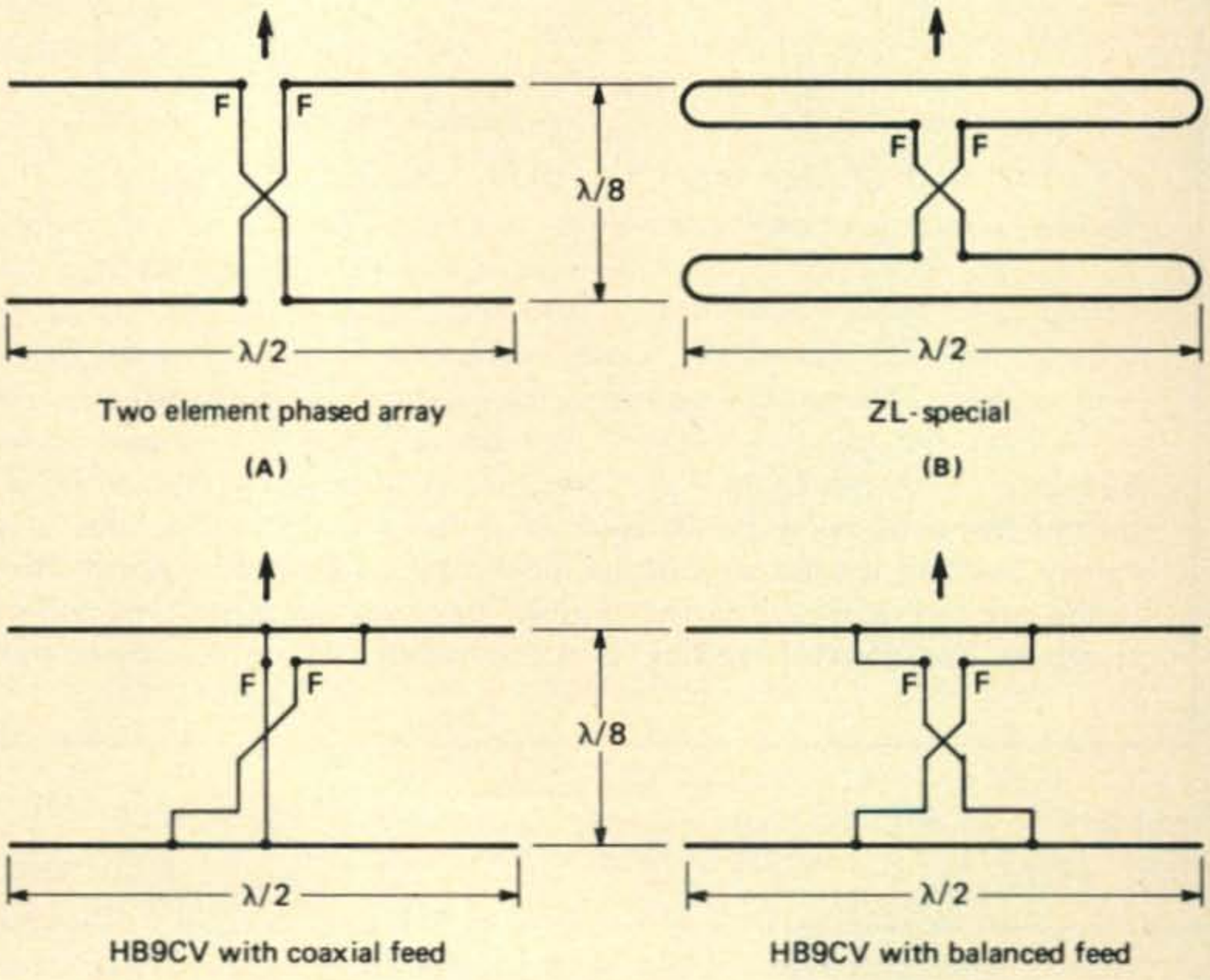


Fig. 3—Various feed systems for a driven array. Basic two element array is shown in illustration (A). This antenna provides about 4 decibels power gain over a dipole with a front-to-back ratio of about 20 decibels. Element spacing is approximately ⅛-wavelength. Impedance at feedpoint F-F is about 104 ohms, balanced. The so-called ZL-Special antenna (B) is similar to the array of (A) except that it is made with folded dipole elements. Impedance at feedpoint F-F is about 420 ohms, balanced. The simple HB9CV configuration is shown in illustration (C). Correct phasing between the elements is obtained by interconnecting two gamma matching systems with a phasing wire. Impedance at feedpoint F-F is determined by the gamma dimensions and is unbalanced A balanced version of the HB9CV system is shown in illustration (D) using two T-match systems, interconnected with a two-wire line. Impedance at feedpoint F-F is determined by the dimensions of the T-match and is balanced. In some designs, the length of the two driven elements are identical and very close to 0.94 wavelength. Better front-to-back ratio may be obtained by making the rear element slightly longer than the forward element.

I took a magazine the size of a telephone directory down from the shelf. Pendergast whistled when he saw it. "Wow! A color cover, over 500 pages and a summary of the contents in English, written by W9PQN/JA1YSH!" He leafed through it quickly. "Even if you don't read Japanese you can get a lot of it from the drawings and photos. And look at all that Japanese ham equipment!" Pendergast's eyes glowed.

"And they have a simple description of the ZL-beam and the HB9CV beam (fig. 3). As you can see, the difference is in the feed system. The HB9CV scheme can be used with either a balanced or unbalanced feed system. Actually, it is a version of the gamma match or the delta match applied to a driven array."

"Then these feed system would work equally with either a Yagi or a Quad," asked Pendergast.

"Right", I replied. "Speaking of Quads, I met Clarence Moore, W9LZX, in Houston, at the *National Association of Broadcasters* and he described the great results he was having from his special 80 meter Quad."

"80 meter Quad," gasped Pendergast. "What does he attach it to?"

"Well, it is a little different than what you are visualizing," I replied. "Actually, it is an antenna designed for maximum signal strength close-in, rather than for DX contacts. The antenna is a driven Quad loop, mounted parallel to the earth's surface. It squirts the radio signal straight up to the ionosphere, which reflects the maximum signal down within, say, a 500 mile radius. So the antenna produces a tremendous signal within a couple of hundred miles. W9LZX says a ground screen under the antenna helps, but that it still works well without it (fig. 4)."

"I like that," said Pendergast. "The W9LZX Lazy Quad loop should be great for local nets and rag-chewing. Besides, it doesn't take up much space and can fit into a back yard. And it doesn't have to be very high in the air." Mind if I make a copy of this?"

"Go right ahead," I replied.

"Well, thank you," said Pendergast, arising and stuffing his pockets with bits and pieces of paper, "I just bought a large notebook, and I am going to paste all this information in it. And I'm also going to keep records of all the antennas I put up, along with s.w.r. curves, and all that good stuff."

"That's a great idea," I said. "I do it here, because it is very easy to forget this year what you did last year. Permanent records are very

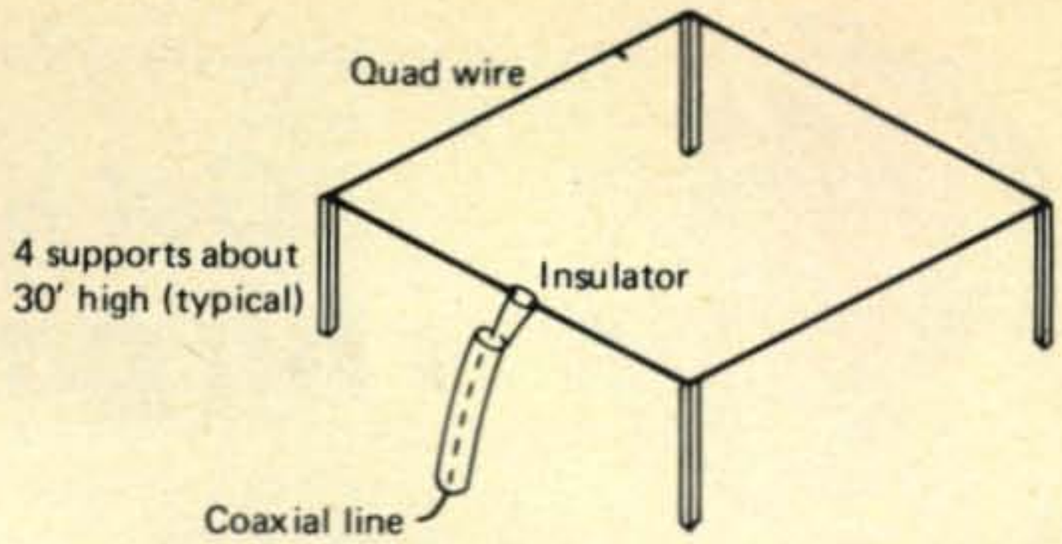


Fig. 4—The W9LZX Lazy-Quad loop antenna for 80 meters. The antenna consists of a single turn Quad loop mounted parallel to the surface of the ground. The loop is 67' on a side and is supported about 30 feet above ground (the height is not critical). Antenna is broken at midpoint of one side and fed with a 50 ohm coaxial transmission line. Since there is no polarization, in the common sense of the word, the loop may be broken at any point for the feedline. It may be more convenient to break it at one of the supporting points and run the feedline down the support structure. Maximum radiation from antenna is at very high angle to lay down a good signal at distances less than 1000 miles on the 80 meter band.

helpful. About 2 year ago I put up a tribander and carefully measured the s.w.r. for each band. About every six months I recheck my measurements, and I've found that the antenna traps age. That is, they change with time, and the s.w.r. curve of the antenna gradually shifts as time goes on. The s.w.r. curves I run now don't look at all like the curves I ran when the beam was brand-new."

"Well, what's happening to the antenna?" demanded Pendergast.

"I wish I knew," I replied. "It still works good. But one of these days I am going to have to take it down and examine the traps. I think it is just Mother Nature at work. That is, the continual force of gravity plus the forces induced by the wind may possibly cause cold flow in the forms that support the trap coils. That's my guess."

Pendergast prepared to leave. "A most informative session," he declared. "See you on the low end one of these days." ■

Mako

. . . by JA3OVM

TVI

DX

BY JERRY HAGEN, * WA6GLD

As the bottom of the sunspot cycle nears (possibly in late fall) DX conditions on the high bands have been marginal, however, quite a bit of DX has been available on the lower bands. Winter and Spring 75 Meter DX has been good and some good 20 meter openings have occurred on occasion. Here on the West Coast 40 meters has been disappointing throughout the Winter, with the exception of good JA openings during the ARRL C.W. Contest. DXers fascinated with 80/75 meters seem to favor a vertical antenna for long haul DX and several report using as many as 100 radials to the ground plane. Reports of 80/75 Meter DX in the *Long Island DX Association Bulletin,* and the *West Coast DX Bulletin* have been remarkable.

DXTRA

The letter reprinted below was received by Tava, K4AEB who is our North Alabama DX Club CQ DX Committeeman and provides the FCC's concept of special Prefixes for the 1976 Bi-centennial year for the USA.

Dear Mr. Franklin:

This concerns your petition to permit amateur stations to utilize special call signs during the 1976 bi-centennial year. Normally we would assign a rule making number to such a petition. However, we have already given the matter considerable thought and intend to adopt some kind of system for use by amateur stations.

We are not yet certain of the details. The system must provide for all existing prefixes in an acceptable manner; be entirely voluntary for amateurs; must involve absolutely no paper work at the Commission, and yet comply with the international radio regulations. We think such a system can be worked out. Consequently, there is no need for us to go through the routine of assigning an "RM" number to your request and the consequent bookkeeping involved. We shall announce the system at an appropriate date in time for everyone to become familiar with it. In the meantime, we would be glad to receive any suggestions which meet the above criteria.

Thank you for writing.

Cordially 73,

/s/A. Prose Walker
Chief, Amateur and Citizens Division

Naturally, all WPX enthusiasts will be pleased to hear of this plan. As a result of this action, *CQ* is planning to sponsor a special WPX award for working the USA Bi-centennial prefixes. Details will be worked out by the *CQ* DX Committee and will be announced as soon as the FCC plan for commemorative prefixes has been completed.

CQ DXer For June

With the help of the *CQ* DX Committee, we plan to feature a short article and photo of a top DXer each month. The DXer of the month will be chosen from the DX Clubs which are represented on the *CQ* DX Committee. Our first DXer represents the Virginia Century Club which is located in the Norfolk/Virginia Beach area. The 1974 officers are Bud White, W4TZX, President; Gay Milius, W4NJF, VP and *CQ* DX Committee Member; and Vic Samardza, W4EXI, Secretary/Treasurer. At present, there are 22 members who are all DXCC members and 15 hold WAZ. A total of four members are represented on the DXCC Honor Roll and two on the *CQ* WPX Honor Roll. The Virginia Century Club Member nominated for DXer of June is "P. B." White, W4OM who is a past President and a DXCC Honor Roll member with 348 countries confirmed. "PB" was first licensed in 1922 as 3OL and has held W3FQP and W4JBS, the latter being the call used to earn DXCC #69. Our DXer runs a Collins "S" line driving a home-built, 3-1000Z amplifier. Antennas are a Hy-Gain, 4-element Yagi, 15/10 3-element Yagi and Trap dipole for 40/80 meters. W4OM prefers 20 meter s.s.b. but has been active in both s.s.b. and c.w. contests in the past. When

The CQ DXer for June, W4OM, represents the Virginia Century Club.

*P.O. Box 1271, Covina, California 91722.

WPX HONOR ROLL

The WPX Honor Roll is based on confirmed current prefixes which are submitted by separate application in strict conformance with the CQ Master Prefix List. Scores are based on the current prefix total, regardless of an operators all-time prefix count.

Mixed

W4LRN 1300	PAØSNG 943	I6SF 862	IØJX 803	WA6EPQ 713
VE3GCO 1073	DL1MD 940	W9FD 860	K6SDR 780	PAØVB 706
F9RM 1053	ON4QX 930	W4BYU 859	JA1AG 765	W6NJU 706
W2NUT 1025	W3GJY 918	WØAUB 856	SM7TV 752	W3YHR 701
WA6MWG 1015	W4BQY 916	YU2DX 855	K2ZRO 751	W9ZTD 700
W8LY 1013	WB2FMK 910	WB4KZG 850	WA2EAH 700	WAØCPX 693
W3PVZ 1001	YU1AG 908	G3DO 849	K8UDJ 750	W8GMK 683
W8ROC 980	W4IC 900	W6ISQ 847	CT1LN 749	WA6JVD 678
W4CRW 972	K1SHN 893	K2AAC 843	WA5LOB 749	WA5VDH 659
DJ7CX 960	W4WSF 877	WAØKDI 824	PY4AP 735	WB4SIJ 654
W6TCQ 954	DL1CF 872	W9WHM 811	KØBLT 733	

C.W.

W8LY 1001	VK3AHQ 809	YU1AG 723	VO1AW 681	W6TCQ 604
W8KPL 955	W9FD 802	WA6MWG 719	WA6JVD 667	VE4OX 600
DL1QT 900	W4BYU 768	K1SHN 715	SM5BNX 652	OK2QX 600
W2HO 885	K7ABV 755	W4IC 700	K2ZRO 635	
ON4QX 835	G2GM 749	OK1DB 693	K1LWI 629	
W2AIW 813	DJ7CX 730	W6ISQ 685	W8GMK 628	
WB2FMK 800	K2AAC 726	I6SF 676	W3ARK 620	

SSB

W4NJF 1100	I8KDB 873	I4ZSQ 780	K1SHN 737	WB2NYM 677
F9RM 1000	DL1MD 858	G3DO 765	OE2EGL 730	I8YRK 662
IØAMU 957	HP1JC 851	IT9JT 762	W6RKP 725	WB6DXU 656
CT1PK 930	IØZV 827	W3DJZ 761	OK1MP 715	WA6TAX 615
W9DWQ 917	PAØSNG 824	W6TCQ 759	YU1AG 697	CR7IK 613
DL9OH 911	WØYDB 819	W4IC 750	ZL3NS 685	I4LCK 608
K2POA 883	F2MO 780	WA5LOB 747	CX2CN 679	WB4KZG 600

not on the amateur bands W4OM occupies his time with his Hatteras 36-foot boat and is the Chief Judge of the Virginia Beach General District Court. During World War II, "PB" was Norfolk, Virginia Civil Defense Head and he is currently Comander of the Virginia Beach Power Squadron.

1974 Trans-Equatorial 160 Meter Tests

The 1974 Trans-Equatorial Tests have been organized by PY1RO and EI9J, who state that conditions during this period for the past 4 years have been excellent.

Times and Dates: Throughout June 1974, daily from 0000—0030 Z, extending into July and beyond 0030 Z, conditions permitting.

Objective: Make use of the peak conditions that exist during June for N/S path QSO's on 160 meters.

Jack, F5IQ, has been one of the operators at XU1AA during the past year. (*Photo via F2MO*)

Participants: Stations interested in 160 meter DX in Europe, South America, Africa, Near and Middle East and East Coast USA.

Frequencies: Europeans transmit on 1825-30 (the DX-window), South America on 1800-08 kHz. Other DX will use one or the other segmnt, depending on who they call. Exception: ZS stations will xmit on 1930-1935 kHz.

Here And There In The World Of DX

Andy, VE1ASJ completed a month's operation as VX2AB working over 2000 stations and

The CQ DX Award Program

C.W. DX

147—G3AGN

SSB DX

332—WA9BHH	336—W9PHJ
333—9H4G	337—WA1FBX
334—UW3IN	338—JA2JAB
335—OK1DVK	339—UK2WAF

Endorsements

SSB: F2MO—310, DL1MD—275, WB4SIJ 250, 9H4G—250, UW3IN—200, W9PHJ —150, WA1FBX—150, JA2JAB—150

28 mHz: 9H4G, WA1FBX

3.5/7 mHz: K6WR

Complete rules and application forms for the *CQ* DX Award Program may be obtained by sending a business size, self-addressed stamped envelope to DX Editor, P.O. Box 1271, Covina, CA 91722.

100 countries. Andy was surprised at the number of stations who indicated that VX2AB was their first Zone 2 QSO.

The Delta DX Association (Louisiana) recently hosted DXCC Chief Bob White, W1CW and XYL Ellen, W1YL. Visiting DXers DJ5TH and LU4CP also visited the Delta DX Gang. The current club officers are WA5WEY, President; W5KKZ, VP; W5JFB, Treasurer; and WA5YFQ, Secretary.

The Radio Society of Okinawa still awards the KR6 Certificate, however, QSO's must be made prior to the reversion of Okinawa to Japan on May 15, 1972. Requirements are working and confirming five different KR6's. A verified log extract and $1 should be sent to RSO, P.O. Box 465, APO San Francisco, CA 96331.

North Florida DX Association members operated from Turks & Caicos Island in the *CQ* WPX Contest. The contest call was VP5CW, however, individual members were assigned the following calls: W4ORT/WP5CW, WB4EYX / VP5WW, VA4UFW / VP5BW, W4SME/VP5WS.

Club station VE3LSS sponsors the Maple Leaf Award for working different Canadian prefixes beginning with QSO's after 1965. Award Custodian VE3GCO can provide details.

Eric, 9H4G has been having rig problems since lightning struck some time back, but has managed to raise his *CQ* 2 × SSB DX Award total to over 250 countries

Rick, WA5VDH and Tom, WB4SIJ have joined the WPX Honor Roll in short order. Tom, WB4SIJ has been off the Novice bands less than three years where he received WPNX #29 in March of 1971. Rick, WA5VDH just received 5BDXCC #314 but being a University of Arkansas student has curtailed his operating.

The FCC issued a number of special call authorizations for World Telecommunications Week from May 11 through May 19. The participating stations can be identified by the "ITU" suffix such as KD4ITU, KF6ITU, KD8ITU and KD9ITU.

John, K6SE/2 has urged that DXpedition activity to the Caribbean be increased during the sunspot low as 80 to 40 meter activity. John recently signed PJ8SE from Statia Island (which has a total of 12 square miles) and as PJ8SE/6 from Saba. A total of 3,851 QSO's were made using a Swan Cygnet and Vertical.

Al, K4FCZ/8 states that Alex, A4XFJ in Oman is now QRT, however, A4XAA, A4XFD and A4XFF are active with Beams and Linear amplifiers!

Fred, K7OTF who previously signed KC6FM, 3D2FM and several other calls will be spending the next three years in Thailand.

The Hollywood ARC plans to activate the special call KH4FLA during Florida Amateur Radio Week, June 16-23. The s.s.b. frequencies are 3930, 7230, 14330 and 21430 while c.w. will be 70 kHz above the band edge.

The Wizard Lake DX Club of Edmonton, Alberta will sign VA6WDX for the remainder of 1974 to commemorate the Centennial of the Royal Canadian Mounted Police in Alberta.

The USSR 4L3ø calls used in the past winter were to commemorate the 30th Anniversary of the breaking of the seige of Leningrad during World War II.

THE WPX PROGRAM

Mixed

431—W9OEQ
432—WB4UKA
433—WA9HEV
434—JA2JAB
435—JA2KLT
436—W2FVS

C.W.

1301—OK1DKR
1302—JA9BCU
1303—W2FVS
1304—JA5EYW
1305—JA1KRU
1306—WAØKDI
1307—UL7FJ

2XSSB

790—JA8BAR
791—UK3YAB
792—UA4CO
793—WA4NRE
794—K5FKD
795—F6BGW
796—JA2JAB

VPX

64—UA4-095-48
65—UA3-157-10
66—UA3-170-599
67—UA9-167-36
68—UD6-001-3

Endorsements

Mixed: W8ROC—1000, DL1MD, W8ROC—950, K200—900, WAØKDI—800, W4HOS—750, W8CNL—700, WA5VHD—650, JA2KLT—500, JA2JTB—450

C.W.: K8MFO, WAØKDI—650, OK2BLG, JA1KRU—500, K9UIY, WA5VDH—450, VO1KE, UY5FF, W2FVS, UY5OQ, UB-5VK, JA5EYW

S.S.B.: DL1MD—850, W4WSF—800, WB4-KZG—600, JA2JAB—500, WA5VDH—450, DK5GX—400

VPX: WDX2OBU—400

160 Meters: K8MFO, OK1DVK, VO1KE, OK1DKR

80 Meters: DK5GX, K6SSN, OK1DKR

40 Meters: DL1MD

20 Meters: WA4NRE, W2FVS

15 Meters: JA2JAB, W2FVS

10 Meters: W4WSF

Africa: WA5VDH

Asia: I8QO, JA2JAB

Europe: I8QO, DK5GX, WDX5FEB, JA2-JAB, W2FVS

North America: K8MFO, W4WSF, W2FVS

Complete rules for WPX may be found on pg. 67 of the February, 1972 issue of *CQ*. Application blanks and reprints of the rules may be obtained by sending a business size, self-addressed stamped envelope to WPX Award Manager, P.O. Box 1271, Covina, Ca 91722.

The WAZ Program

Single Band WAZ

14 mHz C.W.

2.....K6GA

S.S.B. WAZ

1180.....JA7GY
1181.....JA6CNL
1182.....K4FTY
1183.....WB4TPU
1184.....W3ZNH
1185.....DL7OK
1186.....OE7UD

C.W.—Phone WAZ

3675.....OK2BKI
3676.....I1CXU
3677.....KA6WS
3678.....W8OA
3679.....WA1JMP
3680.....F8FF
3681.....VE4IE
3682.....I2RTI
3683.....I2YDX
3684.....DM2BBK
3685.....YU3CM
3686.....WB2AQC
3687.....G3IZJ
3688.....DL6OL
3689.....DK1VN
3690.....W6APW

Phone WAZ

495.....W6KQY

Complete rules for the Single Band WAZ program are shown on pgs. 57-58 of the December, 1972 issue. Complete rules for regular WAZ may be found on pages 64-66 of the June, 1970 issue. Application blanks and reprints of both sets of rules may be obtained by sending a self-addressed, stamped envelope to John A. Attaway, K4IIF, P.O. Box 205, Winter Haven, FL 33880.

QSL Managers Directory

We have received a review copy of the new *QSL Managers Directory* published by DX Publications. The new directory lists over 4,000 stations with QSL Managers, which were gathered from various publications spanning the past 2 years. A QSL Manager Address section contains addresses of over 2,000 QSL Managers. The new publication will have quarterly supplements and appears to be very complete. A descriptive flyer is availble from DX Publications, 7632 Woodland Lane, Fair Oaks, CA 95628. The *CQ* DX Department often receives requests for QSL Manager information, however it is impossible for us to keep any organized record of QSL Managers, thus the QSL Managers Directory is highly recommended.

Larry, K9LKA is a longtime DXer and Contest Operator. His station consists of separate 813 GG amplifiers for each band.

Doug, VE5RA has used this nice layout to work 155 countries. He enjoys the CQ WW Contests and operates on all bands.

News Bulletin!

The Government of Viet Nam (GVN) recently granted two individual amateur radio licenses to Robert Brougham (XV5AA) and George Johnson (XV5AB). Both the ITU in Geneva and the FCC in Washington have been notified that the GVN has officially approved the operation of these two stations with amateurs in other countries of the world, including the U.S. Bob's home call is WA7QDG and George's home call is W5EVD.

QSL Information

A4XFD—via G3XEC
A4XFJ—via K4FCZ/8, 259 Beachview, Rochester, Mich 48063
A5IPN—via W1JFL
A7XA—via DJ9ZB
CR3WB—via CT1BH
CR7RM—via W0GX
FM7AQ—via WB4SPG, 426 Sugarland Run Dr, Sterling, Va 22170
HK7BDA—via WA1QBH
HK0AB—via SM3CXS (Mar '74)
HZ1AB—via DJ9ZB
KH4FLA—via W4OZF
KH6IJ/KS6—via KH6IJ
M1DX—via DJ9ID
PJ8SE/6—via John Irwin, 578 Morris Ave, A-6, Elizabeth, NJ 07208
SV0WPP—via WA1QBH
TU2DQ—via WB4SPG (See A4XFJ)
TZ2A—via HB9TZ
VA6WDX—via VE6LB
VK0DM—via VK3FF
VP5CW—via W4ORT
VX1KE—via WA1QBH
VX2AB—via VE1ASJ
VR1PB—via K9KXA
ZF1AO—via W2JNO
ZF1TZ—via W4BTZ, P.O. Box 52701, Atlanta, Ga 30305
3D2ER—via K4FCZ/8 (See A4XFJ)
3D2IJ—via KH6IJ
4W1GM—via W3HNK

73, Jerry, WA6GLD

This fine station belongs to Paul, W4YWX who is a member of the CQ CW DX Honor Roll, and also holds WAZ, WPX and USA-CA.

The most powerful signals under the sun!

hy-gain

Redesigned

HAMCAT

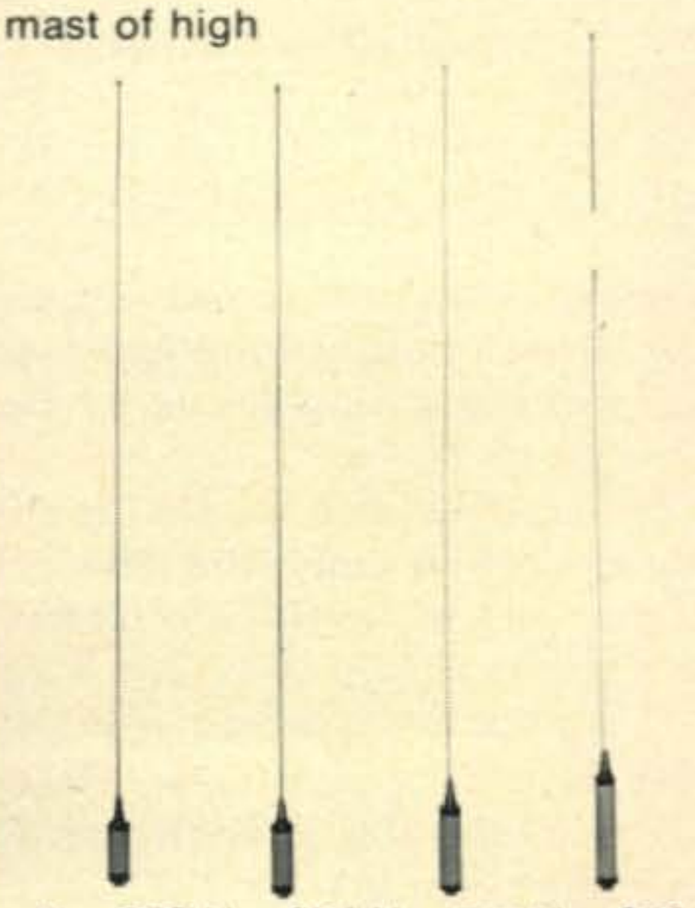
Out-hustles them all!

The famous HAMCAT...now redesigned for greater performance...*equals* or *exceeds* the performance of any other Amateur Mobile antenna. *We guarantee it!* And you need buy only one mast...whether you mount it on fender, deck or bumper. There's just one set of coils and tip rods...and they all stand up to maximum legal power. That's performance, that's value...*THAT'S HY-GAIN!*

Original Hy-Q "quick changer" coils wound on tough fiberglass coil forms for greater heat resistance, less RF absorption / Fiberglass shielded coils can't burn up, impervious to weather / Shake-proof, rattle-proof, positive lock hinge now even stronger...eliminates radio noise / All stainless steel tip rods won't bend or break / Full 5′ mast gives you 10% more radiating area than the competition / Rugged swivel-lock stainless steel base for quick band changes, easy garaging.

Get the Hamcat...from Hy-Gain

Order No. 257 All new design 5′ long heavy duty mast of high strength heavy wall tubing	**$18.95**
Order No. 252 75 meter mobile coil	**$24.95**
Order No. 256 40 meter mobile coil	**$19.95**
Order No. 255 20 meter mobile coil	**$16.95**
Order No. 254 15 meter mobile coil	**$14.95**
Order No. 253 10 meter mobile coil	**$12.95**
Order No. 499 Flush body mount	**$ 9.95**



HY-GAIN ELECTRONICS CORPORATION

8601 Northeast Highway Six
402/434-9151

Lincoln, NE 68507
Telex 48-6424

Propagation

BY GEORGE JACOBS,* W3ASK

TWENTY METERS looks like it will be the best band for DX during June. It should open shortly after sunrise and remain open for several hours in almost all directions. When propagation conditions are normal or better, chances are good for openings to Europe, Central and South America, the South Pacific, Australasia and the Far East, before noon-time absorption sets in. A second, and stronger peak is expected during the afternoon and early evening hours. During this time span good openings should be possible towards Europe and Africa, Central and South America, and towards the Middle East. Later in the evening, and until Midnight, openings should peak towards South America, Antarctica, the South Pacific and Australasia, and the Far East. When conditions are somewhat better than normal, look for *20 meter* openings towards the south and to the Pacific and Oceania well past Midnight.

Few, if any DX openings are expected on *10 meters*, except to those areas of the Caribbean and Central America within the 1300-mile range of short-skip sporadic-E openings from the USA. An occasional longer opening into South America may be possible during the late afternoon hours. Except for sporadic-E openings within a 1300-mile radius, not much DX expected on *15 meters* either until after Noon. During the afternoon hours the band should open towards Central and South America, with signals building up to very strong levels by the late afternoon.

Longer hours of daylight and higher levels of static will reduce considerably the chances for DX openings on *40, 80* and *160 meters*. Some fairly good openings, however, are forecast to several areas of the world for *40 meters,* during the hours of darkness. Occasional openings should also be possible on *80 meters* during this same period.

Plenty of good short-skip openings are expected on the h.f. amateur bands during June. For distances less than 250 miles try *80 meters* during the day, *160 meters* at night. For openings between 250 and 750 miles, *40 meters* should be best during the day and *80 meters* at night. For openings beyond 750 miles, *20 meters* should be optimum during the day and *40 meters* at night.

This month's *CQ* Progagation Charts contain DX predictions for the period June 15 through August 15, 1974. Short-skip Charts for June, for distances between 50 and 2300 miles, and from Hawaii and Alaska, appeared in last month's column.

Instructions for the use of this month's DX Charts appear elsewhere in this column.

LAST MINUTE FORECAST

Day-To-Day Conditions Expected For June, 1974

Propagation Index	*Rating & Forecast Quality* (4)	(3)	(2)	(1)
Date June, 1974				
Above Normal: 7-8, 10-11, 20	A	A	B	C
Normal: 1, 4-6, 9, 17-19, 21-23, 26-27, 29-30	B	C	D	E
Below Normal: 2-3, 12, 15-16, 24-25, 28	C	D	E	E
Disturbed: 13-14	D	D	E	E

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals.

B—Good opening, moderately strong signals with little fading and noise.

C—Fair opening, signals between moderately strong and weak, with some fading and noise.

D—Poor opening, signals weak 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 particular opening for any day of the month. For example, all openings shown in the Charts with Propagation Charts with a *propagation index* of (4) will be good on June 1, fair on June 2 and 3, good on June 4-6, etc.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, or subscribe to MAIL-A-PROP, P.O. Box 86, Northport, N.Y. 11768.

V.H.F. Ionospheric Openings

Sporadic-E short-skip propagation should increase considerably during June, resulting in fairly frequent *6 meter* openings over a range of 1000 to 1400 miles. During periods of widespread ionization, two-hop *6 meter* openings may occasionally be possible up to about 2300 miles. An occasional *2 meter* short-skip opening, between approximately 1200 to 1400 miles, may also be possible during periods of intense sporadic-E ionization. Short-skip openings are most likely to occur between 10 A.M. and 2 P.M. and again between 6 and 10 P.M., local daylight time, although they can occur at other times as well.

No major meteor showers are expected during June.

The radio storm predicted for June 13-16 looks like a good bet for auroral activity on the v.h.f. bands. Check the "Last Minute Fore-

*11307 Clara Street, Silver Springs, Md. 20902

cast" at the beginning of this column for other days during June that are expected to be below normal or disturbed on the h.f. bands, since auroral activity may occur on these days as well.

New-Cycle Sunspots Reported

The Swiss Federal Observatory at Zurich reports a monthly mean sunspot number of 23 for March, 1974. This results in a smoothed sunspot number of 35, centered on September, 1973. The sunspot cycle is measured by these smoothed numbers. A smoothed number of 19 is predicted for June, 1974, as the present sunspot cycle continues to decrease towards a minimum value.

There is an observable pattern on the sun itself that often makes it possible to determine the approach of a new cycle. As a new cycle is about to begin, the first spots will appear on the *opposite* side of the sun's equator and with magnetic fields of *reversed* polarity from the spots of the previous cycle.

Earlier this year, scientists at the Kitt Peak National Observatory in Arizona reported sighting the first sports of a new sunspot cycle, with their powerful telescope. However, the actual date on which the present cycle will end and the new one begins will depend on when the number of spots from the new cycle will equal the number of spots remaining from the present cycle. Judging from the distribution of the spots on the sun's face, and their movements, this date is at least a year away, and probably won't occur before the fall of 1975. But the new cycle is on its way, and with it will be an eventual improvement in h.f. propagation conditions. For more information about the sunspot cycle, be sure to read "*The Sunspot Cycle;-Analysis and Prediction*", by Cohen and Lintz. You'll find it on page 24 of the March, 1974 issue of *CQ*.

MAIL-A-PROP

If you have a need or an interest in propagation forecasts on a *weekly* basis, similar to those that appear in this column, then give some thought to MAIL-A-PROP.

MAIL-A-PROP is an "almost instant" subscriber propagation service that has achieved an accuracy in excess of 95% during the past year.

Written in simple language, this two-page *weekly* newsletter covers day-by-day the latest propagation data expected for an entire week in advance (Tuesday-to-Tuesday). It contains a description of propagation conditions expected each day in terms of *above normal, normal, below normal* or *disturbed*. Band openings are described as *excellent, good, fair* or *poor*. Best times for openings of each h.f. amateur band 10 through 160 meters are given for each day of the forecast period, to each of the world's Continents.

In addition, MAIL-A-PROP contains the latest assessment of solar activity, special DX tips, a forecast of ionospheric openings on the v.h.f. bands, special short-skip forecasts for the traffic man, and general news concerning radio propagation.

The newsletter is enlarged to include special forecasts for all major *ARRL* and *CQ* Contests.

MAIL-A-PROP is sent (by AIRMAIL if necessary) so that it will arrive in Monday's mail, or sooner, in time for *full* use. It is in a convenient written form, and is available for ready reference at any time. It's about the closest thing to a "do-it-yourself" propagation forecaster that you can find anywhere.

An annual subscription to MAIL-A-PROP, anywhere within North America (including the 50 states, Canada, Mexico and the Caribbean area), is $30 for 52 issues; $17 for six months or 26 issues. A monthly sample subscription (4 issues) is available for $3. *All rates include postage, airmail where necessary.*

Subscriptions to MAIL-A-PROP should be sent to MAIL-A-PROP, P.O. Box 86, Northport, N.Y. 11786. Take most of the guesswork out of h.f. propagation, try MAIL-A-PROP!

73, George, W3ASK

June 15—August 15, 1974

Time Zone: EDT (24-Hour Time)

EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	*Nil*	15-18 (1)	06-07 (1) 07-08 (2) 08-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-20 (3) 20-21 (2)	20-22 (1) 22-23 (2) 23-01 (3) 01-02 (2) 02-03 (1) 21-23 (1)* 23-01 (2)* 01-02 (1)*
Northern Europe & European USSR	*Nil*	*Nil*	06-09 (2) 09-15 (1) 15-19 (2) 19-21 (3) 21-23 (2) 23-01 (1)	21-22 (1) 22-00 (2) 00-02 (1) 21-00 (1)*
Eastern Mediterranean & Middle East	*Nil*	11-14 (1) 17-18 (1)	13-15 (1) 15-18 (2) 18-22 (3) 22-00 (2) 00-06 (1) 06-08 (2) 08-09 (1)	20-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
West & Central Africa	*Nil*	11-14 (1) 14-17 (2) 17-18 (1)	00-07 (1) 07-08 (2) 08-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-00 (2)	20-22 (1) 22-00 (2) 00-02 (1) 21-01 (1)*
East Africa	*Nil*	14-17 (1)	16-18 (1) 18-21 (2) 21-23 (1)	22-00 (1)
South Africa	*Nil*	11-13 (1)	15-16 (1) 16-18 (2) 18-19 (1) 01-03 (1)	21-22 (1) 22-00 (2) 00-01 (1) 23-01 (1)*

How To Use The DX Propagation Charts

1. Use Chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 call aeras in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. An * indicates 80 Meter openings. Openings on 160 meters are likely to occur during those times when 80 meter openings are shown with a *propagation index* of (2), or higher.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this Propagation column for the actual *dates* on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M., 13 is 1 P.M., etc. Appropriate *daylight saving* time is used, *not* GMT. To convert to GMT, *add* to the times shown in the appropriate Chart 7 hours in the PDT Zone, 6 in the MDT Zone, 5 in the CDT Zone and 4 in EST Zone. For example, 14 in Washington, D.C. is 18 GMT and 20 in Los Angeles is 03 GMT, etc.

5. The charts are based upon a transmitter power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 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.

6. Propagation data, contained in the Charts has been prepared from basic data published by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

Central & South Asia	*Nil*	*Nil*	08-11 (1) 20-23 (1)	20-22 (1)
Southeast Asia	*Nil*	*Nil*	07-08 (1) 08-09 (2) 09-12 (1) 19-23 (1)	*Nil*
Far East	*Nil*	*Nil*	07-08 (1) 08-10 (2) 10-12 (1) 20-23 (1)	*Nil*
South Pacific & New Zealand	*Nil*	19-22 (1)	19-21 (1) 21-02 (2) 02-04 (1) 07-10 (2)	02-03 (1) 03-06 (2) 06-07 (1) 03-06 (1)*
Australasia	*Nil*	19-22 (1)	06-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 22-00 (1) 00-02 (2) 02-04 (1)	03-04 (1) 04-06 (2) 06-07 (1) 03-06 (1)*
Central America & Northern South America	15-17 (1)	14-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	06-07 (1) 07-08 (2) 08-10 (4) 10-12 (3) 12-16 (2) 16-18 (3) 18-22 (4) 22-23 (3) 23-00 (2) 00-02 (1)	20-22 (1) 22-23 (2) 23-03 (3) 03-05 (2) 05-06 (1) 22-00 (1)* 00-03 (2)* 03-04 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	15-17 (1)	11-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-20 (2) 20-21 (1)	16-18 (1) 18-19 (2) 19-20 (3) 20-22 (4) 22-00 (3) 00-02 (2) 02-06 (1) 06-07 (2) 07-08 (1)	22-00 (1) 00-04 (2) 04-06 (1) 00-05 (1)*
McMurdo Sound, Antarctica	*Nil*	*Nil*	17-19 (1) 19-22 (2) 22-00 (1)	00-04 (1)

*Predicted times of 80 Meter openings. Openings on 160 Meters may also be possible during times when 80 Meter openings are shown with a forecast rating of (2), or better.

Time Zones: CDT & MDT (24-Hour Time)

CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	*Nil*	16-18 (1)	06-08 (1) 08-11 (2) 11-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-22 (1)	20-22 (1) 22-00 (2) 00-02 (1) 21-00 (1)*
Northern Europe & European USSR	*Nil*	*Nil*	05-07 (1) 07-09 (2) 09-15 (1) 15-17 (2) 17-20 (1) 20-22 (2) 22-23 (1)	20-00 (1)
Eastern Mediter-ranean & Middle East	*Nil*	*Nil*	07-09 (1) 14-16 (1) 16-18 (2) 18-20 (1) 20-22 (2) 22-23 (1)	21-00 (1)
West & Central Africa	*Nil*	14-16 (1)	06-08 (1) 13-15 (1) 15-17 (2) 17-18 (3) 18-19 (2) 19-21 (1)	20-00 (1) 23-01 (1)*
East Africa	*Nil*	*Nil*	16-18 (1) 18-20 (2) 20-22 (1)	20-23 (1)
South Africa	*Nil*	10-12 (1)	14-16 (1) 20-22 (1) 22-00 (2) 00-02 (1)	21-23 (1) 23-00 (2) 00-01 (1) 23-01 (1)*
Central & South Asia	*Nil*	*Nil*	09-11 (1) 18-20 (1) 20-22 (2) 22-00 (1)	*Nil*
Southeast Asia	*Nil*	20-22 (1)	08-10 (1) 20-21 (1) 21-23 (2) 23-00 (1)	*Nil*
Far East	*Nil*	20-22 (1)	07-08 (1) 08-11 (2) 11-21 (1) 21-23 (2) 23-01 (1)	04-07 (1)
South Pacific & New Zealand	*Nil*	15-19 (1) 19-21 (2) 21-22 (1)	17-19 (1) 19-22 (2) 22-00 (3) 00-04 (2) 04-07 (1) 07-09 (2) 09-12 (1)	01-03 (1) 03-04 (2) 04-06 (3) 06-07 (2) 07-08 (1) 01-04 (1)* 04-05 (2)* 05-06 (1)*
Australasia	*Nil*	16-18 (1) 20-22 (1)	06-07 (1) 07-09 (2) 09-11 (1) 15-17 (1) 20-22 (1) 22-00 (3) 00-02 (2) 02-04 (1)	01-03 (1) 03-06 (2) 06-07 (1) 03-06 (1)*

[Continued on page 74]

NOVICE SHACK

BY HERBERT S. BRIER,* W9EGQ

LAST month, we depicted electric current as consisting of a countless number of electrons, which are minute negative electrical charges, zipping in chain fashion from atom to atom in the conducting medium. The individual electrons travel very short distances from one atom to the next; nevertheless, their electrical charges travel from the negative end of the conductor to its positive end at about the speed of light through space—300,000,000 meters per second. This picture is not quite accurate under all conditions, especially in semi-conductors, but the slight deviations do not decrease the value of the model.

Electric current comes in two styles: Direct current (**d.c.**), which always flows in the same direction through a circuit, and alternating current (**a.c.**), which alternately flows first in one direction and then in the opposite direction, as illustrated in Fig. 1. Although direct current is easier to visualize, alternating current is much more versatile. Virtually all the electrical equipment used in the United States is powered by 60-Hertz (cyces-per-second) alternating current for reasons explained below. From the amateur point of view, however, the big advantage of alternating current is that high-frequency alternating-current signals may be fed into an antenna and radiated into space to be intercepted by other antennas over the hills and far away. Radio transmitters are, therefore, really high-frequency alternating-current generators. Their output signals are called *radio frequencies* or *r.f.* because they are used in radio communications.

Knowing that radio signals travel through the atmosphere and space at the speed of light—300,000,000 meters per second—if the *frequency* of a signal is known, its **wavelength** (the distance that the signal travels in the period of one cycle, like a wheel rotating) is equal to the total distance travelled in a second divided by the frequency, or: Wavelength (meters) =

$$\frac{300{,}000{,}000}{\text{Frequency (Hz)}}$$

or

$$\frac{300}{\text{Frequency (mHz)}}.$$

Dividing 300,000,000 by the frequency in Hz gives the wavelength, which is expressed in **meters.** These relationships indicate why the amateur bands are sometimes identified by frequency and sometimes by wavelength. The latter is normally given only in round numbers, however: 7 mHz—40 meters, etc.

When the wavelength is known, if follows that the length of a ½-wave-(length) antenna is half the wavelength of the signal. The physical length of the ½-wave antenna will actually be slightly different than a half wavelength in space. Two factors are involved. One, the signals travel slightly slower on a conductor than in space. Two, the diameter of the antenna wire and how the antenna is supported has some effect on the electrical versus physical length.

A.c. power is transmitted over long-distance power lines at very high voltages to permit the maximum power to be transmitted at the minimum current, thereby minimizing the voltage and power lost in overcoming the resistance of the power lines. Efficient power transformers supported on the utility poles behind their homes reduce the high voltages to 120 or 240 volts before being delivered to the householders.

Unfortunately, it is not easy to change d.c. voltages efficiently. A resistance inserted in series with a conductor carrying either a.c. or d.c. will reduce the output voltage. (By Ohm's Law, $E = I \times R$, where $E =$ the electromotive force in volts lost, $I =$ the current in amperes, and $R =$ the resistance in ohms.) But the power so lost is dissipated as heat in the resistance. Any desired number of battery cells may be connected in series to produce a desired direct-current voltage. Except for these expedients, however, once a d.c. voltage is generated, one tries to design his equipment to operate at that voltage. Of course, direct current does have its uses. Receivers and transmitters must be operated on d.c. (except that the cathodes of tubes operated from the commercial power lines may be heated with alternating current.) Otherwise, the receiver and transmitter output signals will be 100-per cent modulated at

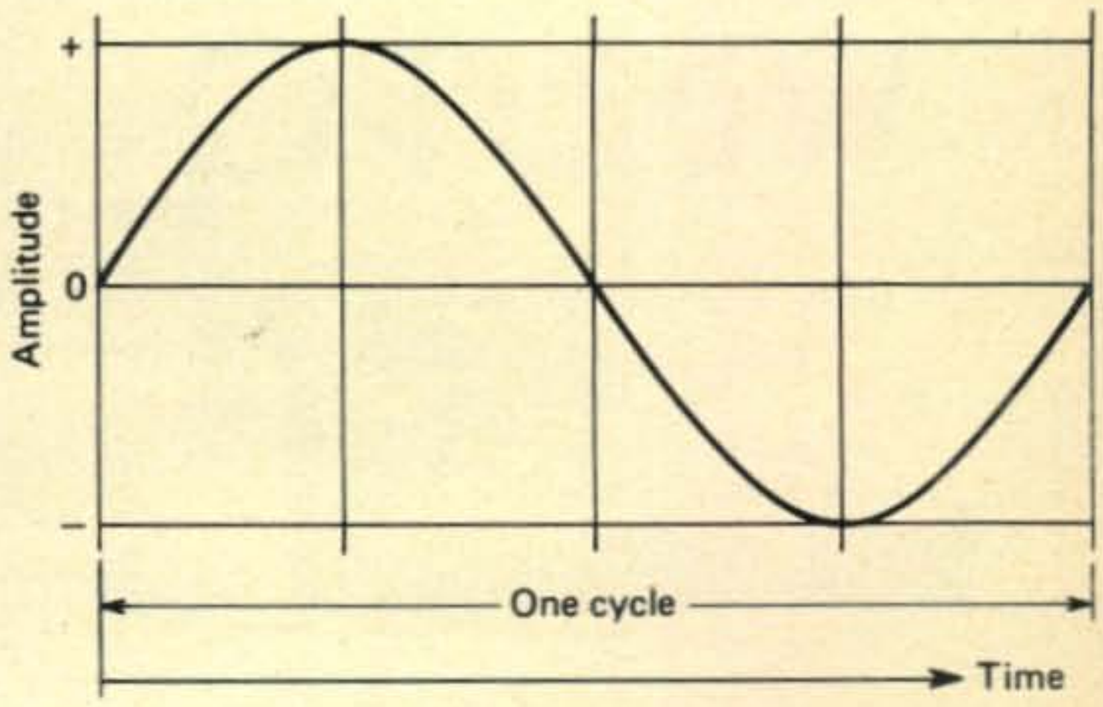


Fig. 1—Graphical representation of an alternating current of any frequency. Low-frequency alternating current lights and powers our electrical equipment, and high-frequency current (*r.f.*) transmits our thoughts by radio around the world.

*385 Johnson St., Gary, Ind. 46402

Patricia Simonsen, WN7UDM, WN5HSR, is obviously proud of being a radio amateur. While they do not appear in this picture, the original one revealed at least three antennas in the background.

the power-line frequency. The Federal Communications Commission amateur regulations specify that amateur transmitters operating on frequencies below 144 mHz must be powered by adequately-filtered direct current for that reason. As a result, amateur transmitters and receivers operated from a.c. power sources employ a **rectifier** to convert the alternating direct current to pulsating direct current, and a filter smooths the pulsations into pure direct current. In future columns, we will continue to explore the electron and all its works.

No-Code Licenses in Japan

Japan has had a no-code Novice-type license, as well as a 5-w.p.m. license, since 1958. Both licenses permit operation on all amateur frequency bands available in Japan, except the 14-mHz band, with a transmitter power of ten watts. But it was not until 1966, when the Japanese government authorized the Japanese Amateur Radio League (JARL) to issue such licenses to students of the League's amateur study courses who passed the final examinations, that these elementary licenses made much of a mark on the Japanese amateur picture. Today, however, there are about 300,000, no-code and 30,000, 5-w.p.m. amateurs in Japan. In contrast, there are only about 25,000 First Class and Second Class Japanese amateurs who have passed comprehensive code and theory examinations. Second Class licensees demonstrate their code proficiency using the conventional radiotelegraph code and are permitted to use a transmitter power up to 100 watts. First Class licensees must also demonstrate their proficiency in the Japanese radiotelegraph code. They are normally limited to a maximum transmitter power of 500 watts but can use more, if they can convince the Japanese "FCC" that they need additional power.

The majority of complaints against the Japanese Novice-type licensees are the discourtesy and poor operating procedures of some of them and their ignoring of the 10-watt power limitation. For that matter, if the Japanese government is a signatory to the International Tele-Communications treaty, it is ignoring the provision that all radio amateurs authorized to operate on frequencies under 144 mHz are to pass a code test. But 300,000 Japanese amateurs couldn't care less.

This attractive photographic QSL card of Winston Vargas, WB2SPJ, 118 Lexington Ave., New York, N.Y. 10016 indicates that youcan put together a good looking amateur station in eight months as a Novice. Thanks to Mark, WN2SFF for sending it.

Novice News

Howie Weiss, WN2PKL, 704 Manor Court, Brooklyn, N.Y. 11235, worked 40 states and half of Canada on 40 meters in four months on the air. He was running under 15 watts to an Ameco AC-1 transmitter driving a "long-wire" or an inverted-V antenna. A Hallicrafters SX-100 does the receiving. Howie has a "secret;" his uncle is George Jacobs, famous Propagation Editor of *CQ Magazine*. He is 15, has ordered a new Drake TR-4C transceiver, and has put up a new tri-band beam, all in preparation for his Advanced class license, although he had not taken the test he wrote. That's confidence! It pays to have a friend. Chip Stephenson, WA3SXV, 2047 Waterloo Rd., Berwyn, Pa., possibly should have his call letters in small print on WN3SVQ's WAS certificate!. WN3SVQ needed only New Hampshire for his WAS on the 3.7 mHz Novice band. Chip found a N.H. station on 3535 kHz and led him by the hand to 3702 kHz, where SVQ worked him... Mrs. Patricia Simonsen, WN7UDM, WN5HSR, 501 So. Ash St., Centralia, Wash. 98531, says she is the only Novice in the northwest with special call-letter license plates for her automobile. Not every Novice has two sets of Novice call letters

at the same time, either. She uses WN5HSR at her winter station on her husband's 80-acre ranch in Taos, New Mexico. Look for her on 80 and 40 meters. When not on the air or moving, Patricia reads her husband's latest *CQ* before he gets home from work and studies for her General examination.

While the appearance of a new *VHF Handbook For Radio Amateurs* might not be of major interest to all Novices, your Novice Editor and Bill Orr, W6SAI, writer of the Antenna Column in *CQ*, highly recommend this one, possibly because we wrote it. At the very least, the *VHF Handbook* helps explain why the v.h.f. bands have become so popular in recent years. The publisher is Radio Publications, Inc., Box 149, Wilton, CT 06897 . . . John Palmer, WA6TLJ/HK6, A. A. 1028, Pereira, Columbia, South America, often works U.S. Novices on the 40 meter and 15 meter Novice bands. He transmits and receives on a Swan-500, s.s.b./c.w. transceiver in conjunction with a home-built, 4-element vertical antenna and puts a good signal into the "States." Call WA6TLJ on or slightly lower than his frequency on 40 meters and on or slightly higher than his frequency on 15 meters. You do not have to include the "/HK6" when you call. Mail your QSL card direct . . . Gene Molter, WN2MKB, 170 Biltmore Dr., Irondequoit, N.Y. 14617, "wasted" a year of his Novice license getting his station together. His FLDX-400 transmitter and Hammarlund HQ-215 receiver, plus a Hustler 4-BTV vertical antenna, are now working fine. Gene says that 15 meters can't be beat when conditions are "right," but 40 meters has its moments, too. His best contact has been a half-hour chat with Utah. He highly appreciates the friendliness, understanding, and patience of the General Class operators who come into the Novice bands to work Novices.

Now is the time to mail us a letter telling us of your thrills, chills, and even disappointments as a Novice. Include a sharp picture of you and your station and details of what you are using and whom you have worked. Black and white pictures are preferred but good color pictures can be used. Send all information to address at the front of the column. 73, Herb, W9EGQ

CQ Country Chart
A two color, wall-sized country chart is available on poster stock and in large type for only $1.25 per copy postpaid. Address request to: CQ DX Country Chart, CQ Magazine, 14 Vanderventer Ave., Port Washington, N. Y. 11050.

QRP

LOW-LOW POWER OPERATING

BY ADRIAN WEISS,* K8EEG/Ø

LET us turn to the subject of front-end selectivity in our continuing discussion of how to obtain optimum performance from this type of receiver. The most common problem encountered by those who have built or used the direct conversion receiver is termed "cross-modulation." This is a condition in which strong signals far removed from the operating frequency feed through to the mixer stage and appear in the audio output along with the desired signal. The cross-modulating signal is not affected by tuning the receiver to a different frequency, and sounds like a constant background program superimposed upon desired signals. Usually local b.c. stations or megawatt shortwave stations are the source of the interference. Actually, the problem can be traced to deficiencies in the receiver itself.

For some inexplicable reason, both commercial and home-builders alike appear to exert little effort to insure that their receivers exhibit sufficient front-end selectivity, and hence, the cross-modulation problem arises. Perhaps it is because of the apparent simplicity of this type of receiver, or the desire to save a few extra cents on production line costs of items such as the HW-7, which is notorious for this problem. Actually, the proper application of a few basic principles governing front-end selectivity will clear up the problem.

Front-End Selectivity

The direct conversion type receiver is no different than the superhet or other types when it comes to obtaining good front-end selectivity, and the same principles apply in all cases. The objective of front-end design and construction is to insure that one, and only one, signal path from antenna to mixer stage occurs. Hence, that section of the receiver between the antenna and mixer is the most important with respect to receiver performance. For it is in this section that the initial process of discriminating between wanted and unwanted signals must take place effectively. A few basic principles apply here.

1. For effective discrimination between wanted and unwanted signals, there must be only one signal path from antenna to mixer.

2. That signal path must include highly selective (high Q) tuned circuits which pass only signals in and very near the desired operating frequency while shunting all other signals to ground. The tuned circuit usually consists of a coil-capacitance combination. Only one L/C ratio will provide optimum performance at a given frequency. Hence, maximum selectivity will be obtained when a separate coil-capacitor tank is used for each design frequency segment. While it is possible to parallel a 1000 pf variable with a single coil and cover the 80-10 meter range in a front-end setup, it is unwise and will result in uneven receiver performance across that range. Taking the frequency characteristics of the device used in the mixer into consideration, performance on each band should be roughly equal if optimum L/C ratios are achieved for each band.

3. The degree of selectivity achieved is directly proportional to the Q factor of each of the tuned circuits constituting the front-end, and to the number of such tuned circuits placed in the signal path from antenna to mixer.

4. The amount of signal passed to the mixer should be just above the minimum level necessary for proper operation of the mixer device. The same applies to the signal level at each of the tuned circuits. This will avoid desensitization and degradation of selectivity which occurs because of signal overloading.

With these principles in mind, let us examine some of the common mistakes which result in cross-modulation difficulties.

Shielding

Those signals which appear as cross-modulation interference are present on any antenna, regardless of whether it is cut to the frequency of that signal or not. Thus, they appear also at the receiver antenna input jack or connector. It is necessary to stop them at that point. The solid-state devices used typically in the direct conversion mixer stage are extremely sensitive, so much so that a quarter-inch lead actually can function as a superminiature antenna, picking up signals independent of the actual external antenna.

Proper shielding precautions are therefore of great importance. First off, the receiver should be housed in a metal enclosure — otherwise powerful r.f. fields from a local bc station are sure to be picked up by the mixer device wiring. Next, any leads which go from the antenna jack to other points in the receiver should be shielded coax—the miniature RG-174U is perfect for this application. The importance of this precaution was brought home during this writer's early experimentations with a homebrew direct conversion receiver. This particular receiver included v.f.o., mixer, audio filter, and audio output stages on a single 2 1/1" x 3" p.c. board, with two pairs of toroidal inductors for 40 and 20 meters. It was a small package indeed. The p.c. board

*213 Forest Ave., Vermillion, SD 57069

parts for antenna input were removed from the mixer input by hardly more than ⅜", and cross-modulation could not be eliminated from megawatt shortwave stations during peak evening hours, regardless of what was tried. However, as soon as the input tank was removed from the p.c. board, the problem stopped.

At times it is desirable to switch between input tanks for multiband operation, with the bandswitch located on the front panel, as was the case with another receiver built by this writer. Again, failure to adequately isolate mixer from antenna input resulted in cross-modulation, which was eliminated by installing shielded coax leads and grounding the shield at both ends. In this case, the unshielded antenna leads were at least 1½" from the mixer—the cross-modulating signal was strong enough to influence the mixer from that distance. Likewise, care must be taken to isolate the typical R.F. GAIN CONTROL—a potentiometer inserted between antenna input and the first tuned circuit. This is especially true if a wirewound type pot is used—a perfect miniature helical antenna! The best practice is to mount the pot right at the antenna input jack, and use an extension shaft to bring the controls out to the front panel. Or use shielded coax for the lead wire. One can get away with mounting the pot on the front panel if shielding precautions are taken—each case will have its own requirements.

In our next installment of this discussion, we will turn to the actual manner of hooking the antenna to the input tuned circuit.

News And Views

Let's round out this month's column with a report from Sandy, W2GRR.

"DX has always been my first love, but lately it has become increasingly boring to me due to the ease with which I can work anything on the band. I have a good DX location (Scotch Plains, N.J.) and a four element beam with loads of r.f. to feed to it. When a real goodie pops up I'm usually one of the first to snag it. The sport of DX'ing had really vanished for me, but QRPp operation has renewed the thrill for me of making routine DX QSO's. I approached QRPp operation with much scepticism. I figured that with poor sunspot activity and characters like myself to compete with, I would be lucky to work a VE! My first try at QRPp was about a week ago, and I couldn't believe the rseults. With my beam rotable from only North America through east (due to a broken seal in my rotator), I wroked 23 countries on five continents in my first three hours of operation! I even got off to a good start on my QRPp WAS in that Hawaii was the first state that I worked. This all was done with five watts output. One UP2 gave me a 589, and when I told him I was running only five watts, he replied, "I can hardly believe that you are only running that much power." As I was finishing with him, another UP2 called me and also gave me a 589. Then a G called me and also gave me a 589. He said that I was one of the strongest W's coming in at the time. I still can't believe what five watts can do. Can you imagine how great amateur radio would be if we were all QRPp? Besides the KM6, my longest DX haul was a UKØ that first day—he gave me a 559. My second day on the air I ran off seven new countries to bring my two days total up to 30 countries! One thing that I can hardly believe myself was that on that first day I snagged an LU1 station with my beam pointed to the northeast! He gave me a 599. I take the report with a grain of salt, but just getting through to him off the side of the beam was incredible. Well, Ade, as you can see by the above, I am hooked on QRPp. As soon as my rotator is fixed I plan to really start rolling. Shine up one of those DXCC trophies and I'll see you on the bands."

Sounds like Sandy had a really fabulous time, judging from his letter. Anyone want to venture a guess on what he means by "really rolling?" At any rate, I was on during the same DX contest and ended up with about 65 QSO's in 34 countries. The real thrill came when a pipeline opened to Europe and I actually worked 23 Europeans in 50 minutes! Doesn't happen like that very often. Hope to work many of you during Field Day, which is just around the corner.

73, Ade, K8EEG

MATH'S NOTES

BY IRWIN MATH,* WA2NDM

SINCE we have been somewhat delinquent in past months, we would like to catch up on the various new semiconductor devices recently announced.

From National Semiconductor, 2900 Semiconductor Drive, Santa Clara, California, comes news of their new LM395. This device, which looks like a power transistor is actually a PNP transistor driving an NPN darlington with an overall gain of 1,000,000! This means that base currents on the order of microamperes will control collector currents up to the 2 ampere maximum output level. Additional components within the package are said to make this "transistor" blowout proof. Current limiting circuitry and thermal sensing circuitry will cut off the output stage if either 2 amperes is exceeded or the device heats up above 165°. The only way to damage the unit is by exceeding the 40 volt maximum voltage specification. Even if this is done, the device fails as an open circuit, protecting succeeding stages. Speed of the device is said to be ½ microsecond and as a result is should be great for power upply pass transistor elements, lamp drivers, motor and relay control elements, modulators and audio amplifiers. Price is $4.95 each in 100 quantities, quite inexpensive when you realize that it will not blow out.

RCA has announced a new low power COS/MOS device that, although it is somewhat expensive (around $15 in 100 quantities) does quite a lot for the money. The CD4059AD is a 4 decade completely programmable divide—by — N counter that can be switched to divide by any number from 3 to 15,999. This device, supplied in a 24 pin DIP package would make a dandy synthesizer component for a phase locked loop or frequency divider chain. It will drive TTL logic directly and will operate properly with a power supply input of 3 to 15 volts.

Another interesting low power COS/MOS chip from RCA is their 16 pin DIP TA6179W. This $15 (100-999) chip is a 14 stage counter that will work at voltage as low as 1.1 volt (*get out the old D cells*) and can be used in low power counters, dividers, sequence generators and the like.

Getting down to more reasonable price levels for amateurs and experimenters is a new linear stereo multiplex decoder from RCA. This device, the CA3090AQ which will directly replace the popular CA3090Q requires only one inductor (one adjustment for complete alignment) and provides complete automatic stereo switching, drive for a stereo indicator lamp of up to 100 milliamperes, distortion of less than .5% and complete enable/defeat provisions. Price in 1-99 lots is $4.95 and 100 pieces will cost $3.30 each.

V.h.f. amplifier builders, like the 2 meter f.m. boys who have to have more and more solid state power, would do well to write to Communications Transistor Corporation, 301 Industrial Way, San Carlos, California 94070 for their *RF Power Transistor Guide* and price list. Included in this small brochure are 42 r.f. power transistors that can be used in building all types of "bricks, blocks, etc." in output wattages as high as 100 watts at 175 mHz, 50 watts at 470 mHz or 150 watts at 50 mHz for a single transistor.

Push-Pull or parallel operation can of course double, triple or quadruple output power.

Prices for each of the transistors is given and are quite reasonable. All devices incidently will operate with infinite u.s.w.r. Two typical prices are: The B40-12; 10 watts in at 147 mHz and 44 watts output (at 12.6 volts) for $23 in single quantity and: the CM25-12; 7 watts in at 420 mHz with 30 watts output (at 12.6 volts) for only $31.00 in single quantity. Remember though, you have to build the amplifier. In conclusion, we would like to present our new 1974 updated semiconductor manufacturers address list for all of our readers who have written asking for sources of data. All of these will, I am certain, be glad to furnish data sheets and or application information for any of their devices that you may have or be interested in. If we have left out any other suppliers that you might need, please write and I will include those addresses in a future column.

Amprex Electronics, Solid State Division, Providence Pike, Slatersville, Rhode Island 02876 (401) 762-9000.

Crystalonics, 147 Sherman Street, Cambridge, Mass. 02140 (617) 491-1670.

Delco Electronics, General Motors Corp. Dept. 5146—700 East Firmin St. Kokomo, Indiana 46901 (317) 459-2175.

ECC Corporation—1011 Pamela Drive, Euless, Texas 76039.

Fairchild Semiconductor—464 Ellis Street, Mountain View, California 94040 (415) 962-5011.

General Electric—7 Electronic Park, Syracuse, N.Y. 13201 (315) 456-2357.

International Rectifier, Semiconductor Division, 233 Kansas Street, El Segundo, California 90245 (213) 678- 6281.

[*Continued on page 74*]

*5 Melville Lane, Great Neck, N.Y. 10023.

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

*May 31-	June 3	CHC/FHC/HTH QSO Party
*June	2	Minnesota QSO Party
June	1-8	Six Meter QSO Party
June	8-9	RSGB Field Day
June	8-9	ARRL VHF QSO Party
*June	9-15	Mass. Amateur Radio Week
June	15-16	All Asian Phone Contest
June	22-23	ARRL Field Day
July	6-7	Venezuelan Contest
July	20-21	Space Net VHF Contest
July	20-21	Colombian Contest
July	27-29	County Hunters C.W. Party
Aug.	3-5	Kentucky QSO Party
Aug.	10-11	Argentina Phone Contest
Aug.	10-11	European C.W. Contest
Aug.	24-25	All Asian C.W. Contest
Sept.	7-8	ARRL VHF QSO Party
Sept.	14-15	European Phone Contest
Sept.	14-15	SAC C.W. Contest
Sept.	21-22	SAC Phone Contest
Oct.	5-6	VK/ZL/Oceania Phone
Oct.	12-13	VK/ZL/Oceania C.W.
Oct.	12-13	RSGB 21/28 mHz Phone
Oct.	19-20	Manitoba QSO Party
Oct.	19-20	RSGB 7 mHz C.W. Contest
Oct.	**26-27**	**CQ WW DX Phone Contest**
Nov.	2-3	RSGB 7 mHz Phone Contest
Nov.	**23-24**	**CQ WW DX C.W. Contest**

*Details in last month's Calendar.

Six Meter QSO Party

Starts: 0000 GMT Saturday, June 1

Ends: 2359 GMT Saturday, June 8

The New Jersey Chapter of the National Awards Hunters Club has been active for 5 years. This is their 1st QSO Party.

Exchange: RS(T), ARRL section, state and if NAHC member, regardless of chapter.

Scoring: One point for QSOs with stations in own section, 2 points if with other sections, 3 points if with a station outside the United States. (KH6 and KL7 considered DX).

Multiply total QSO points by ARRL sections plus total NAHC members worked.

Use any authorized mode but no repeaters.

Awards: Certificates to the top scoring stations in each ARRL section.

Mail logs by July 31st to: NAHC Contest, c/o Vince Del Giudice, P.O. Box 91, Franklin Lakes, N.J. 07417. Results will be published in the Club's October Newsletter.

*14 Sherwood Road, Stamford, Conn. 06905.

RSGB National Field Day

Starts: 1700 GMT Saturday, June 8

Ends: 1700 GMT Sunday, June 9

While stations outside Great Britian are not eligible to enter this activity on a competitive basis check logs are welcome. A certificate will be awarded to the overseas station in each continent whose logs shows that he contributed the most contacts to the competitors.

Send your check logs to: RSGB HF Contest Committee, c/o D. Thom, G3NKS, 20 Bramble Close, Copthorne, Sussex, RH10 3QB, England.

ARRL Field Day

Starts: 1800 GMT Saturday, June 22

Ends: 2100 GMT Sunday, June 23

Here's one Field Day you can really get involved in. This one stirs up a lot of stateside activity and probably involves more man power than any other activity in the country.

The May issue of *QST* gave all the details. Additional information can be secured from ARRL Headquarters, 225 Main Street, Newington, Conn. 06111.

All Asian DX Contest

Phone: June 15-16 C.W.: August 24-25

Starts: 1000 GMT Saturday.

Ends: 1600 GMT Sunday.

This is the 15th year the JARL has sponsored this contest and this year a Phone section has been added for the first time. The exchange is between Asians and the rest of the world, on all bands 1.8 thru 28 mHz.

Classifications: Single operator, single band and all band. Multi-operator, single transmitter, all band only. (No multi transmitter).

Exchange: For OM stations, RS(T) plus age of operator. For YL's, RS(T) plus OO.

Scoring: One point per QSO. Asians use non-Asian countries for their multiplier. (ARRL DXCC list). Non-Asians will use prefix of Asian countries. (*CQ* WPX list). Note: Ogasawara JD1 (Bonin & Volcano) are in Asia. Minamitor Shima JD1 (Marcus) is in Oceania.

Final Score: The sum of QSO points from each band × the sum of the multiplier on each band.

Contest Results
1973 All Asian

No. America			K4RDU	14	9
K6AHV	**A**	**61,171**	**WA6LHN**	**7**	**14,222**
W6PAA	A	57,620	K6DC	7	8,892
K6UA	A	54,747	**W6CUF**	**3.5**	**2,583**
W7SFA	**A**	**54,444**	K6ERT	3.5	2,540
W6PLH	A	37,224	W7YTN	3.5	720
W5WZQ	**A**	**28,908**	K5PFL	3.5	364
W6OVO	A	4,158	**W7DL/7**	**1.9**	**30**
W1ZM	**A**	**3,007**	**VE7WJ**	**A**	**38,340**
WB6PUU	A	1,220	**VE7AZT**	**7**	**756**
W6RQZ	A	510	**Multi-Operator**		
K6EBB	**21**	**1**	**W6BIP**		**30,810**
K6SDR	**14**	**15,990**	WB6ZUO		29,512
W6HQN/6	14	14,432	K6AA/6		28,665
K6ZM	14	11,388	W6OKK		28,356
VE7AUA/W6	14	6,464	**So. America**		
W3WJD	14	5,808	**LU5HFI**	**A**	**76,986**
W9LVT/6	14	3,750	LU5BB	A	20,636
WA6AHF	14	2,550	LU6EF	A	1,323
W1ARR	14	2,368	**LU3DSI**	**21**	**627**
K3YUA	14	2,145	**LU6FA**	**14**	**3,534**
WA1ABW/6	14	1,944	**LU8BAO**	**7**	**800**
WA7NUH	14	1,408	**LU2ECO**	**3.5**	**30**
W4WSF	14	320	**PY1EMM**	**21**	**42**
W4ORT	14	242	**PY7APS**	**14**	**462**

Awards: To the highest scorer, both phone and c.w. as follows: Single operator, all band. Certificate and medal in each continent. Certificates in each country and each USA call area. Additional certificates up to the fifth rank where returns justify. There are also certificates on each band in each country, and medals for the top multi-operator station in each continent.

Logs: Keep all times in GMT, fill in country or prefix column *only* first time it is worked, and use a separate sheet on each band. A summary sheet is a must, showing the scoring and other information, and a signed declaration that all rules and regulations have been observed.

Disqualification: Violation of the regulations in the country of the contestant, or the rules of the contest, or unsportsmanship conduct, or taking credit for incorrect QSO's or multipliers, or duplicate contacts in excess of 2% of the total made on the same band, will be deemed cause for disqualification.

Things to remember: Non-Asian stations use country prefixes for their multiplier. Multi-operator stations are restricted to single transmitter operation. Contacts on different bands in the same time period are prohibited. (Club stations are considered as multi-operator). Each operator of a multi station gives his age in the exchange. And KA contacts do not count.

Logs must be *received* no later than Sept. 30th for the phone contest and Nov. 30th for the c.w. Logs go to: J.A.R.L. Contest Committee, Central Post Office, Box 377, Tokyo, Japan.

Country List of Asia:

A4X, A51, A6/MP4D, A7, AC3, AC4, AP, BV, BY, CR9, EP, HL/HM, HS, HZ/7Z, JA/JE/JF/JG/JH/JR, JD1 (Ogasawara), JT, JY, MP4B, OD5, S21, TA, UA/UK/UV/UW9-Ø, UD6/UK6C-D-K, UF6/UK6F-O-Q-V, UG6/UK6G, UH8/UK8H, UI8/UK8I, UJ8/UK8J-R, UL7/UK7, UM8/UK8M-N, VS6, VS9M/8Q6, VU, VU (Laccadive), VU (Andaman), XU, XV/3W8, XW8, XZ, YA, YI, YK, ZC4/5B4, IS9 (Spratly), 4S7, 4W, 4X/4Z, 7Ø, 7Ø/VS9K (Kamaran), 8Z4, 9K2, 9M2 (West Malaysia), 9N1, 9V1.

Space Net VHF Contest

Starts: 6:00 P.M. Saturday, July 20
Ends: 6:00 P.M. Sunday, July 21
(Local Time)

This event marks the 5th Anniversary of the Apollo #11 space flight. Rules are the same as previous Space Net contests with an additional special bonus for contacts made during the actual time period the Apollo 11 astronauts walked on the moon. (10:56 P.M. July 20 to 1:15 A.M. July 21).

Use any of the v.h.f. bands, 50, 144, 220 and 432 mHz, but no repeaters.

Exchange: RS(T) and Zip Code number. Non-US use P.O. name.

Scoring: Two points per QSO on each band. Contacts made during the moon-walk period will be worth 10 points. Each different Zip Code or P.O. area worked counts one in your multiplier. (Counted only once). An additional 10 points may also be added to your multiplier.

Final Score: (QSO points + bonus QSO points) × (Multiplier + 10). The same station may be worked on each band for QSO points but the multiplier is counted once only.

Awards: To 1st and 2nd place winners in three classes based on power used. 1-25, 25-100 and over 100 watts input. There are also awards for multi-operator stations, club and Novices. All stations submitting a log will receive an attractive certificate.

Logs must be postmarked no later than August 4th and go to: Space Net VHF Contest, Att: A. W. Slapkowski, WB2MTU, Box 909, Sicklerville, N.J. 08081.

Colombian Contest

Starts: 0001 GMT Saturday, July 20
Ends: 2359 GMT Sunday, July 21

This year's contest commemorates the 164th year of Columbia's Independence. Activity will be on a world wide basis.

All bands, 3.5 thru 28 mHz, both phone and c.w. And three classes, single operator, single and all band, multi-operator, single transmitter.

Exchange: RS(T) plus a 3 figure contact number starting with 001.

Scoring: QSO's with HK's, 5 points; with stations in the North American boundaries, 3 points; DX countries, 2 points; and with stations in the same country, 1 point.

Multiplier: Total of different DX countries worked on all bands.

Final Score: Sum of QSO points from each band multiplied by the sum of different countries worked on each band.

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Communication Technology Group

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1973 U.S.S.R. Contest

All Band

W3EZT	**43,680**
WA1NRV	**38,658**
W8CQN/2	**36,260**
W2FVS	9,156
W6PLH	7,502
W4KMS	1,080

14 mHz

W8QXQ	**13,430**
K#CMF/4	**7,452**
W8DSO	**6,760**
WB2AQC	6,510
W1RML	6,248
W4WSF	6,216
WB8EUN	6,003
WA2DLV	4,520
W3ARK	3,675
WA9JCO	2,380
W8TBZ	2,268
W2CKR	2,058
WA2AUB	1,092
W#MHK	804
W3OJS	767
WA2ZWH	748
W4JUK	570
W6KYA	510
K9VQK	459
K3CL	150
W#HAW/6	27

All Band

LU5HFI	**50,224**
TI2DX	2,744
KH6CF	**567**

14 mHz

YV5CKR	**6,930**
VO1KE	2,700
VE5RA	2,640
HP1AC	2,329

Multi-Opr.

WA5STI	**2,016**

Awards: A Silver Cup to the World Winner. Nine silver plaques, six to the continental winners and three for the top scoring station in each category. There are certificates for the winners in each country.

A minimum of 50 QSO's must be shown by all awards winners.

Use a separate sheet for each band, indicate the country multiplier only first time it is worked and include a summary sheet with scoring.

The usual rules of disqualification will be in force. Excessive duplicate contacts, incorrect QSOs or multipliers and rules violations.

Mailing deadline is September 30th to: L.C.R.A. Concurso Independencia, Apartado Postal 584, Bogota, Colombia.

County Hunters C.W. Contest

Starts: 0000 GMT Saturday, July 27
Ends: 0600 GMT Monday, July 29

The C.W. County Hunters Net encourages and invites mobile and portable operation from the less active counties during the contest.

The same station may be worked on each band for QSO points. Portable and mobiles changing counties may also have repeat QSOs. Stations on county lines exchange only one number but each county is counted as a multiplier.

Exchange: QSO no., category (F-fixed, P-portable, M-mobile) RST, state, province or country and county for US stations.

Scoring: QSO's with fixed stations 1 point, with portable or mobiles 3 points. Multiply total by number of U.S. counties worked.

Frequencies: 3575, 7055, 14070, 21070, 28070.

Awards: Certificates in three categories.

F-Top fixed or fixed portable in each state, province or country, 1000 or more points.

P-Top score in each state by a portable operating from a county other than its normal location, 1000 or more points.

M-Top scoring mobile in each state operating from 3 or more counties, with a minimum of 15 QSOs from each county.

There are Trophies for the Top single operator Portable and Mobile in the United States.

Stations with 100 or more QSO's *must* include a check sheet of counties worked.

Mailing deadline is Sept. 1st to: C.W. County Hunters Net, c/o Jeffrey P. Bechner, W9MSE, 64 North Pioneer Parkway, Fond de Lac, Wisc. 54935.

Editor's Notes

We hit another bad one in this year's WPX SSB Contest. Conditions were pretty horrible, an example of things to come. Don't expect any improvement for the next couple of years, contrary to some optimistic reports you may hear. We haven't touched bottom yet.

We finally received official announcement of this year's USSR Contest. Much too late to be used but the dates and times as published last month were OK.

73 for now, Frank, W1WY

1974 QCWA QSO Party
Top 25 out of 207 Entries

W3IN	**398**	**21,094**	W9BX	177	7,788
W6FQ	340	17,680	K4QW	203	7,511
W4WKQ	321	14,124	W7JSE	176	7,392
W4NH	303	13,938	W0KH	170	7,310
W2QL	257	12,079	W9IB	160	7,040
W7AYO	223	10,258	K4ET	154	6,776
W9LNQ	230	10,120	W3FSP	154	6,468
W9CLO	223	9,812	W8GP	149	6,407
W9CAS	220	9,680	KV4AB	171	6,327
W9CV	205	8,610	W9EN	150	6,150
K4NE	194	8,342	W1HV	149	6,109
K2DW	197	8,077	K4TM	150	6,000
K2HA	183	7,869			

The second number indicates the number of members contacted. W3IN now has two legs on the National Plaque. A third win will retire it.

THE awards PROGRAM

BY ED HOPPER,* W2GT

USA-CA HONOR ROLL

2500		1500		1000	
K2LFG	170	K7LTV	240	W2MEI	322
K7LTV	171	W2MEI	241	K7LTV	323
K7VSE	172			500	
2000				G2WQ	992
K7LTV	198			W2MEI	993

The "Story of The Month" for June, as told by Ted, is:

Ted W. Midlam, Sr. K7SQD/W7DSJ, ex K8GKF.

(*All Counties #107, 8-14-73*)

"I am 62 years old and was born in Dayton, Ohio, and spent 52 years there, but now I don't know how or why.

"County Hunting began for me in 1958 trying for all Ohio counties. But before I could reach that goal, *CQ* magazine came out with their USA-CA Program and I got USA-CA-500-AWARD #53, dated 1-29-62, endorsed All A-1, All 7, and All 14.

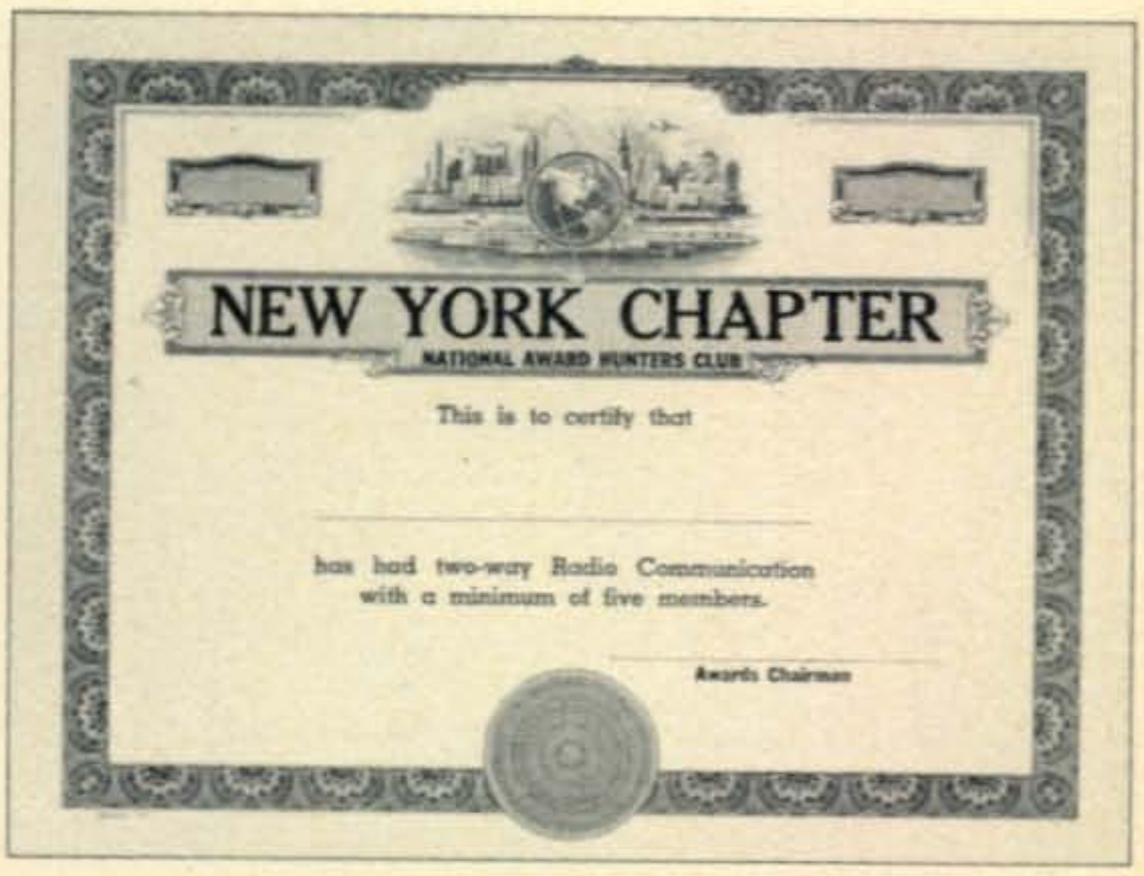
"The move to Utah was made in April of 1962 and while trying to earn a living, I had to curtail hamming and County Hunting except on Sunday afternoon. The CH net was the hang out and even being the only active CHer in Utah, I got very few new counties, but on January 13, 1965 I did qualify for USA-CA-1000-#63, All A-1, All 14 and the first 1000 to a Utah station.

"It took another four and one half years before the 1500 mark was reached and it would have taken much longer had I not run into a bunch of swell guys and gals around 14.3 plus. I was listening up on that part of the band one day and I almost went nuts at all the counties that were being given out by a mobile operator, and almost all of them I needed. I was a little scared about putting a c.w. signal on that part of the band, but those new counties made me a real dare devil. I waited until there were no more takers for the county in Montana, then gave W6LWM/M7 a call, setting on the edge of my chair. I guess I must have shown my excitement, some how, but any way Bill came back to me with a 499 like the c.w. signal was something new up there. I gave him a 5-7, just like I had been working one all my life.

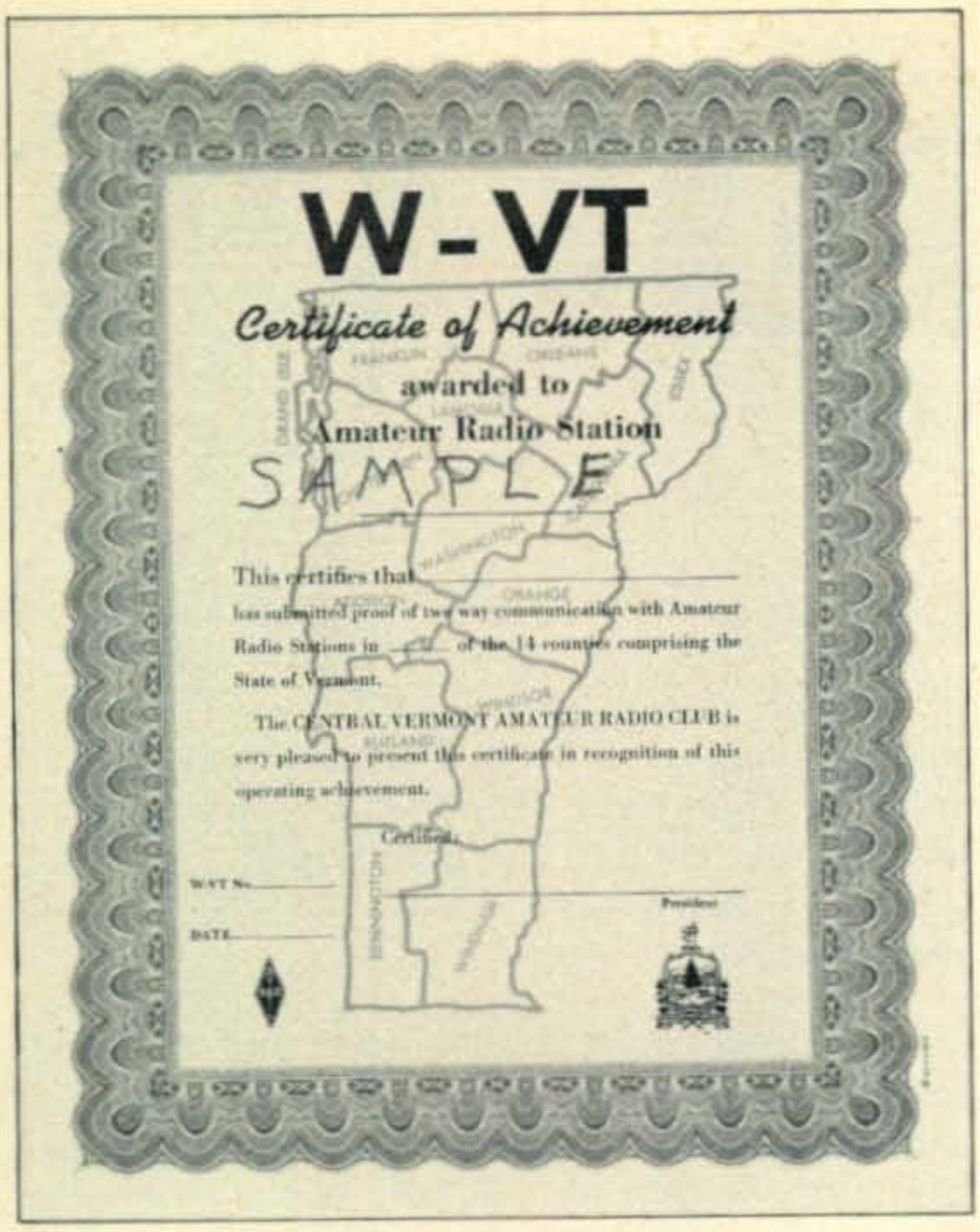
"That was the turning point in my County Hunting activities, although I still operate c.w., I listen on that mobile net continuously. And before I go any farther with this, I want to say that without the help of this swell bunch of guys and gals, I would still be looking for 3079. (Now

*P.O. Box 73, Rochelle Park, N.J. 07662.

Ted Midlam, K7SQD and that beautiful USA-CA that I issued.



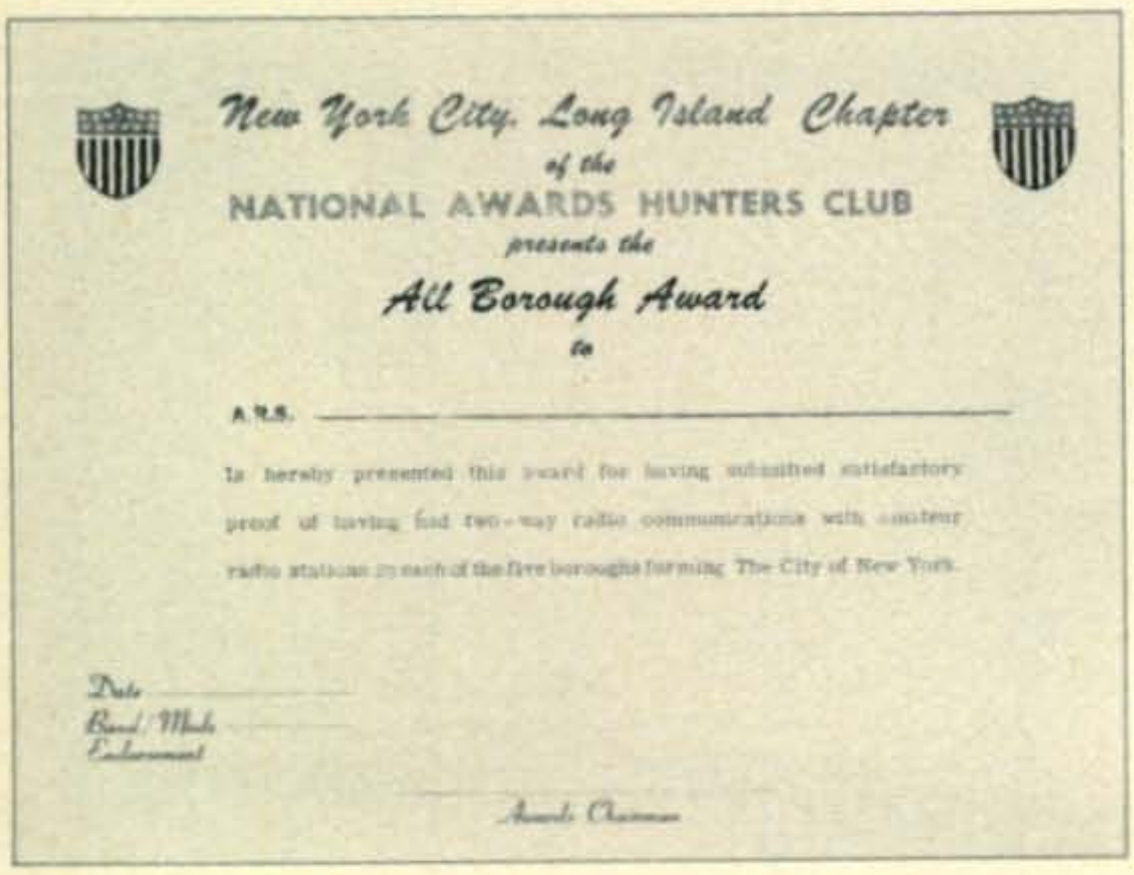
Worked N.Y. Chapter NAHC Members.



Worked Vermont.

3076). I have had the pleasure of meeting several when they have come thru the unexplored section of Southeastern Utah, and even had the privilege to help one who had difficulty with a trailer in some rough country. Some day I will be able to make one of the get-togethers out here in the wide open spaces. They are all a great bunch.

"The 2000 mark was achieved, #104 All A-1, in just 6 months and 2500 just 5 months and ten days later, #90. After that 2500 mark, the counties seemed to come slower, but even I could figure that with the coming of the super hi-ways, no one had to zig-zag thru a state anymore, so those counties off the beaten path became the rare ones.



Worked All N.Y. Boroughs.

"I finally got down to 12, then 5, then 3 and stayed there for quite some time. Meanwhile I kept listening and hoping some one would make a trip. Even with the gas shortage, I never gave up hope. I started looking thru the callbook for possible fixed stations in Camas county, Idaho, Chouteau and Wheatland counties in Montana. I wrote to a fellow in Harlowtown, but I picked the one ham who had lost his gear in transit and was off the air. About that time Fr. Terry showed up in Camas and his K6HZI/7 sure sounded good and thus ony 2 to go. Another letter went off, this time to Ft. Benton in Chouteau county, but again no luck because although I could read him, he could not hear me.

"On July 23rd I heard WØOXN mobile in Gallatin, Montana, with help from Karl, WA6MAR, NC, Peter, WØOXN was persuaded to go to Wheatland. So I sweat out the hour and a half drive, wondering what would go wrong, like the rig blowing up, or the band going dead, I just knew something would go haywire. But lo and behold in the alloted time I faintly heard Peter, but he was not able to hear me—but he did go to 40 for me and we made it ok with him 5-7 and me 579. As I hung around 40, even Peter went back to 20, I became very lucky, the band was silent for a few seconds and then, there was WA7UWC, portable 7 in Chouteau county, checking in. I honestly did not believe it because he was so loud, then I realized we were on 40 and he was my last county! George gave me 579 and he was 5-9, it was quite a shock, and it went so fast, I don't believe anyone heard us, but that was the one I had been looking for, for 13 years.

"My sincere thanks to all the mobiles and Net control stations who relayed my c.w. signal to the mobiles. Some day when I can afford a s.s.b. rig, I promise that no one will have to beg for a net control, I just wish I could do it on c.w.

Yes, I received All Counties #107, All A-1, 1st to Utah, All QRP." (*Note All A-1, is NOT to be confused with two-way A-1, but Ted is the first to make it All A-1*).

Awards Issued

Manuel Greco, K2LFG keeps at it and made USA-CA-2500.

Ronald Conley, K7LTV, new address 37 Wyoming Ave., Billings, Montana 59102, was issued USA-CA-2500; 2000; 1500; and 1000.

Vic Seeberger, W7VSE also got USA-CA-2500 and raised his endorsement for his USA-CA-1500 to All S.S.B.

"Steady" Lidell, W2MEI got busy and applied for USA-CA-1500, 1000 and 500. All these endorsed All A-1.

Archie Brown, G2WQ acquired USA-CA-500 endorsed All A-1.

Awards

Worked Vermont: This certificate of achievement is sponsored by the Central Vermont Amateur Radio Club of Montpelier. It will be awarded to any amateur submitting QSLs from 13 or 14 counties in Vermont showing two way communication with his station. A certified list of contacts will be accepted in lieu of the QSLs. This should be signed by a club official or a local amateur, indicating that he has seen the cards and that they are valid as claimed. Mobile and portable stations worked in Vermont are valid contacts, but should show the name of the town within the county for which credit is claimed. All contacts should be made from within a 25 mile radius of your present QTH. Send cards with return postage or list to: Ray N. Flood, W1FPS, W-VT Custodian, 2 Marlboro Ave., Brattleboro, Vermont 05301.

The *New York Chapter* of the *National Awards Hunters Club International Inc.*, offer the following *Four Awards*:

Worked All (N.Y.) Boroughs Award: Stations less than 25 miles from New York City must work 12 statiins in the following proportions: 2-Bronx; 3-Brooklyn; 2-Manhattan; 3-Queens; 2-Staten Island.

Stations over 25 miles from New York City must work 5 stations in the following proportions: 1 (one) in Bronx, Brooklyn, Manhattan, Queens and Staten Island. All band and mode endorsements offered.

New York County Award: This Award is issued in 5 classes. Free gold seal endorsement for each class. Class 5-5 Counties; Class 4-15 Counties; Class 3-30 Counties; Class 2-45 Counties; Class 1-All 62 Counties. All band and mode endorsements offered.

Worked All Members Award: Basic Award for working 5 members. Free gold seals for 15, 25, 50, 100. All band and mode endorsements offered.

Net Sign-In Certificate: Basic award for 25 sign-ins with free seals for 50, 75, 100, 125, and 150. All band endorsements.

Stations over 25 miles may sign-in via telephone or QSL. Only 1 sign-in is required. Fee for *this* award is 40¢ in stamps.

Note: Fee for all of the other Awards is $1.00 plus GCR. Apply for Awards (or any information on their Awards Program) to : Arthur Altarac, WA2KXE, 162 West Hudson Street, Long Beach, N.Y. 11561.

Certificate Of Accomplishment — UHF-VHF: This Award is offered by the Dutchess County VHF Society to any station that contacts either the club station WB2FKJ or any member station on two bands 220 mHz and above. WB2FKJ is active during both the June and September ARRL V.H.F. contests and will be glad to look for stations on these higher bands, if a request is made on 50 mHz of 144 mHz. WB2FKJ always operates from Dutchess County in the Mid Hudson Valley. Any requests for schedules at other times, and requests for the Award should be addressed to: Robert S. Grant, W2LWI, Scty. of DCVHFS, Myers Corners Road, R. D. #3, Wappingers Falls, N.Y. 12590.


UHF VHF

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DUTCHESS COUNTY VHF SOCIETY

WB2FKJ

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FREQUENCIES _____ _____ _____

CONTEST MGR _____ PRESIDENT _____

Dutchess County (N.Y.) VHF Society WB2FKJ Award.

Notes

By the time you read this, hope you all have your reservations for the KC 1974 Convention. . . . also that you remember to send in your Annual County Hunter SSB Contest logs to, Jim, KØARS.

Also remember the 1974 CW County Con-


NATIONAL AWARDS HUNTERS CLUB

New York State Chapter

NAHC NY Chapter Sign-In Award.

test 0000 GMT 27 July to 0600 GMT 29 July-logs go to Jeff, W9MSE, for full details see CONTEST CALENDAR by Frank Anzalone, W1WY.

In a nice letter from Duane, K2PFC from Congress, Arizona, he has information to the effect that the County of Apache, Arizona will soon be divided. More data later.

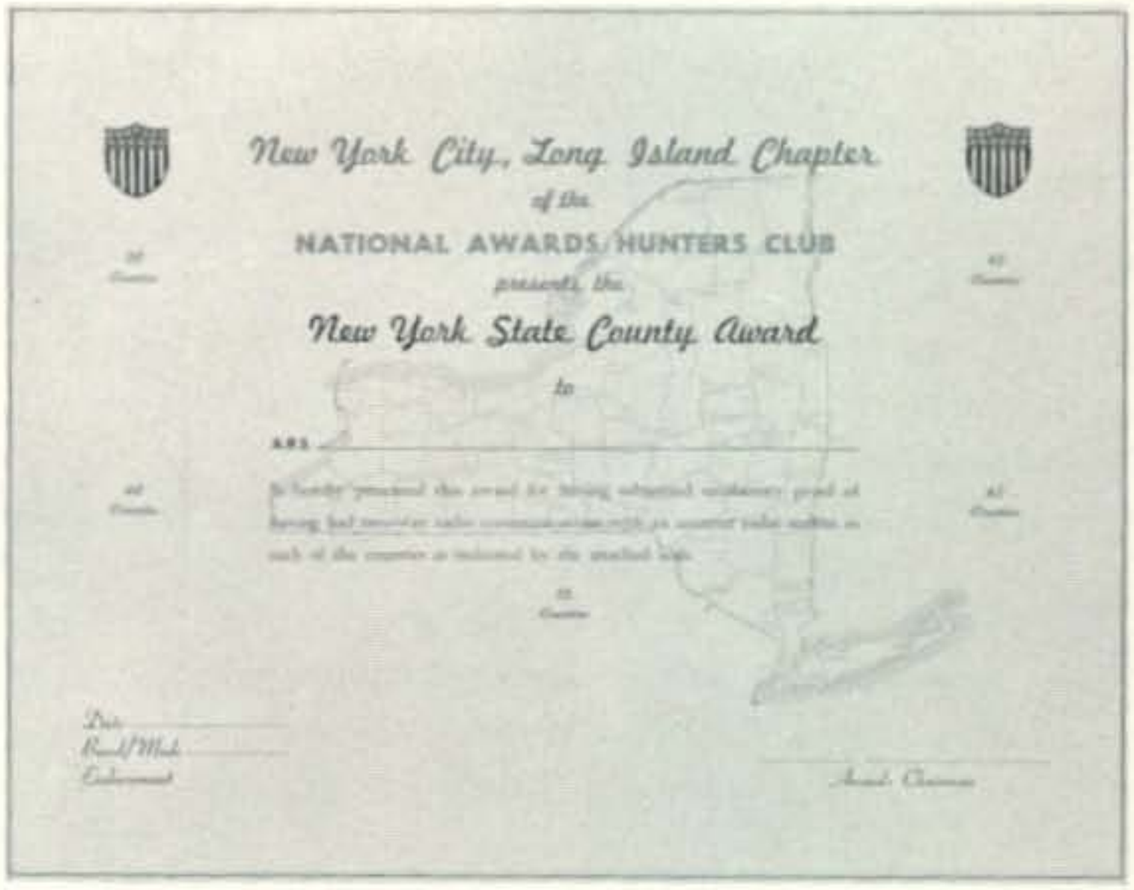
Note to Virginia County Hunters: Charlie Lambert, WA4EPH, 6300 Binns Ave., Richmond, VA. 23225, is trying hard to compile a list of active County Hunters in Virginia and perhaps form a loosely organized Society—no dues, etc., but a help to others needing Virginia Counties. Write Charlie for information, etc...

Tab Books have a new 1974 catalog of their technical books and their projects—write for a free copy to: Tab Books, Blue Ridge Summit, PA. 17214.

I'm still looking for data/fotos (if possible) from a great number of you County Hunters, come on, kick in.

How was your month? 73, Ed., W2GT.

25 All Counties Winners at KC '73 Convention. They are: First row, WAØEVO, WB4WDY (WA5AEB), W7OK, WB6EXT, WA4LSU, W9UZC (TG9UZ), K8IQB, K2PFC, WAØDCQ. Second row, K8KOM, K3LXN, W3JZY, K4ISE, K8DCR, WAØGZA, K9DCJ. Third row, WØBL, WB4FBS, WØSJE, W4IZR, W9DRL, K5KDG, W8UOQ, WA4ULL, WAØWOB. (There are now 116).



New York State County Award.

SURPLUS sidelights

BY GORDON ELIOT WHITE*

A NUMBER of readers of this column have written to ask that I deal with the Teletype stunt box, which is a great mystery to the uninitiated. Since RTTY is almost entirely dependent upon surplus machines, I think it fits into the realm of the surplus column, so here goes.

First, by definition, any teleprinter, and even most tape printers, perform certain non-printing functions. The ordinary motions such as shifting from letters to figures, carriage return, line feed, etc., require mechanical operations in addition to, or in place of, printing. These are called "stunt" functions, although often the term is applied to operations other than those required in basic printing. In most machines, however, all non-printing functions are performed in the same basic way, i.e. in a "stunt box."

This is simply a device which "reads" the character received, and if it is a "stunt," performs the indicated function. All teleprinter devices do this with a series of bars which are coded, like keys to a lock, so that they will respond only to the proper character. When that character is "seen" by the bar, it drops into a notch, allowing its mechanical function to take place. Like the old Rube Goldberg contraptions, the pawl falls into the notch allowing the wheel to turn thus driving the lever which drives the pawls which turn the platen which feeds the paper, or whatever.

On the early teleprinters, only the necessary functions were coded into the machine, and there was no practical provision for doing anything else, such as closing a switch or ringing a bell or "recognizing" a call. Nowadays, almost all printers have some repertoire of "stunts." Since I am most familiar with the #28 machine, I will describe its operation, but those with other machines should realize that they have at least rudimentary "stunt boxes." The Model 15 has space for quite a few "stunts," but the thing is so hard to work on that virtually no one uses it.

The electronic printers, like the late Kleinschmidt 311's and that ilk, have stunts coded in, but they are a bit hard to change. Some may have straps which may be set by the operator, as in the Extel unit, but for the most part no one seems to be doing much with them beyond straight printing. The #32 and #33 Teletype machines have "stunt" provisions, but getting at them is so complex that you have to virtually dismantle the beasts—no job for the novice.

Kleinschmidt mechanical printers have certain stunt provisions, but they are not simple to work on either.

The #28 (and the #35, an 8-level machine) however use a well-designed, flexible, large and easily reworked stunt box which anyone ought to be able to take out and replace without any trouble at all and no risk of bollixing up his unit. It holds 42 stunt bars, a capacity which provides space for a great number of interesting stunts, and is in effect, a mechanical computer with both permanent and temporary memory storage.

The #28 stunt box is an aluminum rack filling the entire width of the printer between the frame plates. Each slot may hold a keyed bar, together with mechanisms for pressing the stunt bars against another series of coded bars inside the printer which move in response to the incoming signal.

Stunt bars located in the stunt box slots are selected when their tines match the pattern formed by the code bars, allowing the stunt bars to move forward, initiating the stunt desired.

The full sequence is this: A character is received by the selector magnets of the printer. The magnets trip transfer levers which set up the character in the code bars which run across the entire width of the printer, just below the typebox. The pattern in which the notches on the front of code bars are set—mark or space, depending upon whether they are moved to right or left—tells the printing mechanism what character to print. At the same time, notches on the back of the code bars provide a pattern which is "read" by the stunt bars. Both functions are done simultaneously, but independently.

There are five steps involved in the operation of the individual stunt bars, from the time they move forward until they are disengaged.

Obviously, the stunt bars must be coded, either by the manufacturer, or by the operator installing them. Teletype Corp. offers both types, pre-coded, for most functions such as "space," "Line Feed," etc. or as "universal" bars, with two rows of tines. After you decide what character you want the bar to respond to, you break off the unneeded tines to fit the pattern desired.

There are a couple of problems in trying to relate the coding to the usual mark-space patterns of the various characters: the code bars are not arranged in sequence from #1 through #5, and there are three extra code bars in the machine. The best thing to do is simply follow the diagram and not worry about how it got that way.

*1502 Stonewall Rd., Alexandria, Va. 22302

A word of caution: it is *very easy* to mess up a universal stunt bar (part number 153440) when coding, by breaking off a wrong tine. These cost $2.75 each, and have to be bought new of course. Be cautious and be sure before you start twisting with your needle-nose pliers.

Once the stunt bar is selected, it moves its associated function lever which operates a switch, with its top end, operates a slide in the machine, with its bottom end, or does something else with fingers which may be attached elsewhere along its anatomy.

A large selection of function levers are available.

The one thing which separates the #28/35 stunt box from all earlier stunt mechanisms is its ability to respond to a sequence of characters. For example, you can code the stunt box to turn on a light when it receives the last three letters of your call, say X, Y, Z.

The character X will operate the first stunt bar which will move a blocking arm to allow the next bar to move when Y is received, which will enable a third bar to operate on receipt of Z. Unless the characters are received in the proper sequence, nothing will happen. If your call is received, the Z bar will close a switch, turning on the light.

Another common "stunt" is print-non-print. A set of parts similar to the letters-figures shift mechanism can be used to shift the top code bar to the left. It will then operate a set of parts which will block the operation of the print hammer, thus preventing printing. The stunt box will continue to operate, and can be used to put the printer into "print" condition by shifting the suppression bar back to the right on receipt of another "control" character.

In Bell System operation, the code bar next to the bottom is used for select-non-select. By coding the stunt bars properly, the unit can be made to recognize a character *only* in select, or *only* in non-select.

You could code the stunt box to put the printer from "non-print" into "print" when your call was received, then go into "select" mode on receipt of, say, a net identification character, and turn on a tape printer when a third code was received.

When the printer was not in "select" the tape printer switch would not operate, in case its code was to be received by coincidence, in some unrelated message.

The bottom bar controls the letters or figures position of the print head. Obviously you can code stunt bars to operate or not depending whether the unit is in letters or figures mode.

I will continue on this subject next month.

Phantom Copying [*from page 24*]

by a large circle. "Do you follow me so far, kid?"

"Yes, I think so," he said, thoughtfully nibbling the nail of his little right finger, "but why can't I just copy it down the second I hear the letter?"

"Look . . . I don't pretend to know the psychology involved in this copying technique; it's a technique that works, and works real well; the all-time champ McElroy used that technique; I use it, and so do all QRQ operators, whether they realize it or not. The technique is simply the ability to copy behind, as I said before."

Harv searched the youngster's face, wishing he could come up with a more logical approach. "Look at it this way: when you're copying at your top speed, putting the letters down the instant you hear them, you quickly find yourself becoming overly tensed and jumpy. It's as though every fiber in your body were being used to accomplish that one main job: to recognize the letter being sent and to put it down on paper just as fast as you can, and then get ready for the next letter. With each letter your mental 'spring' becomes wound tighter and tighter, and eventually,

bonnng—you're finished: the human anatomy just can't work right under that kind of tension."

"Yes, I sure do get nervous when I'm copying my limit, especially when I start to miss a few here and there; but how will this copying behind help?"

Somewhat frustrated, Harv scratched the dandruff over his right ear: "Okay . . . look at it this way. As I'm talking right now, you could possibly miss a word, because of some distraction—the noise from a car—but you would automatically compensate for that missed word and instinctively 'fill-in' according to the general sense of the sentence. We do this sort of mental 'filling' all the time.

"Now the principal reason you were able to fill in was that you were able to hold the spoken words, including the space for the missed word, in your mind's eye, and then to instinctively fill-in the appropriate word according to the general sense of the sentence.

"With the copying-behind technique, we're doing pretty much the same thing—holding the most recently sent words and then, if necessary, filling-in the blanks according to the sense of the sentence. The first technique —talking and listening—we've done since childhood; the second technique—copying behind—is brand new and must be learned; that is, if you ever expect to become a real good c.w. man."

"You bet I do," said Ernie, nodding his head enthusiastically; "how do I go about learning this copying-behind technique; I want to learn it right away; how long does it take, Harv?"

"Hold it . . . steady, now," laughed Harv. "Explaining the technique is one thing; mastering it is another. But in general, it boils down to a steady regimen of practice, and more practice. Granted, some of us have a degree of natural talent that makes it easier —but most hams, if they apply themselves, can master it well enough to graduate in the QRQ class."

"How do I get started?"

"Okay . . . here's what you do: the very next time you're copying W1AW on paper, gradually reduce the up-and-down movement of your pencil until the writing begins to look like just so many wiggles. While you're making these little wiggles, of course, you're still copying the way you normally would, except that now your handwriting has become so sloppy that nobody could decipher it—except you. Although it looks like just so many wiggles, you're copying clean c.w. in your mind's eye, upstairs, here," he said, tapping his forehead with the stem of his pipe.

"Okay, I'm with you," said Ernie.

"Good. Next, you reduce the movement of the pencil still further so that the pencil is now just wiggling about a single spot on the paper; regardless of what the pencil is doing, you're still copying clean c.w. in your mind's eye . . . upstairs."

"Okay," said Ernie," pencil is just wiggling over the same spot on the paper, but I'm still copying . . . upstairs."

"Right. Now, once you've mastered that little trick, lay the pencil aside but continue to write as before, but now using only your index finger for a pencil. In other words, your copying stance is just as it was before, except now you're using just your index finger resting lightly upon a single spot on the paper. You'll feel your index finger twitching as you continue to copy in your mind's eye."

"Sure sounds weird, all right."

Harv smiled broadly, pleased that he had gotten through. "For your next practice phase, you alternate between regular writing-it-all out copying and this 'phantom' copying, as I like to call it—copying with just your index finger resting on that one spot. Practice one minute of regular copying and one minute of phantom; alternate between the two until you can do the changeover easily. It'll be a little tricky at first, but fun, too. But give it a fair try; after all, you didn't reach your present code speed overnight either."

The youngster nodded, "I can do it; I know I can."

"Good. I know you can, too. But I still haven't told you the best part."

"What's that, Harv?"

"While you're phantom copying, you'll feel yourself becoming more and more relaxed. Since you've rid yourself of all that manual labor of stringing a lot of letters across a paper, you're now able to concentrate more and more on 'seeing' those letters as they zip by your mind's eye. At first you'll be seeing only two or three letters; later, as you continue to practice, you'll begin to recognize short, familiar words—words like *The, here, there,* and so forth, plus all those familiar endings, like *ed, ing, able, ment.* You'll see while you're phantom writing that these familiar groups will pop right out at you."

"Gee," said Ernie, mouth open.

"And as you get still better at phantom

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copying, you'll begin to see in your mind's eye a whole word, then several words—without the slightest difficulty. You'll begin to copy and hold small phrases—you'll see the whole phrase right before you, and you'll find yourself filling in any missing letters in the copy just as naturally as you're listening to me now. When you've reached this point, your added confidence will help to raise your QRQ ability even higher.

"Then a wonderful thing happens: you soon discover that you don't have to keep your index finger resting on that spot any more. You may merely think in terms of phantom copying. You'll copy the stuff without too much trouble no matter what you're doing—looking out the window, going into another room, or just dozing at the console with your feet propped up."

"Yeah," said Ernie, "like you were doing before, copying all the Field Day stuff in your head . . . wow, how I wish. . . ."

"Stop wishing and start doing . . . by practicing the phantom technique each day . . . about fifteen minutes of practice is about right for a start."

"Got it, Harv, but," and his face drained somewhat, "how will all of what you've said help me when I take that big 'twenty' code test, when I have to write it all down on paper?"

"Nothing to fret about. Remember how you are to practice—by alternating between the two techniques, regular copying and phantom copying. Phantom copying will strengthen your regular copying tremendously. As you regular copy, you'll have no need to copy right on the edge anymore. You may even find yourself lagging behind several letters, all in a completely relaxed manner, too. You'll get so relaxed and confident that you'll copy the stuff on paper with hardly a glance at the words themselves."

"Gee, I can't wait to start practicing this phantom copying."

"You'll do just fine, Ernie; just practice, and time will do the rest. Telling someone how to phantom copy is a lot harder than actually doing it. It's like trying to tell a guy how to shave with a razor without his cutting his jugular vein: once you've shaved a few times, the whole thing gets a lot easier—though, I admit, not necessarily any more enjoyable. It's just a question of time."

"I don't shave yet, Harv."

"There, too . . . just a question of time." ■

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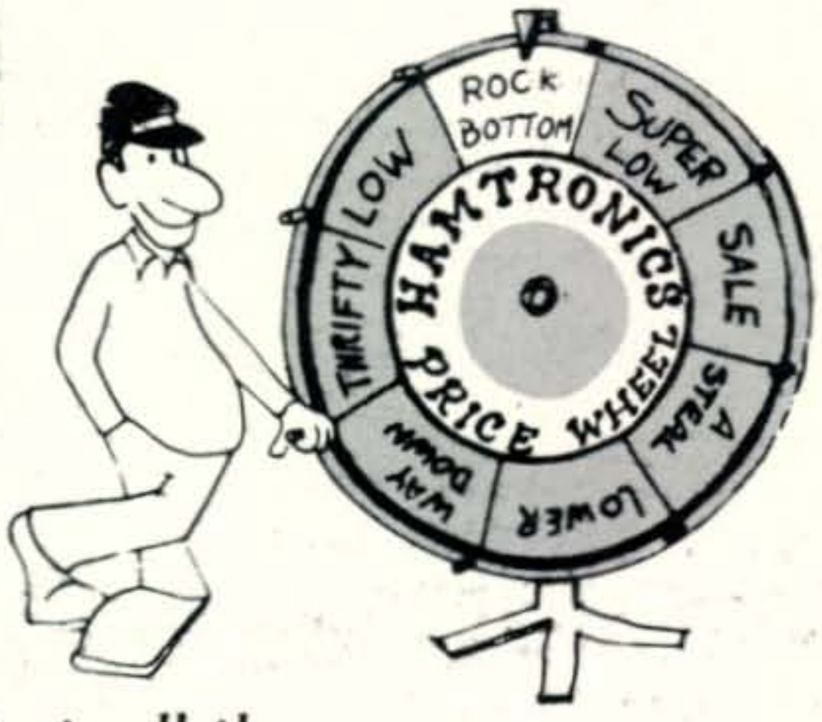

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Math's Notes [*from page 58*]

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Until next month.

73, Irv, WA2NDM

Propagation [*from page 52*]

Central America & Northern South America	15-18 (1)*	11-14 (1) 14-15 (2) 15-16 (3) 16-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	05-06 (1) 06-07 (3) 07-10 (4) 10-12 (3) 12-16 (2) 16-18 (3) 18-20 (4) 20-22 (3) 22-00 (2) 00-01 (1)	20-22 (1) 22-00 (2) 00-02 (3) 02-04 (2) 04-06 (1) 22-00 (1)* 00-03 (2)* 03-04 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	14-17 (1)	08-12 (1) 12-15 (2) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	06-07 (1) 07-08 (2) 08-15 (1) 15-17 (2) 17-18 (3) 18-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	21-23 (1) 23-03 (2) 03-04 (1) 22-04 (1)*
McMurdo Sound, Antarctica	*Nil*	*Nil*	17-19 (1) 19-21 (2) 21-23 (1)	03-07 (1)

Time Zone: PDT (24-Hour Time)

WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western Europe & North Africa	*Nil*	*Nil*	06-07 (1) 07-08 (2) 08-14 (1) 14-18 (2) 18-20 (1) 22-00 (1)	20-23 (1)
Central & Northern Europe & European USSR	*Nil*	*Nil*	06-07 (1) 07-09 (2) 09-16 (1) 16-18 (2) 18-19 (1) 21-23 (1)	20-22 (1)
Eastern Mediterranean & East	*Nil*	*Nil*	06-08 (1) 15-17 (1) 20-21 (1) 21-22 (2) 22-23 (1)	*Nil*

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Model 45 80-10m Antenna	84.95
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East Africa	*Nil*	*Nil*	15-17 (1) 17-19 (2) 19-20 (1)	*Nil*
South Africa	*Nil*	*Nil*	06-08 (1) 15-17 (1) 22-00 (1)	20-21 (1) 21-22 (2) 22-23 (1) 20-22 (1)*
Central & South Asia	*Nil*	*Nil*	07-08 (1) 08-10 (2) 10-11 (1) 18-20 (1) 20-22 (2) 22-23 (1)	*Nil*
Southeast Asia	*Nil*	15-17 (1) 20-22 (1)	07-09 (1) 09-11 (2) 11-12 (1) 21-23 (1) 23-00 (2) 00-02 (1)	03-07 (1)
Far East	*Nil*	16-17 (1) 20-21 (1)	07-08 (1) 08-10 (2) 10-13 (1) 20-23 (1) 23-02 (2) 02-03 (1)	02-03 (1) 03-05 (2) 05-07 (1) 03-05 (1)*
South Pacific & New Zealand	*Nil*	12-14 (1) 14-17 (2) 17-20 (3) 20-21 (2) 21-22 (1)	02-06 (1) 06-09 (2) 09-11 (1) 17-20 (1) 20-22 (2) 22-00 (4) 00-02 (2)	00-02 (1) 02-05 (3) 05-07 (2) 07-08 (1) 00-02 (1)* 02-05 (2)* 05-07 (1)*
Australasia	*Nil*	16-19 (1) 19-21 (2) 21-22 (1)	19-21 (1) 21-23 (2) 23-01 (3) 01-02 (2) 02-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-16 (1)	00-02 (1) 02-04 (2) 04-06 (3) 06-07 (2) 07-08 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
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Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	14-16 (1)	10-12 (1) 12-13 (2) 13-14 (3) 14-16 (4) 16-17 (2) 17-18 (1)	04-08 (1) 14-16 (1) 16-18 (2) 18-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	21-23 (1) 23-02 (2) 02-04 (1) 22-02 (1)*
McMurdo Sound, Antarctica	*Nil*	*Nil*	17-19 (1) 19-21 (2) 21-23 (1)	22-00 (1) 03-06 (1)

Cop's Corner [*from page 38*]

ated people together by radio? Not everyone in our society is as mobile as they'd like to be. People would like to get together with other people, but can't because of the distance. Overseas phone patches are an excellent example of hams helping out in these situations; but there are also people in hospitals and nursing homes, and people who just don't have the money for travelling or prolonged long distance calls. These folks are isolated too.

Those of us with SSTV gear are in a particularly good position to make a contribution. People really dig seeing their friends and relatives over the air, even in P7 yellow. Last summer Jack Petree, WB4OVX, invited some old friends of mine over to his shack for a ham radio/SSTV reunion with my wife Madaleine and me. Dan Ross, WA1EYX, did the same thing with some of Madaleine's relatives living in Springfield, Massachusetts. It was lots of fun, with plenty of clowning around and merriment, and it meant something to the people involved. A more dramactic SSTV get-together a few years ago involved a chaplain wintering over at McMurdo Sound Antarctica, and his family in Colorado; but the distance needn't be great for the service to be meaningful. With the SSTV Directory in the Callbook it's not too difficult to track down a slow-scanner in another part of the country. How about the possibility of carting your camera and monitor over to a local nursing home, after setting things up in advance? If bringing your rf gear is too much of a hassle, you might phone patch a patient's audio/visual QSO through a local ham's rig. It could mean a lot to someone.

Come share your ideas!

A "Hard Copy" SSTV Receiver

Alden Electronics and Impulse Recording Co. Inc. has for years made facsimile recorders for reproducing weather maps, weather satellite pictures, and the like. They have just announced a new product—their Alden 400 "Push to Print" recorder that makes hard copy pictures from ham slow-scan signals. The recorder records at the standard frame rate of 8 seconds and 15 sweeps per second on their Alfax electro-sensitive paper. Reproduced frames have a 2.3 inch diagonal. The price of $795 is probably low enough to interest some slow-scanners, and the gear is yet another approach for freezing those slow-scan frames. The cost of the special paper is a small fraction of the cost of Polaroid film per frame. If you like to make permanent records of all your SSTV QSO's, the savings in material cost could be considerable. For more information write to Alden Research Center, Westborough, Mass. 01581. You might want to request a sample picture since the paper has a look and feel that differs from the photographic prints we're used to.

Vy 73, Cop, WØORX

Digital Encoder [*from page 20*]

referring to the schematic. When all jumpers are connected, there will be no unused pads on the printed circuit board.

When the assembly of the board is complete, examine the wiring to be sure that there are no short circuits between any adjacent pins on the IC's. It also would be good practice to operate the power supply before the digital IC's are inserted into their sockets, and measure the +5v. and ground connections to each IC.

An oscilloscope can be used to check the operation of Q_1 to be sure it is oscillating. When these tests are completed the IC's may be inserted into the sockets. Wire up the jumper plugs for the desired message, and the unit should generate the proper Morse code.

Operation

To use the output of the encoder, a relay coil may be connected as shown in the schematic diagram. The minimum value of R_{12} that can be used is 330 ohms, since IC_1 is rated to sink 16 milliamperes from the 5 volt supply. In addition, R_{12} can not be returned to a voltage higher than 5 volts, or the rating of IC_1 will be exceeded. If it is necessary to drive a relay which is not compatible with the above specifications, a buffer transistor may be used.

Should you encounter trouble with the unit due to an error in wiring or a defective IC, you may trouble-shoot the circuit with an oscilloscope. Since the clock frequency of the unit is only 6 to 12 Hertz, pulse shape viewing is not practical. The best way to service the unit is to replace the timing capacitor, C_4, with a .01 mf capacitor. This raises the operating frequency by a factor of 220, and allows waveforms to be displayed by the scope. If you use the positive rest pulse at terminals 2 or 3 of IC_{10} or IC_{11} as an external sync signal, the oscilloscope will display the generated code at IC_1 pin 10. It might even be a good idea to make this check even if the unit "sounds" correct, to verify proper dot, dash, and space lengths. ■

CQ Reviews HW 202 [*from page 26*]

is also extremely important to identify all parts before beginning actual construction, especially the terminals and connectors. A low wattage soldering iron of the 37½-watt-

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CQ Country Chart

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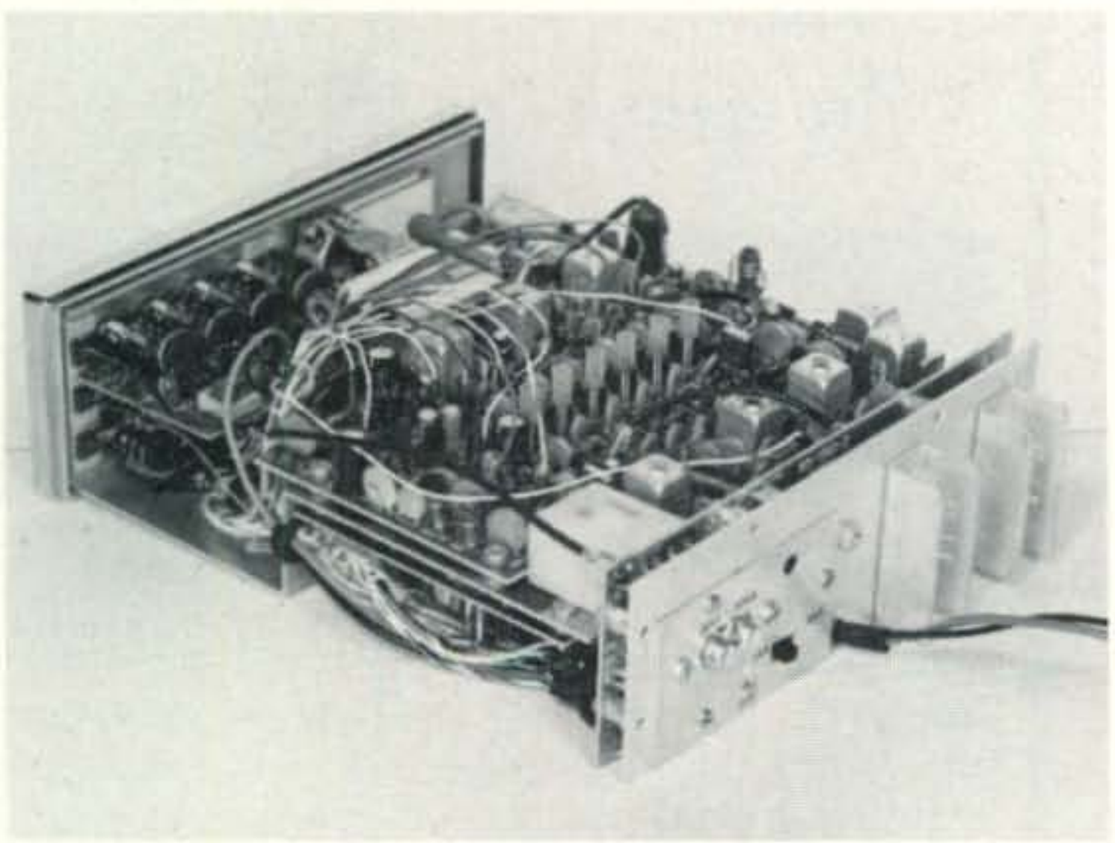
or-less variety is a must with this kit as some sections of the printed circuit foil lift rather easily when overheated. One other negative feature is the use of a phono jack as the r.f. output connector. Although the connector works, it is quite hard to accommodate RG-8/U in the plug!

Operation and Performance

The unit is simple to operate. All one has to do is turn it on, push an appropriate combination of buttons, and talk. The only front panel controls, other than the buttons and meter, are volume and squelch controls. Tuning is pre-set and any 50 ohm 2-meter antenna can be fed. The HW-202 is "burn-out proof" in the sense that it will not be damaged when operating into anything from an s.w.r. of 1 to infinity.

Some of the earliest HW-202 kits delivered exhibited some transmitter instability and low power output. The model assembled by the author was one of these early numbers. Stability was a problem and power output was down to about 7 watts, well below the manufacturers ratings, but performed to the Heathkit specifications after making a few small changes in driver coupling capacitors and others.

Shortly thereafter, however, Heathkit made available a modification kit for early HW-202's, at no cost to the kit builder. The package, designated the HWM-202-1 contains a dozen or so components along with complete instructions for installation. Installation of the kit in the earliest-type HW-202 brought power output to 13.8 watts, well within the rated manufacturer's rated power output.



Viewed from the rear, the tightly-packed receiver circuit board is visible. At the left, behind the front panel, is the optional tone burst encoder circuit board with independent adjustments for four tone frequencies, and durations adjustable from about 1/4 second to continuous. At the rear are simple bolt-on heat sink fins adding to the cooling surface area presented to the PA and Driver transistors, which use the heavy aluminum panel as a heat sink.

Another HW-202 built by a *CQ* staff member was from a later series. It performed to specifications initially and after installation of the kit, produced the same 13.8 watt output as the modified early model. Later models, and obviously all current production kits, already include the changes effected by the modification kit. Heath is to be commended for their responsible post-sale policy.

Power output from our unit was measured into a 50 ohm non-reactive load by measuring the voltage across the load with an r.f. voltmeter. Modulation sounded excellent when listening to the signal on another 2 meter rig. The 146.94 crystal also "netted" exactly at just about the center of the range of the crystal padder capacitor. On Transmit, our unit drew 2.15 amperes from a 13.8 volt power supply.

The receiver produced 20db of quieting (as compared to background noise with an audio v.t.v.m.) with an input signal of only 0.35 microvolts across a 50 ohm resistor at the input connector and the squelch could be solidly triggered by this same signal. Audio quality on a received signal was good but high volume levels caused the speaker to overload, suggesting that an external speaker would be useful for mobile work. Power drawn by the receiver (at 13.8 volts) was about 170 milliamperes at a comfortable listening level.

Accessories for the HW-202 are a tone-burst encoder kit HWA-202-2 at $24.95, an a.c. power supply kit HWA-202-1 at $29.95, and a nominal 40-watt output solid state amplifier kit for mobile operation, the HA-202 at $69.95. We built and tested the tone burst encoder and the power supply, and both were determined to meet or exceed the manufacturer's ratings.

The price of the HW-202 2-meter f.m. transceiver kit is $179.95 complete with crystals for 146.94 transmit and receive, and microphone. If you don't mind the work, you'll wind up with a unit that compares favorably with many of the $250-350 class rigs now on the market. The manufacturer is the Heath Company, Benton Harbor, Michigan. —*WA2NDM*

800 VOR stations in the USA. You are bound to hit one of them."

JUP —"Ok, you've convinced me . . . I will not transmit with my HT . . . I will just monitor the channels."

CON—"Sir, would you please check the receiver crystals now?"

JUP —"All right. The crystal in the receiver for 146.46 is marked 45.253333 and it's third harmonic, which I am sure you are gonna ask me for, would be 135.76 which is nowhere near a VOR frequency."

CON—"But what is the spectrum space devoted to a.m. v.h.f. voice communication in the Aeronautical service?"

JUP —"Unless the Feds just changed it, it's 118.00 to 135.95 megs."

CON—"Sir, do you recall how crummy an a.m. receiver sounds when you pump an f.m. signal through it?"

JUP —"You are telling me that the third harmonic of the receiver crystal is gonna get into the communications receiver of this airplane?" The manufacturer insists that the receiver meets the requirements of Part 15 of the FCC rules and that governs receiver radiations and . . . "

CON—"Let's suppose that the third harmonic of the receiver crystal is a mere one millivolt in the receiver. If it were supressed 60 db below that, it would still be one microvolt, and that could be a problem for a sensitive communications receiver and some of those boxes up there in the front cost about seven or eight thousand dollars . . . and they are pretty good receivers, too."

JUP —"Oh for crying out loud . . . I will only use the HT receiver if the sky is bright blue and the stars are out and I'm absolutely positive that the guys up there driving this thing are flying by visual flight rules!"

CON—"Have you forgotten that all air carriers file and fly IFR flight plans at all times regardless of weather, and that this is a question of Federal Law . . . "

JUP —"Yeah, I almost forgot. The International Civil Aviation Organization says that anything flying above 18,000 feet must be IFR and the FAA says that any Jet air carrier must be IFR all the time at all altitudes."

CON—"So your only hope is to rent a small airplane when you get home and fly only when the weather is perfect, if you want to use the HT in the air."

JUP —"Do me a big favor?"

CON—"Why, of course, sir."

JUP —"Get the hell out of here and let me enjoy the booze!"

One of the interesting possibilities goes beyond the concept of the legality of operating an HT on an air carrier. Generally, the guys that drive the big ones for a living, and I have known many, don't know beans about their electronics equipment. They are required to know how to use them, not understand what makes them tick. Oddly enough, I recall one case of an air carrier flight when the navigation radios were, in fact, disturbed by an on-board HT in the hands of an unknowing ham. The pilot in command exercised his option to abort the flight, based on malfunctioning (he thought) VOR receivers, turned around and returned to the airport where flight had originated, after getting one hour out over the Atlantic. The passengers were more than a little distraught when they all, one hundred and eighteen of them, had to deplane and wait two hours, while maintenance crews changed the radio equipment on the airplane. Not to mention the fact that operating costs on a Boeing 707 run about $2000 an hour, and there were two hours of unnecssary flying accomplished.

I don't know that operating an HT on an air carrier aircraft would cause loss of life or personal damage to anyone, but over the past years, I have heard a series of self-proclaimed experts spouting off on the air as to what can and can't be done with amateur radio on an airplane. None of the guys I have heard knew what he was talking about. The facts are plain. The Law is clear. Violation of the Federal Air Regulations in this aspect is a felony, and worse, today's concentration on security measures against air piracy makes it patent and obvious that any ham who takes a radio out of his luggage on an air carrier flight is truly asking for a pack of trouble. So, be smart . . . leave it packed away until you get to where you're going. Or, leave it at home.

73, Norm, W2JUP

general communications during these announcements.

Even if you don't have two meter transmitting gear, you might want to tune your h.f. receiver into these satellite transmissions just to hear how they sound.

Now that the OSCAR-6 satellite is being used more and more for regular communications rather than just for contest type QSO's, be sure to follow the same good operating procedures that you would on the regular amateur bands. Listen on your downlink frequency before transmitting to make sure that you do not QRM an in-progress QSO. It might not be a bad idea to ask if the frequency is in use before transmitting!

Listen to your downlink frequency during a QSO with headsets. If you don't, you may unknowingly be relaying through your uplink what's coming out of your speaker on the downlink. You might also get a good case of feedback.

If part of the satellite's 100 kHz bandpass is crowded, spreadout to other portions. Remember, that you can go a bit below 29.450 and a bit above 29.550 mHz, if things get real crowded. It's not like falling off the end of the world, since gain is only 3 db down at these points.

Also, keep that power down. All you need is 100 watts e.r.p. to do a really bang-up job through OSCAR-6, and there have been a lot of good QSOs made with much less power. Greater levels of power can easily block the repeater and deprive other amateurs from using it.

Just received a note from WØNQQ/KH6 who is looking for contacts with stations on the east coast of North America. So is KH6IHP, KH6IJ and KH6BTV.

Just heard HK3CMI with a c.w. signal on a downlink frequency of 29.476 mHz.

Reference Orbits

Here are reference orbits for OSCAR-6 for June and July. Dates and times are given in GMT. Be sure to convert correctly to local time in North America. To produce information for other orbits, simply keep adding 115 minutes and 28.75° of longitude for each succeeding orbit. See "OSCAR-6 News" in Feb. 1973 *CQ*, p. 38 for a method to determine the orbits that will be within communications range of a specific QTH.

South-North Orbit Number	Date	Equatorial Crossing Time (GMT)	Long. of Equatorial Crossing (°W)
7430	June 1	0039	57.7
7455	June 3	0034	56.4
7493	June 6	0124	68.8
7518	June 8	0119	67.6
7543	June 10	0114	66.3
7580	June 13	0008	50.0
7605	June 15	0003	48.7
7631	June 17	0153	76.2
7668	June 20	0048	59.9
7693	June 22	0043	58.6
7718	June 24	0038	57.3
7756	June 27	0127	69.7
7781	June 29	0122	68.5
7806	July 1	0117	67.2
7843	July 4	0012	50.9
7868	July 6	0007	49.6
7893	July 8	0002	48.3
7931	July 11	0051	60.8
7956	July 13	0046	59.5
7981	July 15	0041	58.2
8019	July 18	0131	70.7
8044	July 20	0126	69.4
8069	July 22	0121	68.1
8106	July 25	0015	51.8
8131	July 27	0010	50.5
8156	July 29	0005	49.2

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WANTED: SSTV camera and lens. Prefer Robot, or cheap fast-scan camera. WB4EMF, 1606 Jennings Way, Norcross GA 30071. (404)-448-0592.

WANTED: Insulators, any type. Gene Bond, WB2UVB, 15 E. Camden Ave., Moorestown NJ, 08057.

WANTED: Tech. Manual, TM11-2229, buy or trade. P.L. Lemon, 3154 Stony Pt. Rd., Stnta Rosa CA 95401.

SELL OR TRADE: CQ'S from '45, QST's from 1916, Handbooks, Call Books, & Radio Catalogs. Have Radio News, Radio BC & Popular Radio. Want early radio & Wireless gear & parts. Erv Rasmussen, W6YPM, 164 Lowell St., Redwood City, CA 94062.

FOR SALE: SB500 Transverter, $100. HD-10 Keyer, $30. Both MINT. R.E. Loggins RFD no. 1, Jefferson GA 30549. (404)-367-5639.

SELL/TRADE FOR MOD 28 Gear--TS1618 audio FSK conv. tester/gen. with internal audio counter $250; Collins 70E-20 PTO $40; Collins KY-45 FSKeyer $75; TRA7 FSKeyer $75; RME HF10-20 conv. $50; two PRC40AX Xcvrs each $35; RBS $25; RBK $50; RAK $35; WRR3A BLF digital $300; SX28A $75; SRR13A $125; GPR90 $150; SRT15 FSK/FAX Xmtr with 4-400A $400; GR 804-B $100; GR 834-A audio freq meter $75; mint NC300 with all converters and speaker $250. All pick up San Diego. W6CRG 11007 Explorer Rd., La Mesa, CA 92041.

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Urgently need for school science project: Hammarlund HR-10 or SP600VLF; any ARC-5 receiver, especially BCB or 6-9; Rustrak tape and recorder. Call person-to-person collect, Bob Ammons, (406)-543-5359 or write 411 Keith, Missoula, Montana, 59801. Any reasonable price.

HYDROPONICS for XYL while QRL. Build-yourself garden components, books, nutrients. 5-page catalog, send 40 cents, refundable. Incorporated 3-1971, BURWELL GEOPONICS, Box 125-DC, Rancho Sanfe, CA 92067.

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NAME BRAND digital test equipment. Discount prices. Free catalog and price list. Salen Electronics, P.O. Box 82, Skokie, IL 60076.

MAGAZINES FOR SALE: CQ/73/QST/HAM RADIO issues at 10 cents each (plus shipping) from Lockheed Ham Club, 2814 Empire, Burbank, CA 91504. Send list and check. Available issues and any refund due will be sent promptly.

LOOKING FOR old Lionel trains. Interested only in "O" gauge, excellent to like-new condition. Primary interest is locomotives prior to 1952, but will consider complete sets or more recent models. Am willing to buy outright for cash or swap radio gear to meet your needs. Write Dick Cowan, WA2LRO, c/o CQ Magazine, or call 516/883-6200.

FCC test answers any class $2 Dixie Tec box-8352 Savannah, Georgia 31402.

FOR SALE: Spectra Physics 2.0 mw 071-2 HeNe laser tube, brand new with power supply schematic, $110.00. WA2NDM, 5 Melville Rd., Great Neck, NY 11023.

WYOMING ranch land. Deer, antalope, wild horses. 10 acres $25 down, $25 month. Owner-K6ICS Mike Gauthier 9418 Florence, Downey, CA. 90240.

SURPLUS. Giant bargain-packed catalog, $1. Etco Electronics, Dept. CQ, Box 741, Montreal A, H3C 2V2.

Organize & enhance your QSL's with 20 pocket plastic holders. Two for $1.00, seven for $3.00. TEPABCO, Box 198Q, Gallatin, TN 37066.

ANTIQUE Flame Proof Key, Dated 1921, $12.95 PPD; W.E. Sounders, $25.00 PPD, or will trade for your duplicates. Walt Jackson W5ZYA, 909 N.E. 11th, Grand Prairie, TX 75050.

HIGH GLOSS QSL CARDS: From $8.95/1000. Full color catalogue, $1.00. Lijon Graphics, Box 48, East Longmeadow, Mass. 01028.

VACUUM VARIABLES: Jennings CUFC/CVHC 650, 800, 1200, 1600pf. .014UF 50KV pulse caps. Smith Co. 1220 S. 49th St. Richmond CA 94804.

Filter performance computer analyzed, transfer-function; input and output impedances; 10 branches-20 frequencies. Submit diagram showing R,L,C values. H.Post 406 De Encanto, Redondo Beach, CA 90277.

GREATEST of them all! That's the ARRL 1974 National Convention, sponsored by Hudson Amateur Radio Council. Remember the dates: July 19, 20, 21 at the Waldorf-Astoria, New York City. Three days of exciting events!! Wide Array of demonstrations, exhibits and forums featuring latest in FM, SSTV, ATV, RTTY, FAX, Satellites, Antenna design, Transistors, Integrated Circuits, DX, MARS, ARPSC and much more. Something to do every exciting minute for YLs & XYLs -- Tours, New York sightseeing, visits to popular TV shows, Parties, Fashion Shows. Meet the ARRL President, Vice-Presidents, and all 16 Directors! Famous-name Speakers at Saturday Night Banquet! Everything for the Non-Ham, New Ham and Old Timer. For info, contact: ARRL Convention, 303 Tenafly Rd., Englewood, NJ 07631.

BOOKS WANTED: Radio Simplified What It Is, How to Build and Operate the Apparatus 1925 edition by Lewis Kendall and Robert Koehler. John Winston Co. Harpers' Electricity Book for Boys by Joseph Adams. Harpers and Bros.' 1907. Model Building by Raymond Yates, circa 1919. State condition and prices please. W9UKV, Maynard Faith, 1807 Tecumseh St., Fort Wayne, IN 46805.

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SOUTHEAST TEXAS HAMS: I am expanding my business and would like to contact some ambitious people who are interested in building a business of their own beginning on a part time basis. J.C. Birdsall, WA5OKC, 12823 Westleigh, Houston, 77077.

HW101, PS, Mike, Keyer, $300. Power Meters $20. UT1 Transmatch $50. HG10 VFO $20. BC342 $20. Buy all for $400, get cables, extra mike, antenna. You pick up. Townsend, WB4HVU. 404-926-6934. Kennesaw, GA 30144.

WANTED: D.C. P/S for Galaxy V MKIII, K.W. Matchbox, 14AUQ, Brad, WB9LFD, 1029 E. Behremds, Peoria, IL 61603.

HALLICRAFTERS BEST: HT32B, Matching SX-115 receiver, Mint condition, $550. Linear Amplifier, Pair EIMAC 4-1000A, Vacuum variable etc. $425. TA33, Fold over 40 ft. tubular Guyless tower rotor, $150...Firm. K1EUZ, 668 Church St., New Bedford, MA 02745. (617)-995-7538.

WANTED: 01A Tubes; Manual for RCA AR77 receiver; Vol. II. "Surplus Radio Conversion Manual." Will purchase or copy and return manuals. Lloyd Stallkamp, 4723 L-Way, Ames, Iowa 50010.

Did you know that supplements to the book, "CQ YL," are available? They bring the book up to date with YLRL Officers through 1973 and the 6th YLRL Convention, held at Long Beach in May '72. If you have a copy of "CQ YL' and would like to add the new supplements (the pages are "slotted" so they fit directly into the "CQ YL" spiral backbone), drop a note with your request to author/publisher, W5RZJ, Louisa Sando, 4417 - 11th St., NW, Albuquerque, NM 87107. Please enclose two 8 cent stamps to cover cost of mailing. The one and only book about YLs in ham radio, "CQ YL" contains 21 chapters, over 600 photographs. Order your autographed copy, or a gift copy, from W5RZJ, $3.00 postpaid.

Rubber adress stamps. Free catalog. 45 type styles. Jackson's Box 443F, Franklin Park, IL 60131.

AMATEUR VACATION: Livingstone Lodge, Mascoma Lake, New Hampshire, 03748. Cosy Cabin for two, $55.00, weekly. Swimming, Fishing, Boats, Sports, Ham Radio, Showers, Fireplaces, Housekeeping, Children half, Tent Sites, Literature, C. Livingstone, W2LA, (603)-632-7784.

SELL: SYCOMM Super D80 2-meter amplifier, factory tested, assembled only $50.00. Marty, (215)-884-6010.

SELL/TRADE: Clegg 22'er AM $290. HT-200 w/ goodies $250. Write for mailer. WA9KQD, 824 Read Street, Lockport, IL 60441.

QSLS. Second to none. Same day service. Samples airmailed 25 cents. Ray, K7HLR, Box 331. Clearfield, Utah 84015.

FREE crystals with the purchase of any 2 meter FM radio. Write for our deal on the rig of your choice. Factory-quthorized dealers for Regency, Drake, Kenwood, Tempo, Swan, Clegg, Ten-Tec, Standard, Midland, Genave, Hallicrafters, Galaxy, Sony, Hy-Gain, CushCraft, Mosley, and Hustler. For the best deal around on HF or VHF gear, see us first or see us last, but see us before you buy. Write or call us today for our low quote and become one of the many happy and satisfied customers of HOOSIER ELECTRONICS, R.R. 25, Box 403, Terre Haute, IN 47802. (812)-894-2397.

KWM-2 MODIFICATIONS. Detailed instructions and drawings on 40 easy circuit changes to modernize your transceiver. SASE for sample or $5 for all 40. Grasel Enterprises, 5209 Paeso de Pablo, Torrance, CA 90505.

MIX pleasure with pleasure at the Hamburg International Hamfest, Niagara Falls on September 21. For information contact Lin Brownell, WB2HCL, 210 Buffalo, Hamburg, NY 14075.

Looking for 75S3B with CW filter but will trade movie gear for clean 75S3. Write 6AT for list Ed Arnold, 367 North West St., Vacaville, CA 95688.

WANTED: Relay racks, enclosed types in good shape, standard width and depth. WB8NLM, 993 N.E. Catawabe Rd., Port Clinton, OH 43452.

FOR SALE: DX-100 xmtr, $80. Ameco TX-62 xmtr, $90. Both good condition-no shipping. F. Kurz, P.O. Box 347, Zion, IL 60099.

SELL: Heathkit model T3, $10. Heathkit TS4 TV Align Gen., $10. Ameco CB6 converter for 6 mtrs $5. Heathkit IM17 Solid State voltmeter, $10. W8YLJ, Del Carlin RR no. 1, Bryan, OH 43506.

TRANSFORMERS REWOUND: Jess Price, W4CLJ, 507 Raehn St., Orlando, FL 32806. (305)425-7251.

ATTENTION; Philips Telecommunications Holland made, Twelve button touch tone pads w/generator, $11; ppd/insured. WANT: good antenna tuner & Magnum Six speech processor for Drake TR-4. Swank Roberts, WA5GNT, 1130 Fuller Dr. Apt. 223, Dallas, TX 75218. (214)328-9307.

FOR SALE: Swan 500C, VX-2 VOX, 117 XC power supply, 508 outboard VFO, excellent, $500 firm; you ship. M. Harper, Box 2208, Jackson, TN 38301. (901)424-5330.

SELL: CREI course plus RCA Solid-State Course, $35. Many books cheap. S.A.S.E. Samkofsky,-4803 Brenda Drive, Orlando, FL 32806.

FOR SALE: Gonset G66, Very good but bad 20 m osc coil, $30. FOB. Ameco cn 144 conv. IF7-11, A1 $22; ppd. K9DGG, 6361 So. 27th St., Franklin WI 53132.

WANTED: BC603-30-5-MHz conversion data. SELL: 4CX 1000A(new). TRADE? M18/calib. book/ACPS. WA4SIH, 3914 Haley Rd., Martinez, GA 30907.

PROUD new owner of 75A-4 wants copies of all MODS, articles, ETC. on this receiver or info on where to get them. WB9MRP, 8816 Parkway Dr., Highland IND 46322.

WANTED: Ham Counselor for boys' summer camp in New Hampshire to teach and demonstrate Ham Radio in action, and maintain equipment. Write or call: Drew Friedman, 39 Imperial Ave., Westport, CT 06880. (203)226-0334.

FOR SALE: TX-62; $95; VHF-1, $95; Both postpaid; SX-100, $125; PPD, USA. Call WA9YOZ, (219)887-9284. 4259 Harrison St., Gary, IND 46408.

SELL: 2 meter AM & CW transmitter 4CX250B final, T23 exciter, p-b811 MOD. HV & LV supplys final per QST, '56 Oct, Prefer local, $75. KSULB, 11847 E. 16th St., Tulsa OK 74128.

FOR SALE: Highest Bidder; 1917 Hawkins Electrical Guides, 10 volumes, 3368 pages. 1931 Atwater Kent Radio Service Manual, 520 pages. Riders Perpetual Trouble Shooting Manuals, Volumes I through IX. World War I microphone, German made by Eugen Beyer, Berlin, in wooden case of 1920 vintage, never used. Bob Farmer, 3113 No. Columbia St., Plainview, TX 79072.

FOR SALE: Drake 2NB noise blanker, $20; Drake 2AC crystal (100KC) calibrator, $15; EICO 751, AC/PS, $30, AMECO PCB transceiver Pre-Amp $32; Vanguard 2 meter converters, AMECO 2 meter converters, Digi Keyer complete in cabinet, $20. More send for free list. Colella, WA2HQD, 105-18 131rst St., Richmond Hill, NY 11419.

SELL: Heath SB-300 RCVR, $125. Apache TX-1 xmtr, $60. Excellent condition. WA6DGQ, 1504 S. Santa Anita Ave. Arcadia, CA 91006.

WANTED: Central Electronics 600L Linear. J.F. Lowenstein, W7JI, 235 E. 15th St., Tempe, AZ 85281.

FOR SALE: Drake 2B speaker, Q-mult., calibrator, manual. One owner. $185; WB6BCG, James C. Madsen, 3432 N. Fourth, Fresno CA 93726.

WANTED: Millen 2KW transmatch model no. 92200. Some good trades. Jack Simpson, W7HZD, 1106 N. 15th St., Coeur D'Alene ID 83814.

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(California residents please add 5% sales tax)

☐ 20% down payment enclosed, ship C.O.D. ☐ Full payment enclosed. ☐ 10% down payment enclosed, charge remainder to my Swan Credit Account #_____. (All items shipped best way collect.)

Name:_____ Amateur Call:_____

Address:_____

City:_____ State:_____ Zip:_____

FOR SALE: Hammarlund tone encoder/decoder units complete with resonant reed, $15, each. Also 100kc calibrators, $10 each. Wayne Cordell, K4HCS, Rt., 4 113 Church St., Weaverville, NC 28787.

CALL LETTER LICENSE PLATES: Black w/gold letters, $3.00 PPD. Jack Mullarkey, 2604 Chesterfield Place, Anderson IND 46012.

YOUR non-commercial swap-n-sell ads run FREE in TRADIO. Send ads to TRADIO, in care of Wichita Amateur Radio Society, P.O. Box 4391, Wichita Falls, TX 76308.

FOR SALE: High Voltage Bridge, 15KV, 2.0 amps, commercially manufactured (4 sticks), $15. Write WB6FDR, 7423 Oso Ave., Canoga Park, CA 91306.

FOR SALE: SB-640 Factory wired, $100; 813 tubes $5 each. 4-1000A, $25. UCS-300 Vac. variables. $20 each. J. Power 104 Crescent Place, Hanson MA 02341.

WANTED: Gonset 28 and/or 76 in oper-cond.; Western US only; mail details. W6ZI, 595 Midway Blvd., Novato CA 94947.

SWAP: Want AM/FM AC/DC portable radio for new 6m. HA460 xcvr. Each ships. Goodwin, 466 Gerald Rd., Memphis TN 38122.

SELL: Mint 1yr old TR-4C/34PNB, AC-4, MS-4, from WB8IHZ Estate. $700ppd. WA8UUY, 104 Henrietta St., Ravenswood, WV 26164.

WANTED: Old battery radios and crystal radio sets, need not be in working condition. State model and price. David McKenzie, 1200 West Euclid Indianola, Iowa 50125.

WANTED: UV850 screen grid 50 watter, for my tube collection. Give price and condition. Leo Gibbs, W8BHT, 701 Brookfield Rd., Dayton, OH 45429.

SELL: Drake TR-4 with 8 pole-filter, excellent condition. RV-4 VFO, $490. L. Bahr, W9DRC, 8111 Eastwood Lane, Woodridge, IL 60515.

LEGAL NOTICE: SAROC delegates who were snowed-out may submit a request for their 1974 advance registration fee refunt to SAROC, P.O. Box 945, Boulder City, NEV 89005.

WANTED: Beam antennas Tri band and two meter rotator Hamm "M" or equivilant, tilt over tower 35 to 50 ft. Prefer Kansas area; all letters answered. A.H. Davis, W5DPI, 212 Santa Fe, Halstead, KS 67056.

WANTED: Parts for a Duo-Bander 84 or Duo-Bander II, by WRL. All I need is coil L-8. W0LFF, Max R. Otto 733 West Benton St., Iowa City, IA 52240.

WANTED: Drawings for TELAUTOGRAPH telescriber CB, CS and selector. W7FEN Route 1, Box 350, Monroe, WA 98272.

FREE: Sets of Japanese Translations, easy to speak by using phonetics. Copyrighted, send large S.A.S.E. or two IRC coupons to: W.E. Douglass, 3421 Maryann St., Glendale, CA 91214.

WANT: HP 606A or HP 606B. Gen. Sell/Trade, Drake TR4 w/NB-Mint. A. Emerald, 8956 Swallow Ave. Fountain Valley, CA 92708.

WANTED: Good speech processor for a Drake TR-4. P. Feely, 15 Locust Hill, Yonkers, NY 10701.

SELL: CQ & QST 1954-1973. SASE for list. R. Hallowell, 720 N. Sterling Blvd., Sterling, VA 22170.

FOR SALE: Heath SB-610, $60; Hallicrafters HA-1 to-keyer, $45; Vibroplex paddle, $8.00. Jay Sewell, W5DWN, 2714 Pecan Drive, Temple, TX 76501.

POPULAR ELECTRONICS: Complete file (35-Vols) like new. 100's const. articles etc. Highest offer takes. W6CHU, 5141, Lincoln Ave., Los Angeles, CA 90042.

SELL OR TRADE for CB gear, BC-342 C115V. Good condition, $45.00. W6LJF, 3760 Canfield Rd., Pasadena, CA 91105.

CANADIANS: Heath SWR meter $13. ECHO 8-G 4 Band Trap vertical, $35. Ultimate transmatch, $35. VE5RA, 2420 Eastview, Saskatoon, Saskatchewan, Canada.

FISHERMEN: Attract fish to your line with our transistorized wlectronic fish callers. Small, lightweight and battery operated, $4.00. ppd. Will swap one or more for any Ham Gear. James Shank, 21 Terrace Lane, Elizabethtown, PA 17002.

SAROC the prestige National Convention is going home to Hotel Sahara for their tenth anniversary, January 2-5, 1975. Send QSL card for details, SAROC, Box 945, Boulder City, NEV 89005.

WANTED: Call letter license plated for collection. I'll pay postage. Art Phillips, WA7NXL, 3401 N. Columbus Blvd., Apt. 5-0, Tucson, AZ 85712.

FOR SALE: HQ 170 manual/clock, excellent, $140. DX150B rcvr Mint, $95. Color Generator, $65. Call or write, W8SQO, RFD 1 Box 1260, Ona, WV 25545. (304)736-6563.

COMPLETE '72 QST, $3.00. Complete '73 QST $4.00. Complete '73 CQ, $4.00. Add postage. W2JBL, 123 Davis Ave., Hakensack, NJ 07601.

FOR SALE: CX7 A(latest calif. model), $1500; Heath SB220, $320; New Yaesu FT620 6mtr xcvr, $250. S. Towle, 1410 Keokuk St., Iowa City, IA 52240. (319)338-7255.

FOR SALE: Counter-Heath IB-1101. Up to 112 MHz, $200; ppd. Harry McCollum, K5FPI, 1010 West First St., MT. Pleasant, TX 75455.

HAMS WANTED: Join 4,200 member Morse Telegraph Club. Open to General Class (or higher) licensees. Modest annual dues include subscription to great slick paper club newspaper "Dots and Dashes." Hundreds of hams already belong. Send $3 to GST A.J. Long, 520 West Schwartz, Salem, IL 62881.

SOMEWHERE SOMEBODY has out-of-print records of George Segal, singing and playing the banjo. WANTED: Full 7" reel 3 3/4 ips tape of same. Repeats OK. Advise price of reel postpaid. Dr. Hess, W6CK, Box 19-M, Pasadena, CA 91102.

WANTED: Electronic Engineering, from 1949 to 1952. State condition and price. Donald E. Chapman, 1621 W. Division St., Chicago, IL 60622.

WANT: Regulated power supply, variable from 0 to 20 Volts DC and 0 to 10 amps. like Eico model. Sell, new and used EIMAC 3-400Z's. Tom, (215)-887-1232.

SELL: Special power supply and spkr. for T4XB-higher output and better linearity, $40. D. Schwartz 1183 Southeast St., Amherst, MA 01002.

FOR SALE: Teletype Equipment, Models 14, 15, 19, 28. TD's, Reperfs, KSR'S, ASR'S. Parts or complete machines. Write needs and send SASE for complete listing and prices. L. Pfleger, 10615 W. Ridge Rd., Apt. 54, Hales Corners, WI 53130

WANT: Early telegraph instruments, Wireless gear, stock ticker. Dr. D. Spence, Argonne Nat'l Lab, 9700 S. Cass Ave.-Bldg 203 Argonne IL 60439.

FOR SALE: 75A-4, $395; Pair of 4-1000A's Linear, $600; Swan 350 w/AC, $195. Trade any of the above for Drake Line. Tom Neill 1321 Merimac Cove, Memphis, TN 38134.

JOHNSON MATCHBOX: Have 350 Watt model w/meter, WANT KW model. J. Dee, 860 Maple Tree Lane, Wadsworth, IL 60083. (312)622-2354.

FOR SALE: HQ100 with speaker, $85; A1 condition. Don D. Dressen, 17 Woodlyn Lane Bradbury CA 91010.

WANTED: Brown Bros. Key in good condition. Doug Blue, WA7QCN, 2509 Piedmont Place, West. Seattle, WA 98199.

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HALLICRAFTERS: S-95 Civil Patrol VHF receiver, also tunes 2m., $20. WB6VNR, (213)346-5871. Harold Tarallo, 7104 Deveron Ridge Rd., Canoga Park, CA 91304.

SELL: Meters, Milliampere, center reading, 0-150, $3.50 ppd. Goodman, 5826 S. Western Ave., Chicago IL 60636.

FOR SALE: Lafayette HA-650, Transistor, 6mtr xcvr w/battery pak., $65. K6THQ, 1205 Clover-glen Dr., Valinda CA 91744.

FOR SALE: Heathkit Mohawk Rcvr RX-1 in Mint condition. Price $85. WA5WZX, Elmo Baese, 826 E. College St., Seguin TX 78155.

BOEHME 5C TU Book needed. Buy or copy. Pay reasonably. WB4YKK, 1468 Kempsville, Norfolk VA 23502.

WANTED: CRYPTOGRAPHIC gear, books, manuals courses, etc. Louis Kruh, 17 Alfred Road West, Merrick, NY 11566. (516)378-0263.

FOR SALE: New TR-4C MS-4-AC, $595. Bought in Nov. 1973. WB4MTE, 1612 Stone Ave., Crossville, TN 38555.

FOR SALE: Johnson Viking II-CDC Xmtr, VFO, cont. cvg. 1.7-30, MHz, exc. w/manual; $85. B. Budnik, 4061 Portland Ave., White Bear Lake, MN 55110.

FOR SALE: Heath DX-60B VF-1, Hall, S-41 G comm. rcvr-best offer. WB4ZVF, (305)949-1136. J.H. Garlitz, 2250 NE 192nd St., No. Miami BCH, FL 33160.

FOR SALE: Brand New 6146 in factory boxes, $10/pait, ppd. 4-400's Eimac sealed cartons, $35, each prepaid. W4AIS, 306 Thornwood Drive, Taylors, S.C. 29687.

WANT: Swan Phone Patch in good condition. Will pay shipping-best price. W2ASI/4 7010 S.W. 16th St., Plantation, FL 33317.

HEATH Counter-Scaler, Motorola T43 GGV, others, WA5CMC, 2309 Bullington St., Wichita Falls, TX 76301.

TRADE OR SELL: 372 Sams Diagrams with cabinet, also misc. TV shop equipment. Write for list. W.R. Cooke, K5EWJ, 1215 University Ave., Huntsville TX 77340.

MISC. SALE: SASE for list. Test Equipment, tubes, caddy, Sams Man., SB-303. Want VHF gear. Victor Schorn, Rt., 5, Box 323-B, Florence, AL 35630.

FOR SALE: 4-400A, $25; Bud Low Pass Filter LF-601, $10; Dow Co-ax relay, 117 v.a.c. coil aux contacts, $10; plus postage. W6BLZ, Colima St., La Jolla, CA 92037.

SELL: Collins round emblem 516F2 P/S, $125; and Collins 312B5, $375. Buy KWM2 and variable 12 volt power supply up to 10 amps. Call Marty, (215)884-6010.

G.E. Tube Tester, Model TC-3, 1942 Model. Need I.B. H. Anderson, 639 N. Washatch, CO 80903.

SELL: 2 meter Icom IC 21 transceiver. Has both AC and DC supply built in, 16 xtals, SWR and Discriminator meter, $275. L.A. Cohen, K3MXM, (215)887-1232.

SALE: Ten-Tec PM-2, $40; Heath HM102 wattmeter, $25; HM2101, $25; Model 15 w/table, $30; W1KLK, 114 Shelley R., Meriden CT 06450.

SELL: Two sets callbooks, 1971-72, 1967 Domestic, 1963-64 Foreign, L.P. Filter-100w Max., 1.5-30 Mc. Peter M. Feely, W2BAO, 15 Locust Hill Ave., Yonkers, NY 10701.

FOR SALE: Swan 350, X17 XC power supply, excellent condition, $250. L. Knapp, W8IHE, 247 Elvern Dr., Benton Harbor, MI 49022.

FOR SALE: Clegg 22'er FM, $200; FOB. Full of crystals, perfect shape. K3YMN, 2185 Sampson St., Pittsburg PA 15235.

TRADE: Surplus Ham Gear, 1950-1971 QST, 1961-1970-73 MAG., Riders Manuals No. 6 to 10; for old battery radios or crystal sets or old catalogs. David McKenzie 1200 West Euclid Indianola, Iowa, 50125.

OFFER OR TRADE: Tri-ExT588 crankup 88' tower; Trade for small car or pickup; Have all kinds RTTY Gear, state needs. L.G. Basham, W7TCT, 735 Caves HWY, Cave Jct. OR 97523.

SELL: New Hy-Gain 18AVT/WB 80-10m vertical, $50. Can not ship. Paul K8CJX, 22960 Valley View South field, MI 48075.

MUST SELL: EICO 720-90W c.w. xmtr 80-10m $45. EICO 730-Plate Modulator, $35. 4CX250B-$10. New-4CX300A, $12. Best Offer. Michael Mardit, WA2VQW, 10 Maple St., Brooklyn NY 11225.

TEST QUESTIONS & ANSWERS: FCC 1rst and 2nd Class Exams, $5.00. Autopatch Systems, Ltd., Box 291, Western Springs, IL 60558.

ANTIQUE RADIOS: RCA Radiola 60/original speaker, tubes. Edison Model R-5 Console type. Both in fine working condition. A.H. Schnurle, W7DUP, RTE 1 Box 216 ST Anthony ID 83445.

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FOR SALE: Drake2NT xmtr, 12 xtal, mint cond., $115, will ship. R. Motta, WNIPPK, 111 Kentucky Ave., Warwick RI 02888.

WANTED: Johnson Viking Invader 200. State price and condition. K5JZY, 1945 Thomas Road, Beaumont, TX 77706.

WANTED: DeForest spherical Audion Triode with candelabra screw base, good filament and decal label. UV-217 half wave rectifier with brass base. W9LGH, 610 Monroe Ave. River Forest, IL 60306.

WANTED: Manual General Radio Signal Generator Model 805-A. Buy or Rent. A. Bielenda, W2IDA, 43 Chestnut Ridge Rd., Saddle River NJ 07458.

SELL: Hallicrafter T.O. Keyer. Model HA-1. Brand New. $75. F. Martin, 680 N. Terrace Ave. Mt. Vernon NY 10552.

WANTED: Rohn 25G tower sections and guy wire. SELL: Collins75-A1, good condition, $75/or trade for 25G. WB0BQA, Paul Staupe, RTE 1 Box 76, Britt MN 55710.

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WANT: Stock Ticker, Telegraph Gear, Crystal Set, Battery Radio or parts PRE-1925. Dr. D. Spence, Argonne Nat'l Lab. 9700 S. Cass Ave. Bldg 203, Argonne IL 60439.

WANT: Old Radio and communication component parts etc. WA1AWX, 161 Bob Hill Rd., Ridgefield, CT 06877.

WILL BUY: Eico Model 730 Modulator-Driver. JWB Taylor, WN5ISK, P.O. Box 4391 Wichita Falls, TX 76308.

WANTED FOR APACHE: Need low voltage power xfmr from your old TX-1 to restore mine. Exact original only. E.J. Sigmund, WA3BFS, P.O. Box 245 Jeannette, PA 15644. (412)527-1272.

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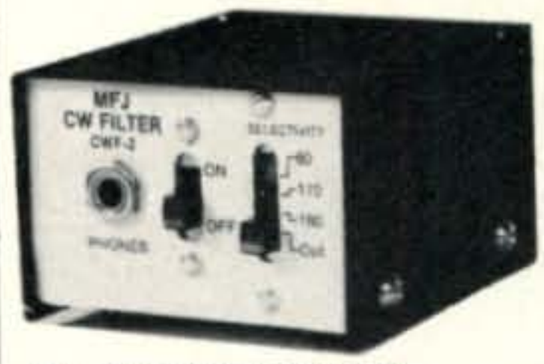

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CENTER FREQUENCY: 750 Hz
INSERTION LOSS: None. Typical gain 1.2 at 180 Hz BW, 1.5 at 110 Hz BW, 2.4 at 80 Hz BW
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IMPEDANCE LEVELS: No impedance matching required
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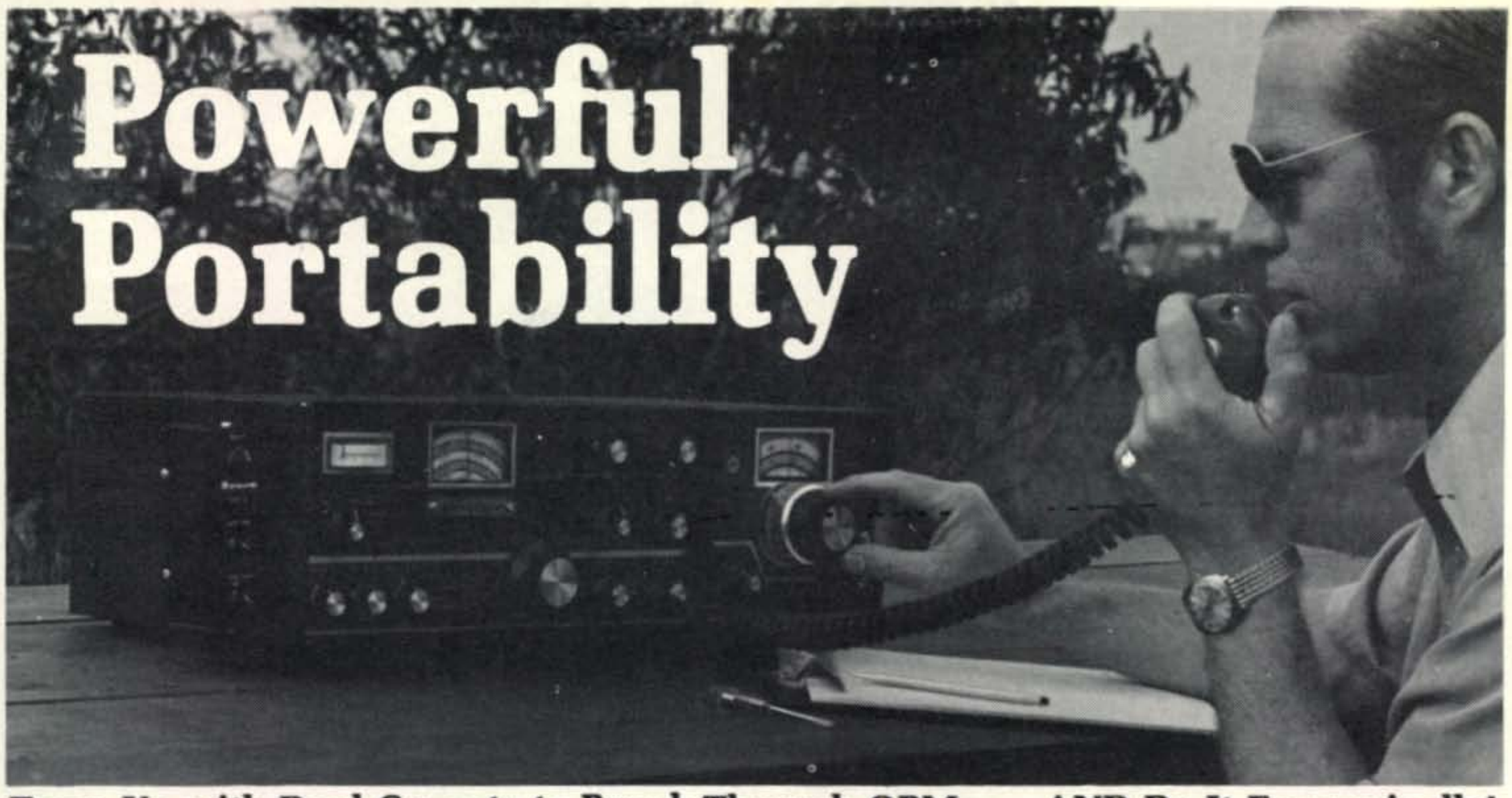

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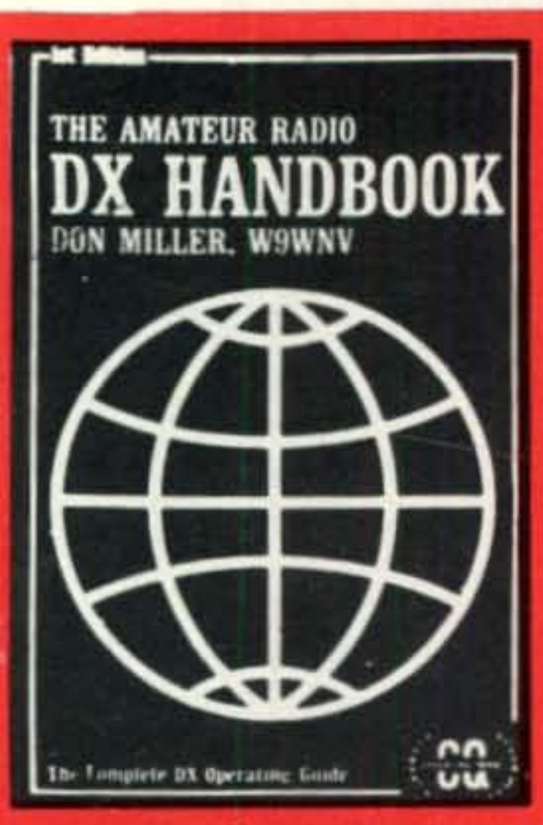

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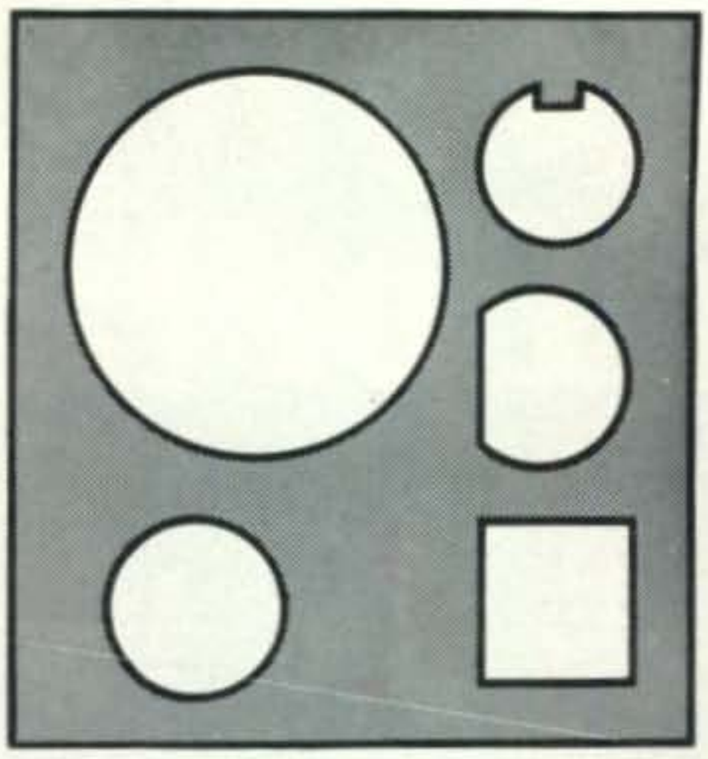

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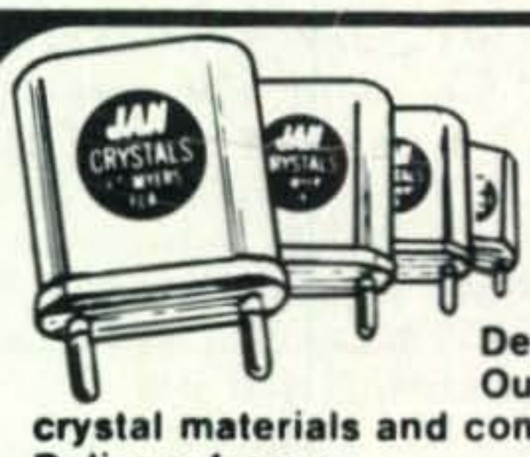

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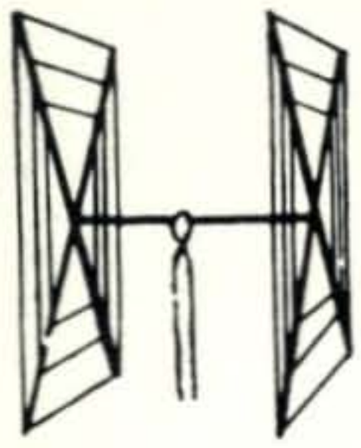

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SWR: 1.05:1 at resonance
Gain: 8.1 db. over isotropic
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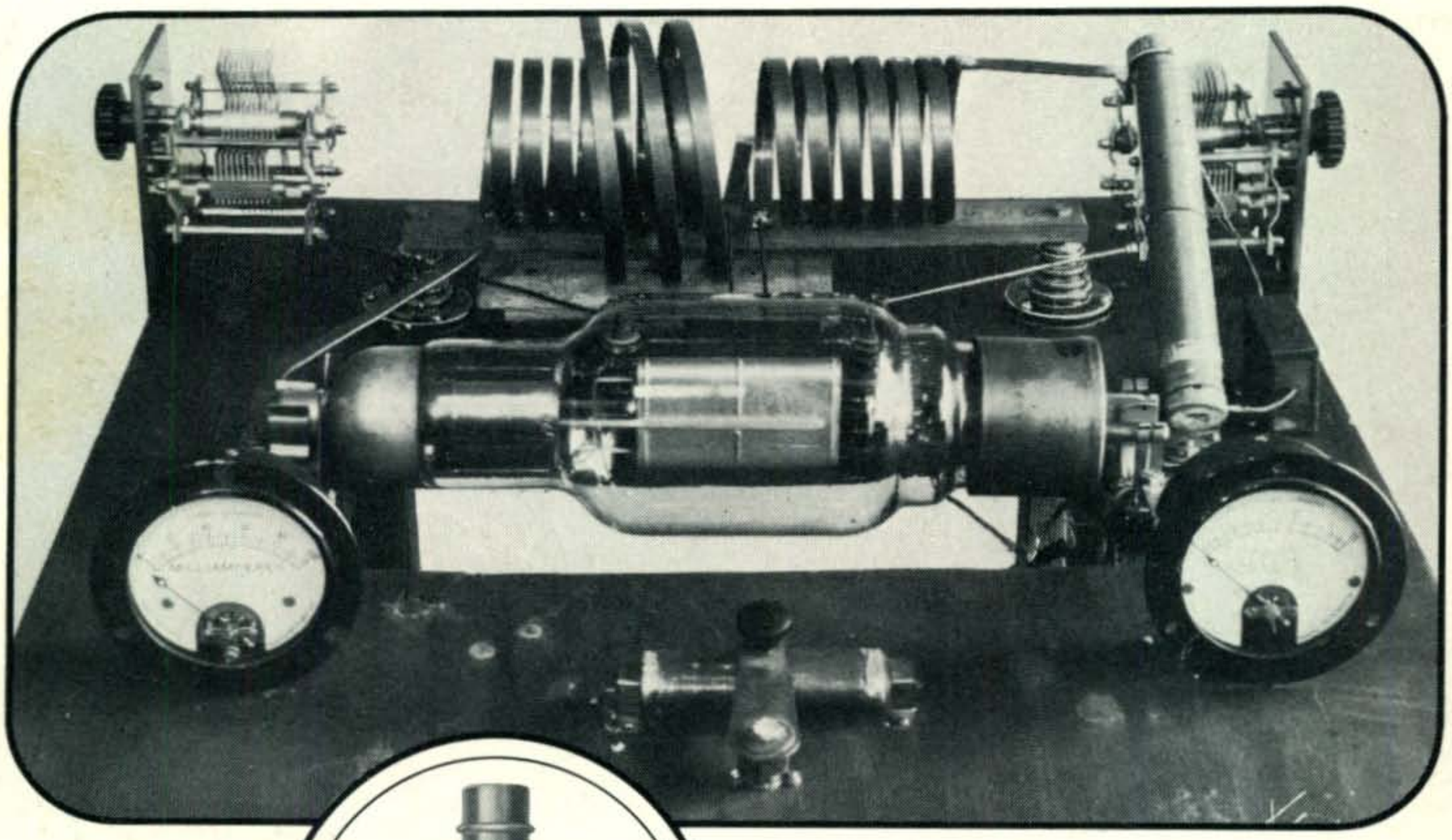
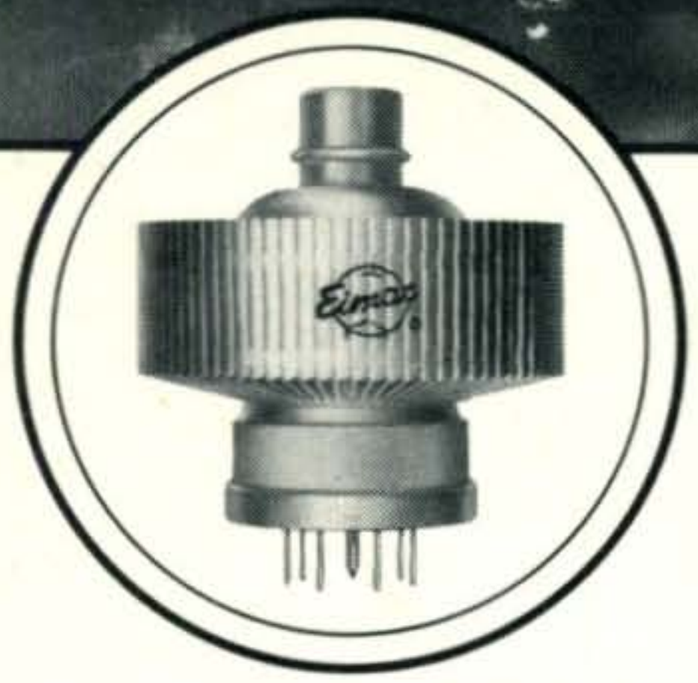


The 6TS transmitter that made wireless history in 1925. This transcontinental QSO marked the beginning of the short-wave era.



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For technical information, contact EIMAC Division of Varian, 301 Industrial Way, San Carlos, California 94070. Or any of the more than 30 Varian/EIMAC Electron Tube and Device Group Sales Offices throughout the world.

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