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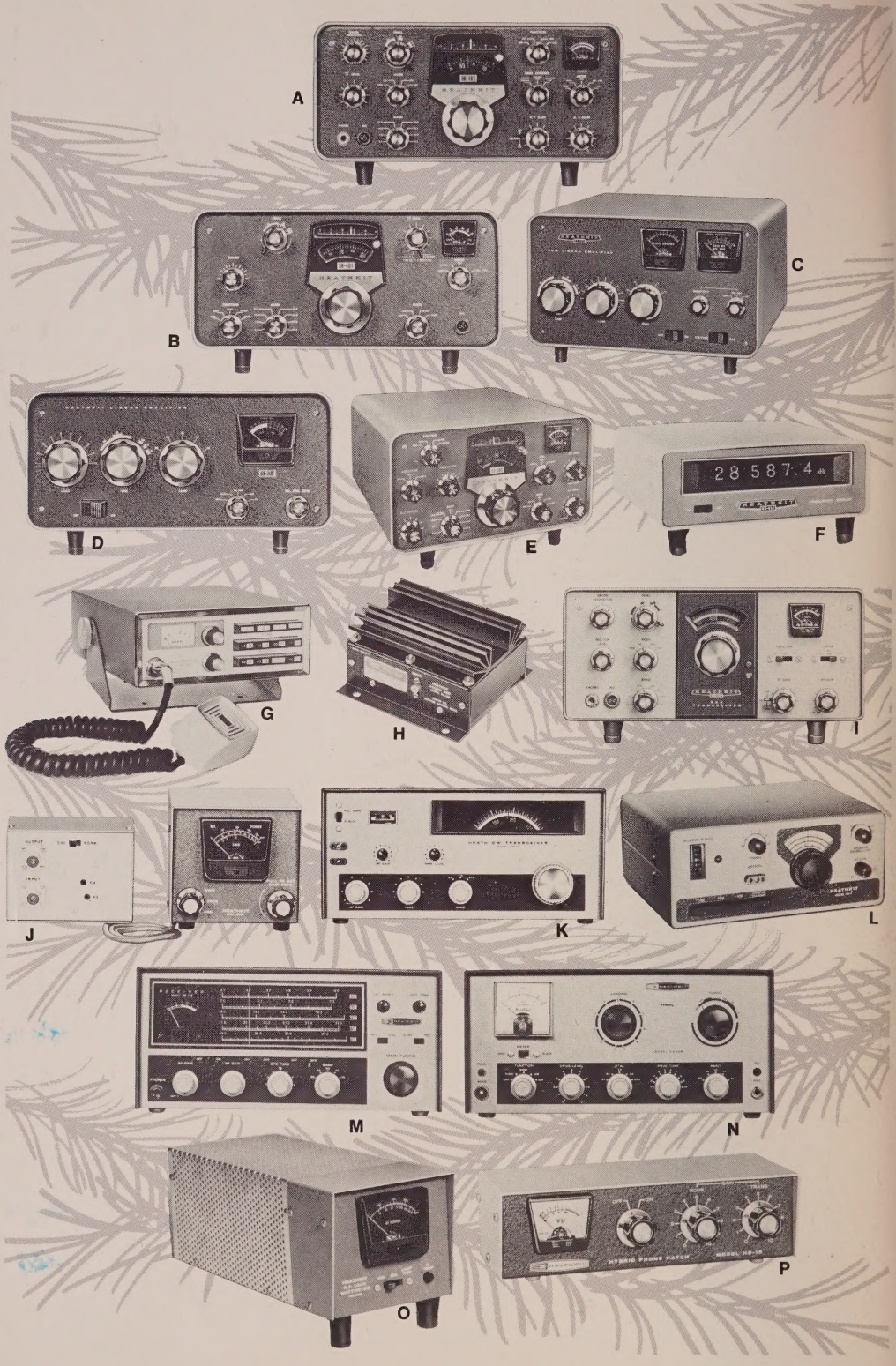
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Heathkit Gear puts Christmas in the air.

A) SB-102, 80-10 M SSB Transceiver...world's most wanted rig. 180 W PEP SSB, 170 W CW. Front panel selection of built-in 2.1 kHz or optional CW crystal filters. Solid-state LMO. 0.35 uV receiver sensitivity. Fixed or mobile operation with optional power supplies.

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B) SB-401 Amateur SSB Transmitter...performance companion to the "303". 180 W PEP SSB, 170 W CW on 80 thru 10. Built-in power supply. Assembled LMO. Requires SBA-401-1 crystal pack for operation with receivers other than SB-300/301/303.

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I) HW-101 80-10 M SSB/CW Transceiver...an improved version of the famous HW-100. New receiver circuitry for 0.35 uV sensitivity. New dial drive mechanism for smoother, more positive tuning. New selectable CW filter option. The world's best buy in an SSB rig.

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J) HM-102 Wattmeter/SWR Bridge...a low cost, high performance accessory every ham needs. Reads RF output from 10-200 & 100-2000 watts. Built-in calibrator permits 10% accuracy of meter in any location. 50 ohms.

Kit HM-102, 4 lbs. $29.95*
Kit HM-2102, 2-Meter Wattmeter/SWR Bridge, 4 lbs. ..$29.95*

K) HW-16 Novice CW Transceiver...a high-performance 3-band CW transceiver...covers the lower 250 kHz of 80, 40 & 15 meters. 75 watts input for novice class — 90 watts for general class. Provisions for VFO transmitter control with Heathkit HG-10B.

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L) HW-7 CW QRP Transceiver. Features VFO & provision for xtal transmit operation. Covers CW portion of 40, 20, & 15 meters. Transmitter circuitry provides input powers of 3 watts on 40 meters, 2.5 watts on 20 meters, 2 watts on 15 meters. Operates from optional AC power supply or 12V battery.

Kit HW-7, 6 lbs. $69.95*
Kit HWA-7-1, AC Power Supply, 4 lbs. $14.95*

M) HR-10B Amateur Band Receiver...with extra-durable two-tone wrinkle finish to match the DX-60B transceiver. Tune AM, CW and SSB with 80 through 10 meter coverage. Provisions for plug-in 100 kHz crystal calibrator.

Kit HR-10B, 20 lbs. $79.95*
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N) DX-60B Phone & CW Transmitter...with wrinkle finish matching HR-10B. Here's 90 watts on 80 through 10 meters...operates at reduced power for novice class. Provisions for VFO control with HG-10B.

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O) HM-2103 RF Load/Wattmeter has a 50 ohm non-inductive load resistor and features less than 1.2:1 SWR for measuring frequencies from 1.8 to 30 HMz; built-in wattmeter with 0-200 and 0-1000 range, accuracy within ±10% of full scale; power rating of 175 W continuous, 1000 W maximum.

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P) HD-15 Hybrid Phone Patch. Has individual receiver-to-line & line-to-receiver gain controls; VU meter; 30 dB isolation for positive VOX operation. Matches 3-16 ohm speakers & hi-Z or 600 ohm inputs; operates VOX or PTT.

Kit HD-15, 3 lbs. $24.95*

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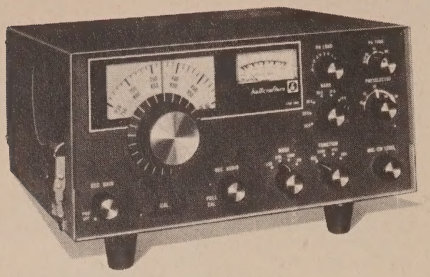
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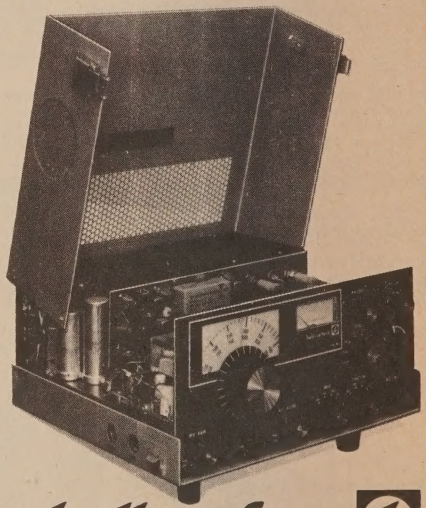
Hallicrafters' all-american made FPM-300, Mark II "Safari" SSB/CW transceiver is Q5... from the Mauritania solar eclipse expeditions to a famous raft adventure in the Atlantic.

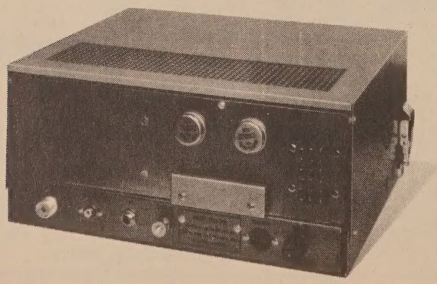


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- Type of service: continuous operation with 2-tone S SB-CW-RTTY (50% duty cycle)
- Power Output: 125 Watts P.E.P. (Nominal) into 50 ohms
- Receiver Sensitivity: Less than 1 uV for 15 db SN Ratio
- Selectivity: 2.0 kHz
- Receiver IM: 60 db below 2 equal 10MV signals
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DECEMBER, 1973 VOL. 29, NO. 12

CQ

The Radio Amateur's Journal

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ZERO BIAS

This past year has seen many thousands of words in dozens of publications, large and small, all focusing on a portion of the rather sparsely populated 220 – 225 mHz amateur band, being eagerly sought by the Electronic Industries Association for CB use. The outraged cries, the anguish, the indignation. How dare someone – anyone – consider robbing the "good guys" (amateurs) of a valuable piece of spectrum to give to "bad guys" (CBers).

Many poorly conceived comments have been filed with FCC arguing against the proposed fast shuffle, and some excellent ones have also found their way into the stack, such as ARRL's. The ARRL offering, we think, is the best example we have seen in several years of what we should expect *always* from ARRL. A summary of the League's reply comments appeared in *QST* for December 1973, and complete copies are available from League Headquarters, we understand.

It will be a while before we know the outcome of all these machinations, and the time might well be spent considering the vulnerability of other amateur bands. Throughout much the world the amateur bands from 220 mHz on up exist on various shared basis with other services, if indeed they exist at all. There doesn't appear to be very much that could be done to alter those circumstances to our advantage, but what do you suppose might happen if one of the sharing service on 420 – 450 mHz decided that sharing was no longer desirable? The likelihood is that amateurs would once again be placed in the awkward position of defending a sparsely populated band with rhetoric and indignation; at best, weak weapons.

The lust for the amateur v.h.f.'s and u.h.f.'s that we're now seeing is only the beginning of what is likely to come, and future attacks on these frequencies are going to be extremely difficult to repel, if they can be repelled at all. Unreasoned prophesies of doom? We don't think so. The fear for the future of the 10 – 160 meter bands which drew such attention in the '50's and '60's will seem tame by comparison to what's to come in the '70's.

It's our feeling that amateurs are going to be hard to stir to action to defend their v.h.f. and u.h.f. bands from future incursions until that threat of incursion is immediate. It's our feeling that the time to begin to plan the defense of these bands is now, *before* petitions are filed threatening the v.h.f.'s or u.h.f.'s.

In other words, we must begin to take the initiative to retain our bands essestially intact *before* we're placed in a *defensive* position.

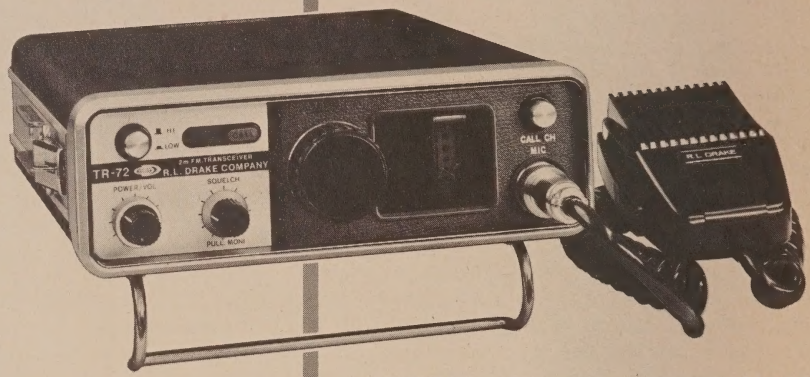
The nature of this initiative is unclear. Campaigns to populate the u.h.f. bands are, realistically, unlikely to succeed sufficiently to be of great value. It will be many years before a band like 1215 – 1300 mHz is populated enough to warrant its continuance solely because of occupancy, and that's only 85 mHz of the 740 mHz of amateur bands between 420 and 5925 mHz. (Amateurs are allocated nearly 13.5% of this prime u.h.f. spectrum.) The "hold" that amateurs have on this range is so tenuous that in some quarters, only passing consideration is given to the fact that these frequencies are allocated to amateurs: commercial services express no doubts whatsoever that amateurs could be usurped from the u.h.f.'s without the slightest bit of trouble! As things stand, they're probably correct.

Truthfully, we don't pretend to have the answers. We feel, however, that answers can be found. We call upon amateurs and ARRL to begin to formulate ideas which can be converted to action at the appropriate time to deter further plundering of the amateur v.h.f. spectrum. In that spectrum lies the amateur radio of future generations. We owe it to those generations and to ourselves to make an honorable attempt to retain it.

73, Dick, K2MGA

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OUR READERS SAY

Toy or Tool?

Editor, *CQ:*

I've just read the guest editorial by WØORX, "SSTV: Toy or Tool?" This is truly a thought-provoking article. I have held my amateur license since 1934 and have gone through many phases of my own Ham career. I do possess Extra class privileges plus 1st class Radiotelephone and Telegraph with RADAR endorsement. Can copy on a mill (solid) 35 WPM from ARRL and 40 WPM from the Connecticut Wireless Assn. I am no novice to amateur radio. Through the years I have noticed a decline in the type of people who make amateur radio what it is today. I am sick at the number of "Screw Driver" mechanics and Appliance operators who have nothing to say what-so-ever. Your Editorial spells all this out in language that all can understand.

We have been too engrossed in the technical applications of our hobby at the expense of using it as a communication tool. The world never before has been separated by a language barrier as now. Not only between our own citizens but more importantly between our own government. Of prime importance also is the total lack of understanding between various cultures of our whole world. At the moment we fail to give credit to the Arab culture for the gift of our mathematics and we most times act as a spoiled child does with a new toy when it comes to Amateur radio. The Bible teaches of the first Tower of Babble and certainly today there is a repeat of this performance. There are literally thousands of different languages and dialects and even with our "International Code" we have failed miserably to really communicate to each other. I wish to compliment you on the message you left in your editorial.

Joseph Rice, W4RHZ
Covington, KY

Good Customer Service

Editor, *CQ:*

I would like to share an experience I had with one of your regular advertisers, Henry Radio.

About nine months ago I purchased a major piece of equipment distributed by Henry Radio through various area dealers. I made my purchase from one of the local distributors being supplied by Henry Radio. During this time I had intermittent trouble that some of my friends and I thought was the fault of the unit. After talking about the problem for all these months (and blowing a few finals), I followed the advice of a few friends with good experiences with Henry Radio and called their Los Angeles branch. I explained the problem to Mr. Ted Henry and after asking me what I wanted to do, he gave me a number of options. I selected an exchange for a brand new unit of the same type. I returned my unit by United Parcel Service on a Monday and on Wednesday of the next week I received my new unit (over $500.00 in value) in fine shape. The unit was not only new, but an improved and updated version of my original unit.

How can you beat this kind of service and product support?

I believe my experience should be heard by others in the ham fraternity so that they might know what kind of service is available from a top reputable organization and not settle for less.

William A. Pearson, WB6QBJ
Novato, California

Sliders

Editor, *CQ:*

Referring to a letter in your Sept., 1973 issue, "Our Readers Say" Column, I completely agree with Sam Robbins' well-written letter. There is really very little character difference between the American Ham Radio and CB outlaws.

I consider myself fortunate to have a VE call and consequently I am not restricted to the American phone frequency allocations.

Doug Renwick, VE5RA
Saskatoon, Sask., Canada

SSTV Optics

Editor, *CQ:*

A little late but anyhow . . . The article by WØORX on SSTV optics (Aug. '73) was good and a long time in coming. It did prompt a comment or two on my part.

The focal length of a compound lens is not measured to the 'optical center' but from the image plane to a point called the 'principal plane,' which may vary considerably between lenses of the same focal length, and is not usually measured but calculated. This is the prime reason why rangefinder and single-lens reflex lenses are not readily interchangeable. I point this out so the reader will not be overly dismayed if calculations and practice disagree!

While a flat-field lens is preferable to a camera lens for this application, this assumes equal quality. The $15-$20 variety of enlarging lenses are something less than sharp until stopped down to f8 or smaller, which dims the image considerably. If a decent camera lens is on hand, it should be tried; it will probably provide satisfactory sharpness and superior brilliance.

Leica-thread (39mm) flanges as well as those for Schneider, Pentax, Nikon, etc., are available in the darkroom supply department of most camera stores and run between $3 and $4.

Bud Weisberg, K2YOF
Bergenfield, NJ

Amateur Spirit

Editor, *CQ:*

This is my first letter to be sent to anyone, anywhere voicing a comment or opinion, so I hope you can publish it as a letter of thanks. Also it may help someone, somewhere to see that getting a "ham" ticket is not next to impossible.

I am 25 years old and have waited to be a "ham" since I was 14, but thought only "electrical engineers" or technicians could possibly pass the test. Eleven months ago, I told Bob Osman, WAØMFX, an instructor at the Linn Technical College, about my desire to get on the air. He told me about the club station, WBØJOR, at the Technical College, in Linn, Missouri. I went there, even though I was not a student, and met Eric Stein, WBØJQB, an in-

[*Continued on page 89*]

The Millen 2 KW Transmatch

Super Heavy-Duty

① Matches 10-300 ohm unbalanced loads to 50 ohm transmitter output, 80 through 10 meters (1300 ohms on 80 and 40).

② Handles the amateur legal power limit.

③ Built-in sensitive trough-line Reflectometer.

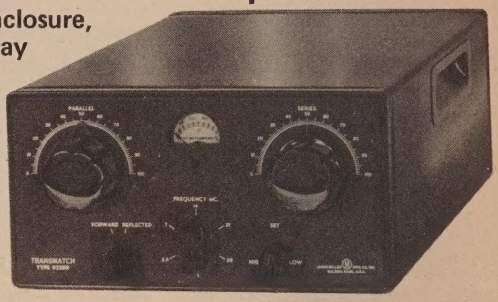
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④ Tight-fitting copper plated enclosure, shielded meter, minimizes stray radiation.

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Announcements

Schererville, Indiana

For the 21st consecutive year, the Lake County Amateur Radio Club, Inc., proudly announces its annual banquet. The date is February 9, 1974, and the time is 6:30 p.m., CST (we start on time). The place is the Sherwood Club, 600 East Joliet St., Schererville, Ind. (2 miles east of Rt. 41, 1/4 mile north of Rt. 30). Chicken dinner, all you can eat. Awards, fellowship, speeches, entertainment, gifts. All for $6.00 per ticket. Come. Bring your wife or girlfriend. Tickets available from club ticket volunteers or from the ticket chairman, Herbert S. Brier, W9EGQ, 385 Johnson St., Gary, IN 46402.

Oak Park, Michigan

Oak Park Amateur Radio Club will hold its Fifth Annual Swap and Shop on Sunday, January 13, 1973 at Frost Junior High School, Cafetorium, 23261 Scotia, Oak Park, MI

Wheaton, Illinois

The Wheaton Community Radio Amateurs (WCRA) will hold their 12th Annual Mid-Winter Swap and Shop on Sunday, February 10, at the DUPage County Fairgrounds, Wheaton. Hours 8 A.M. to 5 P.M. Tickets $1.50 advance; $2.00 at the door. Two buildings again this year and unlimited parking. Bring your own tables. Free coffee and donuts 9:00 to 9:30 A.M. For info and advance tickets contact L.O. Shaw, W9OKI, 433 S. Villa Ave., Villa Park, IL 60181. Advance ticket orders must be postmarked no later than February 3, 1974.

Stolen Equipment

Standard Model SRC-146A FM transceiver in leather case, serial 208070, was stolen from aircraft at Los Angeles International Airport on October 5, 1973. Xtals installed - four amateur and one national weather service. Contact: Lt. W.L. Robinson, SLPD, Chief Security, Salt Lake City International. Phone (801) 328-7652 or P.O. AMF Box 22084, Salt Lake City, Utah 84122.

During the month of July, the Syracuse University Amateur Radio Club, WA2SDY, had its 2 meter transceiver stolen. Regency HR-2 Serial No. 040 3821. Contact Syracuse Univ. Amateur Radio Club, WA2SDY.

GI Special Activity Weekends

12th and 13th, 19th and 20th, January, 1974. The object of this activity is to enable overseas stations work the ten Gi's required for the Gi6YM Golden Jubilee & Marconi/Kemp 75th Anniversary Award. All bands, 80 to 10 meters will be used on am/cw/ssb.

Flushing, New York

The Hall of Science of the City of New York located in Flushing Meadow-Corona Park, Queens, New York, will again offer amateur radio licensing classes beginning Feb. 2, 1974. Classes for Novice, Technician, General and Advanced type F.C.C. licenses will be given in 12 week courses. There is a $5.00 registration fee and Novice and Technician texts are $2.50 while General and Advanced texts are $4.75. Write or call Radio Classes, Hall of Science, P.O. Box 1032, Flushing, New York 11352 or call (212) 699-9400 for information and application.

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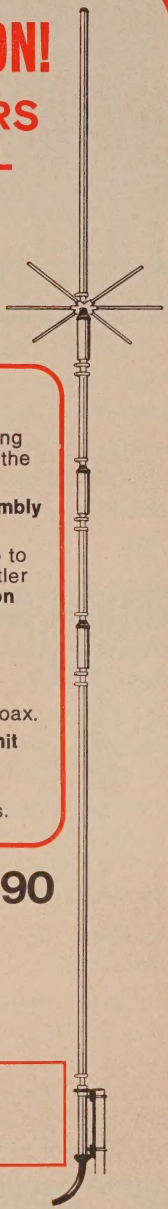
FOUR BAND—40 THRU 10 METERS FIXED STATION TRAP VERTICAL

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- **Lowest SWR**—PLUS!
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- Extra heavy duty aluminum mounting bracket with **low loss—high strength** insulators.
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Model: DI-2

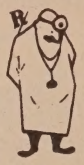
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Model: DI-2A

For detailed specifications, see your authorized Mosley Dealer or write Dept. 212 . . .

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Q AND A

BY CHARLES J. SCHAUERS,* W6QLV



THERE are not too many shops in the United States or overseas which specialize in the repair of amateur radio equipment. Factory service is expensive especialy when one considers shipping charges etc. Most reliable distributors of amateur equipment have efficient repair facilities but these are usually devoted to getting trade-in equipment in shape for sale or checking out new gear.

Q&A has received a number of letters from readers complaining about the service they have received. In one case a transceiver was shipped back and forth between customer and repair facility three times and the set seemed to be worse each time it came back. There is little excuse for this!

We all know that modern transceivers are not that easy to repair, but one need only take a glance at some instruction books to find out why this is so.

The amateur who has his own test gear such as a scope, v.t.v.m. and a transistor tester is in good shape to do his own servicing. A signal generator and a tube tester can often be borrowed.

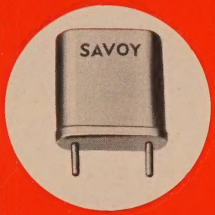
The component that fails most often is still the vacuum tube, followed by diodes, resistors, capacitors, relays, transistors, I.C.'s, power transformers, pots, slide switches etc., in that order. Before an amateur ships his set out for service he should check for the simple causes of trouble first. I maintain that the active ham should be able to shoot his own trouble in the equipment he uses.

Robyn Digital 500 Problem

K6HX (Lew Stoner) ran into a problem with his Robyn Digital 500 transceiver

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MODEL DGA-2040	$59.50
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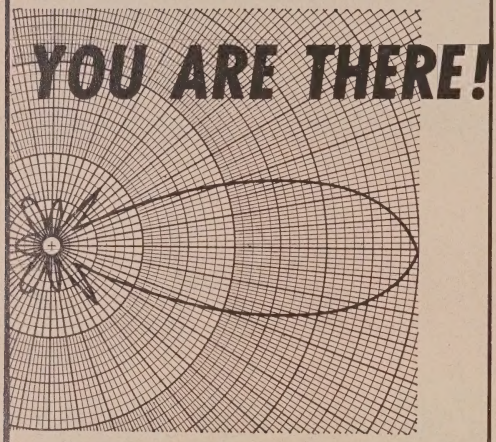
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(which he solved with the help of Linear Systems (SBE)) which I am passing on to those who *may* run into the same problem. To save space I paraphrase most of Lew's letter.

While using the set on 14302 mHz, Lew had a good signal going out on 14198 mHz, that latter on l.s.b.

Careful analysis showed that the crystal local oscillator frequency is 28.5 mHz, the v.f.o. frequency is 5.2 mHz and the s.s.b. is at 9 mHz.

Looking at the pre-mix stage of two transistors, the first of which is the 28.5 mHz crystal—the second in it's emitter brings in the v.f.o. at 5.2 mHz. Hopefully the 28.5 minus that 5.2 resultant, 23.3 mHz would reach the grid of the first tube in the line-up to combine with the 9 mHz (23.3 - 9) to give the needed 14.3 mHz. However, there was also present at the grid of the 6EJ7 mixer a very strong 5.2 mHz v.f.o. signal. Thus the 9 mHz s.s.b. plus the 5.2 mHz v.f.o. gave a signal at 14.2 mHz.

Inspection of the top or component side of the printed circuit board revealed that two 2 Pf condensers were jammed together, one of which brings in the 9 mHz, the other the 23.3 mHz "pre-mix" signal and most of the high level carrying components of the output transistor such as L^{29A} the collector r.f. choke, so the signal reaching the grid of the 6EJ7 was a combination of the 5.2 mHz v.f.o. and 9 mHz s.s.b. signals.

After many headaches, a small 3/4 inch by 2 1/2 inch piece of very flexible printed circuit material with tape on its edges was woven between the offending capacitors and grounded—this eliminated that 5.2 mHz at the tube grid and hence the 14.2 mHz. A torroid 28.5 mHz trap was slipped over L_{11} and an extra tuned circuit placed right on the band-change switch and link coupled to L_{11} sharply tuned to 23.3 mHz polished off the job. TVI was experienced before the work on the set.

Thanks Lew! I wish more readers of this column would share their troubleshooting information as you have—there *is* satisfaction in helping others when one can.

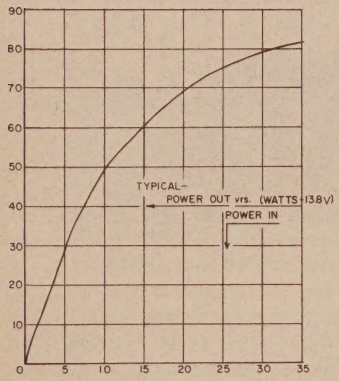
Preamp For Panadapter

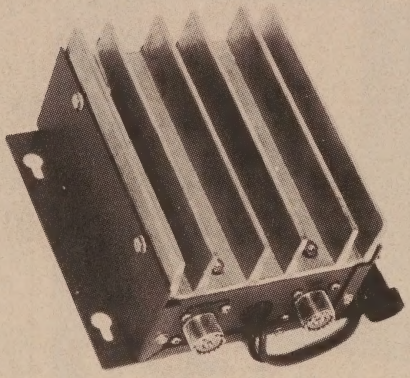
W2GS (Ed. Ehlinger) wrote and said he uses an International Crystal BAX-1 broadband transistor amplifier between his panadapter and transceiver and he obtains sufficient gain to obtain a good set of pips. He uses a piece of metal wrapped around the

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We use a pair of 2N6084 Transistors (each one rated 40 W Infinite VSWR) featuring EMITTER BALLASTED construction and of first Quality, so you can't burn them out in tuning or under any load mis-match; each Transistor has been individually Hand tested at DYCOMM before shipment.

Typical assembly time is 5 hours. Kit is complete with full assembly procedure, including lay-out Photos, and Manual.

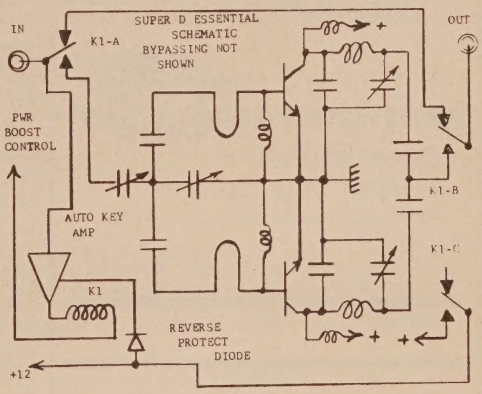
Tune-up and alignment is easy and straight forward using a watt-meter, dummy load and VOM.

Kit includes: 6' control wire, 6' power cables (fused), 4' RG58 to make interconnect cable, 2 PL 259 connectors, and all other parts required for this PROFESSIONAL $150.00 Amplifier.

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Basic design proven in thousands of D's
Operates with ANY 2-35W Rig
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Dashboard control available
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mixer tube which serves as a "coupler" to the adapter. Thanks Ed!

866 Hash

"I use a Johnson Valiant, its power supply uses 866 mercury rectifier tubes and these generate a lot of hash. How do I eliminate it?"

My first suggestion is to obtain solid state (diode) plug-in replacements, they may cost a little more but are better. If you don't want to do this try an r.f. choke (5 mf) in series with each 866 plate—make sure the chokes will carry the current required.

SB-102 Hum

"I bought a second-hand SB-102 and note some hum when receiving, especially on c.w. and using phones. What's the cure?"

The hum is no doubt picked up from the l.m.o. power supply and this supply can be modified per the article in *CQ* (Apr. 73), but an easier way to eliminate the hum is by disconnecting the coax lead and its shield from the wiper arm of the a.f. gain control and at point "C" on the audio circuit board. (These leads can be taped on the ends or cut off close to the harness). Then a 10 inch length of small 52 ohm coax was connected in its place but *routed* straight along the edge of the chassis. *Both ends* of the coax shield were soldered to ground points. (Thanks to Mike, W8CEB for his approach to the problem)

Rectifier Diodes

"What should I know about the 'selection and treatment' of silicon diodes for rectifier service in a power supply I contemplate building for a maximum power linear?"

Space precludes going into a lengthy discussion, but here are some salient points to remember. Never choose diodes on the basis of their average d.c. current rating but rather on the current surge rating which is generally about twelve times the maximum of the latter. Diodes can be connected in series for a higher PIV (peak inverse voltage) operation and in parallel for a higher current handling capacity.

A resistor in parallel with a capacitor should be placed across each diode in a series string to equalize PIV drops. Resistors should be used in series with each parallel diode to equalize current distribution.

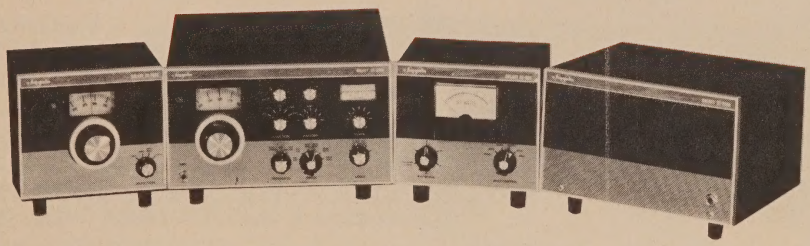
The value of resistance chosen for the series connected diodes should be about 500

[Continued on page 94]

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GT-550A Transceiver The matchless heart of the 550A System. No other transceiver can give you this performance for the price. Operating fixed station or mobile, the GT-550A is guaranteed to have top frequency stability after warm-up. A graph showing stability during final check-out is included with each unit. 25 KHz calibrator and VOX, optional.

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Harmonic and Spurious Radiation – Carrier suppression in excess of 45 db down, unwanted side bands minus 55 db oscillator feed through and mixer spurious products down 50 db. Second harmonic minus 40 db and third order distortion in excess of minus 45 db.

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

Audio Frequency Response – Minus 6 db approximately 300/2400 Hz determined by side band filter.

RF Compression Characteristics – Up to 10 db RF compression without distortion.

Receiver Sensitivity – Better than .5 uv for 10 db S+N/n ratio.

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

Receiver Spurious Response – Image rejection better than 40 db down. Internal spurious below 1 uv equivalent input.

Frequency Calibration – Interpolation to 1 KHz in 5 KHz increments.

Frequency Stability – Within 10 Hz during any 30 minute warm-up period, less than 100 Hz in any 15 minute warm-up period, not more than 100 Hz with a plus or minus 10% line voltage variation.

Calibration Accuracy – Interpolation to 1 KHz after calibration.

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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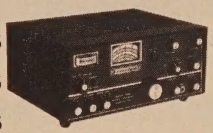
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300B Cygnet *de novo* . . $499.95
VX-2, VOX unit $35.95
SWAN 14-A, converter . . $44.95



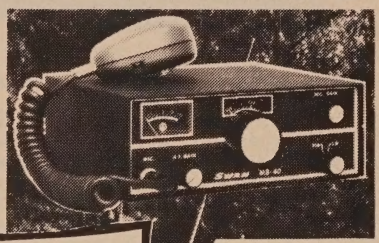
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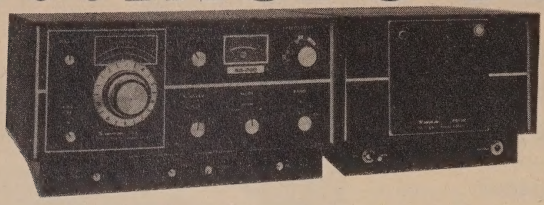
Like its big brother, the SS-200, this monobander needs no transmitter tuning and is infinitely protected from VSWR damage. Front-end overload, distortion and cross-modulation is virtually eliminated.

Select the MB-40 for 7.0 to 7.3 MHz use, or the MB-80 if you prefer to work 3.5 to 4.0 MHz. Whichever monobander you select, we'll include the correct single-band coil and whip antenna together with a bumper mount and microphone. A total value of $374.00 offered during this special holiday season for only $320. SAVE $54.00.

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THERE'S MORE (PLEASE TURN THE PAGE)

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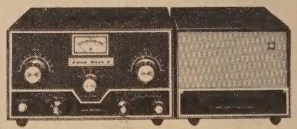
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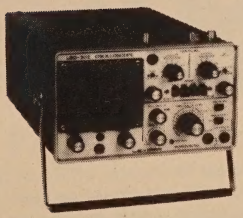
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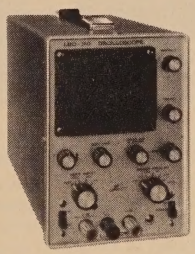
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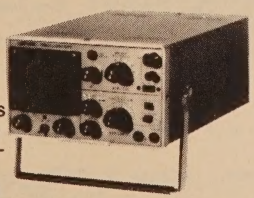


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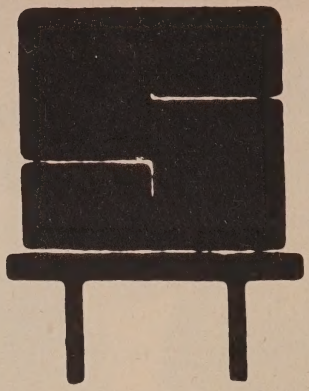
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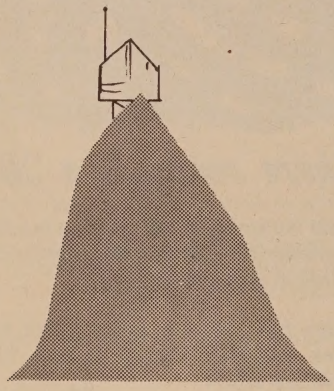
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An Audible Meter for the Blind Amateur

BY HOWARD F. BATIE,* W7BBX/4

IF you were blind, how would you read a meter? How difficult would it be to tune up even the simplest rig? Or even if you weren't blind, how would you adjust a circuit for which the metering is done at a remote location? The device described here, an audible meter, is one answer to these questions.

The purpose of this article is three-fold: 1. to take the reader in a purposeful step-by-step sequence through the design considerations necessary to arrive at a working circuit, 2. to describe the theory of operation of several simple but very useful building-block subcircuits, and 3. to arrive at an end product which both meets the design goals and is useful.

The circuit of the audible meter is basically a form of an analog-to-digital converter, where a pulse train or a square wave of varying audio frequency is produced by the d.c. voltage developed across the meter terminals.

Desired characteristics and particular constraints for this project were:

1—Clearly audible tone which varies in response to a d.c. input voltage.

2—Lowest frequency tone of about 400 Hz with zero voltage developed across the meter.

3—Increasing tone with increasing meter reading.

4—Two octave audio tone range with zero to full meter deflection.

5—Calibrated tones for each meter division (0, 1, 2,. . . 9, 10) for aural comparison of meter reading.

6—High input impedance to permit permanent direct connection to the existing metering circuit without affecting its reading.

7—No expensive or hard-to-get components.

*2912 Johnson Road, Falls Church, VA 22042

The voltage amplifier is connected directly to the meter to be monitored (fig. 1); the amplifier input impedance must therefore be very high with respect to the meter resistance to prevent additional loading on and erroneous readings from the meter. A means of controlling the amplification must be provided, since the output voltage is essentially within a fixed 2-5 volt range (the reason for selecting this range will be discussed later) driving the voltage-controlled oscillator, or VCO, but the input voltage may differ between meters. The specified +2 to +5 volt d.c. input to the VCO should vary

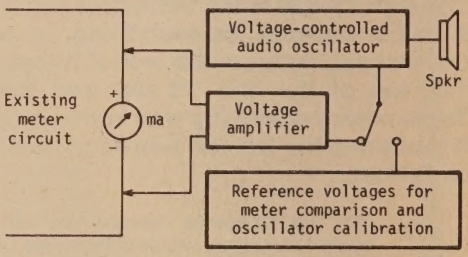


Fig. 1—Functional block diagram of the audible meter for the blind.

the oscillation rate of the VCO as linearly as possible, and between an arbitrary but convenient range of two octaves. This will provide sufficient audio resolution of the tones generated between two adjacent meter divisions, such as 0 and 1, or 4 and 5. If a random pitch (meter reading) can be compared to specific calibrated audio pitches which in turn correspond to specific meter readings, and interpolation between meter divisions is possible by ear. Thus, a blind person cannot only tune a transmitter for maximum or minimum indications, but also adjust to, for example, 65 on a 0-100 meter scale with very good accuracy.

Voltage-Controlled Oscillator

Perhaps the simplest VCO for the audio range is a UJT relaxation oscillator, shown in fig. 2. R controls the charging rate of capacitor C; when the voltage across C reaches a specific level (determined by the emitter-to-base 1 voltage and the intrinsic stand-off ratio of the UJT), C discharges through the emitter, base 1 and R_2 to ground; a pulse waveform is developed across R_2. By varying R, the charging rate of C, and thus the pulse repetition rate of the oscillator, is varied.

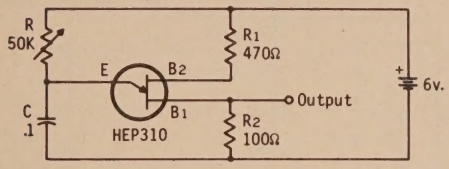


Fig. 2—Uni-junction transistor relaxation oscillator.

The charging rate of C may also be varied by substituting a constant-current source. If the current source is a transistor connected as in fig. 3, the current charging C may be made proportional to an input voltage, V_{in}. The Q_2 base resistor should be chosen to keep Q_2 within its active region over the desired range of V_{in}. R_4 will limit the upper frequency generated by the oscillator, as well as the range. Indicated component values give a two-octave range in output frequency with the minimum frequency about 350 Hz and an input voltage range of 3 volts: V_{in} (min) = 2.0v; V_{in} (max) = 5.0v. Maximum rate of change of the audio tone occurs near V_{in} (min). Current drawn is about 1 ma.

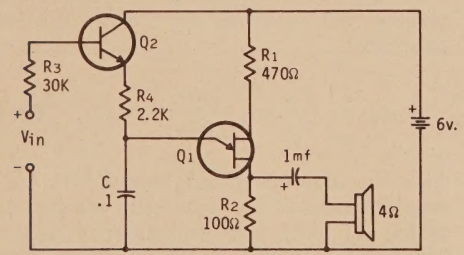


Fig. 3—Addition of Q_2 makes VCO frequency a function of V_{in}.

The disadvantage of a UJT oscillator is that the pulsed output, when impressed across a speaker voice coil, produces a very uncomfortable tone. Even listening to a square wave is much preferable than listening to pulses. A simple square wave oscillator is shown in fig. 4.

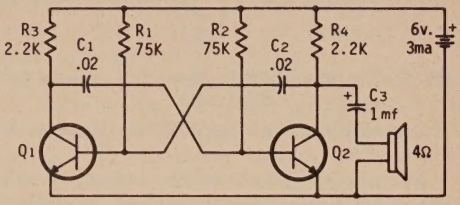


Fig. 4—Simple square wave oscillator.

The circuit is a basic collector-coupled astable multivibrator whose flip-flop rate is determined by the coupling capacitors C_1-C_2 and the charging resistors R_1-R_2:

$$f_o = 1/[(0169)(R_1C_2+R_2C_1)] \quad \text{Eq. 1}$$

If R_1=R_2 and C_1=C_2, the output is a symmetrical square wave; otherwise a non-symmetrical square wave results.

For our application, a constant-current source is again substituted for the frequency-controlling resistance, as shown in fig. 5.

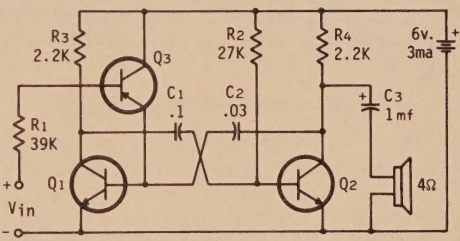


Fig. 5—Addition of Q_3 enables voltage control of oscillator of fig. 4.

The values in fig. 5 have been adjusted to give the same low f_o and delta-f_o range with the same delta-V_{in} as in the UJT oscillator. A.f. linearity is better than the UJT version, especially near the high frequency end; however, some experimentation may be necessary depending on the characteristics of Q_3. All random unmarked transistors used in the breadboard model worked very well.

Voltage Amplifier

A compensated 741C operational amplifier (op-amp) was selected because of its low cost, high input impedance, large output voltage swing and ready availability. Ordinarily, op-amps and differential amplifiers are used as small-signal or a.c. amplifiers; however, both may be used as very effective

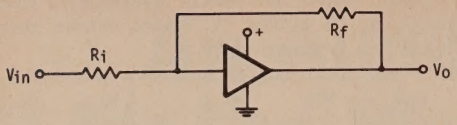


Fig. 6—The ratio of *Rf* to *Ri* controls voltage gain of op-amp.

d.c. amplifiers with appropriate biasing circuits.

The op-amp amplification factor, or voltage gain (op-amps are voltage amplifiers, whereas transistors are usually current amplifiers), may be easily adjusted over a wide range by varying a single resistor (fig. 6).

$$A_V = \frac{R_f}{R_i} = -\frac{V_o}{V_{in}} \qquad \text{Eq. 2}$$

where R_f is the feedback resistor (normally greater than 100K) and R_i is the input resistor. The "–" sign indicates the change in output voltage is out of phase with the change in input voltage; *i.e.*, a positive swing of V_i results in a negative (less positive) swing of V_o.

One side of differentially-connected op-amp, such as the 741C, may also be used, preferably the inverting half as shown in fig. 7.

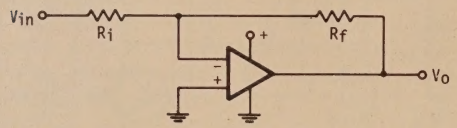


Fig. 7—Using the inverting half of a differential amp as voltage amplifier.

We have previously specified a +2 to +5 volt range for V_o to operate the VCO "frequency control." This range, and the component values of the VCO, were selected to correspond with the quiescient voltage $V_{o(min)}$ of the op-amp and $V_{o(max)}$ with a 6v. supply. To determine the required voltage gain of the op-amp, the voltage developed across the meter terminals must be known, and R_f and R_i adjusted accordingly.

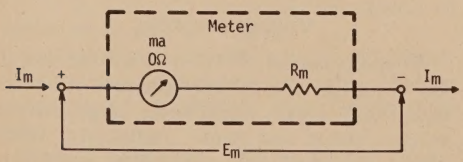


Fig. 8—Representation of a meter, consisting of "deali" meter in series with internal resistance *Rm*.

An actual current meter is represented in fig. 8 by an "ideal" meter (zero internal resistance) in series with its actual internal resistance: The current I_m passing through the meter develops a voltage across the meter terminals equal to

$$E_m = I_m R_m \qquad \text{Eq. 3}$$

For a 1 ma meter, R_m is usually on the order of a few tens of ohms. However, the precise resistance of the meter can be found by the method shown in fig. 9 (NEVER measure the resistance of a milliameter with a vom!):

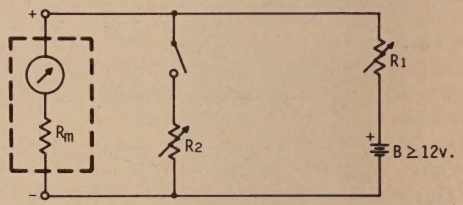


Fig. 9—Measuring the internal resistance of a meter.

1—Remove the meter from any existing circuit.

2—Select $R_1 = 2B/I_{m(max)}$ ($R_1 >> R_m$, $R_2 >> 2R_m$).

3—Disconnect R_2, adjust R_1 for full-scale deflection.

4—Connect R_2, adjust for half-scale deflection.

5—Remove R_2 and measure with vom; $R_2 = R_m$.

The desired meter to be monitored was a 1 ma meter with an internal resistance of 43 ohms. Therefore, at full scale deflection, 43 millivolts is developed across the meter terminals. This 43 mv is to produce an op-amp output swing of 3 volts (5v-2v); therefore:

$$A_V = -\frac{V_o}{V_i} = -\frac{3.0\text{v.}}{0.043\text{v.}} = -70 \qquad \text{Eq. 4}$$

Also, the ratio of R_f to R_i must be 70. A 22 megohm resistor was arbitrarily selected to permit R_i to be large enough to present a high input impedance to the op-amp in other applications, while still maintaining a ratio of R_f and R_i which could be varied over a wide range. It should be noted that either R_f or R_i can be varied to adjust the amplifier gain; normally R_f is varied to provide an adjustable gain while maintaining a constant

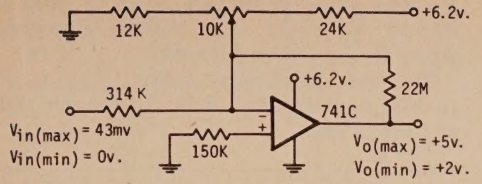


Fig. 10—Fixing *Ri* and *Rf* at the values shown, and biasing to keep IC in its active region yields final version of voltage amplifier.

and high input impedance ($Z_{in} = R_i$) with R_i fixed. In this application, Z_{in} is not very critical since the circuit to be monitored has a very low impedance, R_m. The value of R_i is determined by:

$$R_i = \frac{R_f}{R_i} = \frac{22\text{Meg}}{70} = 314\text{K} \qquad \text{Eq. 5}$$

When a single power supply is used, it is necessary to bias the input port of the amplifier to maintain the IC in its active region. In addition, since one half of the 741C differential array (the non-inverting transistor) is not used, the unused input port was connected through a 150K resistor to ground. This value was found experimentally to minimize output voltage drift when the input voltage was held constant, and may vary between IC's. Our voltage amplifier now looks like fig. 10.

To provide for A_v adjustments, R_i was replaced with a 500K pot in series with a 39K resistor. The maximum and minimum theoretical gains then available are:

$$A_{v(max)} = \frac{22\text{Meg}}{39\text{K}} = 563$$

$$A_{v(min)} = \frac{22\text{Meg}}{539\text{K}} = 48$$

Therefore, the desired VCO performance can be obtained over an $E_{(max)}$ range of from 5 mv to 48 mv with the values given. If the maximum voltage developed across the meter is greater than 48 mv, decrease R_f to reduce the gain of the op-amp.

To maintain consistent performance in the IC active region, the power supply should be well-regulated. This can be accomplished by using a 9v. transistor battery and a 6.2v. Zener regulator diode. The op-amp and VCO combined current drawn from a 6.2v. source is about 4½ ma.

Figure 11 shows the op-amp/VCO circuit developed so far. Note that it is necessary to reference all voltages to the potential of the negative meter terminal, NOT chassis ground potential. The two may differ by hundreds of volts, depending on the remote circuit being monitored. No matter what potential the meter is at, this circuit responds only to the *difference* in potential developed across the meter. It is therefore important to insure that no inadvertent connections are made to the chassis of the audible meter, which should be connected to the chassis of the monitored equipment by the shielded 2-conductor cable. Check the speaker to be used to insure that one side of the voice coil is not connected to the frame of the speaker.

Calibration/Comparison Divider

In order to provide reference tones to which the tone produced by a random meter voltage can be compared, fixed "standard" input voltages must be available which correspond to the meter voltages present at each of the eleven meter divisions, 0-10. A simple resistive voltage divider is used to provide these eleven voltages, switch selected, as shown in fig. 12.

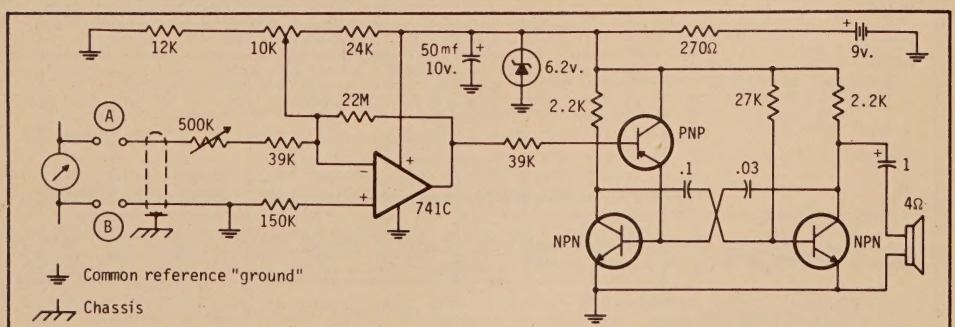


Fig. 11—Voltage amplifier combined with voltage controlled square wave audio oscillator.

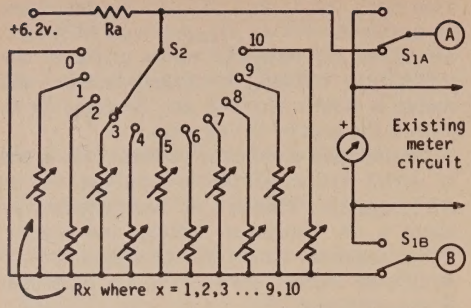


Fig. 12—Basic step voltage divider for reference tones.

The values of the series divider resistors R_X (x-1,2,3,. . .9,10) are found from:

$$R_X = \frac{(V_{in\ x})(R_d)}{V_Z - V_{in\ x}} = \frac{(R_d)(V_{in\ x})}{V_Z}$$

(since $V_Z >> V_{in\ x}$)

where $V_{in\ x}$ is the voltage across the meter when pointing to the xth meter division. R_d must be chosen to be very large compared to R_X since a voltage division of up to 1400 is desired. V_Z is the zener voltage supplying power to the divider network.

For the monitored meter, $V_{in\ x}$ = (0.043v.) (x) and V_Z - 6.2v. R_d was selected as 150K. Then,

X	0	1	2	3	4	5	6	7	8	9	10
R_X	0	104	208	312	416	520	624	728	832	936	1040

To enable sufficient trimming resolution for precise setting of the 10 pots, the final divider circuit is arrived at. Pulling together all the subcircuits discussed, a final composite schematic for the audible meter is shown in fig. 13.

Construction

Layout is not overly critical, although PC board construction is preferred since lead lengths can be minimized with proper planning. Only two front-panel controls, S_1 and S_2, are required; a small (1½" or larger) speaker may be mounted wherever desired. S_1 is a toggle d.p.d.t. center-off switch with momentary contact on one side and fixed

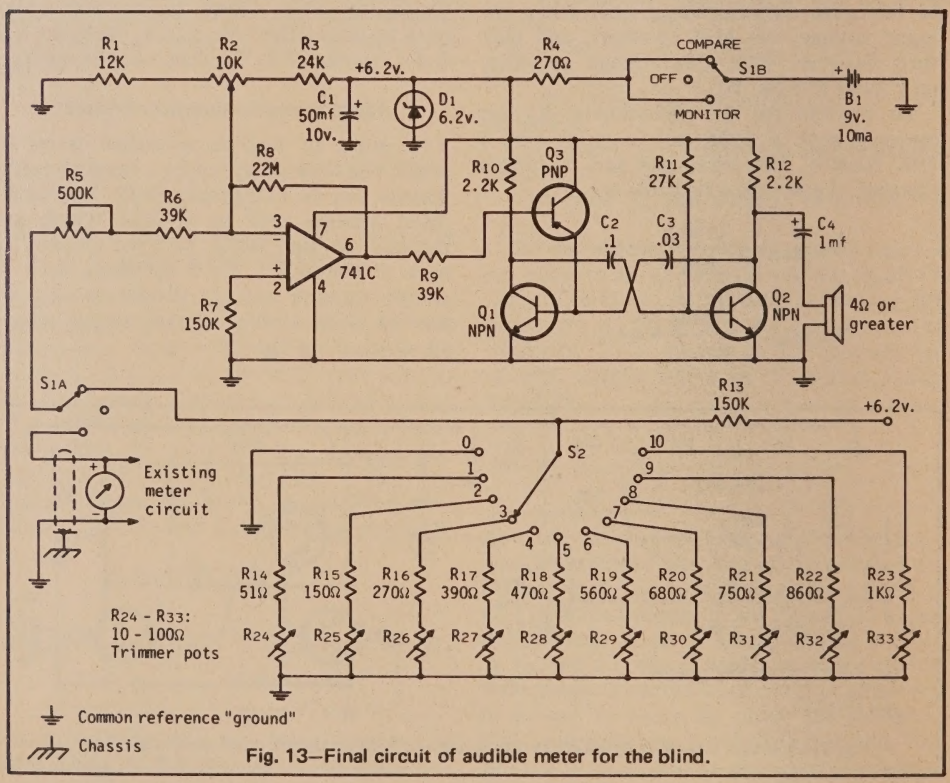


Fig. 13—Final circuit of audible meter for the blind.

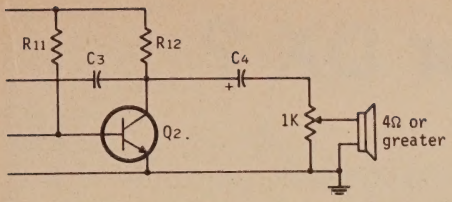


Fig. 14—Addition of a separate volume control, if desired.

contact on the other; the fixed side is used for the MONITOR position, and the momentary contact side for the COMPARE position. S_2 selects the fixed tones produced by the resistive divider. If desired, a separate volume control may be added as shown in fig. 14; alternatively, if a fixed volume is desired, the value of coupling capacitor C_4 may be decreased until the desired volume is produced.

Adjustment

With the equipment power off, connect the audible meter directly to the meter to be monitored. Turn on the metered equipment and adjust it for an indicated zero reading. Set the sensitivity pot R_5 (fig. 13) for maximum resistance (minimum op-amp gain) and connect a vom (20K/volt or better) between op-amp output pin 6 and the common reference ground. Place S_1 in the MONITOR position and adjust the bias pot R_3 to the point where +5 volts is indicated on the vom, but any further rotation of the bias pot causes the op-amp pin 6 voltage to decrease toward +2 volts and the tone to change.

Readjust the metered equipment for a full scale meter reading (exactly). Trim the sensitivity pot R_5 (the vom reading should start downward toward +2 volts) until continued rotation of R_5 has no further effect. The vom should read about +2 volts at this point. These two adjustments are fairly sensitive and determine the ability of the VCO to audibly "track" the meter voltage.

With S_1 off, tune the metered equipment for an indicated value of 1. With S_2 in position 1, flip S_1 back and forth between MONITOR and COMPARE, adjusting R_{24} until the tones in the two S_1 positions coincide. Tune the equipment to 2, place S_2 at 2 and repeat the procedure, adjusting R_{25}. Continue similar adjustments for the remaining eight meter divisions, S_2 positions and trimmer pots R_{26} through R_{33}. ■

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Whither DX ?

BY KATASHI NOSE,* KH6IJ

WHERE are PY2CK, W1FH, W1GKK, ZL2GX, and other leaders of DX of yesteryear? Are they getting old? Have they lost interest in this hobby, or has the spirit of the chase been blunted by DX tactics of this generation?

Has DX lost its spirit of competition and sportsmanship? For that matter, exactly what is DX, now that a fellow with a four-foot whip attached to the side of a high rise apartment zeroes in on your frequency and works the same DX you have just worked with a kilowatt and a multi-element array?

How much of a thrill is there to DXing when one has to take a number and await your turn by districts – is this DXing? Or is it a tacit admission that the DX operator cannot or does not know how to handle a pileup?

Time was when skill, know-how, luck and patience were the hallmarks of a DXer. Today, I'm afraid it is who you know and how much you can buy.

Organized DXing as we know it today, is a postwar phenomenon and is only 25 years old. Let me back up a bit. I know nothing of the spark days except for what is written in history. Some stunning DX was worked in the early twenties, and we have all read of the thrill of the first trans-Atlantic crossing in 1923 between 8AB (Deloy) and 1XM (Reinartz). The Seefred brothers 6EA and 6EB worked Japan in 1915 with a crystal set for a receiver. For that matter, in 1903 the Andaman Islands had a wireless system with which it worked the Indian mainland, and in 1903 Branley worked across Massachusetts Bay with his set.

DX then, is a relative matter, and by DX I mean the kind of disorganized bedlam and turmoil the bands is thrown into when Don Miller steps off a boat at low tide, stands knee deep in water, and proceeds to work the world.

I cannot help but recall my early receiver, a 201 and later a UX199 with a Kurtz Kasch dial. I grasped the knobs with two hands, one for tuning and the other for regeneration, for tuning was a two-handed process.

A regenerative set without a metal front panel was not exactly a stable set. You found a station and promptly lost him when you started to transmit because the receiver would block completely. The tuning process would have to be repeated and you would find your station just about in the middle of his long transmission. You called CQ someplace in the middle of the band and you listened for answers any place in the band, or even in a different segment of the 20 meter band (the 20 meter band had a phone segment in the middle).

My transmitter was a 201A with 45 volts of battery power. I recall answering CQ's for six months without getting a reply. Then,

*4207 Huanui St., Honolulu, Hawaii 96816



Mobile station KH6IJ (then K6CGK) "on the beach" with 201 transmitter, 45 volt battery, 201-201-112 receiver, and Brandes phones.



The future Mrs. KH6IJ was at the same site. Note longwire antenna from door handle. The car is a Chevrolet Coupe with rumble seat.



Same location 40 years later, but with experimental and research license KB2XXK for geosynchronous satellite ATS-1 communication.[1]



The same YL, now Mrs. KH6IJ, same location, 40 years later, just having finished talking to New Guinea, Fiji and Samoa via satellite.

one night I thought I heard New Zealand, 2FQ, come back to my call but I wasn't sure.

One night in 1932 I called CQ and as usual expected no answer, but this time I thought I was hearing things because W6AM, W6CUH, W6ENV, and a host of others were calling me. I had stumbled into one of ARRL's early DX tests. I worked ten stations that night, and from that night on I has hooked on contests.

I gradually graduated to a high power (ten watts) pair of '45 tubes in TNT and DX came a little easier.

I remember the August 1932 issue of *QST* in which Charles Perrine, W6CUH, set the stage for high power. His article "32 Watts per Dollar" was the forerunner of today's high power technique. This article with Loy Barton's "Class B Modulators" are the classics of ham radio. Perrine used a pair of 852's driven by another 852 (75 watt tantalum plate) with the remarkable efficiency of 85%, 800 watts to a pair of 75 watt tubes. The secret was high drive, low "C" tank, and a quick tune up procedure.

The depression was still with us and I used tin foil from cigarette wrappers and wax paper from bread wrappers to make filter capacitors, and made my own tuning and neutralizing capacitors from old refrigerator trays and aluminum from washing machine agitators, with hacksaw and file.

The stage was set for the next phase – and what a period it was. I say it was the "Golden Age of DX." W6QD was the editor of a West Coast publication called *Radio*, later to become *CQ*. This was the period from 1934 to 1939.

Stations such as ON4CSL operated by Reverend Caroll Stegall, "The Voice of the Belgian Congo," threw the ten meter band into an uproar. Daylight DX was upon us. AC4YN (Mr. DX) from Lhasa Tibet was the symbol of DX. Gioga and Cooper, had just described their experiment with Yagi beams on ten meters in *Radio* magazine.

Equipment and DX kept pace and some of us remember the calls such as F8EX, F8EO, ON4AU, G6LK, G5BY, FB8VX, V8AB, EAR96, X23A, X1G, AC2RT, PK1DA, J5CC. Such things as 11 year cycles were unknown terms which had not yet been conceived. VP5PZ from Kingston Jamaica, and ZS2A Uterheight, were S9 on 7 mHz.

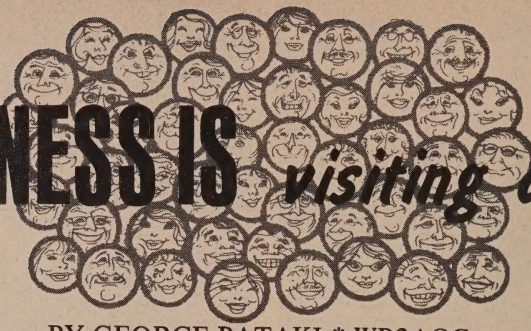
This was the happiest time of my DX life. DX was worked by patience, luck and good fellowship. There was no pressure, stations were there for the digging. There was none of the pettiness and snarling, characteristic of the phone bands of today. If someone stole your DX from under you, you admired his skill, but then most of the serious DXing was done by c.w. and one couldn't make too many wisecracks by c.w.

I remember August 31, 1939 very well, for on that night I worked a slew of Europeans, never before possible from Hawaii. You may recognize some of the calls – SP1AR, ES5C, OK2AK, LY1KK, LY1J, OH3NP, EA4AO, I1ER, and of course F8EX and F8EO. Days later German armies marched into Poland and World War II had begun.

DX was never the same after that and we struggled along until December 7, 1941, and

[*Continued on page 88*]

[1]Nose, K., "Using the ATS-1 for Communication," *QST*, Dec. '71 p. 48.



HAPPINESS IS *visiting a ham!*

BY GEORGE PATAKI,* WB2AQC

THIS year we had a blessed event: Steve, my father-in-law came from Romania to visit us. Steve is an s.w.l. and is studying for his amateur license. He likes to listen on the bands and likes even more to visit hams. So we took him on a Caribbean cruise . . . an island hopping tour . . . visiting 11 islands plus Venezuela.

Guadeloupe

Our plane landed at Point-a-Pitre late in the evening. The MS *Istra*, a fine Yugoslav vessel, was leaving at midnight, so we had very little time.

Five minutes from the pier is the QTH of Monique and Jean-Pierre, FG7XL but the front door was already locked when we arrived. If their neighbors never had a chance to listen to a late night pile-up, now they got it: the three of us, standing on the dark street, calling, "FG7XL, FG7XL, this is WB2AQC . . . WA2BAV . . ."

Even a lonely passerby liked our serenade and joined us. Finally, after every window on the block was lit, Jean-Pierre opened the door and invited us in for a short visit; Monique told us about their JY9XL operation in Jordan and we told them about our West African DXpedition.

At the end of our cruise, two weeks later, we had a chance to see Point-a-Pitre by day. The market place is interesting but I prefer to shop for food in a supermarket. I don't recommend spending too much time in Point-a-Pitre.

Antigua

On our first Caribbean cruise we visited Antigua but didn't meet any amateurs because we landed at English Harbour, "the wrong side of the island." Most hams are in St. John's.

This time we got to the right side of the island but we met the "wrong" man. I had written to Barney, VP2AA, asking to meet him but he didn't answer. In Antigua I called him up but after being questioned at length, I was told that Barney wasn't home and probably would return late. On our way to visit another ham we saw a house with a big beam. Quite happy that we'd found a ham, we entered and . . . suprise . . . who was living there and finishing his lunch? Barney VP2AA, who declared: "I'm not interested in meeting foreigners . . . ," letting me understand that my face was too pale to be accepted. This was the first time I met discrimination among hams and I'm sure its a rare exception.

Searching for friendly amateurs we found two CBers, Jim, the "Red Fox," an American, and Arnold "Kitty Hawk," an Antiguan. Both were very enthusiastic about ham radio and with their help we met Jerry VP2AC, an excellent ham, DXpeditioner and newsman. There aren't many like him on this island. I recommend skipping Antigua;

*34-24 76th Street, Jackson Heights, N.Y. 11372.



In Point-a-Pitre, Guadeloupe, Monique and Jean-Pierre, FG7XL, were visited by Eva, WA2BAV and her father Steve.



Darell, KV4HI, in St. Thomas, demonstrates his station to Eva, WA2BAV.

touristically I could not find anything interesting.

St. Thomas

In Charlotte Amalie, St. Thomas, you have to do two things: buy duty free liqour and meet Dick, KV4AA, in his appliance store. We did both and through Dick we met Darell, KV4HI, whom I once worked on s.s.b.

Darell took us sightseeing and to his QTH located at an altitude of 850 feet, ¼ mile from the ocean. What a sight and most of all what a position for his beam! Eva and I made a few QSOs with much better success than from our home QTH.

There aren't too many active hams on this island, but if you meet one like Darell, that's all you need. I recommend strolling along the docks, admiring the beautiful ships and boats, and window shopping on the main street.

Puerto Rico

Everybody is a friendly host in Puerto Rico. The climate is pleasant, the sights are magnificent and there are plenty of hams. What else could we ask?

We docked early in the morning and went sightseeing – Old San Juan, San Cristobal, El Morro fortresses – all a photographer's delight.

We spent the afternoon with Jose, KP4DDO, a college student who is active in every contest and pile-up, and guest operated his station, signing portable KP4.

Jose has decorated a large wall of his radio room with specially selected QSLs which fluoresce with beautiful colors when illuminated by an ultra violet lamp.

With Jose we went to see Eliot, KP4DSH, and later Alicia, KP4CL, and her husband Felix, KP4CK. Although we had met these people before, the Spanish hospitality has no limits.

Puerto Rico should be visited by everybody who goes down to the Caribbean, not as a DXpeditioner, because there are plenty of KP4s on the air, but just for the beauty of the island.

Dominican Republic

There is quite a large number of Dominican amateurs in New York, operating under the Reciprocal Operating Agreement. All of them were very helpful, informing their friends back home about our visit, so when we docked at Santo Domingo, Felix, HI8FED, Jose, HI8JD, and his very pretty daughter, Maira, were waiting for us at the pier.

Together we went sightseeing, visiting the oldest cathedral in the Western hemisphere, dating from 1512, with the remains of Christopher Columbus. Later we visited the new amateur radio club house, built with funds collected slowly from enthusiastic but not too wealthy hams.

I was told that it's quite easy to get a Dominican license, not only a "portable HI8," but a real HI8 call. The call will be HI8X . ., the letter X after the district number shows that the license belongs to a foreign ham. For forms and details send a s.a.s.e. to Jose, HI8JD.

One of the best hotels in Santo Domingo, "El Ambajador," employs 3 or 4 amateurs. Peri, HI8PM, the hotel's chief accountant, said the hotel will reserve the most adequate rooms, will even help install the antenna, for any amateur wanting to spend a nice Carib-



"Happiness is visiting a ham." Jose, KP4DDO and Steve, a Romanian s.w.l. prove it.



In Port-au-Prince, Haiti, a pool-side meeting with (l. to r.) George, WB2AQC; Steve; Sen. Barry Goldwater, K7UGA; Eva, WA2BAV and Julius, HH2JT.

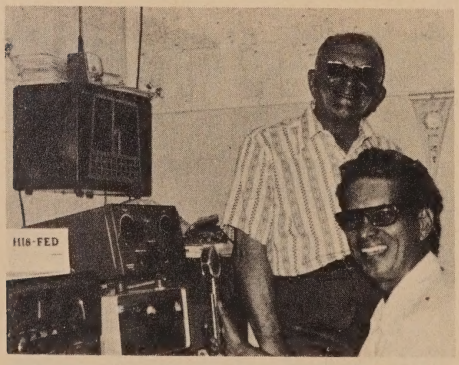
bean vacation and DXpedition in the same time.

We visited Felix's family and of course his station HI8FED. Felix is an M.D. and a college professor. We had dinner in his house and we ate local specialties, most of which I've never seen before.

Periandro, HI8NDV and Bolivar, HI8BC, came there to see us, and that's just what they did; they looked at us with friendly smiles and answered every question with the same magic sentence: "No speak English."

Later, on the way to visit Jaime, HI8JE, our car passed several military check points. The soldiers waived their guns, looked at the passengers, but not even Steve, my scared and suspicious looking father-in-law, presented any problem. Steve was very lucky because he was traveling with a Romanian passport and did not have the required visas; we just smuggled him in and out from island to island.

There was quite a ham gathering at Jaime's house — about 15 amateurs with their wives.



In Santo Domingo, Felix, HI8FED, is the host and Steve is the guest.

They presented me with a beautiful "welcome award," hand made on a very thick parchment and looking like a very old document, written in Spanish. I don't understand what it says, so I prefer to think it's a "welcome award." Otherwise, how would I justify having it framed and hung in my living room?

I recommend a vacation/DXpedition on this island, but it would be very useful if you learned some Spanish before going. On your way you could stop in my living room, read my "award" and tell me all about it.

Don't miss the chance to meet local hams.

Haiti

I was very curious about this country. Most of what I read and heard about it was not very flattering. And because Haiti is the only place in the Western Hemisphere where amateur radio is practically illegal, I did not have too much sympathy for it.

During our short stay, I disliked the pushy guides and taxi drivers, the noisy, agressive and hard bargaining merchants and the extreme poverty displayed everywhere. But I have to recognize that the Haitians are artistically talented; the best woodcarving and most beautiful paintings in the whole Caribbean are made here.

I visited Julius, HH2JT, at that time the only active ham in the whole country. Julius is an American, a successful businessman, and a very nice guy, but not too active on the air. Julius has an excellent rig, a very good location and being the only ham on the island, he enjoys a special status. But this status is not always desirable: when he calls a rare station for his DXCC, he has to fight not only 10 other hams calling the same

[*Continued on page 88*]

QRPp

LOW-LOW POWER OPERATING

BY ADRIAN WEISS,* K8EEG

A LOT of fellows wonder if it takes anything extra to become a successful QRPp operator. After all, when a guy is only running a couple of watts, he isn't very likely to put out a block-busting signal that pins every S-meter on the band, is he? In fact, he's competing for contacts with guys who are running a hundred or even a thousand times more power than he is! Very likely, his QRPp signal will be S5-S6 on the average, S7 sometimes, S8 rarely, and S9+20 db once in a coon's age. On the other hand, the QRO boys generally are in the S7-S9 category most of the time. How can the QRPp operator manage to make contacts consistently against such uneven odds? What this all points to is; yes, the QRPp operator does need something extra to be a success.

The major problem faced by the QRPp operator is to *make himself heard and easily copied* despite the uneven odds against him in the form of QRM, QRN, and QRO signals. Thus, quite a bit of skill and knowledge go into every successful low power operator. This is one of the major reason why I think that the QRPp movement is the healthiest thing to happen to amateur radio for many a year – it automatically forces an operator to upgrade (incentive licensing anyone?) himself in terms of gaining a comprehensive knowledge of all the variables involved in the operation of a transmitting system, and acquiring all the operating skills that are necessary once the old super-dooper Thud-Boom linear isn't around to hide his ineptitude. If the QRPp operator is going to make himself heard, he has to be a sharp cookie! Skill and knowledge have to make up for the loss of 150, 500, or even 1000 watts. That ain't just a dime's worth of difference neither!

And the variables are many and complex. It all boils down to knowing what to expect from a given transmitting system under varying conditions. This involves a working knowledge of propagation on each band, a knowledge of antenna theory and practice, knowing where and when to call which station, following low-loss construction practices, efficient transmitter design, and many other things. The basic purpose of this column is to introduce the neophyte QRPp operator to all the knowledge and skills that will make him a highly competent operator. And, by the way, the QRO boys can read along and pick up a few pointers that may turn them into better operators.

The first variable that a QRPp operator should know is his output power.

Output Power

The standard of comparison in QRPp operation is *Output Power*, and for very good reasons. Output power is the only measure of the really important factor – the power which the transmitter can deliver to the antenna, which is the first link in the propagation circuit. What to expect in terms of distance on a given band depends upon the power which enters the propagation circuit, and the attenuation factors operative in the ionosphere on that band. More about this later. The fellow who is putting out one watt and expects to work 4000 miles over a propagation circuit whose attenuation factor is above 140 db just doesn't know what to reasonably expect. Hence the emphasis upon output power. Input power is totally meaningless in this context.

The designation *QRPp* is applied officially to stations operating at less than five watts *output*. Those of us involved in the low power movement have been working hard to eliminate the very unscientific practice of assuming that the output from a rig is 50% of its input. There is absolutely no scientific basis, either theoretical or practical, for justifying such an assumption. What's more, power output measurements are so simple that any amateur – QRO or QRPp – should be able to determine how much power his transmitter is putting out.

Output Power Measurements

Three methods of measuring output power are described below, and the references cite articles describing other approaches. These three are the most basic.

1. *Commercial Wattmeter*. One approach is to purchase a commercial wattmeter such as the Bird Wattmeter line (about $130) and mate it with the QRPp slug (about $37.50)

*213 Forect Ave., Vermillion, SD 57069

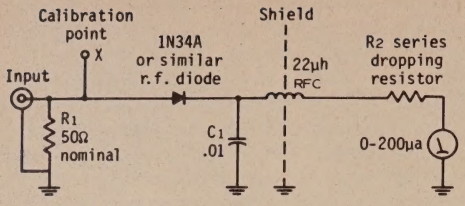


Fig. 1—A simple, low cost r.f. output meter.

for very accurate power output measurements. I am not aware of any other commercial wattmeter available with QRPp calibration.[1]

2. *VTVM/FETVM R.F. Measurements.* The typical v.t.v.m or FET v.m. can be used for the purpose of determining r.f. output power with very reasonable accuracy. The instrument must be frequency compensated to the frequency at which the measurements are to be taken. An r.f. probe is necessary, and most manufacturers supply these at a slight additional cost. Normally, the typical v.t.v.m. is calibrated in a.c. volts r.m.s., while more expensive models have both a.c. volts r.m.s. and peak scales. The operating manual will indicate frequency compensation, calibration, and manner of obtaining an r.f. voltage reading.

The ARRL *Handbook* describes the construction of an r.f. probe which can be used with electronic voltmeters (see 1973 edition, p. 535). This probe is connected to the negative d.c. terminal, and the d.c. volts scale read out in a.c. volts r.m.s. Note that this r.f. probe can be used only with v.t.v.m. or FET type meters because the high input impedance of these instruments provides an essential part of the voltage divider circuit of the r.f. probe. It will not work with cheapie voms and the like.

Once the r.f. probe is in hand and calibration is known, measurement of r.f. power output is a simple procedure. The r.f. voltage developed across a 50 ohm nominal (measure it first!) dummy load is solved for r.f. power with the following formulas:

$$\text{Watts} = \frac{(\text{Volts r.m.s.})^2}{R(\text{dummy load})}$$

or:

$$\text{Watts} = \frac{(0.707 \text{ Volts } peak)^2}{R \text{ (dummy load)}}$$

The formulas apply only to a c.w. signal – see reference 1 for complete discussion of r.f. power in complex waveforms such as encountered in an s.s.b. signal. A suitable dummy load can be constructed by merely twisting a pair of two watt, 100 ohm carbon composition resistors together with minimum lead length. For power levels under 2 watts, a pair of half watt resistors will do, and can be soldered directly into a coax plug with negligible lead length.

The above method can be used to calibrate an instrument such as in-line wattmeter. The formulas are transposed to solve for volts r.m.s. vs. watts power:

$$\text{a.c. volts r.m.s.} = \sqrt{\text{Watts} \times R}$$

or

$$\text{a.c. volts peak} = 1.414 \sqrt{\text{Watts} \times R}$$

If a lab type antenna impedance bridge is available, the radiation resistance at the antenna terminals can be measured with it, and that figure used to determine the power actually delivered to the antenna.[2]

3. *R.F. Output Meter.* A very simple, low cost, r.f. output meter is shown in fig. 1. When properly constructed and calibrated, the instrument is capable of providing accurate measurements of r.f. power output. The circuit is quite simple. An r.f. voltage is developed across R_1, rectified by CR_1, and charges C_1 to *peak* volts r.f. A meter is used to measure that *peak* voltage, and the formula solves for average power with reasonable accuracy.

The circuit can be haywired on the spot when the need arises, and a v.t.v.m., FET v.m., or vom used to measure the voltage (d.c. scale). However, the presence of r.f. feedthrough will upset meter accuracy, and the circuit is useful only for relative output indications.

For permanent construction, the instrument can be housed in a Minibox large enough to accommodate a separate microammeter. The only critical factor involves isolating the meter from r.f., and this can be accomplished by dividing the Minibox in two with a snug fitting shield. A small r.f. choke is positioned halfway through the shield between the dummy load and r.f. circuitry compartment, and the meter compartment. R.f. feedthrough is thereby eliminated.

The power level desired determines the sensitivity of the meter and the size of the

[1] "Measuring Power Input and R.F. Power Output," *CQ*, Feb. 1969, p. 31.

[2] "A Simple and Accurate R.F. Power Output Meter," *Ham Radio*, Oct. 1973, p. 26.

series dropping resistor R_2. It is possible to go down to the microwatt level with this instrument. With a 200 μa meter, R_2 = 150K ohms will provide full scale deflection at about ten watts output, 100K ohms at 5 watts, and so on to lower levels.

Calibration of the meter is accomplished at d.c. A variable metered voltage source, such as a regulated a.c. supply, or four 9 volt transistor batteries in series, connected to the instrument through a potentiometer, is connected at the calibration point shown – dummy load disconnected, of course! Table I shows the formula used to calculate the d.c. voltage vs. watts for calibration points, and the microammeter points can be jotted down beside these in a third column. The accuracy of calibration can be checked by attempting to reset the calibrating voltage by reading out on the microammeter. A reasonably high order of accuracy is possible with close attention to details. See reference 2 for a complete description of this instrument.[3]

We'll have to save a Bruene in-line wattmeter/s.w.r. bridge for our next column.

Awards-News-Operating Events

As we promised, here is a description of the most difficult awards ever offered in amateur radio – QRPp DXCC and Milliwatt DXCC.

QRPp DXCC requires that an applicant work 25 ARRL DX countries while running not more than five watts output for the basic certificate, with increments of 25 countries for endorsements at the 50 and 75 country level. Upon presentation of QSL proof of contacts with 100 ARRL DX countries, a handsome trophy will be awarded the applicant. See *CQ*, December, 1972, p. 61, for a photo (bikini model included) of the first QRPp DXCC trophy awarded to K4OCE, who now has somewhere around 150 countries.

Milliwatt DXCC is the ultimate! An applicant is required to work 20 ARRL DX countries while running less than one watt output for the basic certificate, with 20 country increments for endorsement stickers at the 40, 60, and 80 country levels, and upon presentation of QSL proof of contacts with 100 DX countries, the applicant will be awarded a suitable engraved, handsome trophy. W4VNE is leading the pack for Milliwatt DXCC with 76 countries to date. Complete details on these awards from Ade Weiss, *The Milliwatt*, 213 Forest Ave., Vermillion, SD 57069.

We will include periodic DXCC and WAS listings in this column. We'd like to run the first in the February, 1973 issue, so please drop us a card indicating how many countries or states you have worked and your power output level.

[3]See also "Simple R.F. Output Metering," *CQ*, March 1973, p. 38; "An R.F. Output Meter," *CQ*, May 1968, p. 22; "An Accurate R.F. Power Meter For Very Low Power Levels," *Ham Radio*, Oct. 1972, p. 58.

$$\text{Average } P_o = \frac{E^2}{2R}$$

Transposed to solve for E^2:

$$E = \sqrt{P_o \times 2R}$$

P_o	Volts (E)	μa
10.	31.94	203
5.0	22.5	145
4.0	20.2	129
3.0	17.7	113
2.0	14.3	93
1.0	11.0	67
0.9	9.6	63
0.8	9.0	59
0.7	8.5	55
0.6	7.8	51
0.5	7.14	48
0.4	6.4	43
0.3	5.5	38
0.2	4.5	30
0.1	3.2	22

Table I – Calculating the d.c. voltage vs. watts for calibration points on author's meter.

Upcoming AGCW DL QRP Contest

The AGCW DL QRP Contest is a twice-yearly event specifically for QRPp operators. The winter session will be held January 12th, 1974, 1800 GMT,, to January 13, 1974, 1500 GMT. See CONTEST CALENDAR for complete details. 48 logs were turned in for the summer session, and I hope that a lot more will turn up this winter as a result of publicity in this column. Be sure to mark those dates on your calendar! The DX fellows will be looking for weak stateside signals because each U.S. call area counts as a separate multiplier! *(Details from Ade Weiss on request, SASE please.)*

[*Continued on page 89*]

IN recent years I have become concerned by trends in electronics as related to amateurs and other experimenters. And, of course I have not been alone. The matter has been raised in the American Literature, often in *QST*, and even in light-hearted vein there by Mike White, K3UFJ in April 1972. It has been raised often in the British Literature, most poignantly by Pat Hawker, G3VA, in "Technical Topics" monthly in *Radio Communication*. And modern trends have been examined in the Australian literature, particularly in the *Australian EEB*. I'd like here to bring together a number of these ideas which have arisen from the increasing complexity of modern technology. If we ignore them in favour of a simple world of fancier modulation and better antennas, we may be sorry.

MEANS in amateur radio vs ENDS

by R. L. GUNTHER, *VK7RG

The Significance of Automation

The steady decline in the proportion of electronics experimenters is a phenomenon too well known to labour further. But not as often realised is the significance of automation as it affects amateurs and other experimenters.

As electronic components become more compact and more sophisticated, and as their design and application involves merely the use of a few moments of computer time, the demands by industry for the traditional engineer will decrease. What then about the role of the amateur group as a pool of technical skill available for the good of society? Are we in danger of producing increasing numbers of technical people for a time when the need for them will be less?

The obverse side of the coin is equally dismal. As pointed out in an article in the *Australian EEB*,

> "The technician/engineer is on the way out, replaced by fuse-blowers and clerks. And what will this do to ham radio which traditionally draws its members largely from the engineer/technician class?"

The most obvious answer is that it will increase the number of "hams" at the expense of amateurs!

The Role of the Amateur

In such a situation, the demise of constructional and experimental activity amongst amateurs shows merely as a symptom of the deeper cause: In an age when circuits come prepackaged, what is the incentive to learn and experiment? The answer is, presumably, the use of such packages to produce more complex circuits, and we have indeed seen this happening recently in the flurry of phase-stable and digital systems invading the amateur literature.

The difficulty appears that such synthesis of module applications requires a considerable increase in the sophistication of electronics knowledge by amateurs – just at the time when the forces of automation are tending to restrict opportunities for knowledgable people. Without the exercise of considerable self-control, the result for the majority of us will be inevitably to take the easy way – appliance operation. Recent efforts by the FCC to upgrade American licensing helped to counter this trend, but they must in the long run succumb to popular taste (as when the licensing was downgraded in the first instance) or to commercial trends . . .

Now, there are virtues in the intelligent operation of our Radio Frequency Appliances, and these have been pointed out in the periodical literature, notably in *CQ*, *Worldradio* and *QST*. But if amateur radio is to become merely a mindless diversion for affluent "hams," it has scant prospect of survival. This has been stated succinctly in the October 1970 *Wireless World* (U.K.):

> "Is it true that the ham of today does no more than gossip on the air while twiddling gleaming perspex (lucite) dials of a shiny piece of commercially constructed equipment? If so the frequency bands allocated to amateurs are being wasted and should be re-allocated to a more deserving cause."

Or consider David Tanner (VK8AU) in *Amateur Radio* (Australia) of October 1970:

> "It isn't good enough any longer, just to get on the air for the sake of enjoying oneself. As Amateurs we ought to be doing a lot more to demonstrate to the world at large that we do indeed have something worthwhile to contribute. Sometimes I doubt it."

The Role of the Experimenter

The other side of that coin, too, is hardly more encouraging. All of the radio amateur magazines are dedicated largely to the amateurs who still build, or are at least interested in building, if only vicariously.

But the stark realities of engineering progress are forcing upon the hapless experimenter, alone and afraid of a robot he never made. This experimenter is being forced into the role of unessential dreamer, a builder of gadgets which,

a) May be irrelevant to the requirements of our high pressure age, or

*P.O. Box 177, Sandy Bay, Tasmania 7005.

b) Have already been developed more fully and more competently by teams of Engineers working in brightly lit and expensively equipped laboratories.

The latter point is particularly a sore one for the modern amateur: virtually all the major engineering achievements in these days are coming from commercial engineers – not from individual amateurs (unless those amateurs happen to have considerable engineering experience). If you disbelieve this, follow the field in Pat Hawker's "Technical Topics" in *Rad. Comm.* (U.K.) or in his fascinating book, *Amateur Radio Techniques*, (published by RSGB).

The Role of the Amateur Magazine

The amateur magazine plays an obvious role in the guidance of the experimenter. At the same time such a magazine has to cater to the needs of amateurs who create human contacts rather than equipment – the amateurs who at their best are ambassadors of human values, and at their worst are the infamous "appliance operators;" both have "fun," as one Editor has stated it, but there is rather a difference in results.

Additionally, most amateur magazines are paying altogether too much attention to the publication of endless variations on technical devices, and not enough on how or why they are to be used. To choose a trivial example, yet another low-noise amplifier has scant value if it is to be used in a neighborhood with an S8 noise level.

The Handbooks reflect the picture, with innumerable designs showing exactly how to build thus and such, complete with all constructional details. The sensible alternative would be to present good basic circuits with good general principles telling how to apply them. And then the constructor puts them together. For this the "Applications" chapter could consist of a large number of block diagrams. And once one knows how to lay out a chassis (from the appropriate chapter, plus experience) and to drill holes, why must the same story be repeated endlessly?[1]

So too with the magazines. What is important is that they feature more articles relating the uses and technical correlations between devices already invented. We need more synthesis of ideas, less invention of trivial circuits. Otherwise we shall choke in a sea of exponentially-proliferating technology!

Now it seems to me that all these mutually-exclusive requirements impose a substantial strain on the wisdom and balance needed to pilot a technical publication through the 20th century. It is hardly surprising that the human beings involved sometimes descend to ego and empire building.

What is the answer? Amateur magazines and amateur handbooks must be able to lead, not merely follow popular taste. They are a potential force for good in the community, and they can help to create a communion of "amateurs." But Editors are human, and they are subjected to political and commercial pressures. In any event, however, they cannot act creatively unless they know what to create. This requires a clear definition of goals and of suitable means to achieve them.

Means Versus Ends

Let us consider the general question of means versus ends in electronics, with special reference to amateur radio. If our goal is to create a trained body of engineering technicians we're not doing very well – and the abovementioned social forces are going to frustrate us even further.

If our means involve a greater willingness to learn the new technology creatively, our ends will be more valuable. This idea as postulated by Ghandi and others ought to work as well in technology as it does (or ought to) in politics.

We must define goals, too, if our means are to have a general direction.

The Uses of New Tools

I have proposed a gaggle of lovely generalities, but do they have meaning in practice? The new technology is using components of ever-greater complexity. They allow the possibility of assembling circuits more easily, more cheaply, and more competently.[2]

But we shall use them intelligently only if we use more sophisticated techniques. Will this happen? Only if we make the effort to study the sophisticated theory. How many people will do this? Already in the literature we can see the uncritical use of ICs; if we do not achieve a high engineering competence in their use we shall create banal shadows of the gadgets engineers can make better.

When we replace discrete components by integrated ones, what insight will this bring? Will we

[1]These ideas and others have been described cogently in "Objects and Requirements of an Amateur Radio Handbook," *Aust. EEB*, Nov. 1971 and Feb. 1972.

[2]The case for IC's has been stated well by VK7ZAR in the June 1972 *Australian EEB*. The point being raised here carries his argument one step further: what do we now do with those ICs?

A penetrating philosophical look at where amateur radio is now, and where it's heading.

merely be assembling prettily-coloured Leggo blocks? What joy is there in "building" a receiver consisting of Block A to which you connect aerial and Block B to which you affix a loudspeaker?

The answer is presumably that the creative experience previously satisfied by the assembly of separate components must now be expressed in the way that the circuit modules are assembled to make highly complex circuit "systems" which perform specific tasks, *e.g.*. phase-locked detectors and frequency synthesizers, or a wide range of automated control devices (more on that later).

And what has happened to the simple electronics which we used to enjoy just for the sake of creative enjoyment, for fun? I fear that it is gone forever, to be replaced by a more complicated world. It has been said that the tools of a grown-up workshop are potentially more satisfying than the toys of a child's playroom. But a grownup tool can be used to fashion a bombsight as well as a copy camera. The use of more complicated tools will not produce better or more satisfying results unless we have defined better (and more satisfying) goals.

What are those goals in respect of experimental electronics? I'm not altogether certain, but unless we discover them we shall be forced into the role of appliances operators as discrete components become *obsolete* – and that includes transistors!

The Bands and Their Uses

We assume automatically that the amateur bands should be retained for amateurs; that is our goal. But is it a suitable means to populate the bands to a level of intolerable QRM; use them or lose them? Are we in fact going to retain the bands just because we use them densely? According to this beautiful logic the American Citizen Banders ought to be given the whole spectrum from 14 mHz to 148 mHz.

This matter is presumably to be decided by the dreaded International Conference at Geneva one day. But are not international decisions based largely on economic and political foundations – or have we not heard any Intruders on the bands recently, eh? These economic and political matters have deep roots, and it is simpleminded indeed to believe that "representation" by amateurs can do anything anywhere – unless perhaps on the councils and boards of numerous industries and governments.

All things being equal, however, it would certainly seem a logical tactic for anglo-saxon representatives to international conferences, to acquire some understanding of the languages spoken by other delegates – a point sorely raised by a prominent letter recently in *CQ*.

We grasped the technique of Single Sideband as an answer to band crowding and to communication effectiveness; that was our goal. But was it a suitable means to jam a gaggle of new signals on the air to fill the spaces with unpleasant-quality speech, or to make a mockery of communication by the mindless pursuit of contests on one hand or the exchange of trivia on the other?

We have had endless debates on modes of modulation, the virtues of repeaters, the value of high power – as though these devices themselves ought to govern the uses we would make of them. Has it been a suitable means to organise ever-more efficient nets to communicate ever-less significant information? Do not the CB'ers do as much?

Good Causes Neglected

Consider *Worldradio* magazine (2509 Donner Way, Sacramento, California 95818). It is devoted to the really constructive side of amateur *operating*, the first publication to specialise in this field and with the high idealism expressed in *Worldradio*. Yet, in spite of the fact that the greater part of amateur activity in these days consists of communication on the air, *Worldradio* is relatively unknown. Why? Its certainly not for lack of publicity, because those of us involved in publishing amateur literature have been promoting that magazine actively.

Much the same problem is faced by *The Milliwatt* (Meckling, South Dakota 50744) which features a fine treatment of QRPp construction and operation. And their discussions involve a wide range of ingenious techniques for doing things better. Many amateurs pride themselves on their ingenuity in putting their equipment to efficient use – why, look at the never-ending search for the Perfect Antenna, or the Quest for the Low SWR. Why, then, do not QRPp and *The Milliwatt* receive more support?

Surely all active amateurs are concerned either with operating or with experimenting/constructing, or both? Yet the bulk of their support goes to the big glossies which frequently feature projects of elegant complexity but little relevance to the ordinary small-time experimenters, let alone the people who never touch a soldering iron! And not only in America.

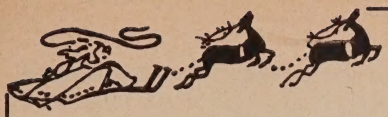
Amateurs are rather good at talking about goals. Are they willing to be intelligent at achieving them?

The Automated "Ham"

In the confusion of means and ends my vote for the most intriguing and potentially depressing news of the year goes to the devices for the automatic transmission and reception of morse code. When that circuit has been completed what will remain of c.w.?

I first remember seeing something on this subject in the January 1971 *QST*, and since then we have seen a c.w.-translator receiver in *Ham Radio* of Nov. 1971, a gadget for memorising and regurgitating c.w. characters in *73* of Dec. 1971, an audio tape-controlled c.w. keyer in *CQ* of Nov. 1971, and a programmable digital keyer in the May 1972 issue of *Amateur Radio* (Australia).

In the February 1972 *73* was another in the line of servosystems for automatic tuning of the transmission line, and in that issue a complete keyboard-operated automatic morse-code generator "for better sending by everybody." And indeed,



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such devices are also now available commercially. Finally, there was "Designing Diode Matrix Units" in the January 1972 *73*, and I reckon there will be a gaggle of similar articles by the time this is printed.

The amount of ingenuity which has gone into these designs is truly impressive, and I stand in awe of the digital techniques involved. Yet again I ask, what does it mean? Are means to be divorced from ends? Henry Thoreau once dryly remarked that we may now travel vast distances (and at the incredible speed of 30 m.p.h.!) – but have we asked ourselves what we shall do when we arrive at the end of the line?

It is doubtless fascinating to design automatic devices, but we are faced with the question of their use. We have also seen problems arising from military applications of perfectly reasonable gadgets, *e.g.*, in the exercise of American hegemony in Viet Nam. Who is master: man or his machine?

In this case there is nothing technically more startling about automatic communication of Morse than of radioteletype, and indeed for the same trouble the latter is more efficient as a strictly automatic system. But in this instance the means of automation cuts across the goal of individual proficiency in receiving c.w. or in transmitting it. There are reasons for operating c.w. other than to avoid QRM.

Just as the availability of cheap surplus and of elegant commercial equipment has served to reduce experimental endeavour, so the ready availability of automatic c.w. can destroy the art of radiotelegraphy.

You might say, "So what? C.w. is a nasty chore and an unnecessary burden on communication in an age when we can speak so easily to the ends of the earth." This kind of opinion has found wide expression in the amateur literature, and even by at least one editor of an amateur radio magazine.

The same might be said of gardening, painting, or playing the piano. But a player-piano driven by air and a scroll has never given soul to its music. And a motor mower makes a fine job of the lawn, but I wonder what happened to the birds and the smell of fresh grass. So too, the creativity and satisfaction of c.w.?

You may perhaps claim that in view of the material advantages available we can live happily without soul, birds, or individual expression – and I have actually heard that argument put forward by a scientist at a conference. Perhaps so, but the experience of human civilization says otherwise.

Ponder the implications of the closing sentence of ZS6BT's article on c.w. reception in the November 1971 *Ham Radio*:

> "There is nothing more pleasing to the c.w. DX man than a really weak signal producing a 1-milliwatt audio signal with an absolutely quiet background."

Add whatever technology you wish to improve the copy of that signal[3] but remove the human element and all you have is a stack of expensive machinery.

Cybernetic Implications, I

Consider W5VFZ's enthusiastic comment about the use of his "Button Box" in the February 1972 *73*, an automatic keyboard c.w. transmitter:

> "Build one of these button boxes, practice a few minutes to get the hang of it, and hit the airways prepared to enjoy a brand of c.w. that is more enjoyable than any you have encountered before. Oh yes, you should buy a bigger hat before you start using it on the air, because you are sure to get a swelled head for all the compliments on your fine fist."

Enjoyable? What? Communication? Typing speed? The thrill of posing as a c.w. operator with nerves of steel?

I have typed, I'm sure, a couple of million words of technical material, yet I have found that if I compose text on the typewriter first it comes out dry, wordy, and pompous. (If you think that this text is overdry you should see some of the alternatives!). Everything I compose, therefore, has first to be written out in my shocking scrawl. The result may not necessarily be more sensible, but it will be easier to read, and additionally it may have greater prospect of making sense.

If we interpose cunning gadgets between ourselves and our environment we stand a good chance of losing control of that environment. The implications for the individual (you and me) and for the race (you) are substantial.

Consider WA6ATT's description of a use for the Morse Memory, in the December 1971 *73*:

> "On the last Field Day our group used the Morse Memory for every c.w. contact and it now seems difficult to imagine how we operated c.w. contests before. It took care of about 90% of all situations which we encountered. Since the Morse Memory does not hold any message permanently, for the next contest two different messages can be programmed into the unit."[4]

To accomplish this feat for radiotelephone transmission you would need only a loop on a tape recorder, and automatic translation of received speech is in sight; see *QST* for October 1971: "Limited Speech Recognition."

The implications of this are substantial, and started becoming relevant with the introduction of semi-automatic keyers, progressing smoothly to electronic keyers which removed any vestige of c.w. "style" which survived the "bug" type keyer, and now we see the completely automatic message sender – and receiver?

The performance of a "contact" which can be handled almost entirely by machinery shows that that event has low Information Content – like static, political speeches, and death: its outcome can be predicted with a high degree of certainty, and therefore it is predictable but not very meaningful. Is this the goal of amateur radio?

[3] And present techniques produce almost incredible results; *c.f.*, *Australian EEB*, December 1971.

[4] See also: "The VE2HN Digital CQ'er" by H. H. Rugg, *QST*, March 1972.

Cybernetics, II

The point can be illustrated not merely by the encroachment of automation. In reading the amateur literature I have noted frequent statements to the effect that it really isn't worth building such-and-such for oneself since it is available so cheaply and easily commercially. Perhaps so, but what about the odd individual who feels willing and able to make the device himself. Faced by a Part Number he has been robbed of essential information needed to help him mould his environment.

You may reply, "All right, go ahead and build your own devices; there is nothing to prevent you from making your own capacitors and resistors too, if you feel like it, and even your own valves and transistors." Certainly, but natural lazyness tends to discourage this in the older generation, and the newer generation will have only the new values to guide them. It is also worth noting that from time to time there appears in the electronics literature articles for making one's own capacitors when these can serve a better function than the commercially-available item – or in these progressive days when a component is no longer commercially available!

The point I am trying to make was well illustrated when I was looking for details of the phase-shift network used in *receiver* sideband-phasing adapters.[5] Nowhere in the ARRL's *SSB for the Radio Amateur*, nor in their 1972 *Handbook* could one be found. The situation was summarized candidly on p. 101 of the 1958 edition of the s.s.b. book:

"This network isn't shown in the schematic, but J_2 is the octal tube socket it plugs into. For anyone who has fears about the complexity of an audio phase-shift network, forget them; the - - - - is inexpensive, comes sealed in a metal tube envelope, and all you do is plug it into the socket." Presto.

But the device involved could have been replaced by four whole resistors and four capacitors in its simplest form, and its adjustment requires a signal generator and an oscilloscope – surely standard equipment for modern amateur installations?

When information becomes inaccessible, performance must deteriorate, because you lose ability to compare achieved goals with desired ones. Here is a technical example of this in current amateur operating practice, as related by S. M. Dykes in G3VA's "Technical Topics":[6]

"Mr. Average Ham happily shouts the meter of a rig using two 6146's up to 150 ma, since this 'seems about right' – with the result that his rig runs with severe flat-topping."

The consequence is that he splatters onto his mates on nearby frequencies.

"Since most amateurs run their s.s.b. rigs well into the distorted region, few reports are given of the increased bandwidth (with extra speech clipping added); usually it is accepted as about normal for the mode. . . ."

[5] *Australian EEB*, June 1972.

[6] *Radio Communication*, Sept. 1971.

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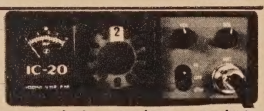
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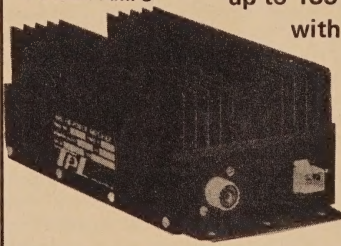
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The only reason that this absurd situation persists is that modern sharp receivers remove most of the spurious sidebands! Here is a typical self-defeating cybernetic situation: the sharp receiver removes information which would tell the receptionist that the transmitter is being abused, and the transmissionist thus loses benefit of feedback of this information from the other. Neither party is aware that the signal, the Single Sideband Signal, is taking up far more space than the despised a.m. (d.s.b.) mode which it replaced!

You see why arguments about modes and methods can be pointless unless accompanied by sufficient information? We require a good blend of data on which to make sane decisions, and the sane goals toward which they are to be directed. We shall not be able to achieve this if our gadgets are allowed to dictate our methods *and* our goals.

Truth is Symmetrical

In fact, a broad range of discussion of the point raised by Dykes in the abovementioned article has appeared in G3VA's "Technical Topics" subsequently. It comes, essentially to the point that a certain amount of flat-topping *can* increase communication effectiveness whilst increasing bandwidth not excessively.

This does not supersede the point I am making. Without suitable care in measurement and operating, the flat-topping can well become excessive, since *insufficient information is available to the operator to allow him to correct the result of this Error*. Indeed, if the original modulation was limited to 3 kHz, then any increase of this bandwidth increases transmitted bandwidth, and is that not a heresy in our efficient technology?

Readers interested in the best technical and philosophical discussions to be found in contemporary amateur literature are well advised to read "Technical Topics" monthly in *Radio Communication*, and in the corresponding anthology, "Amateur Radio Techniques," also sold by the Radio Society of Great Britain.

Quo Vadis?

As I mentioned above, the latest development in automatic QSO-processing promises to extend c.w.-translating systems to speech! In the October 1972 *QST*, WB2EZG describes what is doubtless the forerunner to systems which enable the radiotelephone QSO to be conducted entirely by machine. His "Limited Speech Recognition" techniques require only some additional sophistication as developed by voice-coding research of Bell Labs and a tame computer, to remove the human element entirely. Here is the ultimate in "amateur" radio.

This reminded me of "The Invisible Ham," a story which appeared some time ago in *CQ* describing a marvelous (fictional?) station run completely by computer with all contact made from pre-recorded tapes, with all relevant facts about the QSO received by the computer, analysed, and recorded automatically.[7] At the other end of the aether one presumes there were other computers talking to each other.

The Brilliant Inventor was jubillant about this; look at the time he now had for golf and easy living, yet he could make DXCC three times weekly, and I may add he could again be friends with his wife.

Dream or nightmare? I reckon it depends on what you choose as important. Shall we look more closely where we are going before we argue so passionately about how we are to get there? Shall we apply humanity and commonsense in working out our methods? John Andersen (VK7ZFO) poses the question in the *Australian EEB* of October 1971:

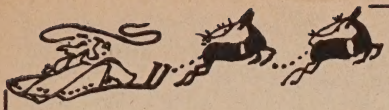
> "Is the Amateur Service providing a pool of trained operators for the armed forces? The latter seem to be well supplied these days. Is it the Civil Emergency Net? Civil Defense is considerably better than even 10 years ago. Is it circuit and equipment design? Commercial neddies have this pretty well taped.
>
> "In short, why are we all here? – and I do not accept 'because we're not all there.' Everything I've ever read in Amateur literature pussyfoots around this question. We should be very sure of what we are about here, as upon the answer depends the solution to nearly all the problems facing the Amateur Service . . ."

Addendum

I may, perhaps, claim prophetic insight, since we have been turning these ideas over for some years in *The Australian EEB*. From recent reading I advance for your consideration the following thoughts from Chapter 19 ("Taming Technology") of Alvin Toffler's significant book, *Future Shock*:

> "We can no longer afford to let such secondary social and cultural effects [of rampant technology] just 'happen.' We must attempt to anticipate them in advance, estimating, to the degree possible, their nature, strength and timing. Where these effects are likely to be seriously damaging, we must be prepared to block the new technology. Technology cannot be permitted to rampage through the society . . .
>
> "Does a proposed innovation help us control the rate and direction of subsequent advance? Or does it tend to accelerate a host of processes over which we have no control? How does it affect the level of transcience, the novelty ratio, and the diversity of choice? Until we systematically probe these questions, our attempts to harness technology to social ends – and to gain control of the accelerative thrust in general – will prove feeble and futile.
>
> "Here then, is a pressing intellectual agenda for the social and physical sciences. We have taught ourselves to create and combine the most powerful of technologies. We have not taken pains to learn about their consequences. Today these consequences threaten to destroy us. We must learn, and learn fast."

[7] See also K3UFJ in *QST* of April 1972 in the same vein.



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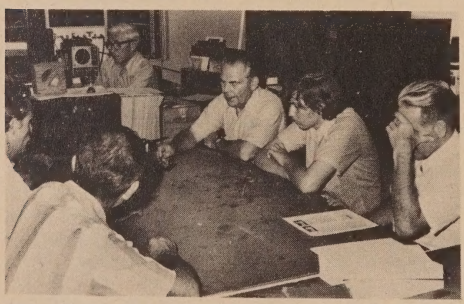
NOVICE SHACK

BY HERBERT S. BRIER, *W9EGQ

WHEN an amateur first gets on the air, just being able to talk to other amateurs, whether across town or across the continent, is a sufficient thrill in itself. This thrill of contact never disappears entirely. But after they have established the fact that their stations are actually capable of working other stations, most amateurs like to set operating goals for themselves and their stations. One of the most popular of these goals is the WAS (Worked All States) certificate.

WAS is an especially appropriate Novice goal. Even with the best equipment, it requires a real effort to work the 50 states in the Novice bands. And accumulating the 50 QSL cards or other proof of the contacts to submit to the American Radio Relay League, Inc., Newington, Conn., when applying for the certificate is an achievement in itself. On the other hand, WAS is a goal within the reach of almost any Novice with simple equipment who replaces signal strength with superior operating ability. Best of all, as you add states to your total, you are increasing your code ability and sharpening those operating skills.

*385 Johnson St., Gary, Indiana 46402



Ray Biederman, WB6NSJ, operating the LERC Amateur Radio Club station, W6LS, in Burbank, while Chuck Cunningham, WA6RQQ, demonstrates to students of the LERC amateur study class the proper way to use a radiotelegraph key. Note that Chuck's entire forearm is supported on the table.

Almost every contact adds a new state when you first get on the air. Of course, the rate of increase soon starts to go down; nevertheless, the average Novice works 20 to 30 states almost automatically simply by working them as they appear in his receiver passband. Then, a plateau seems to be reached, and the same states appear over and over in the station log. How soon this plateau is reached and how high it is depends on the Novice bands operated, the number of hours spent on the air a week, as well as the quality of the station equipment (especially the antenna) and the operator's operating preferences. For example, the operator who prefers to rag-chew an hour or so in the late afternoon on 80 or 40 meters when he gets home from school or work is not going to run up as high a states-worked total as the operator who seems to concentrate on making the maximum possible number of hello-goodby contacts per hour.

The important fact is that the easiest way to get your states-worked total moving upward again is to change your operating habits. Rule one seems contradictory, because it says to get more, you do less. Do less transmitting, of "CQ's" especially, and do more tuning and listening on your receiver. If your budget will stand it, subscribe for the *Call Book Magazine* and its semi-annual supplements. Whenever you hear an unfamiliar call, look it up. If the station is in a needed state and is calling "CQ," answer the call. If the station is already in communication with someone else, wait until the contact is finished and then call the station. Similarly, if the station you call answers someone else, wait until the resulting contact is finished and call again. Above all, do not try to take over the contact by continuing to call the wanted station while the other station is transmitting, and do not immediately call "CQ" on top of the contact, unless you want to earn the reputation of being a "lid" (poor operator) and an "alligator," a station with a very big mouth, very small ears, and a thick skin.

Even if you do not own a *Call Book* or the station heard is not listed, a knowledge of what states are in which call areas, and noting their locations when stations in contact exchange locations help separate wanted and unwanted stations. For example,

if you have already have a California confirmation in you QSL card file, you can ignore all "6's" when looking for new states. Conversely, if you are looking for Delaware and Nevada, you can ignore all stations heard, except "3's" and "7's."

Equally as important as doing a lot of listening when looking for new states is knowing when and where to listen. Certainly, stations located east of the Mississippi River could listen an awful long time in the daytime before hearing Hawaii (WH6, KH6) on 80 or 40 meters. Conversely, 10 and 15 meters are essentially daytime bands; therefore, from late morning until dark is, on the average, the best time to look for Hawaii from east of the Mississippi on the latter bands.

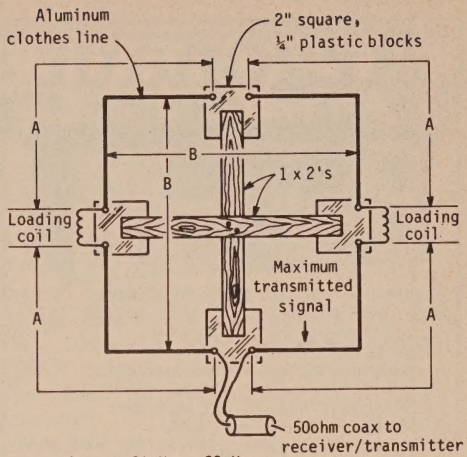
New 10-Meter Contest

Besides the competitive thrill of operating contests, they offer excellent opportunities to add new states and countries in the station logbook. We suggest you consult the *CQ* CONTEST CALENDAR each month if your taste runs in that direction. A brand-new contest is the ARRL world-wide 10-meter contest from 1200 GMT (7:00 A.M., EST), December 15 to 2359 GMT (6:59 P.M., EST) December 16.

LERC Amateur Licensing Course

When he learned about the NOVICE SHACK again appearing in *CQ*, Bill Welsh, W6DDB, Licensing Instructor of the Lockheed Employees Recreation Club, Amateur Radio Club, 2814 Empire Ave., Burbank, California 91504, wrote, "I welcome the return of the Novice Column to *CQ*. Novices too often get lost in the overly-technical publications which make it almost impossible to extract understandable explanations to even the most simple questions. Herb is an experienced amateur with a real interest in Novices. I hope you will send him information about your operating experiences, pictures, helpful tips to be shared with other Novices, and questions which may also be bothering other Novices. With your help, I am sure that Herb will keep this your Novice column in fact as well as in name."

With over a quarter century of experience conducting amateur study courses, Bill is well qualified for the task, as his thousands of successful graduates attest. We highly recommand anyone in the Los Angeles area wishing to become a Novice or to up-grade



Dimensions	21mHz	28mHz
A	5'4½"	4'½"
B	5'6"	4'1½"

Fig. 1—Construction of a square dipole for use on 21 or 28 mHz. Antenna is horizontally polarized when mounted flat, parallel to the earth. Loading coils are constructed of aluminum clothesline wire. For 21 mHz use 7 t. 2" dia., 1½ " long; for 28 mHz use 5 t. 2" dia., 1½ " long. Other materials needed are: 50 foot roll aluminum clothesline wire, 4 inch square of ¼" plexiglass or equiv.; 12 feet of 1 x 2" lumber; 18 No. 8 or No. 10 machine nuts and bolts and flat washers; 12 crimp-on lugs; 52 ohm coaxial cable.

his present amateur license to enroll in the first available LERC Amateur Club license course. You do not have to be a Lockheed employee, and the fee is very nominal.

In addition, although Bill recommends enrolling in your local amateur radio club's amateur study course of one is available, the LERC offers its Novice course by mail. Assuming studying 10 hours a week, the course is designed to prepare a student to be able to pass the Novice exam and be ready to go on the air in six to 10 weeks. Continuing the course will get you your General/Advanced class license in another 14 to 18 months. While many students do the job in less time, Bill believes a slower pace and lots of time on the air as a Novice pays dividends. The idea has much to recommend it.

The LERC course is based on the three McGraw-Hill Book Company's *Basic Electricity, Basic Electronics, Basic Transistors,* and the ARRL *License Manual.* When the student has finished the *Basic Electricity* book and has obtained the other books, he requests his first Novice assignment. The

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request should be accompanied by a heavy 10 X 12" pre-addressed return envelope with 24 cents postage affixed. After the student completes and returns this open-book quiz to the LERC club with another return envelope, the club returns the corrected test along with the second quiz. This routine is repeated until the four Novice tests are completed.

The club also offers a recorded code course on either 7-inch tape reels or cassettes in the same manner for those who want them. The student pays $2.50 for the first tape; when he finishes with it, he returns it to the club in exchange for the second tape, and so on until either the Novice or General class code speed is reached.

For an additional $2.00, LERC will mail any amateur a variety of printed hand-outs, such as a WAS map, Q-signals, amateur frequency assignments, etc. All the material is available from other sources, but it is convenient to have it all collected in a single envelope. Finally, any club or individual considering starting an amateur license course could do worse than to spend $3.00 for a set of the LERC study papers to get ideas for their own courses.

Square Dipoles Antennas for 21 and 28 mHz

Both 21 and 28 mHz versions of the square dipoles sketched in fig. 1 were tested on top of a six-foot step ladder in a first-floor room and fed from an SB-100 transceiver. The first two calls on 21 mHz raised two German stations; the third one raised a WN9, 10 miles away. No foreign DX was heard during the 28 mHz tests, but many S9 reports were received from the west coast over the weekend.

The antenna radiates best in the direction away from the open side. When the loading coils are used, it has about a 1 db (20%) gain over an unbent dipole. Omitting the coils reduces signals about one db compared to the dipole. Front-to-back ratio is five to 10 db.

Notch the supporting 1 X 2's at their centers and bolt them at right angles to each other. Screw two inch squares of ¼-inch plastic to the ends of the cross pieces. Prepare four lengths of aluminum clothesline wire of the specified lengths by crimping terminals or bending small connecting loops on their ends. Bend the conductors 90 degrees at their centers and bolt them to the plastic blocks.

The 21 mHz loading coils are air wound, are two inches in diameter and 1½ inches long, and contain seven turns. The 28 mHz coils are similar but contain only five turns. The coils may be omitted by shorting the appropriate antenna terminals together at the cost of a slight loss in antenna efficiency. On the plus side, omitting them resulted in a feed-line s.w.r. of under 2:1, which will minimize losses in long lines and may make the antenna easier to load without an antenna coupler with fixed-loading transmitters.

Remember, the first step towards having your picture, opinions, and news about your Novice activities appear in the NOVICE SHACK is for you to mail the information to us. The address is: Herbert S. Brier, W9EGQ, The Novice Shack, 385 Johnson St., Gary, Ind. 46402.

73, Herb, W9EGQ

Slow Scan TV

BY COPTHORNE MACDONALD,* WØORX

BOB Suding, WØLMD, had missed the Dayton Hamvention due to a last minute work overload in preparing for his doctorate. He made the Hyannis Convention, however, with a couple of his latest creations. He also gave a talk describing these developments, and what he thinks the next technological advances in SSTV will be. One of his units was a keyboard operated SSTV character generator. The other was his fourth generation digital fast-to-slow scan-converter. (Yep, he's made four so far, each a little simpler and better than the preceding.) He and Mike Tallant, W6MXV, have been exchanging design tricks and shortcuts and it appears that an optimum design using today's components is here, or just about. With 41 IC's, and frequencies ranging from d.c. to 5 mHz, it is not a beginner's project. But those of you with some digital experience might very well be interested in building one. Bob is making copies of the schematics available to individuals for the cost of reproduction and mailing ($1.25). Schematics for his keyboard character generator are also available for $1.25. His QTH is 1955 Ingalls St., Lakewood, CO. 80214.

Bob, and Don Miller, W9NTP, are working together on the next major technical advance – a one frame storage slow-to-fast digital scan-converter. This unit will take a single frame SSTV picture and write it into digital storage. (99 IC's worth of storage!) The stored picture is then read-out non-destructively into a standard TV set for viewing. They hope to have this unit ready for Dayton next year. In two years Bob expects to have a scan-converter that can load the memory with new SSTV data at the same time it is being read out. Image enhancement, and color SSTV displayed on a standard color TV set he sees as the next steps after that.

There is no doubt that these things are technically possible with today's devices. How fast we see them in widespread use will depend upon how fast the cost of digital storage falls in the coming years. The type 1402 dynamic shift registers used for memory in these scan-converters cost about $12 each in quantities of one, and $8 each if you buy 100, from the manufacturer. A fast-to-slow converter uses only one, but Bob's proposed slow-to-fast converter requires 99. Color SSTV would presumably require 2 to 3 times that number. In short, a fast-to-slow converter is *economically* practical today, while the much desired – but elusive – slow-to-fast converter still awaits a cost breakthrough.

Venus Scientific was there, not only with their new SSTV monitor, but also with a pre-production model of *their* new fast-to-slow scan-converter. Venus hopes to introduce it in December or January. I'll have more information on this unit as details become available.

Logic Controlled Audio/SSTV Switching

As promised, this month's column includes schematics of some of the more interesting circuitry used in the control system discussed last month. Figure 1 shows a simple audio/video switching scheme as it might be built to accommodate four input sources. If you understand how it works you shouldn't have any problem making a more (or less) elaborate unit.

The four momentary contact switches could be mounted in a small hand-held box together with a push-to-talk switch, and whatever else is wanted at the fingertips. Each switch triggers its own set-reset flip-flop latching circuit. Actually, when any button is pushed, a "reset" command is coupled through the 0.001 mf capacitors to the "reset" input of all four flip-flops. (This turns off any source that was previously on.) This reset pulse lasts for only about a millisecond. Since the button is normally held down much longer than this, the "reset" order to all the flip-flops is followed immediately by a "set" command to one of

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

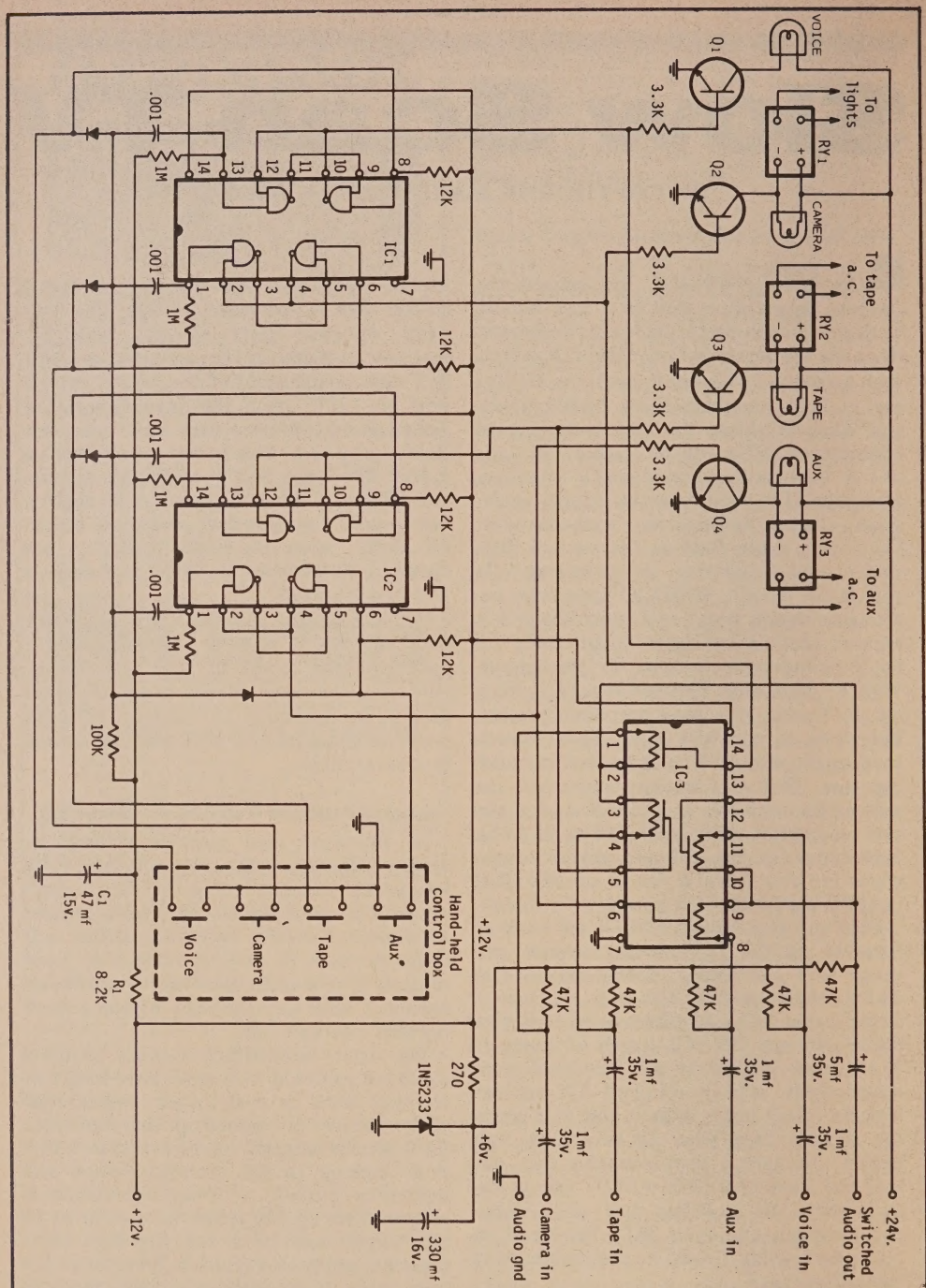


Fig. 1—Four-input push-button controlled audio switcher, and a.c. power control circuit. Transistors: 2N5189, 2N1711, or similar. Status Lamps: 24 volts, 40 ma or less. Diodes: 1N914, or most any silicon diode. IC_1, IC_2: RCA CD4011AE Quad NAND Gate. IC_3: RCA CD4016AE Quad Bilateral Switch. RY_1 - RY_3: International Rectifier, Crydom Div. Model D1210 solid state relay (10 a. at 120 v.a.c.). IC's are shown as viewed from the top.

the flip-flops. This causes the output of that particular flip-flop to switch to +12 volts, and stay there even when the button is released. R_1/C_1 forms a delay circuit that insures that all sources remain "off" when the power is first turned on.

Let's follow the action through the VOICE flip-flop at the far left of fig. 1. Its output appears at pin 10 of IC_1. When the voice is "off" this point is at 0 volts. The base of Q_1 is thus at ground potential, and the VOICE status light is off. Pin 12 of IC_3 is also at ground potential, blocking the flow of VOICE audio at pin 11 from reaching the output audio bus connected to pin 10. IC_3 is a COS/MOS Quad Bilateral Switch, type CD4016AE. The control voltage on pin 12 varies the resistance appearing between pins 10 and 11. With pin 12 at 0 volts, the resistance is many megohms. With the voltage at +12 volts, the resistance drops to a few hundred ohms, allowing the audio to pass to the output bus. The +12 volt condition occurs when the VOICE button is pressed. Naturally, when pin 10 of IC_1 switches to +12 volts, Q_1 saturates, and the VOICE light comes on also.

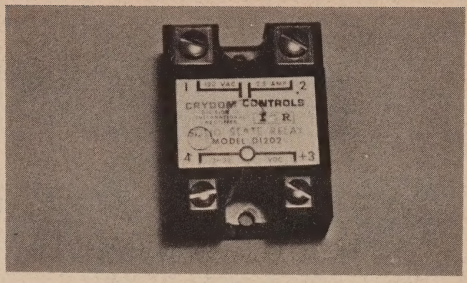


Fig. 2—Photo-isolated solid-state relay used to switch the a.c. to lamps, recorder motors, etc.

Note that solid-state power relays are wired across the other status lights. The relay across the CAMERA light could be used to turn on the bright camera lighting. The relay across the TAPE status light count turn the tape recorder motor on. If you want the camera lights to come on only when both the CAMERA button has been pushed, *and* when you are transmitting, there are a couple of approaches. If a d.p.s.t. push-to-talk switch is used, one section could be wired in series with the Q_2 base lead. Another approach is to feed the voltage

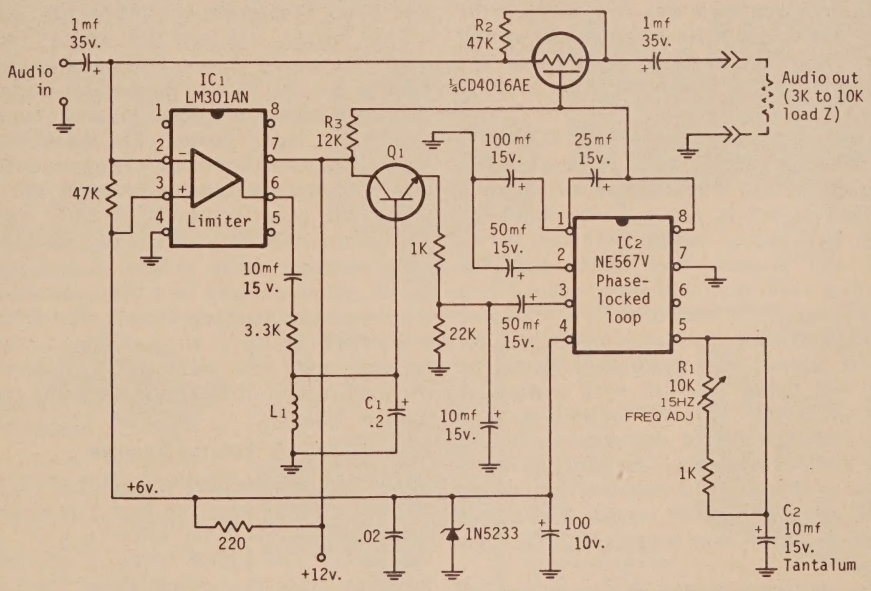


Fig. 3—Circuit which automatically reduces audio volume when an SSTV signal is being received. IC_1: National Semiconductor LM301AN op amp. IC_2: Signetics NE567V Phase-locked loop. Q_1: 2N5089. C_2: Solid Tantalum Electrolytic; all others may be ordinary aluminum electrolytics. L_1: 88 mh torrid.

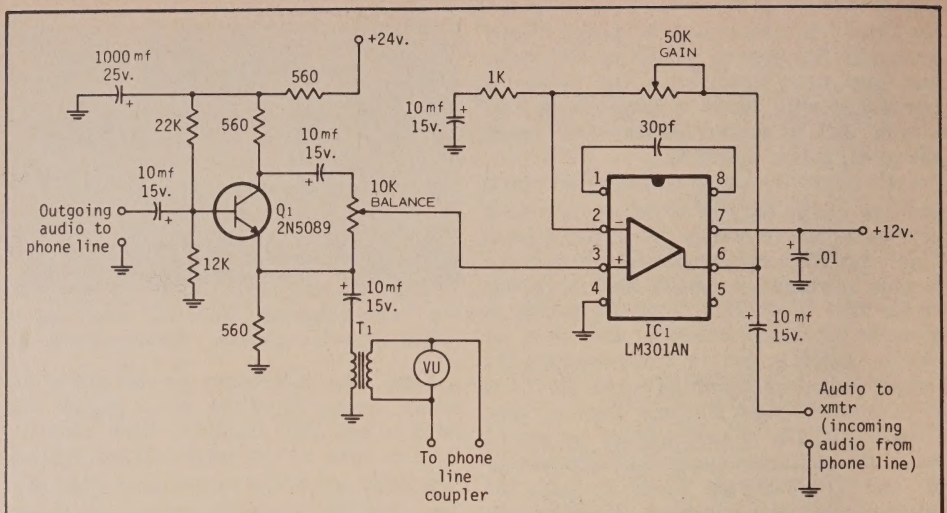


Fig. 4—Phone patch circuit that separates incoming from outgoing audio without the use of hybrid transformers. *IC*1: National Semiconductor LM301AN op amp. *T*1: Inexpensive 600:600 or 500:500 ohm transformer.

appearing across the PTT switch when it is open into some form of logic AND circuit.

While fig. 1 shows a switcher feeding a transmitter audio input, a similar switcher is also useful at the input of the video monitor. Here, for example, a d.c. voltage from the push-to-talk circuit can automatically switch the video monitor from monitoring the transmitter input, to viewing the receiver output.

A few comments on the RCA COS/MOS IC's. The positive and negative peaks of the audio signal into a CD4016AE switch must not exceed certain limits. These limits are the positive supply voltage (+12 volts in this case) and ground. This means that the incoming audio should be superimposed on a bias voltage of +6 volts or so. A 6 volt zener (1N5233) is used to obtain a low impedance +6 volt source. The audio level should be kept well below 12 volts peak-to-peak. A level of "0 VU" on a VU meter is about 2 volts peak-to-peak for sine waves, and is a good level to settle on. The switched audio output of this circuit should feed into a load of 3K to 10K for best results. The circuit should be driven from sources of 1000 ohms or less.

One additional caution. If you do not use all the gates, or gate inputs, in a COS/MOS dip package, be sure to return all unused gate inputs either to ground or to B+. These inputs are very high impedance MOS FET gates and can float up and down in voltage causing temporary malfunctioning, or permanent damage due to device overheating. A copy of the *COS/MOS Databook*, SSD-203A is available from RCA Solid State Division, Box 3200, Somerville, NJ 08876, for $2.00.

This project was my first contact with solid-state power relays. While not as inexpensive as the electro-mechanical variety, they are silent in operation, and require much less input power. The IR/Crydom Model D1210 units I used will operate from any d.c. input voltage between 3 and 32 volts. The input resistance is 1500 ohms. The internal circuitry apparently involves a light emitting diode (LED) in the input circuit, photo-coupled to a thyristor switching circuit that controls the a.c. The D1210 will switch up to 10 amps continuous load current, and will withstand a 1 second overload current of 24 amps, and a one cycle surge of 80 amps.

SSTV Volume Reducer

How many times have you grabbed for the volume control when the ham you've been working switched from voice to SSTV, or vice versa? The circuit of fig. 3 will automatically lower the volume about 7 seconds after the start of an SSTV transmission, and turn it up again about 1 second after the SSTV stops.

[*Continued on page 89*]

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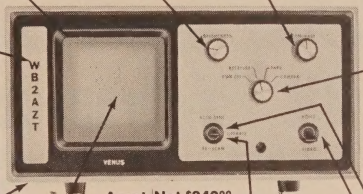
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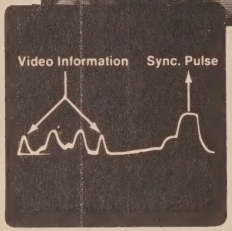
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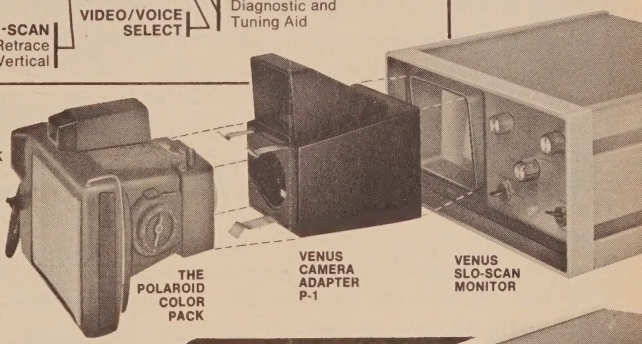


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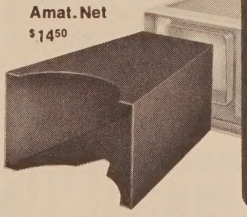
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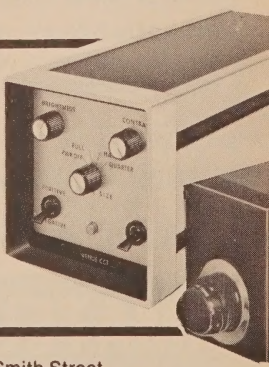


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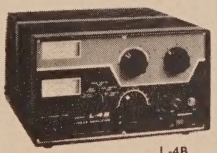


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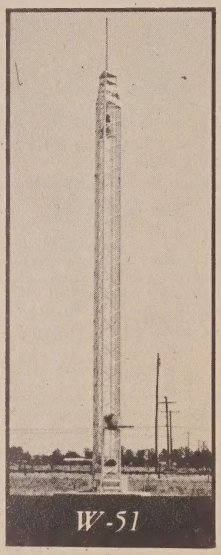
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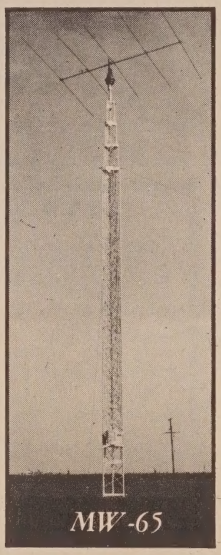
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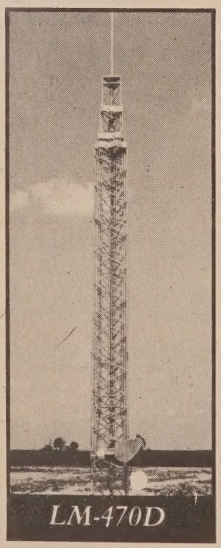
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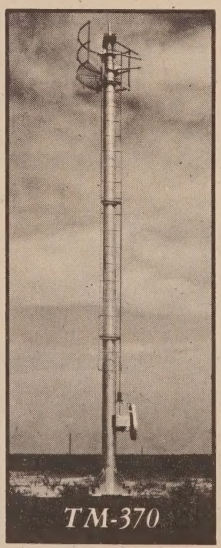
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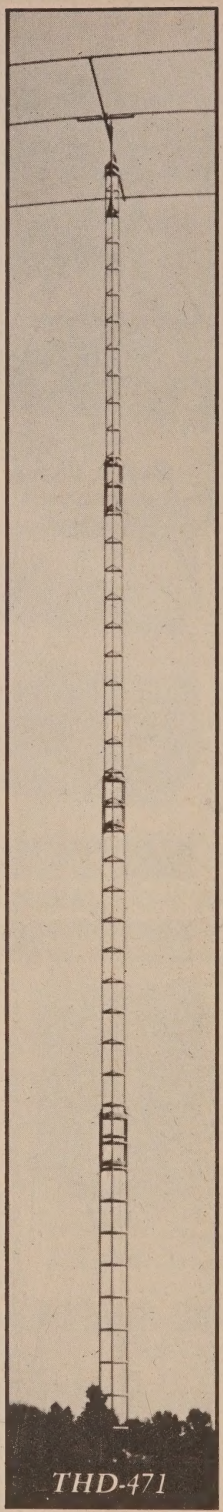
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ANTENNAS

BY WILLIAM I. ORR, *W6SAI

"I should worry . . . . . I should care
I should marry a millionaire . . . .
He should die . . . . . I should cry
I should marry another guy . . . . . "

Pendergast leaned back in his chair, tossed the headphones on the operating table and stared out of the window of the shack. The childish chant floated into the room as if on the wings of a light breeze.

"Good grief," said Pendergast. "Look at that! Little girls jumping rope! I haven't seen children jumping rope for 20 years. They're all out sniffing airplane glue and slitting automobile tires now!"

I looked out over Pendergast's shoulder.

*48 Campbell Lane, Menlo Park, CA 94025

CQ is pleased to present the first of a monthly feature written by the well-known author, W6SAI. Bill is the editor of the highly regarded *Radio Handbook* and the author of the *Beam Antenna Handbook, All About Cubical Quad Antennas, The Wire Antenna Handbook*, and others. He has written over 100 technical articles, many of which have appeared in *CQ*. Bill has designed high gain antennas for military and commercial service, and his antenna handbooks have attained world-wide popularity. W6SAI is also an active amateur, holding DXCC (260 countries) and also the operator at 3AØAF and KH6ADR. Bill promises us an interesting column, dealing with various aspects of antennas, California wines and other topics of interest to today's radio amateur. [*California wines??* – Editor.]

His first column touches briefly on a new and interesting antenna design, and the ever-popular triband, trapped beam antenna.

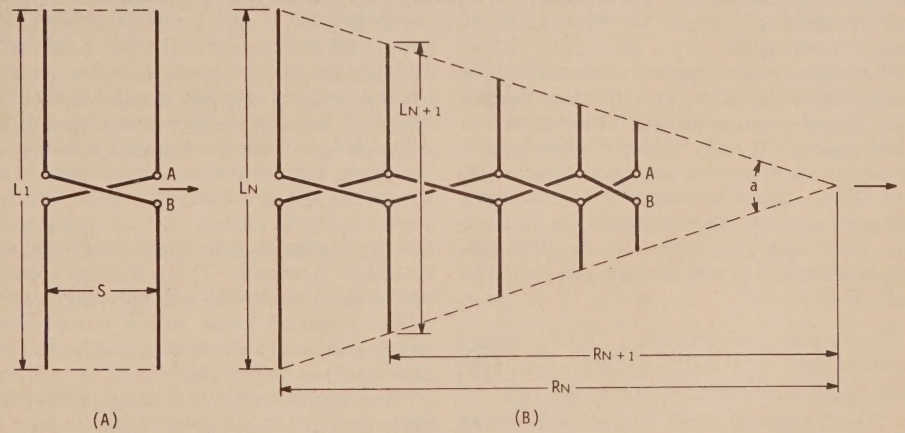


Fig. 1—The ZL-Special antenna (A) may be thought of as one cell of a long-periodic dipole array (B). Operational frequency of the ZL-Special is determined by element length (L_1) and spacing (S), both of which are adjusted for a unidirectional pattern. Phasing line provides proper phase difference between antenna elements. Beam is fed with balanced transmission line at points *A-B*.

Log-periodic dipole array (B) consists of an array of dipoles with lengths and spacings arranged so that the electrical properties repeat periodically with the logarithm of the frequency. Good frequency independence can be obtained when the variation of the electrical properties over one period (and therefore over all periods) is small. Lengths and spacings are a function of included angle, a. Frequency limits of array are determined by lengths of longest and shortest elements. A single cell of the log-periodic dipole can be thought of as a simple ZL-special beam, operable over a very narrow frequency range.

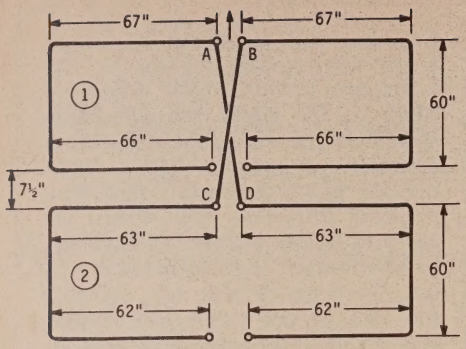


Fig. 2(A)—Drawing of the G3PTN beam for 20 meters. Basically, the antenna is a form of ZL-Special with the ends of the elements folded back in the form of a square. The antenna is fed with a 1:1 balun and a 50 ohm coaxial transmission line at points *A-B*. The phasing line connecting *A-B* to *C-D* is a 86" length of 300 ohm TV-type "ribbon" transmission line, having a 180 degree twist in it. With the phasing line in place, element 1 is adjusted for minimum s.w.r. and element 2 is adjusted for best front-to-back ratio. Elements are constructed in trombone fashion so end sections can slide in and out of center sections

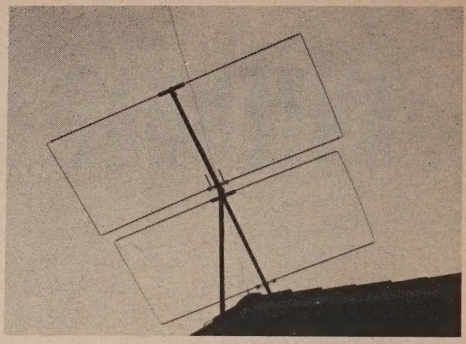


Fig. 2(B)—G3PTN's 2 element "mini-beam" ready for action. Note that small stubs have been attached to element 1 to permit easy adjustment for minimum s.w.r. When properly adjusted, antenna shows s.w.r. of about 1.1 at resonance (14.2 mHz), with s.w.r. reaching 2 at 14.0 mHz and 14.325 mHz. Input impedance of the antenna is close to 42 ohms, with a beamwidth of 70 degrees between the half-power points. Antenna design is covered by British Patent 26716, but amateurs may construct the beam for their own personal use. (*Photo courtesy G3PTN*).

He was right, a small knot of teeny-boppers were happily singing and jumping rope in cadence in a neighbor's backyard.

"The more it changes, the more it is the same," I remarked.

Pendergast turned around and reached for the headphones. "I suppose the same thing is true about amateur radio?," he demanded.

"Certainly," I said. "History repeats itself. Some of the best new ideas are revisions of old ones. Rhigi in Italy was generating microwaves in the Gay Nineties, the mechanical filter was first described in 1924 and single sideband was in limited use about the same time."

Pendergast interrupted, "And there's nothing new about antennas? How about the Log Periodic antenna? That's a new one."

"Yes," I agreed, "But the ancestor of the Log Periodic has been around for a long time. And there's a new version of this oldie today."

"Oh?," said Pendergast, turning off the transceiver and placing the headphones on the desk. "Tell me more. I'm an antenna nut, as you know."

I quickly drew a picture on the reverse side of the log book sheet (Fig. 1). "Here's a sketch of the so-called *ZL-special* antenna. It isn't very well known in the United States, but it is quite popular overseas. As you can see, the ZL-special can be thought of as a single cell of a log periodic antenna, which is composed of a group of ZL-special cells connected in sequence. The main difference between the two antennas is that each cell of the log periodic antenna is cut for a slightly different frequency, thus broad-banding the whole affair. This is a simplified viewpoint, of course, but it illustrates the validity of the ZL-special design. Basically, it is two half wave elements spaced 1/8-wavelength and directly fed, with a 135° phase reversal stub between elements. The odd-ball phasing produces a unidirectional pattern. A practical ZL-special beam has a front-to-back ratio of about 15 decibels and a power gain of about 3 or 4 decibels."

"I've heard about the antenna, but I've never seen one," said Pendergast.

"Well, phased arrays of this type have never gained much favor among amateurs in the United States. The parasitic beam has led the field, since it provides somewhat more gain per element than an equivalent phased array." I paused and reached for a magazine with a startling red cover.

"What's that?," asked Pendergast. "The latest copy of *Playboy?*"

"This is *Radio Communication*, the Journal of the Radio Society of Great Britain," I

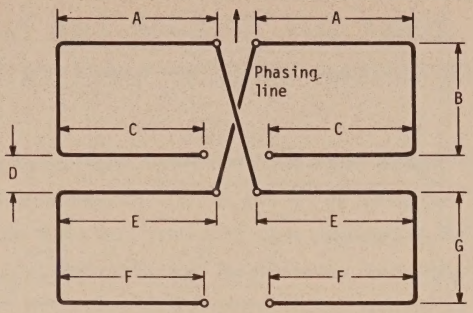


Fig. 3—Dimensions for G3PTN beam antenna for 10, 15, 20 or 40 meters.

Band	A	B	C	D	E	F	G	Phasing line
10	33½"	30"	33"	3½"	31½"	31"	30"	43"
15	50"	45"	49½"	5"	47"	46½"	45"	64½"
20	67"	60"	66"	7½"	63"	62"	60"	86"
40	11'2"	10'0"	11'0"	15"	10'6"	10'4"	10'0"	14'4"

replied. "A really great magazine. You should join the Society and get this publication."

"Is it written in English?," Pendergast asked.

I gave him a withering look. "Written in the King's English, as the saying goes. Don't try to be humorous." I turned to the June article by G3PTN.

"Here it is," I said. "The ZL-special antenna updated to 1973. The author has taken the original design, folded the elements into a rectangular loop and has come up with a compact, 20 meter mini-beam that has a turning radius of about 7 feet. Boom length is only 11 feet, and the maximum 'wingspread' of the beam is only 11'6". That's a pretty small beam antenna for 20 meters."

Pendergast sniffed. "How does it perform?"

"Well, G3PTN built two models of the antenna and made over 1,000 contacts with them over a period of a year. He compared his antenna to a V-beam and concluded his array had a forward gain of about 4 decibels and a front-to-back ratio of about 10 decibels. Here's what it looks like." I drew a second sketch in the log book (fig. 2).

"This is a top, plan view of the G3PTN array. The rectangular loops lie in the horizontal plane. They are made of ½-inch diameter aluminum tubing for the center sections and ¼-inch diameter tubing for the outer sections. Personally, if I built it, I would use slightly larger tubing for increased strength. In any event, the two loops are supported from a boom made of 2-inch diameter aluminum tubing, 11 feet long."

"And the element supports?," asked Pendergast.

"Like this," I said, rapidly drawing fig. 3. "The elements are clamped to a mounting plate by means of U-bolts and plastic insulators made of PVC tubing – you know, the plastic water pipe stuff. At the low voltage points, that is, where the feedline and phasing section are attached, the mounting plate may be made of aluminum. At the high voltage ends (the open ends of the elements) the mounting plate is made of insulating material. G3PTN used *Perspex*, whatever that is. I never heard of the stuff over here, but I suppose it is something like lucite."

I saw a glimmer of interest in Pendergast's eyes, so I continued. "The ends of the elements that are in close proximity at the center are aligned with an insulating dowel, so the two loops are fairly rigid. Electrically, they are connected together by means of a phasing line. The line is an 86" length of 300 ohm TV ribbon, with a half-twist in it. The combination of the twist and the line length provide the proper phase relationship between the two elements. The feedpoint is at the junction of the phasing line and element A. The input impedance of the beam seems to be about 48 ohms, so G3PTN used a 50 ohm coaxial line and a 1:1 ferrite balun for his feed system."

"Why the balun?," asked Pendergast.

"This is a balanced antenna and the

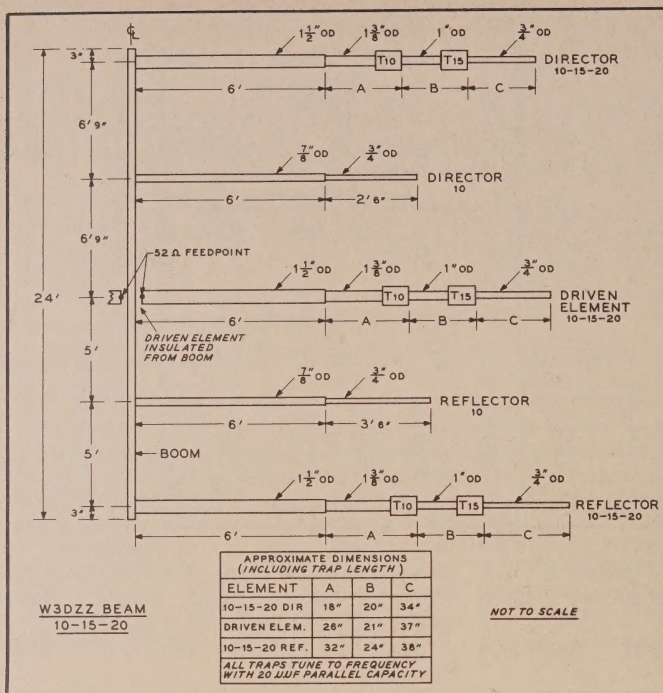


Fig. 4—Dimensions for original W3DZZ triband beam antenna (from *Beam Antenna Handbook*). Original W3DZZ beam had a 24 foot boom and extra director and reflector for improved front-to-back ratio on 10 meters. Driven element was directly fed from a coaxial transmission line. The line was wound into a multiturn coil directly behind the driven element to act as a sort of balun. Antenna feedpoint impedance was somewhat lower than line impedance so s.w.r. never approached unity on any band.

currents in both halves have to be symmetrical. The proper way to achieve this is to use a balun, which provides a balanced termination for a unbalanced transmission line."

"Damned clever," said Pendergast, carefully gathering up the sketches after tearing the pages from my logbook. "This looks like a great beam antenna for the amateur who needs a 'cover' or 'disguise.' It isn't much bigger than a channel 2 television receiving antenna."

"Right," I said. "And a 10 or 15 meter version is even smaller. In fact, you could use this idea to build a 40 meter mini-beam that would only measure 22 feet by 23 feet in size. That's about equal in overall area to a 3-element, fifteen meter beam."

"That would be a little more obvious," said Pendergast. "But it is a great idea. Its awfully hard to be loud on 40 meters when you live on a city lot."

"Well, here are the dimensions for 10, 15, 20 or 40 meters (fig. 3)," I said. "Take your pick."

"Any other pointers?," asked Pendergast.

"According to G3PTN element A should grid-dip to about 13.75 mHz and element B to 15.5 mHz with the phasing line removed. Also, changing the sides symmetrically by one inch changed the resonant frequency by about 100 kHz. At the frequency of resonance, the s.w.r. on the transmission line runs close to 1.1. S.w.r. is less than 2 across the 20 meter band. That pretty well sums it up, and I think it would be smart if you joined RSGB. It's a fine outfit and they have a topnotch magazine . . . . . in English," I added.

"Fair enough," said Pendergast. He hesitated, then said, "I understand that you are going to write an antenna column for *CQ*."

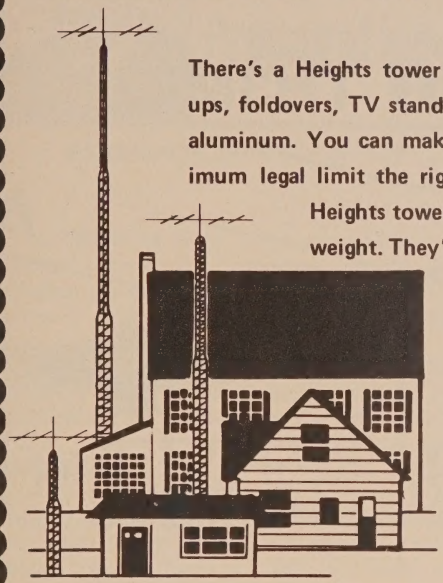
"Yes," I replied. "It seems so."

"Well," Pendergast said, "I hope you cover some basic antenna designs that are popular on the ham bands. There's a lot of confusion about Yagis and Quads and triband beams and too many self-appointed experts giving free advice on the air."

"It sounds as if you are setting me up as a target for brickbats," I replied. "But I certainly will try and answer some of the more common questions. I guess a lot will depend upon the mail I receive, and the questions asked."

"Alright," said Pendergast, "I'll ask the first question. Who invented the trapped, tri-band beam for 20, 15 and 10 meters?

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Where did it come from?"

I reached up onto the top shelf of the radio shack, the one over the window, and pulled down a dusty magazine. "Read this," I said.

"This is the August, 1940 issue of *Electronics* magazine. On page 42 is an article entitled, 'A Multifrequency Tuned Antenna System,' written by Howard K. Morgan of Transcontinental and Western Air, Inc. The short article described a multi-frequency doublet used for reception of aircraft transmissions. The multi-frequency effect was achieved by placing parallel resonant traps at critical places in the doublet antenna. Undoubtedly Mr. Morgan is the grandfather of the trapped beam antenna. As far as I know, this is the only reference to this antenna system published before World War II."

"We should erect a monument to Mr. Morgan," said Pendergast. "I wonder if he was a ham, or not?"

"No way of telling," I replied. "In any event, in March, 1955 an article entitled, 'The Multimatch Antenna System,' by W3DZZ appeared in *QST* magazine. This was the introduction of the famous W3DZZ trap beam, which is the direct father of today's triband beam antennas (fig. 4). So you see that the triband beam has a long history and the principle of the trapped antenna system was well known in 1940, over thirty-three years ago."

"How did the W3DZZ antenna work? Was it any good?," asked Pendergast.

[Continued on page 90]

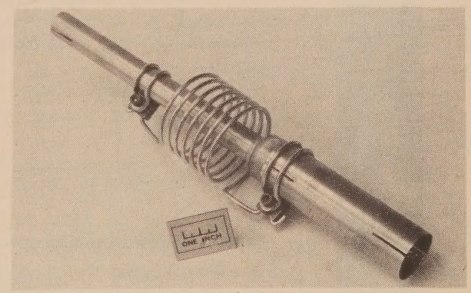
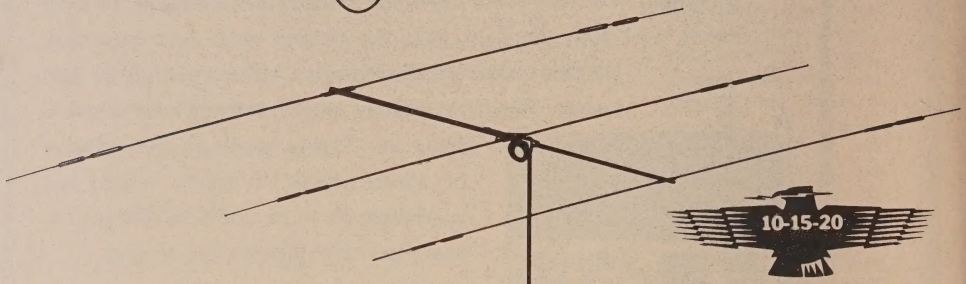


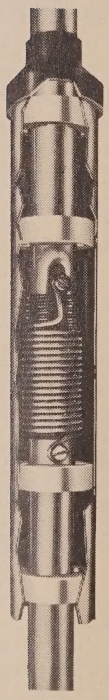
Fig. 5—The original W3DZZ trap element. This high-Q trap is wound of #8 aluminum wire. The coil is 3" in diameter and 3" long. The 15 meter coil has seven turns (shown here); the 10 meter coil has five turns. The coaxial capacitor is at the right and is 20 to 24 pf. Inner dielectric projects about one inch beyond the outer tube to form a long path to prevent breakdown across the dielectric.

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- Thunderbird's "Hy-Q" traps provide separate traps for each band. "Hy-Q" traps are electronically tuned at the factory to perform better at any frequency in the band—either phone or CW. And you can tune the antenna, using charts supplied in the manual, to substantially outperform any other antennas made.
- Thunderbird's superior construction includes a new, cast aluminum, tilt-head universal boom-to-mast bracket that accommodates masts from 1¼" to 2½". Allows easy tilting for installation, maintenance and tuning and provides mast feed-thru for beam stacking.

  Taper swaged, slotted tubing on all elements allows easy adjustment and re-adjustment. Taper swaged to permit larger diameter tubing where it counts! And less wind loading. Full circumference compression clamps are mechanically and electrically superior to self-tapping metal screws.
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Propagation

BY GEORGE JACOBS,* W3ASK

ALTHOUGH solar activity continues to decline, some DX openings should be possible on each of the amateur h.f. bands between 10 and 160 meters during December.

Some 10 meter DX openings, mainly to southern and tropical areas, should be possible during much of the daylight period. Fairly good 15 meter DX openings are expected to most areas of the world sometime during the daylight hours, and the band may occasionally remain open towards the west during the early evening. Twenty meters should open for DX in almost all directions for an hour or two after sunrise, and remain open to one area of the world or another through the daylight hours and into the early evening. When conditions are above normal, 20 meters is likely to remain open towards the south and west during the hours of darkness to about midnight, and perhaps beyond.

With status levels at seasonally low values in the northern hemisphere, and the hours of darkness at a maximum, a considerable improvement is expected in DX conditions on the 40, 80 and 160 meter bands during December. Forty meters should open for DX during the late afternoon hours, with the first signals coming from Europe and other areas in a northeasterly direction from the USA. During the hours of darkness DX should be possible to many areas of the world. The band should peak to Oceania and to other areas in a generally southerly and westerly direction shortly before sunrise.

Fairly good DX conditions are also expected on 80 meters. Openings with relatively strong signal levels should be possible to many areas of the world during the hours of darkness, with conditions expected to peak as the sun rises at the easternmost terminal of a DX path. Even the 160 meter band is expected to have its share of DX during December. Some openings are likely to take place when the transmisssion path is entirely in darkness, or when part of the path is in darkness and the other in either twilight or dawn.

For *short-skip* openings of less than 250 miles try 80 meters during the day and 160 meters at night. Between 250 and 750 miles, best bet is 40 meters during the day and 80 at night. Between 750 and 1300 miles try 20 during the day, 40 during the early evening and 80 later in the evening until sunrise. Between 1300 and 2300 miles, 20 looks best during the day, 40 during the evening to about midmight and 80 for the remainder of the dark hours to sunrise. Short-skip openings should be possible on 15 meters between distances of approximately 1300 and 2300 during much of the daylight period. An occasional opening on 10 meters

*11307 Clara Street, Silver Springs, Md. 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For December, 1973

	Rating & Forecast Quality			
Propagation Index	(4)	(3)	(2)	(1)
Date				
Above Normal 4, 10, 19-20, 26, 28, 30	A	A	B	C
Normal: 1-3, 5-6, 8-9, 11-12, 18, 21-22, 25, 27, 29, 31	B	C	D	E
Below Normal: 7, 13, 16-17, 23-24	C	D	E	E
Disturbed: 14-15	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 *a propagation index* of (4) will be good on Dec. 1-3, excellent on Dec. 4, 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.

should also be possible during the early afternoon.

Sunspot Cycle

The Swiss Federal Observatory at Zurich reports a mean sunsport number of 61 for September, 1973. This results in a smoothed sunspot number of 44 centered on March, 1973.

A smoothed sunspot number of 29 is forecast for December, as the solar cycle continues to dec'line towards a minimum now estimated to be about two years away.

V.H.F. Ionospheric Openings

Quite a bit of meteor activity is expected during the month. *Geminids,* classified as a major meteor shower, should begin on December 12 and last for about three days. Maximum intensity is expected at approximately 4 P.M. EST on December 13, with a meteor rate of about one a minute. This should permit fairly good meteor-type openings on both 6 and 2 meters. A second, but somewhat less intense shower period is expected later in the month. Called *Ursids,* it should last from December 22-23, peaking at about 3 P.M. on the 22nd. A meteor rate of about 15 per hour is expected during this shower.

Trans-equatorial scatter, or TE openings on 6 meters falls off quite a bit during December. An occasional opening may still be possible, however, between the southern half of the USA and South America during the hours of 8 and 11 P.M.

A secondary seasonal peak in sporadic-E propagation generally takes place during December (the major peak occurs during the summer months). This should result in a few fairly good short-skip type openings on 6 meters, between distances of approximately 800 and 1400 miles. Conditions should peak during the early evening hours, but some openings may occur at other times as well.

Some auroral-type v.h.f. ionospheric openings are also likely to occur during December, especially during periods when ionospheric conditions on the h.f. bands are below normal or disturbed. Check the "Last Minute Forecast" at the beginning of this column for the days that are most likely to be in these categories during the month.

160 Meter Annual DX Tests

As solar activity declines, DX conditions improve on the 160 meter band. W1BB informs us of the 1973/1974 test periods.

41st Annual TransAtlantic 160 Meter DX Tests: 160 Meter DX Tests:

0500-0730 GMT, Sunday Mornings, Dec, 23, Jan. 13 and Feb. 10. W and Ve stations use 1800-1807 kHz and DX stations use 1825-1830 kHz.

6th Annual TransPacific 160 Meter DX Tests: 160 Meter DX Tests:

1330-1600 GMT Saturday Mornings, Dec. 22, Jan. 12 and Feb. 9. W and VE stations use 1800-1807 kHz; JAs 1907.5-1912.5 kHz; VKs 1800-1805 and 1825-1830 kHz; ZLs 1875 kHz; KH6 1995-2000 kHz and all others 1800-1805 kHz.

Procedure: Call "CQ DX TEST" first 2½ minutes of alternate 5 minute periods, listening between. W/VEs lead off first 5 minute period, then alternate 5 minute periods thereafter. DX follows, first 2½ minutes of second 5 minute period, then alternate 5 minute periods. Thus, each CQs for one-half of their respective 5 minute periods, and listens for answers during the other half. Set clocks accurately by WWV because it is very important to keep the 5 minute periods very accurately.

Held since 1932, these tests are symbolic of the original crossing of the Atlantic by radio amateurs during the early 1920's. Since power output levels are severely restricted in this band, DX represents more of a challenge here than in any of the other h.f. bands. Conditions this year, however, are expected to be better than they have been for the past eight years, and there is likely to be a greater amount of DX activity on 160 meters during these test periods than ever before. Reports of QSOs during the test periods should be sent for tabulation to W1BB, Stew Perry, 36 Pleasant Street, Winthrop, Mass. 02152.

Special propagation forecasts for the 160 Meter DX Test periods will be included in the regular MAIL-A-PROP forecasts. These will come automatically to regular subscribers, and will also be available on a single forecast basis for $1 each and an s.a.s.e. MAIL-A-PROP, P.O. Box 86, Northport, N.Y. 11768.

This month's column contains DX Propagation Charts valid through February 15, 1974. Short-Skip Propagation Charts for use during December appeared in last month's column.

The Editor of this column would like to take this opportunity to extend his warmest wishes to everyone, everywhere during this holiday season.

73, George, W3ASK

How To Use The DX Propagation Charts

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

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. An * indicates 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 than 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 *standard* time is used, *not* GMT. To convert to GMT, *add* to the times shown in the appropriate Chart 8 hours in the PST Zone, 7 in the MST Zone, 6 in the CST Zone and 5 in the EST Zone. For example, 14 in Washington, D.C. is 19 GMT and 20 in Los Angeles is 04 CMT, 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.

December 15, 1973–February 15, 1974

Time Zone: EST (24-Hour Time)

EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-11 (1)	07-08 (1) 08-09 (3) 09-11 (4) 11-12 (3) 12-13 (2) 13-14 (1)	06-07 (1) 07-09 (4) 09-11 (3) 11-13 (4) 13-14 (3) 14-15 (2) 15-17 (1)	15-16 (1) 16-17 (2) 17-19 (3) 19-00 (4) 00-04 (2) 04-05 (1) 17-19 (1)* 19-20 (2)* 20-02 (3)* 02-03 (2)* 03-04 (1)*
Northern Europe & European USSR	08-10 (1)	07-08 (1) 08-10 (2) 10-12 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-14 (1)	16-19 (1) 19-23 (2) 23-03 (1) 19-02 (1)*
Eastern Mediterranean & Middle East	08-10 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-11 (2) 11-12 (1)	06-09 (1) 09-10 (2) 10-12 (3) 12-14 (2) 14-17 (1) 19-21 (1)	18-20 (1) 20-22 (2) 22-00 (1) 20-23 (1)*
Western & Central Africa	09-11 (1) 11-13 (2) 13-15 (1)	07-08 (1) 08-09 (2) 09-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	18-22 (1) 22-02 (2) 02-03 (1) 00-02 (1)*
East Africa	10-13 (1)	08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	07-13 (1) 13-15 (2) 15-18 (3) 18-19 (2) 19-20 (1) 00-02 (1)	18-00 (1)
South Africa	09-10 (1) 10-12 (2) 12-13 (1)	07-09 (1) 09-12 (2) 12-14 (3) 14-16 (2) 16-17 (1)	06-09 (1) 12-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	18-19 (1) 19-21 (2) 21-00 (1) 19-22 (1)*
Central & South Asia	*Nil*	08-10 (1) 17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 18-21 (1)	06-08 (1) 20-22 (1)
Southeast Asia	*Nil*	08-11 (1) 17-19 (1)	06-07 (1) 07-09 (2) 09-12 (1) 19-21 (1)	06-08 (1) 20-22 (1)
Far East	*Nil*	16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-21 (1)	05-08 (1) 05-07 (1)*

South Pacific & New Zealand	13-17 (1)	11-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	03-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	01-02 (1) 02-04 (2) 04-07 (3) 07-08 (2) 08-09 (1) 04-05 (1)* 05-07 (2)* 07-08 (1)*
Austral-asia	16-18 (1)	09-12 (1) 15-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-18 (1) 18-20 (2) 20-22 (1)	03-05 (1) 05-07 (2) 07-09 (1) 05-08 (1)*
Northern & Central South America	09-10 (1) 10-12 (2) 12-14 (1) 14-16 (2) 16-17 (1)	07-08 (1) 08-11 (3) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-07 (2) 07-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-06 (1)	17-18 (1) 18-19 (2) 19-21 (3) 21-04 (4) 04-05 (3) 05-06 (2) 06-07 (1) 19-20 (1)* 20-22 (2)* 22-02 (3)* 02-04 (2)* 04-06 (1)*
Brazil, Argentina, Chile & Uruguay	09-12 (1) 12-15 (2) 15-16 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (4) 16-17 (3) 17-18 (1)	13-14 (1) 14-15 (2) 15-17 (3) 17-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-03 (1) 05-06 (1) 06-08 (2) 08-09 (1)	19-21 (1) 21-02 (2) 02-05 (1) 21-03 (1)*
McMurdo Sound, Antarctica	*Nil*	07-10 (1) 16-18 (1)	07-09 (1) 17-18 (1) 18-22 (2) 22-00 (1) 00-02 (2) 02-03 (1)	00-05 (1)

Time Zones: CST & MST (24-Hour Time)

CENTRAL USE TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	09-11 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-12 (2) 12-13 (1)	06-08 (1) 08-09 (2) 09-12 (3) 12-13 (2) 13-15 (1) 22-00 (1)	16-18 (1) 18-20 (2) 20-00 (1) 00-01 (2) 02-03 (1) 17-20 (1)* 20-01 (2)* 01-02 (1)*

*Predicted times of 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a forecast rating of (2), or better.

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

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.

North & Central South America	08-10 (1) 10-14 (2) 14-16 (1)	07-08 (1) 08-09 (2) 09-13 (3) 13-16 (4) 16-17 (2) 17-19 (1)	06-07 (2) 07-11 (3) 11-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-06 (1)	18-20 (1) 20-22 (2) 22-03 (3) 03-05 (2) 05-07 (1) 19-21 (1)* 21-01 (2) 01-04 (1)*
Brazil, Argentina, Chile & Uruguay	08-11 (1) 11-15 (2) 15-17 (1)	07-08 (1) 08-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-19 (1)	05-06 (1) 06-08 (2) 08-10 (1) 12-14 (1) 14-15 (2) 15-17 (3) 17-19 (4) 19-20 (2) 20-22 (1) 22-00 (2) 00-03 (1)	19-21 (1) 21-02 (2) 02-05 (1) 21-04 (1)*
McMurdo Sound, Antarctica	*Nil*	07-09 (1) 16-18 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-18 (1) 18-22 (2) 22-00 (1) 00-02 (2) 02-03 (1)	22-05 (1)

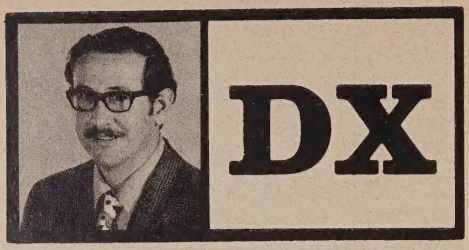
Time Zone: PST (24-Hour Time)

WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	07-09 (1)	07-08 (1) 08-10 (2) 10-11 (1)	05-07 (1) 07-10 (2) 10-12 (1) 23-01 (1)	18-20 (1) 20-23 (2) 23-01 (1) 19-23 (1)*
Central & Northern Europe & European USSR	*Nil*	07-09 (1)	06-07 (1) 07-10 (2) 10-13 (1) 23-01 (1)	17-00 (1) 19-23 (1)*
Eastern Mediterranean & Middle East	*Nil*	07-09 (1)	06-07 (1) 07-09 (2) 09-11 (1) 21-23 (1)	18-21 (1)
West & Central Africa	09-12 (1)	07-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	06-10 (1) 10-13 (2) 13-16 (3) 16-18 (2) 18-19 (1)	18-22 (1)
East Africa	*Nil*	08-11 (1)	08-10 (1) 13-16 (1) 21-23 (1)	18-20 (1)
South Africa	08-11 (1)	06-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	07-11 (1) 11-13 (2) 13-16 (3) 16-18 (2) 18-19 (1) 00-02 (1)	18-20 (1)
Central & South Asia	*Nil*	09-11 (1) 17-19 (1)	08-10 (1) 17-19 (1) 19-20 (2) 20-21 (1)	05-07 (1) 18-20 (1)
Southeast Asia	15-18 (1)	09-11 (1) 15-16 (1) 16-18 (2) 18-19 (1)	07-09 (1) 09-11 (2) 11-16 (1) 16-19 (2) 19-20 (1)	03-08 (1)
Far East	15-17 (1)	14-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1)	08-10 (1) 13-14 (1) 14-15 (2) 15-18 (3) 18-19 (2) 19-21 (1)	00-01 (1) 01-03 (2) 03-06 (3) 06-08 (2) 08-10 (1) 02-08 (1)*
South Pacific & New Zealand	12-14 (1) 14-16 (2) 16-17 (1)	09-12 (1) 12-14 (2) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	07-08 (1) 08-10 (2) 10-15 (1) 15-16 (2) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 03-05 (1)	22-00 (1) 00-03 (2) 03-06 (3) 06-07 (2) 07-08 (1) 00-03 (1)* 03-06 (2)* 06-07 (1)*
Australasia	13-15 (1) 15-17 (2) 17-18 (1)	08-12 (1) 12-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	01-03 (1) 03-06 (2) 06-08 (1) 01-03 (1)* 03-06 (2)* 06-07 (1)*
Northern & Central South America	09-11 (1) 11-14 (2) 14-16 (1)	06-07 (1) 07-08 (2) 08-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (2) 07-09 (3) 09-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-20 (2) 20-22 (1) 22-00 (2) 00-06 (1)	18-20 (1) 20-22 (2) 22-02 (3) 02-04 (2) 04-05 (1) 19-21 (1)* 21-01 (2)* 01-04 (1)*
Brazil, Argentina, Chile & Uruguay	10-12 (1) 12-14 (2) 14-15 (1)	07-10 (1) 10-12 (2) 12-13 (3) 13-15 (4) 15-16 (2) 16-18 (1)	08-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-23 (1) 23-01 (2) 01-06 (1) 06-08 (2)	20-22 (1) 22-01 (2) 01-04 (1) 22-02 (1)*
McMurdo Sound, Antarctica	*Nil*	07-09 (1) 12-15 (1) 15-17 (2) 17-18 (1)	16-18 (1) 18-19 (2) 19-22 (3) 22-01 (2) 01-03 (1) 07-09 (1)	23-05 (1)

CQ'S DIAL-A-PROP

For the latest up to the minute propagation forecasts and special contest predictions call 516-883-6223 any time day or night for a recorded message on conditions.



BY JERRY HAGEN, *WA6GLD

WITH Winter upon us, conditions for DX will shift to the 40 and 80 meter bands. There should be good DX on these bands as conditions were very good throughout the summer. Serious DXers will be thinking of better antennas for the low bands.

DXTRA

Our DXTRA for this month again concerns the Countries List subject as provided by the International Amateur Radio Club (4U1ITU). At this time the IARU is considering adopting a Countries List which is separate from the ARRL list and could be used for DX Awards and Contest Multipliers. At this time a preliminary list has been generated which contains 404 countries. The basic list includes all present ARRL Countries plus an expansion based on further political and geographic division. For instance, divided countries such as Korea, Vietnam and Germany are counted for two countries. Island groups which have distinct geographic separations such as the French Oceania group (F08), Gilbert, Ellice, and Ocean Island groups are given country status for each group. The territory administrated by each Nation in Antarctica creates 11 countries (Argentina, Australian, Belgium, Chile, France, Japan, New Zealand, Norway, Antarctica, United Kingdom, and USA). Further political subdivisions in the USSR are given country status. The IARU has asked *CQ* DX Editor K4IIF and *CQ* Contest Editor W1WY to review the proposed list and comment on the content and applicability to *CQ* DX Awards and *CQ* DX Contests. DXers may recall K4IIF's article in the October, 1972 Issue of *CQ*, where all countries were classified by type of government.

Of course before implementing a new countries list there must be much consideration of criteria for addition and deletion of countries, the effect upon DX Contests, and the effect upon societies issuing awards.

WPX - Virginia Beach Style

During the past summer, this editor was priviledged to visit the QTH's of W4LRN and W4NJF, two of the Worlds three WPX leaders. These two gentlemen along with the late W4OPM have surely made Virginia Beach the WPX Capitol of the World! Clem, W4LRN feeds his 'S' Line and Heath Linear into a Mosley Triband TA-33 Beam and a ground plane for 40 meters. As seen by a glance at the Honor Roll, Clem has put his rig to good use and has a substantial lead in the Mixed WPX standings. Gay, W4NJF operates almost entirely on 2 X SSB with this 'S' Line. His antennas include a Hy-Gain 204BA Yagi on 20 meters, Hy-Gain 10/15 meter duo-bander and dipoles for 40 and 80

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



The top spot on the WPX 2 X SSB Honor Roll is held by Gay, W4NJF who uses this nice layout on all bands.

The WAZ Program

S.S.B. WAX

1138....VE7HP	1142....WA8LUC
1139....W9OHH	1143....UA1CS
1140....W6FET	1144....UW3BV
1141....W3QND	

C.W.–Phone WAZ

3600....WA6CMX	3607....W8III
3601....WA5EEM	3608....KS6DY
3602....W1CT	3608....W1RML
3603....JA6MJV	3609....K4NE
3604....JH1WIX	3610....YU2CBM
3605....WB2PWU	3611....JH1OTZ
3606....W3ZBW/4	3612....OK1DH

Phone WAZ

486....W8JXM

Complete WAX rules are shown on pages 64-66 of the June, 1970 issue. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to DX Editor, P.O. Box 205, Winter Haven, Florida 33880.

meters. Gay has probably completed this 5 Band DXCC by the time this is published. These WPXers are both retired US Navy Officers, with a combined total of over 50 years military service.

Clem and Gay spoke highly of the WPX and DX enthusiasm of the late W4OPM who was recently elected to the *CQ* DX Hall of Fame (See July, 1973 *CQ* DX Column). Joe, W4OPM was well respected for his operating ability and high standards of operating courtesy. In honor of W4OPM's WPX accomplishments, the Virginia Century Club is sponsoring a trophy for the USA single operator, single band winner in the *CQ* WPX SSB Contest.

On The Light Side

The Southern California DX Club Bulletin suggests that DXers establish appropriate 8 Codes as an aid to DX operating. Some possibilities listed are:

8-3 He shut down an hour ago - you can stop calling him now!
8-4 I hear you 5 by 9 - I just don't want to talk to you!
8-5 You're beautiful when you're mad!
8-6 What do ya' expect? 'AOA only got a 3 by 4!
8-7 Use a dummy load, stupid!!
8-10 I give up - C U next pile up!
8-19 Sorry 'bout that, Chief!
8-20 May the great Kahuna befoul your r.f. clipper!!
8-21 Great Scott, do you get paid by the word?
8-25 I hope they catch you!!
8-28 Same to you, fella!!!
8-30 What's his call?
8-35 This has to be the worst run DXpedition ever!
8-50 Bug Off!!!
8-51 He's listening up 10 kHz - so quit calling him on his frequency, idiot!!!
8-54 He's working by call areas, so wait your turn, lid!!!
8-57 He's working from a list, so shut up stupid!!!

Oh My - A plan for environmental cleanup of the DX Bands.

The CQ DX Award Program

C.W. DX	S.S.B. DX
122 . . . .G3HB	293 . . . .WA2MBP
123 . . . .YU2OB	294 . . . .WA5RXT
124 . . . .WA5RXT	295 . . . .K7RDH
125 . . . .WA5ZWC	296 . . . .ZL1AMO
126 . . . .WA2MBP	297 . . . .UG6JJ
127 . . . .W9OHH	298 . . . .UA1CS
	299 . . . .W9OHH

Endorsements

CW:200-W9OHH, 150-YU2OB
SSB: 275-W5QBM, W9OHH, 200-K3KNH, ZL1AMO, 150-K7RDH, UA1CS
3.5/7 mHz: W9OHH
28 mHz: G5GH, K7RDH, W9OHH

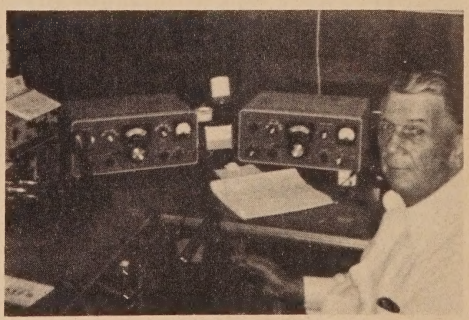
Complete rules for the CQ DX Award Program may be obtained by sending a business size, self-addressed, stamped envelope to Award Manager, P.O. Box 1271, Covina, CA 91722 or to the DX Editor.



John, 9M2IR, attended the open house held at the W6AM station. Seated is Don, W6AM with guests (1) Frank, W6AOA and John, 9M2IR. John's present and valid calls include VE7IR, VK6IR, XU1IR, 9M6IR, DU1IR, S21IR, VS5IR, HS1AIR, ZL2SR, G3SFD and 9V1QO. *(Photo by W6EIF)*

Novice Band DX

We are pleased to have Novice DX reports from Ron, WN4ASV; Mike, WN4BNV; and Jim, WN7UMU for this months column. Early fall conditions have produced good openings to Europe, Oceania, and South



Number 1 on the WPX Mixed Honor Roll is Clem, W4LRN who uses a converted typewriter to key his 'S' Line for c.w. operation.

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 . . . 1250	ON4QX 916	YU2DX 855	WAØKDI . . . 790	KØBLT. 733
VE3GCO . . 1030	W6TCQ. . . . 904	W4IC 850	WØAUR. . . . 785	JA1AG. 730
F9RM 1003	W4CRW 900	W4BYU 824	K6SDR. 770	WA6EPQ . . . 713
W8LY 986	K1SHN 893	I6SF 814	SM7TV 752	PAØVB 707
W2NUT 982	YU1AG 893	W9WHM. . . . 811	K2ZRO 751	W6NJU. 706
WA6MWG . . 962	DL1MD 892	G3DO 810	K8UDJ. 750	WA2EAH. . . 700
DJ7CX. 960	W4BQY 875	WB4KZG . . . 810	CT1LN. 749	W9ZTD 700
W3PVZ 960	DL1CF. 872	K2AAC 783	WA5LOB . . . 749	WAØCPX . . . 693
PAØSNG . . . 943	W4WSF. 863	W6ISQ 803	PY4AP. 735	W8GMK. . . . 683
W8ROC 929	W9FD 860	W3GJY. 797		

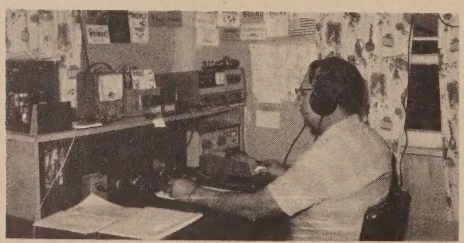
CW

W8LY 975	VK3AHQ. . . 809	G2GM 728	WA6MWG . . 674	WA6JVD . . 634
W8KPL. 910	W9FD 802	K1SHN. 715	W6ISQ 666	K1LWI 629
DL1QT 861	WB2FMK. . . 770	YU1AG 705	I6SF. 658	W8GMK. . . . 628
W2HO 825	K7ABV 745	K2AAC 686	SM5BNX . . . 652	W3ARK 620
ON4QX 823	W4BYU 744	OK2DB. 693	W4IC 652	VE4OX. . . . 600
W2AIW 813	DJ7CX. 730	VO1AW. . . . 681	K2ZRO 635	OK2QX 600

SSB

W4NJF . . . 1082	I8KDB 839	F2MO 780	W6RKP 725	YU1AG 677
CT1PK. 930	K2POA. 833	W3DJZ. 761	G3DO 719	I8YRK. 662
IØAMU. 909	IØZV 827	W4IC 750	I4ZSQ 719	WB6DXU. . . 656
DL9OH. . . . 890	PAØSNG. . . . 824	IT9JT 747	W6TCQ 709	CR7IK 613
W9DWQ. . . . 881	WØYDB 809	WA5LOB . . . 747	ZL3NS. 685	I4LCK 608
HP1JC 851	DL1MD 805	K1SHN 737	OK1MP. 680	

America on the 15 meter Band. After several months of listening, WN7UMU finally connected with JA2BAY (7101-1000), KC4USZ (7110-0600Z), and KG6AAY (7102-1000Z) after hearing much DX below the 7.1 mHz Novice Band. Stations reported on the 21 mHz Novice segment were: CR6LX (21140-2100Z), EA8CS (21118-1700Z), EL2NS (21104-1700Z), HK3CTJ (21125-1900Z), WN3RVO/HK8 (21110-2130Z), HR4DS (21135-1930Z), PJ8NLO (21143-1730Z), K4VMA/VP7 (21138-0000Z), VP9HN (21108-1800Z), VK5WC (21130-0100Z), WB4BUQ/8R1 (21115-2130Z), WN4ZYF/KV4, WN3U1W/KPW, XE1UV, ZF1WB, I0VAW, WH6HSS, VP2LF, PZ1DJ, VK6HD, KJ6BZ, KJ6DI (21115-2130) and LU2A6D. These reports sure illustrate that the Novice can work plenty of DX. It should be noted that all three of the reporters were using 75 Watts, v.f.o., and Yagi beams. With the sunspot count declining the importance of a beam or quad will become more essential.



Ed. WN8IOT at the rig which earned him WPNX L 56 as well as WAC and WAS as a Novice. Ed now has his Advanced Class ticket and is looking for DX on s.s.b.

DX Achievements

Ed, WN8IOT hung on to his Novice Ticket for the full two years so he could finish up his WPNX, WAS, and WAC Awards as a Novice. Running 70 watts to a 5 element 15 meter beam, Ed worked 50 countries and had 45 confirmed. His receiver was an old Hallicrafters S76 which proves an expensive receiver is not needed to work WPNX! Congratulations to Ed on this fine achievement and his new Advanced ticket.

The Murphys Mauraders (New England

Contest Club) now boasts four 5BDXCC member - K1OME, WA2EAH, W2GUH, and K1ZND. That represents lots of DX confirmed, especially on the low bands. The Southern California DX Club has increased its 5BDXCC members to 12 with the addition of W6DQX, K6SDR, WB6UDC, and K6SSN.

Here And There In The World Of DX

Ed, W3GID states that Dave, KA2DF hopes to visit Macau shortly, however the only licensed amateur (CR9AK) has been in Portugal so *no* arrangements have been made as of press time. . . . . The Camel Drivers Radio Club (Kabul) hosted VE3ECN and VE3EEE in June reports YA1AB. . . . . Ercole Di Natale, IT9EDN would like to correspond with any W/K Amateurs in Italian. His address is: Via Vanvitelli - 19, 96100 Siracusa, Italy. . . . . Karl, SM5-2735 writes that *CQ's* VPX Award was his 86th Amateur Award received. Karl has now over 450 prefixes confirmed. . . . . Garth, Ex-5H1LV/5H3LV has returned to Canada and is now signing VE7AUE. . . . . WPX Honor Roll member PAØSNG states that the PA25 prefix used by PAØ amateurs from 24 August through September was to celebrate 25 years of reign by Queen Juliana. This special prefix counts for PA2 for WPX. . . . . Jock, W5FGO has suggested that *CQ* sponsor an award for Maritime Mobile stations to earn. Maritime Mobile Amateur Radio Clubs are now centered in Germany, Sweden, and Houston, Texas. The Maritime Mobile Amateur Radio Club in Houston has over 200 members and holds the club call W5CXM.



Southern California DXers hosted GM3MBS (Ex-VQ8CC) who vacationed on the West Coast last Spring. On the right is the So. Calif DX Club CQ DX Committee Member, Jay Holladay, W6EJJ. *(Photo by W6NJU)*

The WPX Program

Mixed		S.S.B.	
401	JA6MJV	762	W8IMZ
402	JY6FC	763	W6TTS
403	YU2BOP	764	W7CUJ
404	K3SXQ	765	PY3BXW
405	K4ZYU	766	JA6MJV

C.W.

1270	W0MHK	1275	UT5EH
1271	K2JFJ	1276	UY5VA
1272	VO1KE	1277	UA4BI
1273	JA6MJV	1278	UA3QO
1274	SP5EXA	1279	UC2AS
1275	UT5EH	1280	UV3DU

WPNX

62 . . . . WN5HII

WPX Endorsements

Mixed: 1000–PAØSNG, 900–W6TCQ, 850–YU2DX, 550–HI8LC, 450–DJ6WD, JA6MJV
C.W.: 600–W9WCE, WA5ZWC, 660–VE1MF, 500–UT5EH, 450–W4ZYQ, SP5EXA, 350–UV3DU
S.S.B.: 850–PAØSNG 650–WB6DXU, PY3BXW, 550–PY2CAB, 500–WB2FMK, 450–K7RDH, 350–W6TTS
VPX: 450–SM5–2735, 350–WØ–6437
40 Meters: UT5EH
20 Meters: UT5EH, UV3DU
15 Meters: JA6MJV
Asia: WA2EAH, JA6MJV, UT5EH
Europe: SV1EN, JA6MJV, VO1KE, SP5EXA, UT5EH, UC2AS, UV3DU
North America W6KYZ
Oceania: JA6MJV

Complete rules for WPX, WPNX, and VPX 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 Award Manager, P.O. Box 1271, Covina, CA 91722 or to the DX Editor.

Silent Key

The DX Department is saddened to learn of the death of Bob Wilson, W3GHD, who passed away Sunday morning, Sept. 9, 1973 after a "massive stroke." Bob was a member of the *CQ* DX Awards Advisory Committee for over 3 years, and had contributed to the launching of the *CQ* C.W. DX Award, the new Single Band WAZ Awards and to the selection of several recipients of the *CQ* DX Hall of Fame Award. His long experience and wise counsel will be missed in the Committee's deliberations.

[Continued on page 92]

the most powerful antennas under the sun!

The Best Vertical There IS!

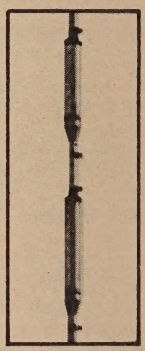
80 through 10 meters

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- Recessed coax connector furnished.
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- Constructed of extra heavy wall high tensile aluminum.
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The 18AVT/WB is constructed of extra heavy duty, taper swaged, seamless aircraft aluminum with full circumference, corrosion resistant compression clamps at all tubing joints. This antenna is so rigid, so rugged...that its full 25' height may be mounted using only a 12" double grip mast bracket...no guy wires, no extra support...the 18AVT/WB just stands up and dishes it out!

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MATH'S NOTES

BY IRWIN MATH,* WA2NDM

THIS month we will continue the discussion about operational amplifiers started last month. At that time we saw how the device could be used to implement the basic arithmetic functions (+, -, ×, ÷) with just a few external components. Now we will go a bit further.

Figure 1 is a schematic of a very unique circuit used in the instrumentation field. It is called the current-to-voltage converter.

The basic formula that describes this circuit is simply $-i_{in} \times R_f = E_{out}$. What this means is that the output voltage (in volts) is equal to the input current (expressed in amperes) multiplied by the feedback resistor (in ohms). With a suitable op-amp, a 100K resistor, and a 0-1 volt meter, we can then easily fabricate a *0-10 microampere* ammeter, and range switching is as easy as changing the value of R_f.

To understand how this circuit works, one should remember our first rule of last month — "the voltage at the input of an op-amp must be zero". If this is then the case, only current may be present. Rule #2 tells us that the current must flow through the feedback resistor since it can not flow into the input. Therefore, the output voltage must rise to a value sufficient to completely "absorb" the input current. What is this value? Well, according to Ohms Law, E must equal I × R, so the output must rise to the product of I (the input current) and R (the feedback resistor). Be aware however, that while such a circuit is very easy to implement, all of the problems associated with low current circuits such as ground loops, pickup, leakage, etc., do not disappear with op-amps.

Up to this point we have only considered d.c. applications of the operational amplifier. Many of them will perform just as well with a.c. signals however. As an example, consider figure 2. This circuit is basically our simple adder of last month. In this configuration however, it becomes an equally simple but versatile audio mixer.

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

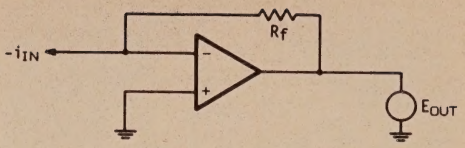


Fig. 1—A current to voltage converter.

When audio is fed to this circuit, R_1 and R_2 act as separate input level controls, while R_3 acts as a master level control. Furthermore, there is no interaction or signals fed between channels since, by rule #1, the input terminal voltage is zero. We therefore have what constitutes an ideal mixer.

In figure 3 we have another useful a.c. op-amp circuit, this time a bandpass amplifier.

The principle behind this circuit is simply: At the resonant frequency of L_1 and C_1, the impedance of the two is very high and the gain of the op-amp (being the ratio of feedback resistance and R_1) is high. At frequencies above and below resonance, the feedback resistance is low and so is the gain.

At this point it should be rather obvious that the uses of the op-amp are pretty much limited only by one's imagination and the limitations of the actual device. In order to become aware of these limitations however, we will look at some of the more common parameters by which operational amplifiers are described.

First of these is the gain of the actual chip. This parameter is referred to as *Open-Loop Voltage Gain* or, the minimum gain that a particular unit will have with no feedback elements connected. Op-amps are available with gains of from a few thousand to over a million. Open loop gain may be specified in an actual number such as 100K, or in db with each 20db being factor of 10. It is

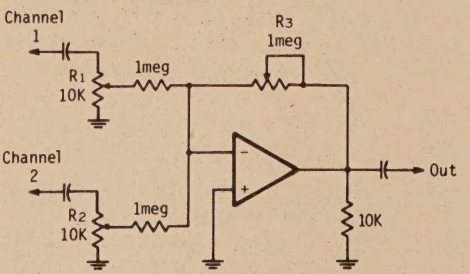


Fig. 2—The mixer discussed in the text. Note that any number of input channels may be used and both high and low impedances can be handled by simply changing the value of the input pot.

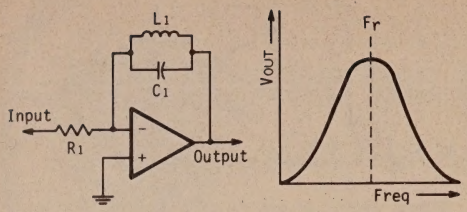


Fig. 3—A simple op-amp bandpass amplifier with a typical response curve.

advisable to choose an amplifier that has a gain of at least 100 or more times the value required in the final circuit.

Output Voltage is a parameter that describes the maximum output voltage that the amplifier can deliver before it saturates.

Output Current is similarly, the maximum current that can be fed to both the load and feedback resistor.

Input Impedance, which in an ideal theoretical op-amp would be infinite, is the actual impedance seen looking into the input terminal. Typical values range from 100k - 200k all the way up to 10^{12} ohms for some FET op-amps.

Since the input of an op-amp does have a finite input impedance, there is always a small current that will flow even though according to rule #2 none should be there. This current is referred to as the *Input Bias Current* or *Input Offset Current*. Consequently, there is also a small *Input Bias Voltage*, instead of actual zero. Typical *Input Bias Currents* are a few nanoamperes (10^{-9}) while *Input Bias Voltages* are only on the order of a millivolt or so.

For a.c. applications a very important parameter is the frequency response. This parameter may be given in several ways. One common way is as a *Gain-Bandwidth Product*.

This is the upper frequency where the gain of the amplifier drops to 1. At 1/10 of this frequency the gain will be 10, and at 1/100 it will be 100 and so on all the way down to the point where the open loop gain is reached.

Another common method for indicating frequency response is in terms of *Bandwidth*. Here, the ± 3db points are given and between these two frequencies, the gain is equal to the open loop gain.

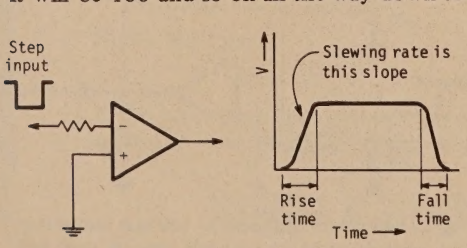


Fig. 4—The explanation of slewing rate as given in the text.

On some op-amp data sheets, frequency response is given in a somewhat roundabout way. This is as a *Slewing Rate*. Figure 4 shows the explanation of this parameter.

When the amplifier is driven by an extremely rapid rise-time/fall-time square wave, the output rise and fall time must be slower than the input. It is this rise and fall time that is the slewing rate and it is usually expressed in terms of volts of output change per microsecond, assuming that the output voltage is limitless. A typical op-amp will change at a rate of hundreds of volts per microsecond although units are available that only slew at a few volts per microsecond. Remember however, that an op-amp with a slewing rate of 150 volts per microsecond and maximum output voltage of 15 volts will go from zero to 15 volts in 0.1 microsecond.

There are other parameters of course, that are given on data sheets but the above should be sufficient for elementary experimentation to begin. Next month we will discuss power supply requirements, amplifiers available, and actual experimental setups so you can duplicate these circuits and gain some practical experience.

There are some new semiconductors of interest to amateurs this month and we would like to mention them at this time.

RCA has announced 3 new relatively inexpensive units suitable for the 470 mHz band and they are, in order of power output capability, the 41008, 41009 and 41010. All are designed to operate from only 9 volts making them ideal for hand held u.h.f. transceiver use. The 41008, at ½ watt output, comes in a radical lead package and costs $5.40 in 100 quantity. The 41009, also in a radial lead package, produces 2 watts of output and costs $6.90 in 100 quantity. The 41010 which will produce 5 watts of output, comes in a radial lead package too, but this time with a stud for heat sinking capabilities. This unit is $8.40 in the same quantities of the others.

For those people who don't want to go through the trouble of "rolling their own" at u.h.f., RCA has a line of r.f. power modules containing complete solid state hybrid

power amplifiers for mobile use. These modules are complete with all transistors, matching networks, capacitors and other internal components in a single package, and are designed to accept r.f. at a 50 ohm input impedance and deliver r.f. at a 50 ohm output impedance. The units will operate into any s.w.r. from 1 to infinity without damage. All units have a typical overall efficiency of 40%, a power gain of 20db (100 milliwatts in for 10 watts out) and operate from a 12.6 volt d.c. supply. Maximum power output is on the order of 10-15 watts. While the whole range from 395 mHz to 512 mHz is covered, we have listed only the ones suitable for amateur use below. Although the unit prices (1-24) may seem steep, considering the cost of commercial gear at these frequencies, relatively simple low cost transmitters can be built using these modules.

RCA Part #	Operating Frequency	Minimum Output Pwr.	Price 1-24
R44M10	395-440mHz	10W	45.50
R44M13	395-440mHz	13W	52.50
R44M15	395-440mHz	15W	61.50
R47M10	440-470mHz	10W	45.50
R47M13	440-470mHz	13W	52.50
R47M15	440-470mHz	15W	61.50

Another new semiconductor from RCA is their 2N6389. This silicon npn transistor is perfect for v.h.f. and u.h.f. receiver front ends as it offers 15db minimum gain at 890 mHz with a typical noise figure of 4-6db at the same frequency, which drops to only 3db at 450 mHz. It ought to be really hot at 144! The unit comes in a 4 lead TO-72 package and costs $2.10 in lots of 100.

To complete this month just one more item! Exar Integrated Systems, 750 Palomar Avenue, Sunnyvale, Calif., 94086, has just announced their XR-2567. This pin DIP contains two independent 567 type tone decoders in one package and will simplify those touch tone decoder schemes. Each 567 operates over the frequency range of 0.01Hz to 500kHz and meets most of the standard 567 specs. Cost in 100 quantity is $4.60 which is better than 2 separate 567's from a standard manufacturer.

Best wishes to my readers for a happy, healthy and prosperous holiday season and coming year.

73, Irv, WA2NDM

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Must have at least FCC second class radiotelegraph license, have worked as general radio operator for 3-5 years. Capable of handling air-to-ground, marine, radio teleprinter, teleprinter and radiotelephone. Be able to send and receive 25 WPM plain language 20 WPM code.

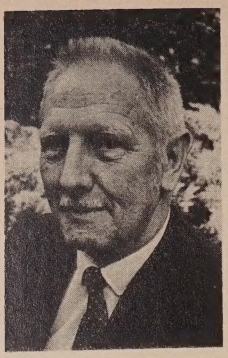
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THE awards PROGRAM



BY ED HOPPER,* W2GT

Special Honor Roll
All Counties
#107 Ted W. Midlam, Sr., K7SQD, 8-14-73.

THE December, "Story of The Month", as told by Bob is:

Robert A. Blakemore, Sr., WA3APO

(All Counties #73, 4-10-72)

"Born July 30, 1938 in Philadelphia, I joined the United States Air Force in 1955 and made a career of it. I was in the Supply area for 13 years and then transferred to Air Transportation, working in the Air Freight area.

"My overseas duty has taken me to Bermuda, Vietnam, and the Philippines. My stateside duty has taken me to Florida three times and now to Texas where I plan to make my permanent home. We have a very beautiful place in the country and plan to work a little with horses.

"I learned about amateur radio years ago from K3EGP, my Dad, but had no interest at that time. I suppose the time was right when I was assigned to the 1934th Communication Sqd., plus living only a few hundred yards from an amateur in Bermuda. So in May 1964, I became WA3APO and held that call until June 1972 when I received WB5HGS.

"I first came upon the County Hunters on 40 meters in 1964. At that time I chased DX, WAS and etc., but finally managed USA-CA-500-#592 in September 1966.

"With a couple overseas tours stopping me, I finally made 3079 #73 on April 10, 1972. My last 3 counties were in West Virginia and I was able to make the grade with the help of W7BBX/M8. I sure have enjoyed every minute of it, but have no desire, at this time, to do it again.

"I hope to get to one of the conventions some day and meet many of those we have talked to over the years. I have met a few and it is always a pleasure.

"The equipment has been the same over the years, consisting of Drake TR3, RV4 and home brew linear, plus various antennas.

"I am married to a wonderful Gal, Jackie, who is happy that I have a hobby that keeps me home, Hi. We have one 6 year old girl,

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



Bob Blakemore, WA3APO/WB5HGS

USA-CA HONOR ROLL

3000		1500		500	
K7SQD	128	WØFBB	232	JH1WIX	961
2500		1000		K8WKZ	962
WØFBB	161	LA2MA	309	WØFBB	963
2000		WA2SAZ	310		
WØFBB	193	WØFBB	311		

Beckie and I have two boys from a previous marriage, Robert Jr., and Steven.

"This Story would not be complete without expressing my deep thanks to all those wonderful people who had a part in helping me. Good luck and good hunting to you all."

Awards Issued

Ted Midlam, K7SQD made *All Counties* endorsed, 1st ALL A-1 (Not to be confused with 2 Way C.W.); 1st to Utah; and 1st All QRP (meaning 100 watts or less). The only other USA-CA Awards that went to Utah stations were: USA-CA-500-#208 to K7MPQ, 3-22-63 and USA-CA-500-#288 to W7ZKL, 10-10-63.

Rudy Veverka, WØFBB acquired: USA-CA-500 All SSB and All A-1; USA-CA-1000 and 1500 All A-1; and USA-CA-2000 and 2500 endorsed Mixed.

Finn Roll, LA2MA was issued USA-CA-1000 and this is the first 1000 award to a Norway station.

Harry Smith (Smitty), WA2SAZ qualified for USA-CA-1000 endorsed All 50 MHZ Phone and this is #1 so endorsed! After chasing them for 13 years, he has worked 1347 counties on 6 meters but is unable to get 227 confirmed, come on fellows and gals- loosen up and send along those missing QSLs. As you will see in the list later, he was #2 to qualify for USA-CA-500-All 50 MHZ Phone.

Taroh Yagi, JH1WIX (who puts a big signal into the USA) claimed USA-CA-500 endorsed All 21 MHZ; All A-1. (Old timers might remember Taroh as J1ZB, AJ4ZZ, J1DO or J2GX, as he has been licensed since 1924.)

Dave Bostedor, K8WKZ qualified for USA-CA-500 endorsed All 50 MHZ Phone (#12).

The VHF County Hunters have been requesting some publicity and as two received Awards this month, it seemed like an ideal time to list those having received awards with 50 MHZ Phone endorsements - all USA-CA-500, with one exception. A careful check brought some errors to light:

1- Helen Harris, W1HOY, #88, dated 2-28-62.
2- Harry Smith, WA2SAZ, #286, dated 10-7-63 & USA-CA-1000-#1 dated 8-22-73.
3- Louis Hubert, K8IXU, #541, dated 12-23-65.



Station of Harry "Smitty" Smith, WA2SAZ.

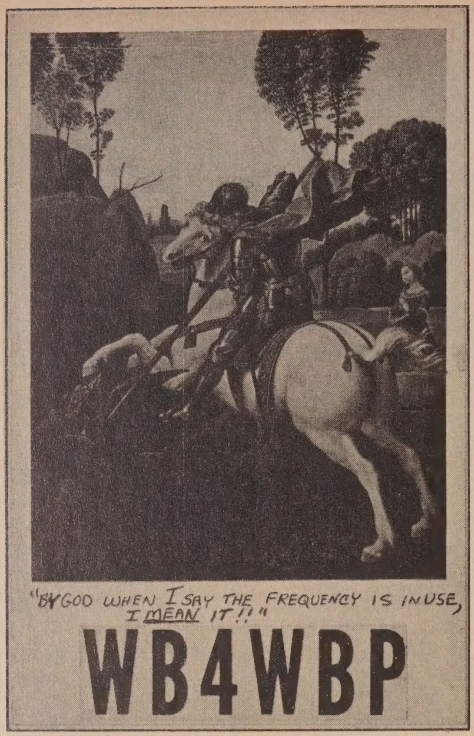
4- Kirk Fourcher, K1MRI, #586, dated 8-17-66.
5- Edward Lips, W3BWU, #604, 12-8-66. (Actually Ed acquired an Award 8-30-65 but his All 50 MHZ Phone endorsement was Dec. 1966.)
6- Jack Wilson, W1QXX, #631, dated 8-16-67.
7- Jerry Medlin, WB2FEQ, #645, dated 11-27-67.
8- Ben Harris, K5DRF, #655, dated 2-10-68.
9- Kay White, K4TBG, #657, dated 2-19-68.
10- Bob Jennings, W1DKD, #908, dated 7-14-72.
11- Steve Rich, WA1DFL, #909, dated 7-15-72.
12- Dave Bostedor, K8WKZ, #962, dated 8-17-73.

Awards

Yogi Bear VHF Society Award: Membership in the Society is granted to everyone who earns the Society certificate. The Society is an informal non-profit group and any surplus funds over and above



AGDX Diplom.



WB4WBP QSL

printing costs is donated to the Jimmy Fund, Boston, Mass. for cancer research in children. Additional donations to the Fund in the name of the Yogi Bear VHF Society will be gratefully accepted. As of August 1972, $65 had been donated. Award issued for contacts with 5 members of the Society. No date or time limit and any valid amateur frequency may be used. Available on a heard basis. Send log data with applications, confirmations not required. Fee is $.35, please include a large #10 size business envelope, self-addressed and stamped for mailing Award. Certificates endorsed for band and mode but only one band/mode per certificate. Additional endorsements require additional application and fee. Awards Custodian: Robert W. Jennings, W1DKD, 15 Cliff Ave., Scituate, Mass. 02066.

Saskatoon Wheat Belt Award: Sponsored by the Saskatoon Amateur Radio Club. Requirements: Saskatoon Amateurs need 10 contacts with Club members from Saskatoon. Rest of Canada, USA and Mexico need 5 contacts. Rest of world need 3 contacts. All Awards sent outside Canada by airmail. Applications to consist of date, call of station, band and mode (a.m., s.s.b. or c.w.). Any band or mode and dates back to March 1, 1963. Cost: North America 1 IRC, rest of world 2 IRCs. This same Award can be obtained by working 2 Saskatoon stations on ten meter a.m. (?). All applications go to: VE5SM, Henry J. Slack, R.R. Saskatoon, Canada S7K 3J5.

AGDX DIPLOM: This unusual countries award is issued by Assoziation Junger DXer In Osterreich (ADXB-OE) for Arbeitsgemeinschaft DX (AGDX), Austria.

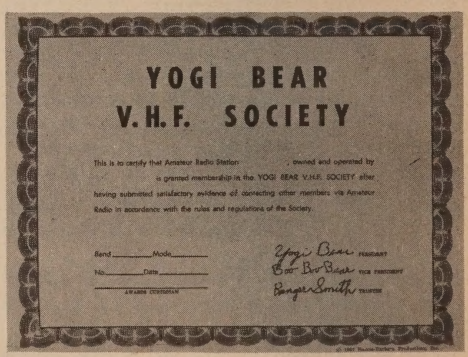
It is available to any b.c.l., s.w.l. or licensed radio amateur. The award is issued for verification (QSLs) from at least 25 radio countries, and can be endorsed for 50, 75, 100, and any additional 10 countries. The names of bearers of awards for more than 100 countries will be published in AGDX Magazine *WELTWEIT HOREN.*

All bands, all modes, all services (broadcast, amateur bands, utility), individual or mixed. Either the EDXC or the ARRL-DXCC list will be accepted.

[Continued on page 94]

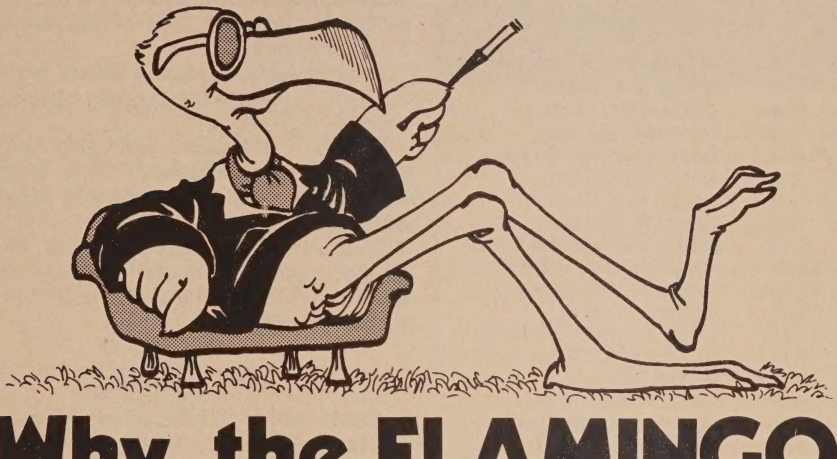


Saskatoon Wheat Belt Award



Yogi Bear VHF Society Award

What has feathers, a lot of class, and loves hams?



Why, the FLAMINGO of course.

SAROC

The Fun Convention

hosted by **SOUTHERN NEVADA AMATEUR RADIO CLUB, INC.** at

FLAMINGO HOTEL CONVENTION CENTER, LAS VEGAS, NEV. 89109 — JANUARY 3-6, 1974

ADVANCE REGISTRATION — $10.50 per person includes:

1. Special room rate of $15.00 plus room tax per night single or double occupancy, effective January 3 through 10, 1974 while 500 rooms last at the Flamingo Hotel.
2. Advance Registration drawing ticket for Saturday.
3. Regular Registration drawing ticket for Saturday.
4. Complimentary cocktail at the Flamingo Hotel.
5. Complimentary KENO ticket at the Flamingo Hotel.
6. Admission to technical seminars, meetings and exhibit area, Friday and Saturday.
7. Ticket for admission to cocktail party hosted by SAROC and HAM RADIO MAGAZINE, Friday.
8. Ladies who register will receive admission ticket for their program on Saturday.
9. Ticket for admission to cocktail party hosted by SAROC and SWAN ELECTRONICS, Saturday.
10. Ticket for Flamingo Hotel Buffet Hunt Breakfast with Champagne, Sunday.
11. Tax and Gratuity on all items 1 through 10 except hotel accommodations.

ADVANCE REGISTRATION with midnight show — $17.50 per person:

Includes all items 1 through 11, plus Flamingo Hotel Midnight Show and two drinks, Sandler and Young are scheduled in the Flamingo Hotel Main Show Room.

ADVANCE REGISTRATION with dinner show — $21.50 per person:

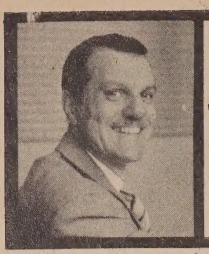
Includes all items 1 through 11, plus Flamingo Hotel Dinner Show (Entree: Brisket of Beef) no cocktails, Sandler and Young are scheduled in the main show room.

Advance registration must be received in SAROC, P. O. Box 73, Boulder City, NV 89005 on or before December 15, 1973. Refunds will be made if request in writing received in P. O. Box 73 on or before January 3, 1974.

SEVENTH NATIONAL FM conference Friday and Saturday, FM Hospitality Room 16/76, 28/88 and 34/94 repeaters. WCARS-7255 and WPSS 3952 special events stations to assist mobile operators.

Mail accommodations request to Flamingo Hotel, Las Vegas, NV 89109 — Do it now!

Mail Advance Registration fee to, SAROC, P. O. Box 73, Boulder City, NV 89005 — Before December 15



Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Nov. 24-25	**CQ WW DX C.W. Contest**
Dec. 1-2	College Bowl Contest
Dec. 1-3	Delaware QSO Party
Dec. 1-3	Lone Star QSO Party
Dec. 1-3	Telco Pioneers QSO Party
Dec. 7-9	ARRL 160 Contest
Dec. 8-9	Spanish C.W. Contest
Dec. 8-9	Tops C.W. Contest
Dec. 9-15	Indiana Amateur Radio Week
Dec. 15-16	ARRL 10 Meter Contest
Dec. 15-23	Space Net VHF Contest
Dec. 22-23	Hungarian Contest
Jan. 12-13	YU 80 Meter C.W. Contest
Jan. 12-13	DL QRP C.W. Contest
Jan. 15-17	OOTC C.W. Party
Jan. 26-27	French C.W. Contest
Jan. 25-27	**CQ WW 160 C.W. Contest**
Jan. 29-31	OOTC Phone Party
Feb. 9-10	Ten Ten Net QSO Party
Feb. 23-24	French Phone Contest
Mar. 30-31	**CQ WW WPX SSB Contest**
Apr. 12-15	County Hunters SSB Contest

Spanish C.W. Contest

Starts: 2000 GMT Saturday, December 8
Ends: 2000 GMT Sunday, December 9

Its the world working the Espanoles on C.W., all bands 3.5 thru 28 mHz in this one.

Exchange: Six figures, RST plus a 3 figure contact number starting with 001.

Scoring: Contacts between EA stations and the Phillipines or Hispanoamerican countries are worth *3 points*. (DU, CE, CO, CP, CX, HC, HI, HP, HR, KP4, LU, OA, PY, TG, TI, XE, YN, YS, YV and ZP or equivalent prefixes.)

Between EA and all other non-Hispano and non-European countries, *2 points*.

Between EA and Europeans, *1 point*.

The same station may be worked on each band for QSO and multiplier credit.

Multiplier: For EA, each DXCC country worked on each band. Others use EA call districts.

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

Awards: Gold, silver and bronze medals to the first 3 place winners, both Spanish and overseas.

Include a summary sheet with your log showing the scoring and other pertinent information, and your name and address in BLOCK LETTERS.

Your entry must be postmarked no later than one month from the end of the contest to: U.R.E. Concurso International, P.O. Box 220, Madrid, Spain.

TOPS C.W. Contest

Starts: 1800 GMT Saturday, December 8
Ends: 1800 GMT Sunday, December 9

The Tops C.W. Club whose activity is consentrated on 80 meters holds its annual contest. Activity will be found between 3.5 – 3.6 mHz. Just a signal report in the exchange.

Scoring: One point for contacts within one's own country, 2 points with other countries on the same continent, and 3 points with stations on other continents. (Call areas in W/K, VE/VO, VK and UA are considered as separate countries.)

The multiplier is determined by the number of different prefixes worked. (Like WPX)

Final Score: Total QSO points x number of prefixes worked.

Entries may be single or multi-operator.

Mailing deadline is January 16th to: Peter Lumb, G3IRM, 22 Hervey Road, Bury St. Edmunds, Suffolk, England, IP33 2DW.

Indiana Amateur Radio Week

Starts: 0000 GMT Sunday, December 9
Ends: 2400 GMT Saturday, December 15

This is not a Contest or QSO Party, just a sort of getting acquainted time. Look for Indiana stations during this period. They will be contacting out-of-state stations and will

*14 Sherwood Road, Stamford, Conn. 06905

give interesting items about their state.

Work 10 different Indiana stations and you are eligible for a certificate. Novice, VHF/UHF and DX stations need only 3 contacts.

Send your list of Indiana stations worked and your nomination for the Indiana station who should get the Hoosier Hospitality Plaque.

Mailing deadline is January 14th to: David E. Mitchell, WB9INF, Box 67, Dupont, Indiana 47231.

ARRL 10 Meter Contest

Starts: 1200 GMT Saturday, December 15
Ends: 2359 GMT Sunday, December 16

This is a new one by the ARRL. The objective being to exchange QSOs with as many stations in and all parts of the world as possible on 10 meters during the 36 hour contest period. This is a worldwide activity and a departure from the usual ARRL format which limits DX stations to working W/K and VE stations only.

A station may be worked once on c.w. and once on phone, but not crossmode. Activity on c.w. must be confined between 28.0 and 28.5 mHz, except OSCAR 6 contacts which are permitted. Entries will be classified as single or multi-operator, however multi transmitter operation is prohibited.

Exchange: Stations in the 50 US states and Canada send RS(T) and state or province. Others send RS(T) and a contact number starting with 001. US stations not located in a state (ie: KP4, KZ5, KC6 and etc.) also use the contact number. Stations not land-based give their ITU Region.

Scoring: Each completed QSO is worth 2 points, 4 points if its with a Novice. The multiplier will consist of US states, VE call areas, ITU Regions and DXCC countries worked. (Except US and Canada)

Awards: Certificates to the highest scoring single operator in each ARRL section, VE call area and DX country. Multi-operator and Novice awards will be given if three or more entries in a section are received.

A s.a.s.e to ARRL will get you appropriate contest forms if you do not want to make up your own log and summary sheet. Check your entry thoroughly for duplicate contacts, unconfirmed QSOs or multipliers and etc.

Mailing deadline is January 21st, to: ARRL Communications Dept. 225 Main Street, Newington, Conn. 06111.



Miro, YU1SJ is very active in amateur radio affairs in Yugoslavia. His involvement in IARU and club activities leave him little time to operate this fine lay-out.

Space Net VHF Contest

Starts: 6:00 P.M. Saturday, December 15
Ends: 6:00 P.M. Sunday, December 23

This is the last in the series of Space Net activities commemorating Apollo moon missions. This one highlights Apollo 8, the first manned flight to the vicinity of the moon, and Apollo 17, the sixth and final lunar expedition.

The Space Net VHF program has received NASA and Presidential citations. Tony, WB2MTU is to be commended for the amateur radio interest he has created in America's space program.

Rules for this week long v.h.f. activity are the same as previous contests.

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. Multiplier is sum of different Zip Code and P.O. areas worked. (Counted only once.) A bonus of 10 is added to your multiplier.

Final Score: Multiplier + 10 x QSO points. Same station may be worked on each band for QSO points but multiplier is counted only once.

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, clubs and Novices. All stations submitting a log will receive attractive certificates.

Longs and requests for additional information go to: Space Net VHF Contest, ATT: A.W. Slapkowski, WB2MTU, Box 909, Sicklerville, N.J. 08081.

Hungarian Contest

Starts: 0000 GMT Sunday, December 23
Ends: 2400 GMT Sunday, December 23

This is a world wide type contest with operation permitted on all bands, both phone and c.w. There are three catagories, single operator, multi-operator and s.w.l.

Exchange: RS(T) and ITU zone number.

Scoring: Contacts between stations on the same continent 1 point, on different continents 3 points. If its with an HA/HG5 its work 4 points, and 5 points if HA5.

The multiplier is determined by the number of different ITU Zones worked.

Awards: Certificates to the top scoring stations in each catagory in each country. The world leaders in each of the three catagories will receive the Budapest Plaque.

A summary sheet with the scoring and other necessary information, and a signed declaration is requested.

Mailing deadline is January 15th to: BRAL Contest Committee, P.O. Box 2, Budapest 134, Hungary.

YU 80 Meter C.W. DX Contest

Starts: 2100 GMT Saturday, January 12
Ends: 2100 GMT Sunday, January 13

Here's another 80 meter c.w. only contest. This one organized by the SRJ of Yugoslavia.

Exchange: RST plus QSO number. (001)

Scoring: Contacts between stations in the same country, *1 point*. Other countries on the same continent, *2 points*. Countries in other continents, *5 points*. And YU contacts, *10 points*.

Multiplier: Of 1 for each DXCC country and each YU prefix worked.

Final Score: Sum of QSO points X sum of DX countries and YU prefixes worked. (Entries may be single or multi-operator)

Awards: Certificates to top scorers in each country, with 2nd and 3rd place awards where justified. (Call areas in W/K, VE, PY, VK, ZL, JA, UA9 & UAØ will be considered as separate areas for awards.)

There are also Trophies for continental leaders in each catagories.

Include a summary sheet and the usual signed declaration. Check log for duplicate QSO's, taking credit for dupes in excess of 3% of the total made means disqualification.

Mailing deadline is March 15th to: SRJ Contest Committee, P.O. Box 48, 11001 Belgrade, Yugoslavia.

DL QRP C.W. Contest

Starts: 1800 GMT Saturday, January 12
Ends: 1500 GMT Sunday, January 13

The DL Activity Group runs two of these QRP contests a year. Summer in July and Winter in January.

Power input is limited to 10 watts or less, single operator and on c.w. only. Limit your operation to 15 hours, the 6 hour rest period may be taken in two parts.

Contacts may be made on 3.5, 7, 14 and 1.8 or 21 mHz, with any station, whether QRP or not.

Exchange: RST plus QSO no. and power input. Add "x" if transmitter is crystal controlled. (i.e. 579 001/8x) Stations using more than 10 watts indicate QRO instead of power number.

Scoring: Contacts with stations in same country 1 point, other countries on same continent 2 points, DX on other continents 3 points. If QSO is with another QRP station add 3 more points. (4 - 6) If your power input is less than 3 watts or xtal controlled, double your QSO points. (8 - 12)

Multiplier: Each DXCC country, 1 if on own continent, 2 if DX on other continents. Following call areas will also count as a multiplier. JA, PY, VE, VK, W/K, ZS.

Final Score: Total QSO points X multiplier from each band.

Use separate log or each band and a summary sheet showing the scoring, times of rest period and information on equipment used. Plus the usual signed declaration.

Mailing deadline is February 15th to: Hartmut Weber, DJ7ST D-3201 Holle, Kleine Ohe 5, Germany.

CQ WW DX 160 C.W. Contest

Starts: 2200 GMT Friday, January 25
Ends: 1600 GMT Sunday, January 27

Rules are the same as they have been for the past several years and will be given in details next month.

As in the past this is primarily a single operator contest but multi-operator entries will be acknowledged.

Once again we admonish state-side stations to keep the "DX Window" (1825 - 1830) clear of W/K and VE operation during DX hours. And we also hope the phone boys will be cooperative for the contest week-end.

Logs sheets and United States Regulations for 160 may be obtained from CQ. Include a large s.a.s.e. with sufficient postage to cover your request.

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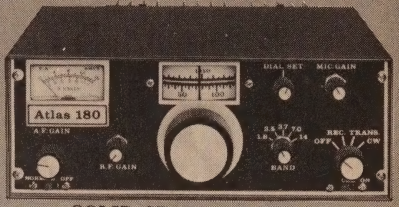
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73 Herb Johnson W6QKI



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Editor's Notes

If you have not already sent in your Phone log for the recent CQ WW Contest, time has just about run out on you so get it to us pronto. The 1st of this month was the deadline. You have until January 15th for your C.W. entry. All scores and calls will be listed in the final results, as well as check logs which sometimes prove very useful.

A reminder to you fellows on the move, APO addresses and etc. Your permanent or stateside address is a must. Certificates will not be sent out until late next summer.

During December PJ stations will be allowed to use the special PJ1 prefix. The VERONA club members promise to activate as many stations as possible. Work three PJ1's and you are eligible for the Curacao Certificate free of charge. Send your application before February 1st to: VERONA, P.O. Box 383, Curacao, Neth. Antilles.

We pride ourselves in the accuracy of the listed contest scores, but errors are bound to show up when you have over 3500 entries. However, we can offer no excuse for leaving out a score that had already appeared in the earlier claimed scores. WA2FCA's fine score of 98,790 points on 7 mHz C.W. was inadvertently left out of the final standings in the September issue. Our apologies Gary.

The Holiday Season will be just ahead of us by the time you will be reading this. May it be a very happy one for you and yours and that you will receive many Blessings during the coming year.

73 for now, Frank, W1WY

As you live and breathe!



Give to Christmas Seals

SURPLUS sidelights

BY GORDON ELIOT WHITE*

THE RBK receiver was bought by the Navy in January, 1951, but it was not in general service with the fleet until well into 1952, making it about 20 years old now, and honestly, it looks older appearing a bit like an early World War II antique.

Though the design is strictly tube-type and distinctly old-hat today, I have had several inquiries about this set, so some must be turning up. I have not seen many myself, although I understand they can be found in many surplus outlets.

It is a decent v.h.f. receiver, being a militarized version of the familiar Hallicrafters two-meter set of the 1950's. Its specs include coverage from 27.8 mHz to 143 mHz (with enough overlap to cover most of two meters) and the usual mil specs, ruggedization, mildew and fungus protection and so on.

The RBK-16, shown here, offers both a.m. and f.m. reception. It operates, conveniently, on 115 or 230 volt a.c. power, so needs no conversion to be usable. The set has an "S" meter, b.f.o. for c.w. work, noise limiter, and panoramic output jacks. The intermediate frequency is 5.25 mHz, and 500/600 ohm audio outputs are provided.

The Navy bought RBK's for many years, all much alike except the RBK-7, -8, -9, -12, -13, -14 and -16 versions had a 6SL7 tube in the audio amplifier while the others used a 6C8. Along with the 6SL7 the same models had a 5U4 rectifier while the others used a 5Z3.

There were blanking circuits in the -7, -8, -9, -12 and -13's. Other differences run to more minor items like audio connector posts, etc.

The circuit consists of a typical Navy radiation suppressor in the front end, an r.f. stage, a 954 acorn tube in the mixer and a 955 local oscillator. There are two i.f. stages, with a 6AC7 followed by a 6AB7 which provided a.v.c. The f.m. stages had a 6AC7 limiter and 6H6 diode discriminator. A.m. was amplified in a third i.f. stage and detected in another 6H6 rectifier. The b.f.o. is a 6J5 and the a.v.c. and noise limiter diodes are in a third 6H6.

One trick to using the RBK is to put the proper jumpers in the "remote control" socket on the rear panel. This is PL-2 marked "DC power input." For a.c. operation, jumper pins 6 to 7 (filaments); 1 and 8 to 5 (ground) and 3 to 4 (B^+). For operation from a remote power supply, pin 3 is B^+ input and pin 7 is filament input (6.3 v.).

Audio is found on pins A and C of socket SO-4. 115 volt power may be applied to pins A and C of SO-5.

SO-2 is the panoramic adapter plug - if you have a 5.25 mHz panadapter around the shack.

The rest of the set is so obvious as to require no further comment here. ■

*1502 Stonewall Rd., Alexandria, Va. 22302

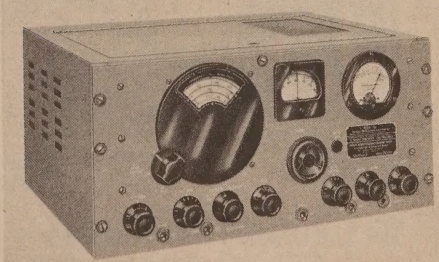


Fig. 1—The Navy Model RBK-16 u.h.f. receiver.

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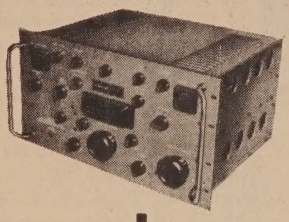
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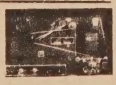
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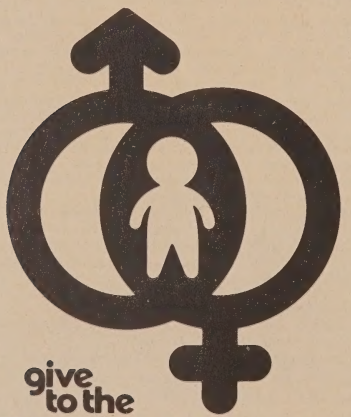
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Whither DX? [*from page 33*]

I need not tell you what happened to hams of Japanese ancestry on that date, for that is another interesting story.

November 1945 has special significance because I had heard that the bands were going to be returned to us. One day while at work in a broadcasting station I was tuning around on the dead 20 meter band and I heard KA1SL (Philippines, now KH6FX) talking to another Philippine amateur. By December of that year the ten meter band was reactivated.

New equipment, better receivers, and a whole body of knowledge about antennas was brought to play.

The rest is an old story to most of us – the exploits of Danny Weil, Gus Browning, and Don Miller – the day of the *manufactured contact* and *Master of Ceremonies* had arrived. ■

Happiness Is Visiting [*from page 36*]

station, but also 20 other stations calling him!

Later I picked up a local newspaper and read the headlines: "Senator Barry Goldwater In Port-au-Prince."

"He's also an amateur radio operator – K7UGA," said Julius.

"I know," I answered, "I collaborated with him in ammending the Communications Act, so that immigrant hams can apply for American licenses even before they get U.S. citizenship."

"Let's go and see him," suggested Julius.

We drove to the hotel where we supposed Sen. Goldwater would stay. Julius went inside and I – having a 6th sense to locate hams – went directly to the swimming pool. There he was, resting under the sun, Barry, K7UGA.

"Senator Goldwater," I said, "I am George, WB2AQC."

The Senator seemed pleasantly suprised and quickly jumped up. I guess his jump was too quick because it triggered two uniformed special guards hiding in the bushes. They were moving fast toward me, pointing their submachine-guns. Fortunately, the Senator came forward with a big smile and shook my hand. The guards missed their big chance to prove their bravery and retreated to the bushes.

In the meantime, Julius, Eva and Steve arrived and I introduced them.

We had a nice time together, but finally, we had to return to our ship. At the departure, just to be on the safe side, I bowed toward the bushes, yelling "Au revoir monsieur." Some tourists walking by looked at me with suspicion, but I know what's good for me!

I recommend buying woodcarving at the Iron Market, paying half of the asked price. Don't ask too many questions, and don't talk politics with anybody.

Next month, we'll conclude this latest travelogue with accounts of our visits to Jamaica, Curacao, Venezuela, Grenada, St. Lucia and Martinique. ■

QRP [*from page 39*]

That's all the space for this month. Closing comment from WA1JGG: "The only soapbox comment I would like to make is that I wish all amateurs would try to work the weaker stations they hear. We all miss a lot by passing over any signal that doesn't pin the s-meter!" Drop our editor a card if you like the new QRPp Column. Likewise, drop me a letter with your WAS/DXCC standings, comments, circuits, or questions. QRPp operators have needed a forum for a long time, and now we have – let's make it a success! 73, Ade, K8EEG

Letters [*from page 7*]

structor and the club advisor. The club was made up of five members, but even though only two of the five had a ticket, (both of these only Novice) the spirit was all F.B. ham. With the help of Steve, now WBØIUN and Ed, now WBØIUM, I got my Novice ticket. The entire club came out and helped me put up my antenna, and offered help whenever needed. Now the club has helped people get one Advanced ticket, 3 Generals, and 7 Novices. Thanks to them, I passed (after twice failing the theory) my General exam, and have something I've wanted for 11 years.

But more important, maybe someone reading this will see the "ham" license is not impossible to get. By the way, I am not an "electrical engineer" or technician; I'm a guard at the Missouri State Prison. If I can learn the code and theory . . . you can!

Bill Green, WBØJLY
Linn, MO

Anonymous Editorials

Editor, *CQ*:

Regarding the cover story in the June *CQ*, I appreciate very much the original intent of the article, and found it a fascinating look at the inner workings of the F.C.C. However, I feel *CQ* made a bad mistake in printing it as an editorial, and an even worse mistake in letting the author remain anonymous. We all know that when a person asks to remain anonymous, that person is afraid of getting recognition (mostly bad – however some is good) for whatever he has done. I personally feel that if this person, regardless of who he may be, is afraid of the reaction to his article, then *CQ* should have sensed this and refused to print it. As I said, I am glad the story appeared in print, but I think it should have been as a documentary, not as a guest editorial. There is no reason for *CQ* to be concerned in the least with the affairs of the A.R.R.L.; there is no reason for bickering or feud between the two, and your cover certainly doesn't do any good to current relations between F.C.C. and A.R.R.L. Furthermore, if this anonymous author feels that Amateur Radio is falling victim to such a feud, then I feel he should express his gripes to his director and vice director and also through the pages of *QST*. The way he has done it, anonymously, through a cover article on another magazine, to me represents the coward's way out.

Charles F. Lambert, WA4EPH
Richmond, Virginia

SSTV [*from page 54*]

The incoming audio drives an op amp (IC_1) which functions as a limiter with incoming audio levels of a few millivolts or above. The sync discriminator, L_1/C_1, is tuned to 1200 Hz. When SSTV is being received, bursts of 1200 Hz tone appear at the base of Q_1, repeated at intervals of 1/15 second. These bursts are rectified by Q_1 and are filtered into a quasi 15 Hz sawtooth by the 10 mf capacitor. This voltage provides the input signal to the phase-locked loop, IC_2. The 567 PLL is designed specifically as a single frequency detector. When the input signal is not a steady 15 Hz, the output at pin 8 remains near ground potential. If the input is 15 Hz, the 567's internal oscillator tries to lock onto it. This locking operation takes about 7 seconds with the capacitors shown. When lock is achieved, the voltage at pin 8 switches to +12 volts and remains there as long as phase lock is maintained. The audio switch shown in fig. 3 is ¼ of a CD4016AE. A 47K resistor (R_2) is placed in parallel with the resistive element so that the volume is reduced by 20 db or so, but not completely killed. (The CD4016AE must of course be supplied with B+ and ground connections as shown in fig. 1.)

If you should want to switch your speaker directly, a 12 volt relay coil could be connected in place of R_3, and the CD4016AE eliminated. Any coil resistance above 120 ohms is OK since the 567 will switch up to 100 ma. A diode should be connected across the coil with cathode toward the +12 volt end of the coil.

The capacitors connected to pins 1 and 2 of IC_2 control the loop lock-in, hold-in, and

noise immunity characteristics. Reducing the capacitance will tend to reduce lock-in time, but will make the circuit more susceptable to noise. With the values shown I have never had the volume "reduce" except when an actual SSTV signal was being received. Deep QSB and strong QRM during an SSTV transmission will bring the volume back up again. I don't normally find this objectionable because the picture is messing up at the same time, and I want to hear what's going on. The loop bandwidth is too narrow to lock both 15 Hz, and 16 2/3 Hz line rate signals. If your DX SSTV contacts are solid enough so that you want this feature, a switch and a second 10K frequency adjust trimmer pot could be added.

A Cheap "Balanced" Phone Patch

When using VOX it is important that the signal going *to* the phone line (receiver output) does not reach the transmitter input many db higher than the incoming signal *from* the phone line. This is also true if you want to put both ends of a phone conversation on the air at the same time. Most patches that separate incoming from outgoing audio use expensive hybrid transformers. Figure 4 shows another approach. Basically, Q_1 acts as a buffer amplifier for the signal going to the phone line. The "secret" lies in the operation of Q_1.

The outgoing signal appears at the emitter of Q_1; it also appears at the collector, but out of phase. It should be apparent that at some point on the BALANCE pot these out-of-phase voltages pretty well cancel out, and little of the outgoing signal reaches the input of IC_1. Q_1 acts as a grounded base amplifier to signals *from* the phone line. With this type of amp, the emitter and collector voltages are *in* phase, so there is no cancellation and a healthy signal reaches the input of IC_1.

The BALANCE control should be adjusted for the deepest possible null of the outgoing signal at the IC_1 output, while making an actual phone call. The depth of the null will depend upon how flat the phone line impedance is across the audio band, and how reactive it is. I obtained a very adequate null with the circuit shown. If you want to do even better, or have a high capacitance phone line, try putting some trial capacitors from the collector of Q_1 to ground; then adjust BALANCE . (Try 0.02 or 0.033 mf as a start, and go up and down from there.)

'Til next month. Vy 73, Cop, WØORX

Antennas [*from page 63*]

"Yes," I replied, "If was a good antenna. The boom was 24 feet long and the elements were very long for a trapped beam. The traps were made of airwound, aluminum coils, about 3 inches in diameter (fig. 5). The capacitor was a coaxial affair, made of two sections of aluminum tubing, with some kind of plastic poured between the tubes and allowed to set. Actually, the capacitor was the weak link in the design as the plastic broke down under the ultraviolet radiation from the sun. It crazed and cracked, moisture got into the cracks and eventually the capacitor blew up, especially if you were running high power. A lot of hams who swore by the W3DZZ beam rebuilt the capacitors with Teflon insulation, and some of these 15 year old beams are still going strong today. The W3DZZ design is a great beam for the home builder and if you have a junkyard of aluminum tubing and plenty of time, you can build a triband trap beam."

I rummaged in the drawer of the operating table and handed Pendergast a sketch of the W3DZZ antenna.

"The big problem, of course, is building the traps so that they stand up in bad weather and making the whole assembly strong enough to withstand winds. It isn't easy, but it can be done. Your reward is a beam having very efficient traps, very low loss, and – one would assume – a high figure of power gain."

"Is it difficult to adjust the traps?," asked Pendergast.

"No," I replied. "The completed trap is grid-dipped to the design frequency. Place the trap in the open, away from metal objects, and grid-dip it, using loose coupling to the grid-dip oscillator. Monitor the oscillator in a nearby, well calibrated receiver. Make each measurement about 5 times and take the average figure from the 15 meter traps to 20.5 mHz. After adjusting the traps by squeezing and expanding the coil, the devices can be placed in the antenna elements with no further adjustment."

"Why are the traps tuned outside the low end of the ham bands," asked Pendergast.

"A good question," I replied. "The only answer is that it has been found by experimentation that best antenna operational bandwidth and lowest s.w.r. across the band is achieved when the traps are tuned up just outside the low frequency end of each band. Maybe it is because the trap has physical

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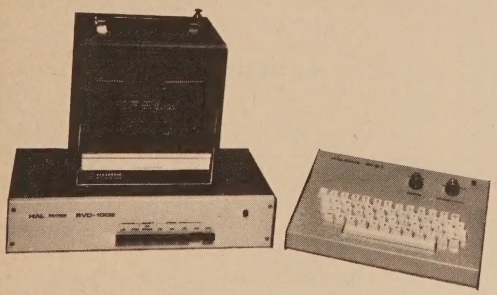
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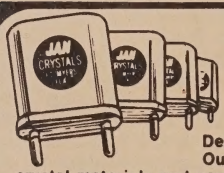
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length to it, which tends to lower the measured frequency below the actual resonant frequency of the trap, assuming it had no physical size . . . . . or something."

"You don't sound very sure of yourself," observed Pendergast. I laughed. "My motto is, 'Often in error, never in doubt.' My information is free, so take it for what it is worth."

We stood up and looked out of the window of the radio shack. The sun was beginning to set now. The little girls were still jumping rope on the soft grass and their chant floated in the open window . . . . .

"Down by the ocean . . . . . down by the sea
Johnny broke a bottle and blamed it on me.
I told Ma . . . . . Ma told Pa
Johnny got a spankin' so ha, ha, ha!"

DX *[from page 73]*
QSL Information

The following QSL information is courtesy of "The West Coast DX Bulletin".

A35FX–Via ZL2AFZ
A51PN–Via W1JFL
CN8BO–Via W4GKE
CR7GJ–Via W3HNK
CR8AM–Via WB6BGO
C31HB–Via DL8NU
C31GW–Via F5EQ
CT2BG–Via WA2BCK
C31BL–Via F3KJ
EL4B–Via K8LUH
EP2DO–KL7BJW
F0AVG/FC–Via DK5OS
FB8XC–Via F2MO
FB8XZ–Via F2MO
GC3PYK–Via WA1KYW
HZ1TA–Via HZ1HZ
HL9VR–Via K4CIA
HI8LC–Via W2KF
IBØPV–Via IØPV
JW1SO–Via LA1RO
JTØAE–Via OK3YAO
JD1AIV–Via JA3GZN
KC6SX–Via JH1ECG
KB6CU–Via WB6IKI
KJ6DI–Via K4RHU
KH6HDB/Kure–Via WA3HUP
MP4BJR–Via K9KXA
MP4BIN–Via WB2FVO
OZ8WH–Via W2BBK
OX5AY–Via K9YPW
PJ8AA–Via W2BBK
SV0WY–Via K0UOP
TU2DO–Via WA2DHF
TU2DV–Via WA6NFC
TU4AG–Via WA6NAM
VP1EG–Via K7DVK
VK9DH–Via W6LYC
VK9MC–Via K6ZDL
VK9DV–Via WA7OMZ
VP2KX–Via WA2IUV
VP2VAV–Via K4CDZ
VS5MC–Via DK5JA
WP2MAP–Via K2JOX
XW8FB–Via W3KT
YJ8BD–Via I0IJ
YK1ØK–Via OK2QF
ZF1KXJ–Via WA0KXJ
ZF1FBI–Via WA2FBI
ZD9GC–Via ZS6XO
ZS3AK–Via DJ9FH
ZK1AI–Via W6KNH
ZK1TA–Via W6KNH
3V8CA–Via F6CLW
3D2FM–Via W7YBX
3A2GX–Via I1ALX
3B6CF–Via JE1CKA
4M1A–Via YV1LA
4X4BL–Via WB2EDV
5R8AC–Via W3ABC
5W1AU–Via W6KNH
7P8AM–Via G3SGK
7Q7DW–Via G3AWY
8P6AC–Via 4S7YL
9G1HE–Via VE3FCL
9M8FDS–Via GW3OJB
9U5CR–Via ON5TO
9X5VA–Via W2PPG
9X5NA–Via W7LFA
DA1SI–Via C. Signer, Box 775 FSB, APO NY 09742

73, Jerry, WA6GLD

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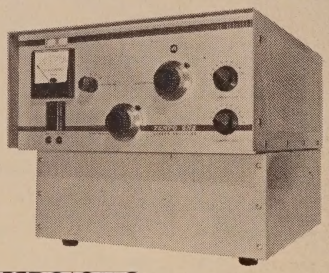
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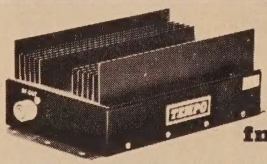
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TPL802B	1 to 3W	80W	2M
TPL502	5 to 15W	35-55W	2M
TPL502B	1 to 3W	45W	2M
TPL252-A2	1W	25W	2M
TPL445-10	1 to 2.5W	12W	440MHz
TPL445-30	4W	30W	440MHz
TPL445-30B	1W	30W	440MHz

TCP 12A Control Head

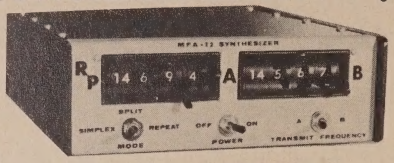
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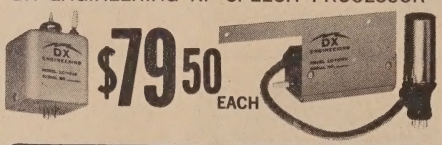
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times the PIV rating. For example if the PIV is 300 volts, then the resistor should be 150K ohms. The capacitor should be around .01 mf and PIV rated, ceramic type.

The resistors used in series with each parallel capapcitor should be selected so that they will present a 1 to 1.5 volt drop at anticipated peak current. The peak current can go as high as twenty times the average current.

Transients or voltage spikes shoot silicon diodes as well as other components. Commercial devices are available which limit surge current. These are connected in the transformer primary circuit to reduce voltage for a short time.

73, Chuck, W6QLV

Awards *[from page 80]*

Applications should include a statement on the mode/modes and list chosen (e.g. "EDXC, Mixed," "DXCC, 2xSSB"). QSLs need not be sent if the application is confirmed by an Award Manager, 2 licensed amateurs or (with listeners clubs) 2 club members. The publisher might ask for sample QSLs to prove the list was correct.

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All applications should be sent to ADXB-OE Award Manager, OE3PUW, P.O. Box XIII, A-2253 GUMPOLDSKIRCHEN, Austria.

Editors Notes

Hope you heard about the 25th anniversay of VERONA and that December 1973 is PJ Activity Month and PJ stations will use the PJ1 prefix, thus PJ1CX - PJ2CX. Special QSLs will be issued and a beautiful Curacao Certificate will be issued FREE for working 3 PJ1 stations. Applications with QSO details, not later than Feb. 1, 1974 via air mail to: VERONA, P.O. Box 383, Curacao, Neth. Antilles.

A beautiful QSL received from John, WB4WBP showing the famous painting by Raphael of Saint George and the Dragon.

MERRY CHRISTMAS for YOU & YOURS! How was your month?

73, Ed., W2GT.

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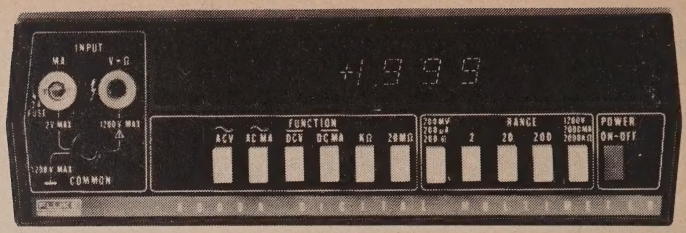
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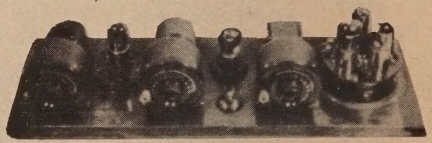
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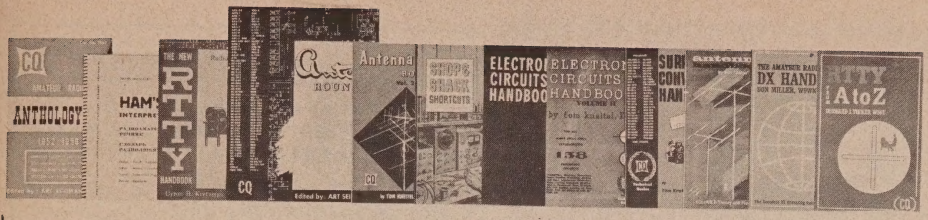
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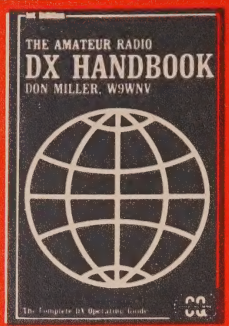
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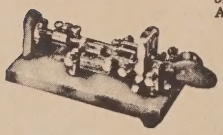
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SELL: Comaire FLM-6 Six mtr. ant. tuner, never used, $17.00; Four new RCA 6146's, $12; Swan 406 VFO, $50; K1IIK, Box 77, W. Dover, VT 05356.

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FOR SALE: Heath HW-29A, like new, $25. WA0-LMK, LeRoy, 1731 South Shore Dr., Worthington, MN 56187.

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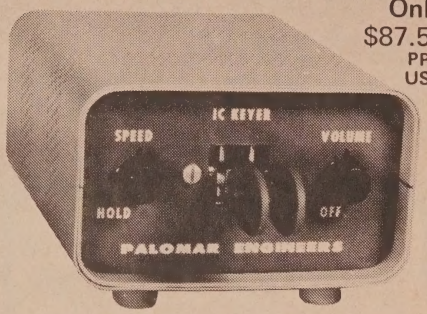
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CASH: For Dumont type 5800-(a)-4 (6m FM) Schematic/manual; Oct '60 and Jan '61 73's. K0YDO, 383 S. Vaughn Way, Aurora, CO 80012.

HW-22A, Linear Systems Mobile Supply, Hustler Antenna, Mic., Package, $125. 875 Lindo Lane, Chico, CA 95926. (916) 343-1519. K6HTM.

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HEATH Hx10 $110, SB620 Scanalyzer, $80, FR4 Freq. meter, $40; Heath Impedence bridge, $75; Telequipment D54 $475. WB4UZT, 271 Tollgate Trail, Longwood, FL 32750.

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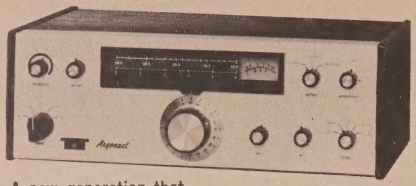
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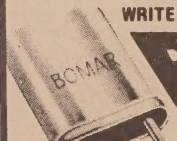
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WANTED: 4 CX1000A socket. For Sale: TH6DX Tri band beam, $85 (pick up). Modified SX-101 Mark III receiver, works perfectly, $50. Others. Don Winfield, K5DUT, 6080 Anahuac Ave., Fort Worth, TX 76114.

SELL: Hammarlund SP600, $150. Pocket Scope, $25. Test equip. Write W3JUO, 1113 Edmonds, Drexel Hill, PA 19026.

HY-GAIN TH6DXX Super Thunderbird Antenna. Brand new, never used. $110. You pay ship. Tappehorn, 2536 Kings Highway, Louisville, KY 40205.

HQ110A, 80-6M, new industrial tubes, $100. FOB Kennedy, 791 Greenwich St., New York, NY 10014.

WANTED: KWM-2, Round Emblem Model. Mint condition. Henry Martin, W8DYA, Box 1275, Bluefield, W. VA. 24701.

LINEAR BUILDERS: Send SASE for LIST of Hi-Power parts, at LO-Prices. Mace, 8600 Skyline, Hollywood, CA 90046.

ENGINEERS/TECHNICIANS — Do you enjoy building ham gear? Like to work with VHF-UHF transmitters and receivers and/or digital logic? If you are a self-starter who enjoys doing his own thing in a small company, informal atmosphere, we would like to talk to you. Call us at A/C 914-235-9400 or send resume with salary requirements. EMERGENCY BEACON CORP., 15 River Street, New Rochelle, NY 10801.

WANTED: Alpha 70 or 77, Henry 4K, and Drake MN-2000. A. Emerald, 8956 Swallow Ave., Fountain Valley, CA 92708.

10m BEAM, Cush Craft, $20. Pair 4-400A $20 ea., New. Local only. (415) 589-1369, S.S.F.

WANT: SB100, 102, 103. TA-33 Jr, TH3Jr or TA33, rotor, any condx. Trade Regency HR-2 — series 15 watt output, 16-76, 34-94, 94-94 22-82, 28-88, 37-97, Regency AC supply, mobile bracket, manual and orig. boxes toward. Clegg FM27 A or B. (404) 963-0464. Robert Pohorence, Lawrenceville, GA 30245.

LOGIC MODULES 2 cents each, you pay postage. SASE for list. K5BCQ, 5114 Geneva, Friendswood, TX 77546.

WANTED: HA-14 KW with AC/DC supplies. Cables and manuals. WB2FNR. K. Baker, 11 Scotch Pine, C. Islip, NY 11722. (516) 234-9113.

BC-342N, xclnt 1.5--18.1 mhz rcvr with manual and matching LS-3 spkr. AC pwr. $50. Silbert, White Sulphur Springs, NY 12787.

WANTED: Hallicrafter HA-1 electronic keyer in good condx. W3HNK, P.O. Box 14, Norwood, PA.

DRAKE 2B receiver with extra crystals. Beautiful condx. $150.00. WB4MTE, Paul Skidmore, 1612 Stone Ave., Crossville, TN 38555.

FOR SALE OR TRADE: Choice U.S. mint plate blocks or F. Day Covers. L.B. Fuqua, W4WBD, Maple St., Box 6, Eddyville, KY 42038.

FOR SALE OR TRADE: (for ham gear) 23 Ch. CB xcvr ARS-Realistic TRC-24 w/complete base, mob. and port. accessories. WB2HTJ, 38 Wayside, Scarsdale, NY 10583.

FOR SALE: Complete texts and answers, N.T.S. Master color TV course, $60.00. A. E. Johnson, K1IIK, Box 77, West Dover, VT 05356.

SELL OR TRADE Hallicrafter SX100, S38E, RME HF10-20, Nat. NC-173, Globe Xmtr. VHF-62 and VFO 6-2. Make offer, will ship, W4GIW, 3949 Menlo Dr., Doraville, GA 30340.

KILOWATT SWITCHES: 5 position, 3 poles. Centralab JV9003. 5kv at 20 amps. Brand new. $6 each. Marty WB6NWW, Box 15015, Long Beach, CA 90815.

TRADE: Johnson Ranger II for Gonset G28 10 mtr transc. Joe, W3TEC, 2045 Wakeling St., Phila., PA 19124.

CHESTER COUNTY (PA) ARC meets last Thursday in West Chester. For information, call: W3HUS, 827-7374.

CLEGG 99er 6m xcvr A1 and Telrex Beam, both $49. WA2PCL, 101-23 Lefferts Blvd., Richmond Hill, NY 11419.

STEREO RECEIVER: As new Scott 340B FM MPX Receiver, 65 watts IHFM, in brand-new walnut case. $85. (was $400). Sochor, Box 552, Arlington Hts., IL 60005.

KRAFT Gold Medal Model aero RC xmtr, rcvr, 4 servos, etc. $125 pp. M. Prather, WN0LEI, 508 W. 101st Terr., Kansas City, MO 64114.

WANTED: Reasonably priced Art/13/Xmitter (surplus), books, mags, courses, sold, bought, and traded. Don Ryan, Star Rt. So. Plymouth, NY 13844.

SB10 with pwr. supply and manuals. Excellent, $35.00. You pay shipping. H. Marowsky, 178 Sunset Rd., Avon Lake, OH 44012.

28KSR Floor Console Cabinet with LESU and wiring. Repairable 28 Flying Head TO's and typing reperforators. D. C. Harrington, 1620 Gardena Ave., Fridley, MN 55462.

HALLICRAFTERS SX-110 Rec., $80, HG-10 VFO, $25. WA6JPL, 2126 Beebee St., San Luis Obispo, CA 93401.

WANTED: Barker & Williamson Portable Whip Antenna (Model No. 370-10). Tom Dornback, K9MKX, 2515 College Rd., Downers Grove, IL 60515.

WANTED: FT101 W6BL Box 1975, Beverly Hills, CA or call Herb, (213) 653-2250 days.

SELL: 'leath SW-717 Shortwave and Broadcast Receiver. Practically new, with manual. $50 plus shipping costs. Joe Roberts, W7DRR, 9251 N. 37th Av., Phoenix, AZ 85021.

ROBOT SLOW SCAN GEAR LN, $200 off. SASE details. W4API, Box 4095, Arlington, VA 22204.

SALE: Radio estate of W6TVT. 75-S-1, 32-S-1, AR-88, SB-33, linears, receivers, transmitters, test equipment, components. Local pickup. (213) 681-9181 or 353-0991, Sunland, CA.

SELL: Heath HR-10B receiver with manual, $45. Good shape. You pay shipping. Joe Roberts, W7-DRR, 9251 N. 37th Ave., Phoenix, AZ 85021.

EC-1 ANALOG COMPUTER, new, $150. SB-33 w/mike, $160. 3" refractor telescope w/access, $160. WA8CKT, John Wagner, 2175 Wagner Dr., Rt. 2, Box 142A, Caro, MI 48723.

2 MTR FM: Swan FM-2X w/ac power supply, 3 channels xtaled. $175. WA8VZO, 119 Kennedy Ave., Follansbee, WV 26037.

FOR SALE: TRI-EX H2N-354 tower, motor, tilt-over base, 20 foot mast. Prefer So. Cal. deal. John, W6UFJ, (213) 926-6062.

CHESS NET: 3.928, Sundays, at 1100- Net Control K2SYJ, Chess Net welcomes all chess nuts!

NEED GOV'T MANUALS for Navy RAX-1-CG-46117, Signal Corps BC-1147-A, National NC-156-1; W. Frelund, 1720- S. Hamp., Mason City, IA 50401.

SELL: Collins Power Supply 516F2, $125, also PM2, $85. Want Xtal pack (PI and 312B5). New Icom IC21 2 m rig. 16 xtals. Marty, 1138 Boxwood Road, Jenkintown, PA 19046.

WANTED: HV X'fmr for Johnson Thunderbolt. Will accept defective unit. I'll rewind. Jim Fleming, 6N705 Harvey, Medinah, IL 60157.

72 ISSUES QST, 11 issues CQ Magazines covering period February 1943 to December 1951, $12 plus $5.00 shipping. RIDERS Number 4 thru Number 15, $5.00 each postpaid. W7BIF, 107 Wyoming, Boulder City, NV 89005.

COMMERCIAL TRANSCEIVER: Westrex 2B, 4 channel, 1.5 to 20 MHz, less rack cabinet, input coils, new. W2IVT, (212) 549-8947.

EQUIPMENT/PARTS: Donations needed. High School Vocational Electronics Classes. Disadvantaged. Egyptian School District No. 5, Tammas, IL 62988.

TAPE RECORDER WANTED: 12 or more track for studio recording, also mixers. Write with full details first letter. Pete Graylich, WB2NRU, 1157 Concord Dr., Haddonfield, NJ 08033.

REGENCY 2 Meter HR-2 Transceiver with 6 pairs of crystals, $150.00. Forrest L. Headley, WA3KRA, 2201 Branch Ave SE, Washington, DC 20020.

WANTED: Antenna Loading Roller Coil and Dial Assembly from TCS Transmitter. Several. C. Frank W0COS, Rt. 1, Rochester, MN 55901.

FOR SALE: TR-3, AC-3 $390.00. R4 $285.00. HO-10 scope, $55. KWM-2, 516F-2, $650.00. SX-101/spkr, $160.00. HW-32A/DC supply, $90. Will ship. Ron Conley, K7LTV, 37 Wyoming Ave., Billings, MT 59102. (406) 245-6918.

MICS TELETYPE EQPT, Cash and carry. (312) 476-8201 days. Goodman, 5826 S. Western, Chicago, IL 60636.

PA421 TRANSFORMERS $1.50 ppd. Goodman, 5826 S. Western, Chicago, IL 60636.

SWAN CYGNET 270, w/AC/DC supplies. $350. Drake 2B, and 2BQ/spkr console, $160. Drake CC! with SC6, SCC-1, CPS-1, $100. Others. Sase gets list. Colella, WA2HQD, 105 18 131 St., Richmond Hill, NY 11419. (212) 641-2559.

SELL: HW17 Heath 2 mtr AM xcvr with FM adaptor. A-1 cond. $115. Ben, WA9RFO, 14420 State, Riverdale, IL 60627. (312) 849-1855.

FOR SALE: Millen counter dial No. 10030, $5, BC-453 "Q" Fiver 200/500 kcs receiver $20 all plus postage. W6BLZ, 528 Colima St., La Jolla, CA 92037.

SIGNAL/ONE CX7A, maint. manual, $1,000.00. Harry Clinton, 107 Juniper Rd., Warner Robins, GA 31093. (912) 923-8407.

DXers write you in English. Why not reciprocate? In 54 languages! Gets QSLs! K3CHP's DX QSL GUIDE, $3.95. Joe Mikuckis, 6913 Furman Pkwy., Riverdale, MD 20840.

FREQUENCY COUNTER: Simpson 2725 5-digit counter with Heath IB-102 scaler, 8 digit equivalent thru 175 MHz, worth over $500 new. Mint, only $210. K9KDI, Box 552, Arlington Hts., IL 60006.

WANTED: Central Electronics 10B diagram. I will xerox. WB6GNR, J. W. Grzelak, 222 N. San Antonio, 4, Ontario, CA 91762.

WANT: Yagi-Uda Antenna Book (English) publ. Sasaki, Sendai, Japan: 183 pages incl. index. George, K6WL, 2535 Maine Ave., Long Beach, CA 90806.

SELL: 3600-0-3600 v. 1 amp Xfmer with 110/220 primary $30 fob. Heath SB-101 cw filter, $14. W0AIH, Paul Bittner, 814 4th St., Virginia, MN 55792.

WANTED: HO-10 or SB-610 monitor scope. State price and condx. WB0BQA, Paul Staupe, Rte 1, Box 76, Britt, MN 55710. (218) 741-2081.

TRADE: Slightly used 13-1/2 ft. travel trailer for ham gear. Drake, Collins, or Heath. Lee Black, Box 462, Chickasha, OK 73018.

WANTED: Door knob capacitors: 500 mmf 30 kv 20 kv. Any quantity. Please give price and quantity. W4GD, 3087 Carnes Ave., Memphis, TN 38111.

JOIN the greatest Ham Club in the world. For information, send to: Joseph Schwartz, K2VGV, 43-34 Union St., Flushing, NY 11355.

WORKED SOUTH AMERICA CERTIFICATE: Work all 13 countries. Send list and $1. HC1TH, 4805 Willowbend Blvd., Houston, TX 77035.

WANTED: Service manual for Hickok 665 scope. Will copy, return and pay postage both ways. W8KGR, RR2, 16B Wooddale, Hull, GA 30646.

LIKE MONEY? Send $1.00 for "Twenty Five Proven Ways to a Million Dollars", WA1BLI, Box 3809 Spfld, MA 01101.

STANDARD 146-A still in factory carton with warranty card and battery pack and stubby antenna, $248.00. W4OAQ, Box 17222, Nashville, TN. 37217. (615) 834-8999.

WANTED: Spark and early a.c. gear; variables, coil forms, verniers, gaps, helix, hardware. Need AT-1, SW-3, Cohen, 1883 Ravenwood Way, Atlanta, GA 30329.

WANTED: Transceiver in mint condition. FT101, KWM2 or TS900 with manual. State price, Mace, 8600 Skyline Dr., Hollywood, CA 90046.

WILL TRADE EXCESS Radio-TV test equipment for like equipment I can use or for Service Data. P.L. Williams, 106 S. Jefferson St., Lewisburg, W. VA. 24901.

BC-342N, 1.5-18.1 mhz rcvr with manual and matching LS-3 spkr. AC pwr. $50.00. Silbert, White Sulphur Springs, NY 12787.

ALL HAMS ARE WELCOME to check into the Penn. ARC CW net. Fridays 0100Z. 21130 Khz. WN3TMP - NCS. Marc Schlessinger, Philadelphia.

HELP: Does anyone have copies of the Phillips and numbers codes? C. D. Prewitt, 129 N. Maysville St., Mt. Sterling, KY 40353. K4ZCD.

FOR SALE: Heath SB-102, $325; AC power supply and speaker, $50. Mobile DC power supply, $50. Mobile mounting bracket, $12. Prefer to sell as a package. Heath HW-16, new but completely built and aligned, $95. Solid State RTTY terminal unit, complete with AFSK oscillator and autostart, write for details. Ken Simpson, WA8ETX, 3700 Mountview, Alliance, OH 44601. (216) 821-0316.

SELL: Clegg 2 and 6 meter Zeus 180W $200 exc. W2RQ, Harry Stenger, 78-20 74 St., Glendale, NY 11227.

FOR SALE/TRADE: HQ129X, $60, Eico Gen's 315 and 360, both $25. HH2BA new ant, $5, Eldico SSB 100, $90. W. Kinne, 1163 Ingerson Rd., St. Paul, MN 55112.

SOLA CV Transformer. 500 watt, $20; 250w $10. Local. Elden Meyer, 4116 N. 72 St., Milwaukee, WI 53216.

OSCILLOSCOPE: Heath IO-14 triggered sweep with delay line. 40 NS rise time. 8 MHZ bandwidth. Like new. Best offer over $200. K2MVR, (201) 239-1050.

HEATH COUNTER & SCALER. Motorola hi-band 3 freq. Chester, WA5CMC, 2309 Bullington, Wichita Falls, TX 76301.

DX60B with crystals, $50. CIE 1st Class FCC Course & Answers. $400. Sell $50. A. Vail, WN2KHN, 29 Prospect St., Amityville, NY 11701.

WANTED: Final- Henry 2K3 or 2K4, SB-220 or similar. Murch Transmatch. SB-303. Magnum six for Heath. W0WAM, Kansas City, (816) 358-1148.

OSCILLOSCOPE: Heath IO-14 triggered sweep w/ delay line 40 ns rise time 8 MHz bandwidth. Like new. Best offer over $200. K2MVR. (201) 239-1050.

WANTED: Instruction manual or Xerox copy, for Heath Condenser Checker Model C-3. WB0IAH, 5004 Amy Circle, Omaha, NE 68137.

SELL: Hammarlund HQ-170 receiver with manual, in good condition. $125 plus shipping costs. Joe Roberts, W7DRR, 9251 N. 37th Ave., Phoenix, AZ 85021.

TOUCH-TONE PADS: 12 button, full leads, guaranteed. Unlighted, $12. Lighted, $16 postpaid/insured. Need DC-3 or 4 supply for TR4. State condition and price. Swank Roberts, WA5GNT, 1130 Fuller Dr., Apt. 223, Dallas, TX 75218.

HOMEBREW LINEAR: 4 811As in GG- 5 band switching with separate HD Power Supply, First $75.00. WB5HGQ, 2117 Westlake Dr., Plano, TX 75074.

WANTED: Robot Model 80 SSTV Camera and Magnum Six for Collins 32-S3. Mike Ludkiewicz, 143 Richmond Rd., Ludlow, MA 01056.

WANTED: KW low pass filter. W6LDM, Ken Bourke, 6939 Florey St., San Diego, CA 92122. (714) 453-2340.

SELL: 51J3 w/prod det, $275. Pair Motorola H-23 2 mtr w/chgr, $75. HQ-110, $55. K0GCJ, 4322 Blauvelt Rd., Grand Island, NE 68801.

TELETYPE PAGE PRINTERS: Model 15 Type in Western Union Floor Console. Checked and ready to go. $50.00. WB5HGQ, 2117 Westlake Dr., Plano, TX 75074.

JOHNSON VIKING II XMTR: Needs minor repairs, w/VFO & Manual. Send for details. M. London, 104 Hilldale Rd., West Hartford, CT 06117.

SWAN CYGNET 270B Transceiver and Vox, Shure 444 Mike. Mint condition. Goldsmith, 72-35 Little Neck Pkwy., Glen Oaks, NY 11004, (212) 343-6193.

2 MTR FM: SBE144 with 9 channels crystalled, $225 or best offer. Want SB640 and SB610. WA1MCY, 53 Old Amesbury Line Rd., Haverhill, MA. 01830. (617) 372-2408.

HEATH GRID DIP meter GD-1B. Coils 2-250 mc. W/manual. Very good condx. $18 postpaid. H. Marhoff, P.O. Box 569, Largo, FL 33540.

FOR SALE: SB303 HA10 kw linear HT37 Swan 350 w/ps. WANT: 200/500cps filter for 75S-3C. 312B4 stn ctl. W7KSG, 1876 E. 2990 So., Salt Lake City, UT 84106.

AWARD HUNTERS: For info New York Chapter, N.A.H.C., Joseph Schwartz, K2VGV, 43-34 Union St., Flushing, NY 11355.

JOIN: Fastest growing CB QSL Club in the Northeast. The CB Radio Club would like to have you as a member. If you collect QSL cards and would like to receive many cards, this is the club for you. Info: please contact: Box 427, Rego Park, NY 11374.

GALAXY III, A.C. supply & vfo, rcvr audio low. Xmtr 300 watts pep. Cheap. $210. W7UD, 3637 W. Grandview, Tacoma, WA 98466.

AM AMATEUR GEAR: Nice equipment. Cleaning out shack. QST's back to 1917. Also 73, CQ, and Radio. SASE for list. W2GHF, CPO - Box 603 Kingston, NY 12401.

SELL: Application of Electronics, 628 pgs., audio visual, Dale. Radiotron Designers Hdbk, 1500 pgs. Radio Handbook, Orr, 810 pgs., $62. All mint. $5 each, FOB. Douglas, 2254 Pepper, Concord, CA 94520.

COMPLETE OPERATING STATION. Drake 2B Rcvr. Valiant Xmtr. All manuals, tower, 3-el beam, all excel., $500. WA2PPV, (516) RO4-9077.

SELL: One owner Collins 32S-1, 516F-2, 75S-1, 312B-3, 30L-1. Beautiful station. $895.00. WA2-RJV, Box 2775, Harrisburg, PA 17105. (717) 761-1107.

WANTED: Color Bar Generator, reasonable. For Sale: Multi-Elmac A-54H Five band Xmtr Am-Cw-$25. W7IDX, 7239 Sunny Brook Dr., Boise, ID 83705.

TV CAMERAS: EMI — Fairbanks Morse with most options, like new, $125 or complete non-working units, $70. WB2CLN, T. Neuhaus, 189-19 45th Ave., Flushing, NY 11358. (212) 463-6296.

EVERY SERIOUS DXer should have a 24 hour wall clock. Battery or electric. Steve Antosh, WB5-BNM, 1524 N. Oklahoma Ave., Shawnee, Okla. 74801.

WANTED: by collector: 50-100w. AM gear. PS unnecessary. State make, mod., serial, cond. W6ZI, 595 Midway, Novato, CA 94957.

SELL: New 2 meter Standard SCR-146, $220; 0.1 watt FM Xmitter, $30. Used Gladding 25 w/ 12 crystals, $200. Heath twoer, $25. W5QNQ, 2025 O'Donnell, Las Cruces, NM 88001.

LINEAR BUILDERS: 30 AMP Filament Chokes for GG Linears. New, Bifilar Wound, 28 turn No. 10 wire on 7-1/2" X 1/2" core. Sat. guaranteed. V. Murrell, K4HHA, Rich Rd., Newport, TN 37821.

220 MHZ: Skeds wanted! AM, CW or SSB. Also any info on 220 FM simplex freq in use. Write: K8HWW or WA8ZCO, 16245 Beechwood, Birmingham, MI 48009.

WWV REC GEN MICRO 550, $95. National URR27 110 to 190 MC $110. Heath 2m Pawnee, mint, $140. John Murray, W2OAP, 40-33 61 St., Woodside, NY 11377.

SELL JOHNSON VIKING TWO, with 122 VFO and manuals. $65 plus shipping. Want DC-35 supply for Galaxy V. Jim Brooks, K0JJV, 1905 Marshall Rd., Hays, KS 67601.

POLYCOMM 62, six & two meter transceiver, AC and DC supply, no manual, $70.00. Jim, K4VBH, Box 268, Americus, GA 31709.

FOR SALE: KWS-1 No. 1451, $750. SC-101 complete $200. B&W 6100 (SSB) $250. Others. Send for list. James W. Craig, 29 Sherburne Ave., Portsmouth, NH 03801.

Eldrado 740 counter, $35, G.E. 30-50 mc FM mobile rec, $20. Variac 220 V $15, Sig Gen 5-100 mc $35. K6KZT, 2255 Alexander Ave., Los Osos, CA 93401.

NOTICE: W1-W2-W3 Novices: The Eastern Area Slow Net, EASN on 3.726 khz 7:30 pm local. Mgr: WA1PHJ. All welcome. de WA2EXX.

NCX5-NCXA. Very clean. $345 FOB Tacoma. W7-UD, 3637 W. Grandview, Tacoma, WA 98466.

WANTED: Good ham receiver, QRP rig, also back issues of Heathkit catalogs. Ed Herbert, WA3NMW, 410 N. Third St., Minersville, PA 17954.

WANTED: Reliable CB'ers in Queens to start radio patrol on channel 9. Will be moving off channel 9 prior to starting patrol. Must be 16 years of age and own a citizens band set. Details: Elmhurst Radio Patrol, Box 427, Rego Park, NY 11374.

RETIRED: Sell 28 years accumulation radio/tv/audio parts stock & test equip. Ham since 1922, SASE for list. W8VZ, 520 3rd St., Marietta, OH. 45750.

WANTED: Schedules with KL7, VE8 and VE7 stations, for friendly chit-chat and info on opportunities in these areas. Gene, WA5ETK, 817 W. 11th St., Littlefield, TX 79339.

SEXTANT: 1907 English, A collector's dream w/5 telescopes, in mahogany case. Perfect condx too. $165.00 postpaid in 48. H. Marhoff, P.O. Box 569, Largo, FL 33540.

SELL: Bendix R.F Power and VSWR Coupler Unit Model 252U1, Freq 3 to 225 MCS, new, $25. You ship. TR4 Rotator and box, $20, you ship. Myron Knowles, 9 Brown St., N. Billerica, MA 01862.

WANTED: PP-1175A, manual and interconnecting cables for RT-68, also AC power supply and manual for BC-221. WA4TOJ, 2957 Gaffney Rd., Richmond, VA 23234.

SALE/TRADE 16mm Movie Equipment. Camera with turret head with three Lens. Sound on film projector/amplifier, speaker. Make offer. 367 Northwest, Vacaville, CA 95688.

GONSET G-50, $85. Ameco 6 & 2 mtrs conv. & powr supply, $30. Ameco SWR bridge & meter, $15. WB2WTJ, 1720 77th St., Brooklyn, NY 11214. (212) 331-6634.

SALE: Collins VHF receiver ARN 14 freq 108-135.9 mhz w/control and Dynam Exc., $60. Bendix UHF transceiver ARC-33 freq 225-399.9 mhz w/control exc., $60. K7SPH, Box 4099, Tucson, AZ 85717.

SELL: Sonar FR-2513 24 channel VHF Monitor Receiver. All crystals. Details on request. WDX-2OBU, 22-26 Greene Ave., Ridgewood, NY 11237.

WANTED: SX122 or 122A in excel. condx. R-50 speaker, SB-34 transceiver, and SB2LA Linear. T. Coddington, WB6AWC, 7825 Scotts Valley Rd., Lakeport, CA 95453.

BARGAIN: HY-GAIN Model 203-BA, 20 meter, 3 el beam with manual, $39. Pick-up or pay postage. K4KZP, 305 Alpine Dr., Roswell, GA 30075.

AWARD HUNTERS: Write to Joseph Schwartz, New York Chapter, N.A.H.C., 43-34 Union St., Flushing, NY 11355.

UHER REPORTER 4000L, like new, all extras, leather case, $180. QSTs 1955 to 1972 5 cents ea., Also CQ-DL, DL-QTC 1960 to 1972. WA9UVL, Kurt Silber, 915 Ransom, Ripon, WI 54971.

NEEDED FOR W.A.S.: Alabama, Alaska, Idaho, Montana, N. And S. Dakota, S. Carolina, Tennessee, Vermont, Wyoming. For a schedule write to: Sid. Deitz, W2FDE, 14 Wickford Ave., Trenton, NJ 08618.

SELL: Ten Tec PM3, $35 plus shipping. K4VZI, 6007 Kaywood, Knoxville, TN 37920.

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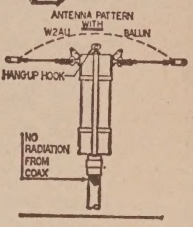
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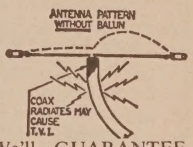
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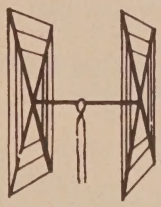
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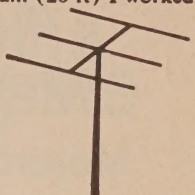
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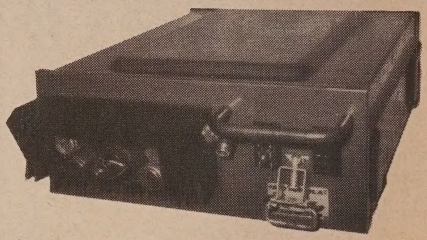
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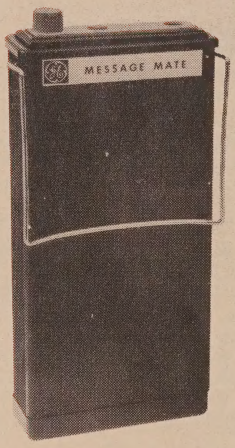
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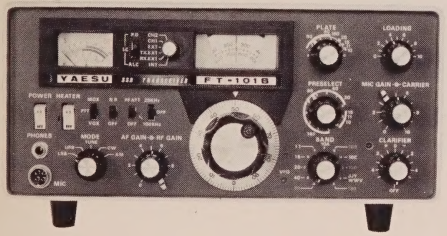
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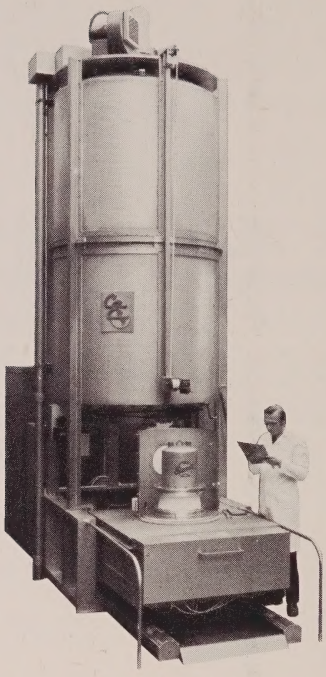
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